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HEAVY EQUIPMENT MAINTENANCE SOFTWARE FOR THE MINING INDUSTRIES

A MARKET FEASIBILITY ANALYSIS

By

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B. S., Montana State University, 1985

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CHAPTER 1

INTRODUCTION

The purpose of this study was to gather data that will help a local software development firm, InfoTech International of Butte, Montana, make pre-introduction marketing strategy decisions. Two products are being considered for market introduction: FACTS, a heavy equipment component monitoring software package for microcomputer use, and ACCESS, a mine networking service for use on either microcomputer or mainframe hardware. The initial application for ACCESS will also be heavy equipment monitoring.

The following analysis focuses on the FACTS software application. This decision is based on a determination by the developers of the package that revenues will be generated more quickly from sales of this product. In addition, time constraints did not permit a detailed analysis of the potential market for ACCESS at this time.

This market research study is needed by the developers of the FACTS application software under study. They plan to make introduce, revise, or scrap decisions based, in part, on the results of this analysis. If results are positive, they will be used as support for requests of federal and state agencies for future funding.

The primary objectives of this research were to determine whether software packages similar to FACTS are currently available in the

marketplace and, if so, at what price they are being offered. In addition, it was the intent of this study to arrive at a conclusion as to whether the heavy equipment industries would be receptive to commercial introduction of the new equipment maintenance monitoring software.

The information gathered through this research can identify specific industries where a need for InfoTech's product exists. It can also provide benchmark pricing for similar packages against which FACTS' cost can be more competitively set. On the other hand, results can lead to the conclusion that no market for the product exists.

The computer software application referred to above has been reviewed by MBA students, by consultants and by federal and state agencies. The results of these previous efforts are reviewed in this research. Ultimately, this effort is an extension of these prior studies and analyses.

Research performed included a search for and review of prior studies of software usage in heavy equipment industries. Data were also gathered on competing software offerings so that price and feature comparisons could be made. Finally, primary data were gathered by surveying the heavy equipment industries. A questionnaire was developed and distributed to a sample of firms selected based on size, industry and geographic location. The survey was designed to solicit information about computer systems and applications currently in use in these companies.

This study was limited in its scope. It was not feasible, given the financial and time resources available, to survey all firms in all

segments of the heavy equipment industries. Only three industries, all

of which are engaged in mining endeavors, were included in the survey

population. This resulted in a very small percentage of all heavy

equipment users being contacted. This may not be a broad enough base

for InfoTech to make a decision on scrapping or continuing its project.

Additional limitations regarding the mail survey are cited at the end of

chapter seven.

Another factor limiting the depth of analysis undertaken by this

study was data availability. Cummulative development costs for the

FACTS package was not determinable. In addition, pricing for the

program had not been adequately researched at the time of this writing.

These problems hampered pricing analysis and made comparison of FACTS to

other packages already available on the market difficult.

The paper is organized into the following chapters. Chapter two

introduces InfoTech and its product, and identifies deficiencies in

InfoTech's marketing plan, as determined through previous research. It

also includes a review of prior studies and analyses of the firm, and

summarizes the recommendations that resulted from these efforts.

Chapter three reviews the results of prior studies of computer

usage within the heavy equipment industries. Chapter four covers

competing software packages currently available on the market and

presents details regarding features, pricing and other available data

for these packages.

Chapters five and six introduce the heavy equipment industries

survey and present its results, respectively. Sample selection,

questionnaire design and the data gathering methodology employed are

discussed, and a stratified analysis of the results is presented. Chapter seven presents recommendations for InfoTech, based on the results of this study.

CHAPTER 2

INFOTECH INTERNATIONAL

BACKGROUND DATA ON INFOTECH INTERNATIONAL

InfoTech International, Inc., (InfoTech) is a Butte-based software development firm. It is an entrepreneurial sole proprietorship. The company currently has two product offerings nearing availability for sale. The first is a personal computer software package called FACTS. FACTS is designed to track heavy equipment component performance for the purpose of improving operational efficiency and maintenance effectiveness.

The second offering is a network service named ACCESS. The network is designed to link heavy equipment operators, information specialists, vendors, manufacturers and academic and business professionals through electronic messages and meetings. Its initial application will be in the area of heavy equipment component monitoring.

InfoTech began, in 1974, as Mine Tire Company, a firm engaged in the distribution of an industrial tire manufactured to specifications designed to extend tire life. The company targeted mining firms as its primary market due largely to the founder's background and experience in this industry. The ideas behind FACTS were born out of this experience.

Mine Tire Company was not a successful venture and eventually was abandoned. In its place and with technological applications in mind,

Mine Tire's founder established a consulting firm, Mine Data Computer

Services, Inc., in 1977. The company specialized in tire management for

large mining operations. It used the initial versions of FACTS to gain

a competitive advantage over other consulting firms and to attract

clients. The FACTS application was then an assembly language system

operating on a DEC MICRO/PDP-11 microcomputer.

The success that was achieved by Mine Data Computer Services and

the increased popularity of small computers prompted the founder to

attempt adaptation of the FACTS software package for IBM and compatible

microcomputers, which represented a large and rapidly growing market.

Thus InfoTech was founded.

Technological advances by the middle to late 1980's improved the

speed, quality and affordability of computer systems, especially

microcomputers. It was possible to link computers in distant locations

to a central data storage and transmission facility. The growth in

networking prompted InfoTech to develop such a system for the mining

industry.

The FACTS software program is a tire information and financial

management system for any size tire fleet. Warranty, purchasing,

maintenance and operating data are input to the system and comparative

information on component performance is generated. The following annual

trend analyses are available: comparative unit performance, operating

cost analysis, comparative wearabilities, comparative purchasing

summary, cash flow analysis, scrap tire analysis, projected annual cost,

comparative test tire analysis, cost analysis of reasons for removal,

inventory cost control, and tire shop scheduling and management.[1]

Total tire costs are detailed for ten different areas in order to effect bottom-line control over tire cost centers. These cost centers include purchasing, service, maintenance, repairing, recapping, inventory, warranty adjustments, tire shop productivity and tire related equipment down time.[2]

FACTS contains unique error-trapping logic which allows almost 100 percent data integrity. The package is designed to provide both rolling stock and scrap tire analysis. The capability to monitor multiple fleets of different types of equipment and the ability to process data at remote sites and import this data to a central location are also FACTS features.[3]

INFOTECH MARKETING PLAN DEFICIENCIES

Several deficiencies in InfoTech's marketing plan were identified directly or indirectly by the studies and analyses performed for InfoTech prior to this research. Deficiencies include a lack of data on competing software packages, no determination of the price at which the product should be offered, and inadequate research on user needs.

The prior studies and analyses and their results and recommendations are discussed at length in the next section of this chapter. This professional paper is an extension of those studies. It is a response to the recommendation of the above cited analyses that a target market segment, if one exists, be defined.

Integral to definition of a product's market is knowledge of the competition. If similar software packages are currently available in the marketplace, it is critical that pricing of the new entrant also be

competitive. This research is designed to provide information useful to InfoTech for development of its pricing and target market penetration strategies.

PRIOR STUDIES PERFORMED FOR INFOTECH

Several analyses of InfoTech have been performed during recent years. These studies have been undertaken by numerous groups, including MBA students and private consultants, and for various reasons. InfoTech has been evaluated at both the micro and macro levels.

In 1985 two University of Montana MBA students, Timothy A. Allwine and Hal Fossum, prepared a consulting analysis for Mine Data Computer Services[4]. The study was focused on whether the firm should develop its proposed FACTS software package as a modular application for the IBM microcomputer.

The study identified four major risks associated with introducing and marketing the product. The first was the market's receptiveness to a complex product for a previously unmanaged field. It was possible that users would be wary of a product that none of their peers were currently using.

The second risk identified by this study was piracy within the software industry. Another firm with a greater resource base, both human and financial, could take the concept, modify the program, and introduce it under their own trademark. Were this to occur, especially if perpetrated by a well known and reputable firm in the industry, FACTS and InfoTech may find themselves in an intensely competitive arena. In this case, creating brand loyalty would be of paramount importance.

Incompatibility of the product with hardware currently in use in the target marketplace is a third potential risk involved with the commercial introduction of FACTS. Although IBM is the leader in sales of microcomputer hardware systems, it may not be the most popular brand within the mining industry. Introduction of an IBM-PC compatible product into an environment in which mainframe hardware is the standard would result in no market at all for the FACTS package.

Dependence on one individual as sole systems expert is the fourth, and perhaps most potentially devastating, risk involved with the current FACTS plan, as reported by this study. If the programmer were no longer available, the time and effort required to train a new systems expert may well exceed that available for a potentially successful introductory schedule. In addition, sabotage of the program is also a possibility.

Allwine and Fossum concluded that the economic and technological scenario at the time was conducive to successful product introduction and market development. They felt that the lack of a comparable product constituted a marketing edge. Their recommendations were four-fold.

First, they suggested that Mine Data Computer Services perform market research and trial marketing in an attempt to anticipate reactions in target markets. They also recommended that Mine Data Computer Services employ an aggressive marketing effort in order to achieve swift penetration of the market. The third suggestion was that the firm develop high quality advertising and user documentation. This would likely require hiring of additional professional and technical staff or the use of agencies. Finally, Allwine and Fossum recommended that Mine Data Computer Services formalize its agreement with the

current systems expert and that a second computer specialist be hired
and trained.

In 1987 and 1988, InfoTech applied for several federal and state
grants designed to foster small business and technological advances.
This necessitated development of a business plan. The plan that
InfoTech compiled was reviewed by the Montana Science and Technology
Alliance (MSTA). InfoTech´s founder stated that the MSTA´s major
criticism was the lack of an adequate marketing strategy. Responding to
this deficiency, InfoTech hired an advertising consultant. No results
of this study have been made available to the author. Because this
study is not intended to extend to the point of reviewing or
recommending advertising strategies, this is not considered to be a
limitation of this research.

In addition, Gary Whitney, a marketing consultant affiliated with
the National Center for Advanced Technology, was retained to develop an
overall marketing plan. His September, 1988, report[5] presented a
marketing approach aimed at reaching a sales level of approximately 500
units during the first year. InfoTech´s goal, as defined in its
long-range business plan, is to sell 18,500 units during the three years
following the introductory year. This number was based on InfoTech´s
judgemental estimation of the potential market and demand for its
product.

The consultant recognized that definition of a target market
segment was essential to success, but he did not come to a conclusion as
to what that market is. Nor did he present specific recommendations on
this point. Only a general approach for accomplishing this task was

described. This report defined the FACTS package as a component
monitoring tool, distinguishing it from preventative maintenance (PM)
packages already available in the marketplace. He stated that "to the
degree that companies don't have any PM application software, FACTS is
new."6

The Whitney marketing report recommended that InfoTech conduct
background research extensive enough to enable the firm to target the
correct market(s). It suggested that InfoTech locate lists which could
be used as a focus for direct mail and telemarketing efforts.
Acquisition of lists to be used as industry information sources was also
recommended. Investigating the competition for information about price,
product and promotion decisions was the final background research effort
suggested by Whitney. Successful efforts in all of these areas should
result, in Whitney's estimation, in a base of potential customers.

The report recommended several methods by which InfoTech could
receive free promotional exposure. The company could secure listings in
directories and software databases. It could also promote itself
through features in trade publications' new product citations,
newsletters and articles. InfoTech could also secure favorable reviews
from appropriate influential industry players, and the firm's systems
expert and the founder could write publishable articles about computers
and heavy equipment maintenance for the trade press. It was recommended
that InfoTech pursue all of the above avenues in its efforts to gain
free promotion. These actions, in his opinion, would result in
increased and favorable recognition of InfoTech within the software and
heavy equipment industries.

Another of the report's recommendations was that InfoTech conduct field trials of the FACTS software package. The consultant recognized that these efforts would necessitiate locating field reviewers, providing FACTS software to the reviewers, and monitoring and supporting these users. He felt that these efforts should be made because valuable feedback would be received that could be incorporated into the product design and marketing message.

Securing dealer commitment was another recommendation of the Whitney report. He suggested that this be accomplished by first locating potential dealers. Once dealers were found, InfoTech could then arrange dealership agreements and establish dealer support functions.

Recommendations were also made in the Whitney report regarding the product, its pricing and promotion, and product distribution. Estimated costs and implementation schedules were also presented for FACTS' introduction.

At present, FACTS software for IBM and compatible PC's is in the debugging stage.

CHAPTER 3

PRIOR STUDIES OF THE MARKET

METHODS OF OBTAINING DATA

"Reviewing and building upon the work already compiled by others is an economical starting point for most research."[7] Studies of computer hardware and software usage specific to a particular industry are more likely to be conducted by oversight or other organizations whose members are firms engaged in that business.

Based on these premises, 28 trade associations and three trade publications were contacted by mail and asked to share the results of any studies of computer usage they had conducted within their industries. Trade organizations in the following industries were approached:

- Coal mining

- Construction

- Logging

- Machinery (equipment) manufacturing

- Machinery (equipment) distribution

- Machinery (equipment) maintenance

- Metals and minerals mining

- Sand and gravel

- Stone

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These industries were selected because they extensively use heavy equipment and because firms within these industries can be found in close proximity to the Butte area. If any of these industries were determined to be promising prospects, pilot studies and direct selling efforts by InfoTech could be implemented quickly and inexpensively.

Of the 28 organizations contacted, two had moved and left no forwarding address. Twelve of the associations did not respond to the request for information even after a second letter was sent. Seven organizations wrote to say that they knew of no such studies having been performed within their industries.

One construction equipment council sent a list of data processing associations that they thought might be of assistance. Another construction equipment organization sent a copy of their annual convention brochure which included a list of all exhibitors. The American Mining Congress sent the list of three publications that were contacted as cited above. None of the journals responded to the request for information but library research uncovered an edition of one of these magazines which presented such a study. Four trade associations provided copies of studies or other systems related activities they had conducted.

A summary of organizations contacted and the responses received can be found in Appendix A.

DATA COLLECTED

The Northwest Mining Association of Spokane, Washington, provided a collection of ten papers presented at their 1985 short course

"Micro-Computer Applications for the Mineral Industry."[8] This course

focused on several computer applications currently in use in the mineral

industry. Topics covered during the course were spreadsheet packages

such as budgeting, cost control and graphics, and Lotus 1-2-3 templates.

Also included were geophysical applications, land use planning programs,

construction project control packages, and computer assisted economic

analysis.

The course was presented because,

> "in 1985, the mineral industry [was] under
> significant economic pressure due to depressed metal
> prices and decreased demand for most minerals. It
> [was] imperative that the industry adopt cost
> effective measures in maintaining mining operations
> and conducting business."[9]

The Northwest Mining Association recognized

> "effective use of computers as one method by which
> the mineral industry [could] maintain cost controls
> and increase productivity. Computer applications
> were being developed and improved continuously for
> nearly every business and technical application.
> Thus, exposure to computers [was] important....in
> the technical and business environment of [the
> day]."[10]

This effort by the Northwest Mining Association, although now

dated, does merit the inference that microcomputers were the systems

that the organization felt had the most potential usefulness within its

industry. Several of the papers presented at the short course were

applications run on IBM and compatible personal computers.

The National Aggregates Association of Silver Spring, Maryland,

provided a 1985 study "Data Processing Equipment Utilized in the Sand

and Gravel and Ready Mixed Concrete Industries."[11] This study contains

very useful detailed data on computer hardware and software then in use

by surveyed industry segment. The segments reported on were ready mixed concrete, concrete piping, sand and gravel, precast and prestressed concrete, and other. Although dated, it may provide a benchmark against which current usage can be measured in order to judge the increase in microcomputer use over the last four years within the industry segments just mentioned.

The Association's questionnaire was mailed to all 409 members of the National Sand and Gravel Association and the National Ready Mixed Concrete Association. Two hundred thirty-three responses were received for a response rate of 57 percent. The results were presented by system type, mainframe/mini or personal computer hardware, and by software used. The software categories were segregated into accounting and industry specific applications. Within each of these four presentations, responses were detailed by industry segment.

Preventative maintenance was one area where respondents were asked to provide data regarding the level and type of automation in their firms. Because this is an application related to FACTS, these results are discussed as they pertain to microcomputer hardware.

One hundred thirty-eight of the 233 respondents (59 percent) to the Aggregates Association survey indicated use of a microcomputer system in their firm. Twenty-four of these 138 (17.4 percent) identified preventative maintenance as one application used on their microcomputer systems. Twenty-two of the 24 (91.7 percent) used IBM or compatible hardware systems. Five of the 24 (20.8 percent) indicated that the PM package used by their company was self-designed or customized for their operation.

For the Sand and Gravel industry segment only, 95 out of 130 firms
contacted responded to the survey, for a stratified response rate of
73.1 percent. Of these 95, 66 (69.5 percent) indicated microcomputer
usage within their companies. Only nine (9.5 percent) of these firms
had a preventative maintenance software application for their computer
systems in 1985. All nine of these, however, were installed on IBM or
compatible systems.

The 1985 Aggregates Association survey also presented comments made
by participants regarding the study itself. Pertinent comments made are
that the survey should:

- Add the software category "Maintenance Record
  Keeping";

- Include a listing of software companies that
  specialize and are used in the industry;

- Include information as to software used in the
  industry and packages designed for the industry
  including price, availability and user
  experience;

- Specify the names of software packages being
  used on microcomputers and personal computers;

- Establish a catalog of IBM-PC compatible programs;

- Include reviews of software suppliers.[12]

Results of the National Aggregates survey lead to the conclusion
that, in 1985, microcomputer hardware, especially IBM and compatibles,
was extensively used within the aggregates industry. One could also
conclude that there was a need, albeit minimal, for maintenance record

keeping software. In addition, respondents appeared to desire catalogs of software suppliers and data on other firms' experience with both the packages offered and the suppliers.

Associated Equipment Distributors (AED) of Oak Brook, Illinois, provided a copy of their April, 1987, survey entitled "Electronic Data Interchange/Communications Questionnaire."[13] Also included was their analysis of its results. The AED survey was mailed to 836 member distributors and had a response rate of 27 percent, or 223 returned questionnaires.

The survey's questions were mainly concerned with member distributor's experiences with and need for communication links with manufacturers. However, four of this survey's questions provided information pertinent to the goals of this study. These questions solicited data regarding current use within responding firms of microcomputer systems.

Sixty-nine percent of distributors responding to the survey (154 firms) said that they currently use microcomputer systems in their operations. The average number used was 3.8 per distributorship. The results stated that the most commonly used brands were IBM and IBM compatibles, although no specific frequency of usage was disclosed.

The results of the Associated Equipment Distributors' survey lead to the conclusion that, in early 1987, equipment distributors responding to the survey extensively used microcomputer hardware systems.

The AED also publishes the periodical Construction Equipment Distribution. The December, 1988, issue contained the article "1989 CED Data Processing Directory."[14] The article was prepared as a guide of

member companies that specialize in providing hardware and software to
the industry. It included purchasing tips and a vendor services buyer's
guide.

The buyer's guide listed thirteen distributors of system-related
products. Of these thirteen, four offer a software package similar to
FACTS that can be run on IBM-PC or compatible hardware. National
Distributor Services, Inc., markets a Machine Ownership package and a
Maintenance Scheduling package. Rinfo, Inc., sells an Equipment
Management software program. Management Technology America offers a
Machine Ownership package and Interactive Software Systems provides an
Equipment Maintenance package. Specific data on the program functions
and operation was not disclosed in the article. Because of this,
detailed comparison of these packages to the FACTS program cannot be
performed.

Constructor magazine's December, 1987, issue included an article
entitled "Construction Industry Software Inventory."[15] The publication
is sponsored by the Washington, D.C.-based Associated General
Contractors of America. The article details the diversity of computer
applications then available to the construction industry in nine pages
of listings. The intent was to help members find the software that best
meets their needs.

Of the hundreds of software applications listed in the inventory,
only four vendors were identified as offering a package similar to FACTS
for use on IBM-PC's and compatibles. ATE Management & Service Co.,
Inc., offers EZFleet; Computer Source, Inc., provides an Equipment
Maintenance package; Diagonal Data Corporation markets FLEETMAINT; and

Fleet Distribution, Inc., offers several fleet-related programs including a Preventative Maintenance package.

Pricing information was not provided for any of the above packages nor were specific details on program functions. Comparison of FACTS' features to these offerings is, therefore, not possible.

Some specific information was provided regarding support and other services included with the purchase of the applications listed in Constructor. This included data on product support and available training. All the packages mentioned above provide toll-free telephone service for user support and trouble-shooting, and include owner and operator manuals in the purchase price. On-site training or instruction from local dealers was also offered by all these manufacturers at no additional charge.

SUMMARY

Two overall conclusions can be drawn from the information that has been collected. First, microcomputers, especially IBM and compatibles, are extensively used in certain industries, such as sand and gravel. Second, it seems as though there may be a limited demand for equipment-related software packages, but at the end of 1987 there were few of these available in the marketplace.

Data collected by review of prior studies of computer usage in the heavy equipment industries does not provide enough of a foundation on which a FACTS marketing decision can be based. Most of the studies discussed are outdated, especially since technology has changed and improved so dramatically during the past few years.

CHAPTER 4

COMPETING SOFTWARE

FEATURES, PRICING AND OTHER DATA

Library research was undertaken in order to gather secondary data on software offerings that would directly or indirectly compete with FACTS in the marketplace. Software listings for 1986-1987 and 1988 were reviewed. These directories identified numerous software packages that may provide additional competition for FACTS.

The Software Encyclopedia 1986/1987: System Compatibility/ Applications, published by R.R. Bowker Company of New York, New York[16] was one source of information. It listed three software packages, not mentioned in the preceding chapter, that seemed to provide performance that could be considered by users as similar to that of FACTS. Unfortunately, no pricing information for the programs was given, and the descriptions of program functions was brief.

The first of these similar software packages is "Computerized Fleet Maintenance (CFM)", provided by Moscom Corporation. It is designed for operators of truck, bus and auto fleets and is meant to function as a troubleshooting tool for management and fleet maintenance personnel. It tracks and summarizes fuel consumption, parts use, repair labor, and vehicle operating costs, and will schedule preventative maintenance based on parameters set by the operator.

The second is "Transportation: Vehicle Maintenance System",
developed by SourceView Software International. It provides operators
of vehicle fleets with a method for tracking and summarizing information
about vehicle maintenance costs.

The third package is "Vehicle Management System: VMS," provided by
Roger Creighton Associates, Incorporated. It is designed for any
vehicle type and includes, among other things, the ability to retrieve
and manipulate data on historical usage, fuel consumption, maintenance
costs, and tire mileage. It also includes a PM system.

Data Sources: Software, 1st Edition 1988 Volume 2, published by the
Ziff-Davis Publishing Company of New York, New York[17] was also used as a
source of information on software packages that would compete with
FACTS. This publication identified over 60 such software packages.

Many of these packages are preventative maintenance programs that
track equipment repair histories and usage, and that also schedule PM.
Review of these packages indicates that they generally offer the same
generic features including basic scheduled services, equipment histories
and, frequently, inventory control over spare parts. Some offered more
complicated applications and were priced higher. The descriptions
included in this listing were often not adequate to determine what a
higher priced package offered that the lower priced programs did not.
Prices ranged from $339 on the low end to $40,000 on the high end of the
spectrum.

Several of these programs are worth mentioning as they may provide
the most direct competition for FACTS. One is "Fleet Maintenance
Management System," by Hansen Software, Incorporated. This program

tracks engine repairs and tire maintenance, and handles spare parts inventories. It assists management in identifying which parts are used on which vehicle, how frequently, and at what cost. It provides cross referencing to establish relationships. No pricing data were listed.

"Micro Truck," by Distribution Management Systems, Inc., includes a tire rotation report detailing usage in addition to its basic generic features. Six of these systems have been installed. The package costs $695.

Also a potential competitor is "EZFLEET Shop Maintenance," by ATE Management Service. This package was identified in the Constructor magazine article discussed earlier. It provides information on component reliability for truck, vehicle or heavy equipment fleets for a one-time fee of $3,500 and up. The program can be leased for $183 per month. Annual maintenance costs are $560. The manufacturer claims that 32 of these systems have been installed.

"Fleet Maint," by Diagonal Data Corporation was also mentioned in the Constructor article. In addition to providing maintenance scheduling and work orders, it reports costs per mile, miles per gallon, fuel and oil usage and total maintenance costs. Finally, it provides tire tracking. The cost of a one-time license is $4,950 to $14,950, or the system can be leased for $460 per year. Maintenance fees range from $595 to $1,500 annually. Three hundred of these systems have been installed.

"MMS (Management Maintenance System)," by The Assist Corporation, provides maintenance controls including work orders, work forecasting, failure analysis, equipment histories, PM, effectiveness analysis, and

cost of ownership reports. Its cost is a one-time fee of $40,000 with maintenance charges of between $500 and $5,000 annually.

Computerized Fleet Analysis, Inc., markets "CFAVMRS," Phases I through IV. This system costs between $1,795 and $4,700 to purchase. Five hundred of these packages have been installed. The program includes fleet maintenance costing, PM scheduling, cost and exception reporting, repair histories, shop productivity, inventory control, vendor analysis, part failure analysis, and warranty and life cycle analysis for any type of equipment.

Oliver Marketing, Incorporated's Specialized Software Division markets "RELCODE" for a one-time fee of $1,495. This package uses data related to the history of component failures to determine the best replacement policy, that is, whether to replace when a component actually fails or to replace on a preventative maintenance basis.

Other of the 60-plus packages described in Data Sources may function in a manner similar to FACTS but, based on the descriptions provided, the above are the most similar. It is possible that modifications can be made to these packages that would permit a more comprehensive tire and other component maintenance program to be installed.

ANALYSIS OF THE MARKET

Equipment related software packages similar to FACTS are available in the marketplace, as established in this and the preceding chapters. However, based on function descriptions reviewed, none are as dedicated to component tracking as FACTS. In addition, no other software package

identified data integrity as one of its features. This unique programming logic is designed to trap input errors. The integrity of reported information provides management a basis for developing productive communications with vendors and manufacturers of tires. Ultimately, FACTS is designed to provide industrial tire users with leverage in persuading manufacturers to develop better quality products.[18]

A majority of the software packages listed in Data Sources had fewer than 75 units installed. Of those with more than one hundred systems in use, most were in the lower, under $2,000, price range. "PMS (Preventive Maintenance System)," by Josalli, Inc., was the package claiming the greatest market penetration with 700 units installed. The cost of this program is $495. It provides equipment inventory and accounting data, PM schedules, equipment hisories, and reporting.

This package was introduced in 1983. Assuming equal annual sales volume, the gross income from this product would be $57,750 per year. The average net profit margin for computer software and services companies included in The Value Line Investment Survey,[19] is 8.9 percent. Applying this margin to the previously derived gross income would result in a $5,140 net profit from sales of the program annually. This would not be a comfortable income for one person and could not support additional reasearch and development or added staff.

"MAINSAVER," by J B Systems, Inc., may have had the greatest financial success of all the 60-plus software packages. Applying the average of its $4,975 to $60,000 price range ($32,487.50) to the 200 systems installed, total gross revenues of $6,497,500 is assumed.

Dividing this by the six years the package has been on the market results in an annual gross revenues of $1,082,917. Again applying an estimated 8.9 percent net margin, J B Systems pocketed as much as $96,380 each year. This income level could support a small business provided that this level of annual sales could be sustained.

The features offered by "MAINSAVER" include a management information system and manpower, materials and equipment histories with financial controls. It schedules PM and tracks plant and equipment, work orders, spare parts inventory, and purchase orders. In addition to IBM products, it is also compatible with several other microcomputer hardware systems.

Of all the packages reviewed, "Fleet Maint," "EZFLEET," "RELCODE," and "CFAVMRS" provide the greatest threat to the market success of FACTS. The first has a built-in tire tracking application. The second tracks equipment component reliability. "RELCODE" maintains component failure history, and "CFAVMRS" includes vendor analysis, part failure, warranty and life cycle analysis applications for eqiupment.

Many of the software packages identified as competitors of FACTS may not exactly duplicate all the functions and intent of FACTS. It is highly probable, however, that some users will view the FACTS program as a substitute for these programs. Given the visibility and track record of packages currently on the market, InfoTech may find it difficult to promote FACTS to a sales volume that would provide a reasonable profit.

In addition, the point at which the marketplace becomes saturated with product offerings is not determinable based on the data collected through this research. Sales volumes achieved by Josalli with PMS and

by J B Systems with MAINSAVER may reflect annual volumes that have decreased over time. One or both of these software packages may be in either the mature or decline stage of product development. If this is the case, FACTS could be planning introduction into a market with limited future prospects for growth and profitability.

Information obtained through review of software listings also permits an analysis of pricing for packages similar to FACTS. As previously stated, prices for similar software programs that were identified in Data Sources ranged from $339 to $40,000. Thirty-eight of these packages listed both cost and number of units installed, and had been on the market for at least two years. The number of units installed for each of the 38 programs was annualized and these values were plotted against the average cost of the package. Least squares regression analysis was then employed to determine the best fitting line for the data. Results are presented in Figure I.

As can be seen, the volume-price line, designated as A-B, has a negative slope, indicating that retail price decreases as volume increases. This is consistent with the theory of economies of scale. It can also be seen from the graph that the price-volume relationship is fairly inelastic. Significant fluctuations in sales volume would not be realized by small or moderate changes in price.

The equation for line A-B, generated from the 38 observations, is $y = 9,650.59 - 42.86 \ x$. This equation can now be used to estimate product pricing for a desired or expected volume of sales, or to estimate sales volume for a specifically priced product, for software packages similar to FACTS.

FIGURE I: Price and Volume Analysis of 38
            Software Packages Similar to FACTS

Line A-B represents the best fitting
line for the data presented. Its
equation is y = 9,650.59 - 42.86 x.

SALES VOLUME AT VARIOUS PRICE LEVELS
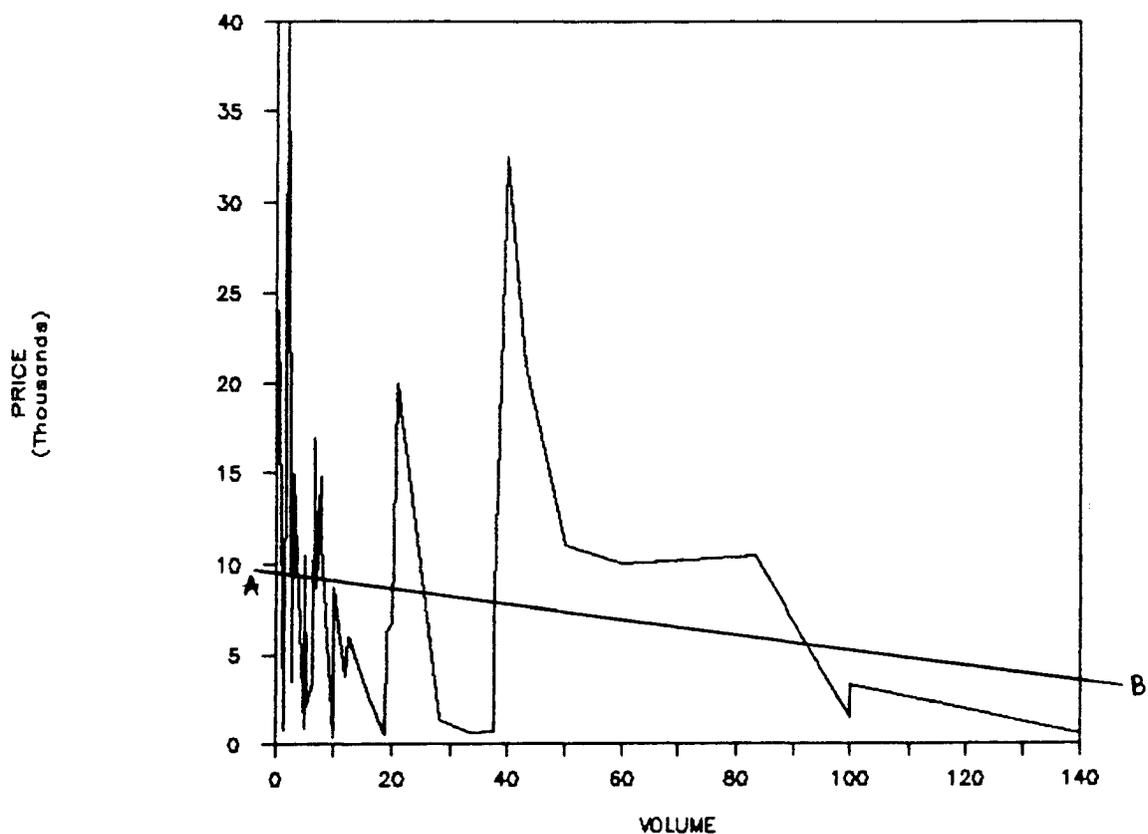
CHAPTER 5

SURVEY OF HEAVY EQUIPMENT INDUSTRIES

SAMPLE SELECTION

In order to determine whether firms in the heavy equipment
industries would be receptive to the commercial introduction of FACTS,
ACCESS, or both, primary data were sought. It was decided that a survey
of these firms would be the most efficient, in terms of coverage, as
well as the most cost effective method of obtaining these data.

The heavy equipment industries include firms engaged in
transportation, logging, mining, and construction, to name a few. The
inclusion of all firms in all the heavy equipment industries as part of
the population would result in an extremely large population.

A statistical sample drawn from such a large group would reduce
coverage, resulting in a relatively small percentage of firms being
contacted. Because the sample would cover numerous industries,
conclusions about the potential market within any single industry may
not be valid or obtainable. It seemed more realistic to restrict the
sample to a few industries so that adequate numbers might be obtained
for statistical analysis. This would permit analysis of the results by
industry and may perhaps identify promising prospects as an industry
group.

Surface mining industries, specifically coal, metals and non-metals and sand and gravel, were selected to comprise the population. This decision was made, in part, for convenience. Several firms engaged in these types of businesses are located in the Butte area. It was possible that if FACTS-like systems were currently being used by Butte-based firms within the above cited industries, their operation could be observed in person.

The sand and gravel industry was included in the population because InfoTech's founder felt that FACTS would be received favorably by these firms. This conclusion was drawn based on his personal experiences with these types of companies.

Listings of U.S. coal mining[20], other mining[21], and sand and gravel[22] firms, prepared by federal government agencies, were obtained and reviewed. Literally thousands of mines were identified by these sources for each of the three industries. For each extractive entity listed, data about the status of operations, active, suspended or abandonded, and the number of employees were given. For obvious reasons only the active enterprises were included in the population.

It can be expected that the larger a firm's operation is, the greater its use of heavy equipment would be. For this reason a definition of firms that were too small to contact was desirable. In addition, delineation between small and large for those firms included in the population seemed appropriate. It was felt that some useful information may come from a stratification of the population in this manner.

A consensus of opinion on the definition of large and small firms between the author, InfoTech's founder, and Gary Whitney, the National Center for Advanced Technology consultant mentioned previously, was reached. The decision was based on the collective experiences of the three parties with these industries, on the ratio of employees to equipment expected for these industries, and on a review of listings of firms engaged in these businesses.

Small coal and metals and non-metals mining firms were determined to be those operations using between 30 and 105 employees. Large firms in these industries would consist of all operations with more than 105 employees. For sand and gravel companies, where it was felt that the ratio of employees to equipment was closer to 1.0, companies with 20 employees or less were excluded from the population. Large sand and gravel firms were defined as having more than 70 employees.

The lower limit for the above definitions of small were determined as judgemental estimates of heavy equipment fleet size based on the number of employees. It was felt that firms with less than the 30 or 20 employees previously described, would have small equipment fleets, and the smaller the fleet, the less likely that computerized tracking of components would be beneficial to or desired by the firm. It was decided that the very small firms would be less likely to be automated to any extent that would provide FACTS with additional potential customers.

The sand and gravel industry parameters were influenced strongly by review of the industry listings. These sources revealed a large proportion of small operations and a smaller number of large operations

in the sand and gravel industry as compared with the other two industries. For this reason, large was redefined downward for this segment of the population.

To further define the population and limit its size, a geographic restriction was also employed. It was decided that mining companies with operations in the western U.S., exclusive of Alaska and Hawaii, and sand and gravel companies operating in California would be included in the population. The eastern boundary of the western U.S. was defined as North and South Dakota, Nebraska, Kansas, Oklahoma and Texas.

A geographic restriction was employed because many of the coal mines in the eastern U.S. are underground operations, which require less heavy equipment. Also, most of the metals mines currently operating in the U.S. are located in the West. The decision to include only California operations for sand and gravel companies was made for two reasons of convenience. First, InfoTech's founder has personal ties to the state and has established some sand and gravel contacts there. Second, the number of California sand and gravel companies was adequate for the purposes of this study. The total of these California firms was greater than the total of coal mining concerns in all of the western U.S.

Based on the criteria detailed above, the survey population consisted of 347 firms. Twenty-two small and 42 large coal mining companies, for a total of 64, are included in this segment. The sand and gravel industry segment is represented by 54 firms, 43 small and 11 large. One hundred large metals and non-metals mining concerns, and 129 small ones are included in the third segment, for a total of 229.

Because the population was reduced to 347 companies, it was
feasible, both in terms of finances and time availability, to survey all
347 firms. Thus, 100 percent of the population was approached with a
questionnaire mailing.

QUESTIONNAIRE DESIGN

The goals of this survey are to indicate the magnitude of need for
FACTS and component monitoring in the marketplace and to indicate
current buying patterns for software of this type. The project was also
intended to provide feedback that could be used to estimate the
potential sales volume that may be expected for FACTS. Finally, it was
hoped that a price range that users would be willing to pay for such a
software package would be revealed through this process.

The survey's questionnaire and cover letter were originally written
as part of a Small Business Institute case prepared in August, 1988[23].
A copy of the form and content of the initial questionnaire and its
cover letter are presented in Appendix B.

Since August, 1988, numerous revisions to the survey questions and
its cover letter have been made. The original version of the survey
materials was first reviewed by independent marketing consultant Gary
Whitney. He suggested several changes to the questionnaire and made the
recommendation that the reference to mining industries in the cover
letter be changed to heavy equipment industries.

The changes that were finally made to the original questionnaire
included reducing questions one through five to three questions, in
order to present only accounting, engineering and maintenance and

operating applications. Purchasing was included as an accounting function and the miscellaneous category was eliminated. Some of the applications originally included within the remaining categories were deleted and some new ones were added. The initial two-plus pages of the questionnaire were now condensed onto one page.

The response code for this set of questions was also revised so that an entry would be made for any application not currently computerized within the respondent firm. The coding originally stated that in these instances the application's response line should be left blank. This approach left room for response errors.

The original question on consulting services was shortened, and questions on networking services were added. The question regarding future application needs was eliminated, as were requests for data on telephone and consulting expenditures.

Added to the survey were questions soliciting information on software and hardware used by the respondent firms, factors contributing to computer related buying decisions, and the personnel involved in these purchase decisions. One question was added which asked how important computerization of equipment and maintenance operations is to the respondent firm.

This revision of the questionnaire was then reviewed by InfoTech's founder and by faculty from the School of Business Administration at the University of Montana. Additional changes were suggested by these parties.

The format of the first set of questions was revised to present codes next to each application, so that the pertinent response could be

circled. Again, the applications identified in this section were revised in order to better gauge the level of computerization within respondent firms. The language used in several of the questions was changed and example responses were added to a few questions. This was done to ensure that the question's intent would be more clearly evident. Additional questions on networking and component monitoring were included in the survey. The questionnaire now contained 17 questions and was five pages long.

This newest version of the survey questionnaire and cover letter was sent to Bill Treadwell of Opinion Research of California, a public market research firm, for professional review. Opinion Research returned the survey materials, along with several constructive criticisms of its format and content. The survey version they envisioned was four pages long and contained 13 questions.

The format of the first set of questions was again changed and a companion set of queries, requesting data on the importance of the application to the respondent, were added. A question asking for the number of PC's used by the responding firm was also included.

The format of the questions on consulting services and the source of software packages used by the firm was revised. The question regarding factors that influence computer related purchase decisions was changed from a ranked response to a scale reponse where each factor is determined to be critical, moderately important or not important.

Three firm-specific questions were also added. One solicits the number of employees utilized by the operation. The second requests the

firm's annual revenues, and the third asks for the job title of the individual filling out the survey.

Questions on networking and specific hardware brands and software packages in use in responding firms were deleted. Hardware usage was incorporated into question one.

Opinion Research of California also suggested one minor change to the cover letter. They recommended that a routing statement be added to the first paragraph.

This revision of the survey materials was then tested. Three tests were performed. First, four individuals unrelated to the heavy equipment industries were given the questionnaire to fill out. Second, a trial analysis of ten fabricated responses was made and compiled. Third, a pre-test of the current version of the questionnaire was administered by telephone to six heavy equipment industry firms not included in the survey population.

These tests were intended to disclose whether any ambiguous or biased questions were included in the survey. The pre-tests should also reveal whether the questions are explicit enough to prompt the desired responses, thus achieving the goals of the research effort.

The pre-testing process prompted further revisions to the questionnaire to ensure that the previously stated goals would be better achieved. The first test prompted only a few changes in language. Positive results here may have been realized, in part, due to the face-to-face administration of the survey. The trial analysis of made-up responses, performed by Gary Whitney, indicated that the

question asking for number of employees in the respondent firm was
unnecessary.

The third pre-test resulted in the greatest number of changes. The
question on the number of employees was returned. The question from the
original version of the survey, asking who was involved in software
purchases in the company, eliminated by the Opinion Research review, was
returned. Most importantly, the question asking for the number of
microcomputers used by the responding firm was changed to solicit the
frequency of use of IBM and compatible systems. The responses to this
question should provide an estimate of the size of the market for FACTS
within the surveyed industries by permitting estimation of the number of
packages that might be needed within each firm.

Appendix C presents the final version of the survey questionnaire
and cover letter. This is the version that was mailed to all firms in
the survey population.

Each question in the final survey questionnaire was intended to
gather specific data. The first question was asked in order to profile
the current level of computerization within firm's in the population.
The software applications and hardware used by respondent firms would be
disclosed. The most pertinent data to the FACTS package is the level of
computerization of component and vehicle related activities.

The second question was intended to determine a firm's perceptions
of the importance of various computer applications to their operations.
In addition, the source or place of purchase of these packages, if
currently computerized in the company, should also be revealed.

In an attempt to profile computer related purchase decision making, questions three and eight were asked. The third question should reveal who is involved in purchase decisions, and question eight is intended to disclose what factors play the greatest role in these purchase decisions.

Question four should provide data that can be used to estimate the size of the market for FACTS, as discussed earlier. If no IBM or compatible microcomputers are used in the surveyed industries, no market for FACTS would exist there.

Questions five, six and seven were designed to solicit information on the extent of use of networking within the surveyed industries. These questions are not specific to FACTS or to this research, but are needed by InfoTech for other reasons.

Question nine, as it applies to operations and maintenance, and question ten are FACTS specific. They both should provide data that will contribute to estimation of the size of the need for FACTS software.

Verification of firm size is the purpose of questions eleven and twelve. Stratification of results was intended because it is thought that the need for FACTS may vary by firm size. The final question is included because responses may be influenced by a person's personal and organizational values. Knowing the organizational background of the person who answered the survey may provide added insight during the analysis phase.

DATA GATHERING METHODOLOGY

The survey materials, cover letter and questionnaire, were mailed to all 347 firms in the survey population. Initial expectations were that a 10 percent response rate would be received from the first mailing of the survey packet. Telephone follow-up was planned so that a 30 percent total response rate would be achieved.

All mailed questionnaires were pre-coded. The coding scheme was established as three numeric characters followed by a colon, followed by three more numeric characters and two alphabetic characters. The first group of numbers are a sequential assignment of 1 through 347 to each firm. Each firm in the population was therefore assigned a unique identifying number. The first alphabetic character will be either an "L" for large or an "S" for small. The second alphabetic character will be a "C" for coal mining, an "M" for metals and non-metals mining, or an "S" for sand and gravel extraction. The middle set of numeric characters is a tally of the parameters identified by the alphabetic characters.

For example, assume the coding sequence was 050:020LM on a questionnaire sent to the ABC Company. This would signify that the ABC Company was the 50th firm on the population listing. It would also identify the company as a large metals or non-metals mining firm, and establishes the fact that ABC Company was the 20th firm on the population listing that possessed these characteristics.

Pre-coding was utilized so that firms returning the questionnaire could be checked off on the population listing. This would facilitate economical telephone follow-up for non-respondents.

Because much of the funding for this project was provided by the Butte-Silver Bow Business Development Center, their letterhead was used for the cover letter and mailing envelopes. Another benefit from using this letterhead is promotion of the project as a not-for-profit endeavor. This might help improve the response rate.

Several additional tactics were employed in an effort to increase the survey's response rate from the first mailing. First, stamped, self-addressed envelopes were included in the mailed survey packet. Second, a return address sticker was placed on each questionnaire so that they could be returned even if separated from the cover letter and return envelope. The final technique used in an effort to increase the response rate was the design of the cover letter. The letter was personalized and explained that the project was being undertaken as part of an MBA program. Non-profit organizations providing assistance in this effort were also identified.

The confidentiality of respondent identity was ensured in the letter. Also, an offer to provide the survey's results to respondents was extended. The final paragraph noted the author's availability to provide assistance to respondents in completing the questionnaire, and expressed gratitude to them for taking the time to answer the survey questions.

CHAPTER 6

SURVEY RESULTS

RESPONSE RATES

Completed questionnaires were returned to the Butte-Silver Bow Business Development Center. Within three weeks, seven survey packets had been returned because firms had moved and left no forwarding addresses or, perhaps, had gone out of business. During this same time period, 120 completed questionnaires had been received. This translates to an overall response rate in excess of 34 percent. Because the actual response rate from the initial mailing exceeded the expected response rate for both the first mailing and the telephone follow-up, a telephone follow-up was deemed unnecessary.

Segmentation of the 120 responses by firm size revealed that 64 large firms, or 41.83 percent of all firms in this category, returned questionnaires. The response rate, 28.87 percent, for small firms was much lower. Only 56 of the 194 eligible firms in this segment completed and returned the survey. The 120 returned surveys were, however, fairly evenly divided between small and large firms. Forty-seven percent, or 56 occurrences, of returned questionnaires were from small firms and 53 percent, or 64 occurrences were from large ones.

This same proportion was not true within industry groups. Of the 64 coal mining firms contacted, 31 returned a completed questionnaire.

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This translates to an overall response rate of 48.4 percent within this industry group. Eleven of the 22 questionnaires sent to small coal companies were returned, for a segmented response rate of 50 percent. Of the 42 large coal firms contacted, 20 surveys were returned, for a 47.6 percent response rate within this category. Table I presents segmented response rates.

Table I - Response Rates by Firm Size and Industry
(Percentages will not add to 100)

	Questionnaires Mailed	Questionnaires Returned	Response Percent
All Large	153	64	41.83
All Small	194	56	28.87
TOTAL	347	120	34.58
Large Coal	42	22	47.60
Small Coal	22	11	50.00
ALL COAL	64	31	48.40
Large Sand	11	5	45.50
Small Sand	43	8	18.60
ALL SAND	54	13	24.10
Large Metals	100	39	37.00
Small Metals	129	37	30.20
ALL METALS	229	76	33.20

Of the 54 questionnaires mailed to sand and gravel extraction firms, only 13 were returned, for a 24.1 percent overall response rate within this industry group. Only 18.6 percent of the small sand and gravel companies approached, eight returned out of 43 sent, responded to the mailing. A better reponse rate, 45.5 percent, was realized in the

large sand and gravel company segment. Five of these eleven mailed questionnaires were completed and returned.

The greatest number of returned surveys was from companies in the metals and non-metals mining industry segment. However, for this group in total, the overall response rate was only 33.2 percent. Seventy-six of the 229 questionnaires sent to the metals and non-metals mining category of firms were completed and returned. Of the 76, 37 were small companies, thus a 30.2 response rate was achieved for this stratified segment. For the large metals and non-metals mining group of companies, a response rate of 37 percent was realized. Thirty-nine of the 100 surveys sent to this category of firms were returned.

Response rates for the various industry segments were not exactly proportionate to the number of surveys sent to these groups. A chi-square test of the hypothesis that the responses received from the three industry categories represent a random sample from the population was performed. The calculated chi-square was 9.04 with 4 degrees of freedom. The critical chi-square value associated with these inputs at the .05 probability level is 9.49. Therefore, the data do not differ materially at the .05 level of significance and can be considered to be a random sample from this stratification of the population and can be analyzed as such.

A chi-square test was also performed to determine whether a random sample had indeed been obtained for the large and small industry segments. This test resulted in a calculated chi-square of 4.15 that was greater than the critical chi-square of .02 at the .05 level of probability. This means that survey responses by firm size are not

representative of a truly random sample response. Therefore, analysis is not statistically valid for this segmentation.

ANALYSIS OF SURVEY RESULTS

The first survey question asked respondents to indicate what hardware systems, if any, are used to support selected software applications in their companies. A compilation of responses to this question for the applications that are most similar to FACTS is presented in Table II. Responses do not total to 120 due to non-responses. Table III shows these results as percentages of all responses to each part of the question.

Table II - Responses to Survey Question #1 (120 Firms)
Hardware Used to Execute Applications

Application	Main Frame	Mini	PC/ WS	Port- able	None
Equipment Component Testing	1	1	8	5	82
Parts Performance Studies Relative to Increasing Machine Uptime	12	6	26	2	59
Vehicle Maintenance Scheduling	16	11	49	1	38
Parts Use By Machine or Equipment	26	14	40	1	26
Independent Component Tracking	19	10	26	1	50
TOTAL	74	42	149	10	255

These results indicate that when the application is computerized in a firm, microcomputer and workstation hardware systems are more extensively used than any other system configuration. Twenty-seven and

one-half percent of total responses and 54.2 percent of respondents

saying that computerization was present in their firm indicate that

these types of systems are utilized. However, the number of firms

indicating that they do not have certain of the applications

computerized was significant.

Table III - Responses to Survey Question #1
Table II Results as Percentages of Total

Application	Main Frame	Mini	PC/ WS	Port- able	None
Equipment Component Testing	1.0	1.0	8.3	5.2	84.5
Parts Performance Studies Relative to Increasing Machine Uptime	11.4	5.7	24.8	1.9	56.2
Vehicle Maintenance Scheduling	13.9	9.6	42.6	.9	33.0
Parts Use By Machine or Equipment	24.3	13.1	37.4	.9	24.3
Independent Component Tracking	18.0	9.4	24.5	.9	47.2

Ninety-seven firms responded to the question on equipment component

testing applications. Of the 97, 84.5 percent indicated that they do

not currently have this function computerized in their firms. Eight of

the 15 firms where this type of software is used said that it is run on

microcomputer or workstation hardware.

Of the 105 companies answering the question segment on parts

performance studies relative to increasing machine uptime, 56.2 percent

responded that they do not have this function automated. Where this

software application was present (46 companies), 56.5 percent of the

firms used microcomputers or workstations to execute it.

Vehicle maintenance scheduling is computerized in 67 percent of the 115 companies responding to this segment of the question. Forty-nine of these 77 firms, or 64 percent, operate the application on a microcomputer or workstation.

One hundred and seven firms answered the question segment on electronic tracking of parts use by individual machine or piece of equipment. Companies in which this application was not computerized comprised 24.3 percent of these respondents. Forty of the 81 firms that have automated this function, operate the application on microcomputer or workstation hardware.

The final segment of this question applicable to determination of the size of the market for FACTS is the query on independent component tracking applications. Of the 106 companies that responded, 47.2 percent do not have this function automated. Of those that do, 46.4 percent run the program on microcomputer or workstations.

Several conclusions can be drawn from the above analysis of responses to survey question one. First, in firms where the selected functions are computerized, the most popular harware configuration used for operating them are microcomputers and workstations. Mainframe automation of these functions is the second most popular.

A preliminary estimate of the size of the market for FACTS can also be made based on these results. Because FACTS offers some form of each of these five applications, one could conclude that all firms that do not currently own a software package that performs these functions are potential customers. This, however, involves some assumptions. The average number of firms indicating non-computerization of the five

functions is 51. This translates to 42.5 percent of all 120 firms
returning a questionnaire. Assuming that those firms responding to the
survey are representative of the population as a whole, 147 potential
customers exist within the population of 347 companies.

The next step in estimating the size of the market for FACTS is
determination of the number of software packages that might be purchased
by the 147 estimated customers defined above. This can be accomplished
by reviewing the results of survey question four. Firms were asked to
indicate how many IBM and IBM compatible PC's and workstations they
currently utilize in their operations. One hundred and fifteen
companies responded.

Five of the responding firms used over 50 IBM compatible personal
computers and workstations in their operations. Twelve companies
indicated use of 26 to 50 of these systems. Use of 11 to 25 IBM
compatible PC's and workstations was noted by 22 respondents.
Forty-three firms said that their operation had 5 to 10 of these systems
installed, while 25 firms indicated that they used from 2 to 4 of them.
Six companies had only one IBM compatible PC or workstation in use, and
two firms had no such system.

The average number of IBM and compatible PC's and workstations
currently used by each of the 115 responding firms is 13.53. This was
determined by first multiplying the number of responses by the midpoint
of that response range. For the "over 50" response option, 60 systems
was assumed. These averages were then summed and divided by 115.

At this point in the analysis, a conclusion could be drawn that the
potential demand for FACTS and similar software packages in the three

surveyed industries is 1,988 units. This is arrived at by multiplying the average number of IBM and compatible PC's and workstations installed in respondent firms, 13.53, by the estimated number of potential customers (147).

The potential demand of 1,988 packages appears to be over-estimated, however, when the results of survey question two are introduced into the analysis. This question asked respondent firms to indicate how important, in terms of cost efficient operations, the software applications identified in question one were, or would be, to their operations. If these applications were already automated, the respondent was also asked to identify where the software package was acquired.

Table IV presents the results of question two as they apply to the relative importance of computerization of the function to the responding company. These results are not significant in and of themselves. However, when the responses of potential customers are isolated, a new pattern emerges. Potential customers are assumed to be those respondents that did not indicate where their firm acquired the identified software. Table V presents these results.

It appears, from this analysis, that those firms without a particular function automated are more likely to perceive its computerization as unimportant. It is difficult, if not impossible, to quantify the impact this might have on the size of the market for FACTS type software. It may be more appropriate to conclude, based on these results, that intense marketing and promotion efforts may be needed in order to convince a majority of potential customers that their

organization can benefit financially from the use of FACTS. The cost of these sales efforts must be taken into consideration when setting the retail price for the package.

Table IV: Responses to Survey Question #2
Relative Importance of Applications

Application	Very Important	Moderately Important	Not Important
Equipment Component Testing	3	10	30
Parts Performance Studies Relative to Increasing Machine Uptime	24	17	12
Vehicle Maintenance Scheduling	49	30	19
Parts Use By Machine or Equipment	48	30	14
Independent Component Tracking	34	27	24

Table V: Responses to Survey Question #2
Non-Automated Firms Only

Application	Very Important	Moderately Important	Not Important
Equipment Component Testing	0	7	29
Parts Performance Studies Relative to Increasing Machine Uptime	5	9	9
Vehicle Maintenance Scheduling	12	13	14
Parts Use By Machine or Equipment	14	2	9
Independent Component Tracking	13	12	19

One last piece of information can be derived from responses to this survey question. A large proportion of firms indicate that at least one

of the selected software packages used in their operations were

developed by in-house data processing departments. Table VI presents a

tabulation of the frequency of this response as compared to the

frequency with which firms indicated that the function was automated.

Table VI: Comparison Based on Survey Question #2
Automated Application and In-House Development

Application	Firms With Automated Application	In-House Developed Application	Percentage In-House Development
Equipment Component Testing	15	3	20.0
Parts Performance Studies Relative to Increasing Machine Uptime	46	18	39.0
Vehicle Maintenance Scheduling	77	38	49.4
Parts Use By Machine or Equipment	81	41	50.6
Independent Component Tracking	56	28	50.0
AVERAGE OF PERCENTAGES			41.8

As can be seen, an overall average of 41.8 percent of respondent

firms have in-house data processing personnel and have developed at

least one of the software packages under study for their own internal

use. With respect to mainframe hardware, it is unlikely that these

companies would be willing to purchase such software at the retail

level. Instead, if they view an existing commercial package as

beneficial to their operations, these firms may attempt to build the

software system themselves.

Microcomputer hardware users, however, may be less likely to

develop their own software. Review of the responses described in

Table VI reveals that 25 of these firms have utilized in house data processing personnel to develop at least one of the applications under study. This number is 20 percent of all survey responses. Assuming that the derived percentage of firms reliant on in-house microcomputer software development is true of the population as a whole, the potential market for FACTS must reflect this factor. The previously determined potential demand for FACTS was 1,988 units. Reduction of this number by 20 percent trims the estimated potential demand for this type of software package to 1,590 units.

Review of responses to survey question ten indicates that the potential market for FACTS and similar software may be even smaller than 1,590 units. This question asked respondent companies if they planned to purchase a maintenance software package during the next twelve months. One hundred and fifteen firms responded to this query. Twenty-two replied "yes," while 70 said that they were not considering the purchase of such a package. Twenty-two companies were unsure, and one was planning to develop this type of application within its organization.

Assuming that all firms unsure about their plans to purchase a maintenance software package could be persuaded to buy, 19.1 percent of those firms without such a system would become potential customers. Adding to this value, the 19.1 percent of respondents admittedly planning to purchase, the potential market would consist of only 38.2 percent of the 147 firms identified earlier as potential customers. This would translate to a demand for FACTS and similar software of 759 units. Using the average of 1,590 units and 759 units, the estimated

potential market demand for FACTS type software would be 1,175 units for the limited and select markets surveyed.

Segmentation of survey responses by firm size reveals that a greater proportion of small companies do not have the selected applications computerized. The small firms also had a lower frequency of in-house development of those selected software applications currently automated in their companies.

The patterns established in Table IV and Table V were not significantly different within either the large or small firm segments, although a higher percentage of large firms did have the applications automated. Thus, it can be concluded that perceived importance of the various applications is not dependent on firm size.

The average number of IBM and compatible PC´s and workstations used by respondent firms was greater within the large firm segment. In addition, a greater proportion of large firms indicated that they were planning to purchase a maintenance software package. The frequency with which firms responded that they were unsure about purchasing such a package was higher for large firms as compared to small ones.

These results are somewhat conflicting. While there are more firms in the small segment that do not have the applications computerized, there appears to be more interest in acquiring these packages within the large firm segment. No conclusion can be drawn from this portion of the analysis correlating the greatest number of potential customers with firm size. As previously stated, conclusions based on firm size are not from a statistically valid random sample.

Review of survey responses by industry segment and by firm size within these industries reveals patterns similar to those discussed throughout this chapter. In an effort to reduce redundancy, detailed analysis of responses by industry segment was not performed.

The extremely small number of sand and gravel firms and the large number of metals and non-metals mining companies that responded to the survey would likely bias any conclusions regarding potential markets by industry segment.

CHAPTER 7

RECOMMENDATIONS

Analysis of the 120 responses to the survey results in an estimate

of the demand for FACTS and similar software packages of 1,175 units.

It is unrealistic to expect one product to capture 100 percent of its

market.   Review of competing software packages, documented in Chapter 4,

indicate that a majority of software programs similar to FACTS have

achieved an average sales volume of about 100 units.

Using this average sales volume as a benchmark, InfoTech may

optimistically realize a market share of approximately 10 percent of

this survey´s projected demand.   This translates to market penetration

of only 118 units within the three industry sample included in this

survey.   Unfortunately, InfoTech should not expect to achieve this level

of sales within the first year following commercial introduction.   Most

of the competing packages have been on the market for between 2 and 6

years before realizing a 100 unit sales volume.   An optimistic estimate

would project a two-year marketing period for FACTS before it could

reach the 118 unit total sales volume level.

Of all the software packages reviewed in Chapter 4, none achieved

an annual sales volume greater than 140 units.   Based on this data and

for the sample only, it seems unlikely that the 500 unit first year

sales level targeted by InfoTech can be achieved.   The total number of

potential customers nationwide and the total number of firms within the select industries was not determined by this research. Therefore, projection of a national sales volume is not possible. However, it does not seem likely, based on the results of this research, that 6,250 packages can be sold in each of the following three years.

Plugging annual sales volume for FACTS of 59 units into the cost-volume line derived in Chapter 4, y = 9,650.59 - 42.86 x, the retail price for FACTS would be $7,121.85. This is a much higher price than that projected by InfoTech and used in developing its business plan.[24] Since numerous competing packages priced much lower than this are already on the market, the outlook for FACTS' success is not promising.

It must be emphasized that this value is a theoretical optimum price and should not be considered a recommended price. A more accurate estimation of retail pricing could be determined if more detailed specifications for competing software packages were available. This information would permit identification of the program that most closely resembles FACTS. Pricing for this package could then be used to gauge a reasonable retail price for FACTS.

Another approach to establishing a price for FACTS would be break-even analysis. This would require determination of a desired profit margin, accumulation of development costs to date, and estimation of future operating costs. Unfortunately, due to the length of the development process, development costs are not available.

A third method for setting a retail price for FACTS would be to price according to the savings predicted for the average purchaser.

InfoTech's founder states that annual tire costs can be reduced by 10 percent through the use of FACTS software. However, this claim is supported by the actual experience of only one mining company.[25] Assuming that savings of 10 percent is an accurate estimate, average tire costs by industry and firm size would be needed in order to set a realistic price. It may be desirable to introduce the product into a lucrative industry and then drop the price for wider distribution.

If possible, InfoTech should gather data from all three price determination methods in order to set a fair retail price which would be accepted by consumers. An average of the three prices could be used. At a minimum, a range within which price can reasonably be established could be determined. This approach would also identify any extremes, high or low pricing, that could result from any of the pricing methods.

It is acknowledged that one limitation of this research is its lack of concrete data upon which accurate pricing for FACTS can be made. Based on data gathered through this research effort, and only for the three industries surveyed, there does not appear to exist a market in which FACTS, in its present form, can be profitably sold at the volumes targeted by InfoTech.

It may be possible, however, to achieve a sales volume greater than 59 units per year if additional industries are also targeted. Construction, trucking and transportation are but three of the many industries extensively using heavy equipment. These industries may provide a market in which potential customers exist that could benefit from the use of FACTS in their operations.

It is recommended that FACTS should not be introduced commercially unless its benefits, features, and functions can command an increased potential market. It may be necessary to expand and enhance the program to include tracking of other heavy equipment components, in addition to tires, such as engines and transmissions. These components are big ticket items for which cost control should be important to management.

It is also recommended, if commercial introduction of FACTS is decided upon, that the target market be expanded beyond mining companies in order to make realization of the desired sales volume more feasible. If the product is introduced, all heavy equipment industries should be approached.

LIMITATIONS OF THE STUDY

This study is limited by its scope. Only those firms engaged in three types of industries doing business within selected geographic regions were included in the survey population. Recommendations and conclusions based on the results of this research must be viewed in light of the fact that a small population base was used. The three industries selected may not be representative of all heavy equipment using industries, of which there are many.

Another limitation of this study is its manual analysis of results. Automated statistical analysis of responses may have revealed additional correlations between industry segments and potential demand.

The results of this research may also be limited due to respondent error. Statistical differences may exist between firms that completed

and returned the questionnaire and those companies that did not respond to the survey. It has been assumed that these two groups are similar.

Finally, in regards to the questionnaire, survey results may be biased toward stating conditions within the metals and non-metals mining industry, rather than for the three industry group as a whole. This is due to extreme under-representation of the sand and gravel industry within the 120 responses.

Another factor limiting the depth of analysis undertaken by this study was data availability. Cummulative development costs for the FACTS package was not determinable. In addition, pricing for the program had not been adequately researched at the time of this writing. These problems hampered pricing analysis and made comparison of FACTS to other packages already available on the market difficult.

If this study were to be repeated, an attempt should be made to contact non-responding firms in under-represented industries in order to obtain a survey response. This would eliminate biases between industries and permit analysis of the potential market for FACTS and similar software by industry segment. It would also improve the feasibility analysis if development costs for the FACTS package were available and if pricing analyses had been performed prior to a study of this type.

APPENDIX A

TRADE ASSOCIATIONS CONTACTED

The following trade associations were selected from listings located in the Encyclopedia of Associations[1]. These organizations were contacted by mail and asked to provide the author with the results of any studies of computer usage within their industries that they may have conducted. Citation numbers listed below the industry type are directed to the reference listing beginning at page 75.

Industry	Organization Name and Address	Data Received
Stone 11 12	National Aggregates Association 900 Spring Street Silver Spring, MD 20910	85 study of data processing equipment utilized in the sand and gravel and ready mixed concrete industries
Metallurgy	International Precious Metals Institute Government Building ABE Airport Allentown, PA 18103	Responded, but no data available
Mining	American Institute of Mining, Metallurgical and Petroleum Engineers 345 East 47th St., 14th Floor New York, NY 10017	Responded, but no data available
Coal	Rocky Mountain Coal Mining Institute 2700 Youngfield, Suite 100 Lakewood, CO 80215	Responded, but no data available
Machinery	American Supply and Machinery Manufacturers Association 1230 Keith Building Cleveland, OH 44115	No response recieved
Machinery 13 14	Associated Equipment Distributors 615 W 22nd Street Oak Brook, IL 60521	Received copy of electronic data interchange and communications survey and results and copy of data processing directory
Machinery	Bituminous and Aggregate Equipment Bureau 111 E Wisconsin Avenue, Suite 1700 Milwaukee, WI 53202	Moved - left no forwarding address
Metal	Silver Institute 1026 16th Street NW, Suite 101 Washington, DC 20036	Responded, but no data available

Metal	Zinc Institute 292 Madison Avenue New York, NY 10017	No response recieved
Mining	American Mining Congress 1920 N Street NW, Suite 300 Washington, DC 20036	Received list of journals
Mining 8, 9 10	Northwest Mining Association 414 Peyton Building Spokane, WA 99201	Received copy of 1985 short course micro- computer applications for the mineral industry
Construc- tion	National Utility Contractors' Association 1235 Jefferson Davis Hwy, Suite 606 Arlington, VA 22202	No response recieved
Forestry	Pacific Logging Congress 4494 River Rd North Salem, OR 97303	No response recieved
Machinery	Construction Industry Manufacturers Association Marine Plaza, Suite 1700 111 E Wisconsin Avenue Milwaukee, WI 53202	Received pamphlet listing exhibitors at the annual convention
Federal	Federal Construction Council 2101 Constitution Avenue Washington, DC 20418	No response recieved
Concrete	National Ready Mixed Concrete Association 900 Spring Street Silver Spring, MD 20910	Refer to National Aggregates Association
Construc- tion	American Society for Concrete Construction 3330 Dundee Road, Suite N-4B Northbrook, IL 60062	No response recieved
Construc- tion	Associated Builders and Contractors 729 15th Street NW Washington, DC 20005	No response recieved
Machinery	Equipment Maintenance Council 113 Highland Lake Road Lewisville, TX 75067	Responded, but no data available

Machinery	Machinery and Allied Products Institute 1200 18th Street NW, Suite 400 Washington, DC 20036	Responded, but no data available
Machinery	Machinery Dealers National Association 1110 Spring Street Silver Spring, MD 20910	Responded, but no data available
Construc-tion	Associated General Contractors of America 1957 E Street NW Washington, DC 20006	Did not respond, but data was obtained at the library
Construc-tion	Construction Financial Management Association 40 Brunswick Avenue, Suite 202 Edison, NJ 08818	No response recieved
Construc-tion	Coordinating Council for Computers in Construction Sweet's/Dodge 1221 Avenue of the Americas New York, NY 10020	No response recieved
Advertis-ing	Construction Equipment Advertisers and Public Relations Council 111 E Wisconsin Avenue, Suite 1700 Milwaukee, WI 53202	Received list of data processing associations
Coal	Anthracite Industry Association 208 N Third Street, Suite 320 Mary Sachs Building Harisburg, PA 17101	Moved – left no forwarding address
Coal	BCR National Laboratory P.O. Box 278 350 Hochberg Road Monroeville, PA 15146	No response recieved
Coal	National Coal Association 1130 17th Street NW Washington, DC 20036	No response recieved

[1]Karin E. Koek, Susan B. Martin and Annette Novalo, eds., Encyclopedia of Associations, 1989, 23rd Edition.

APPENDIX B

ORIGINAL SURVEY COVER LETTER AND QUESTIONNAIRE

August 20, 1988

Diane Nalty
2002 Oregon
Butte, MT 59701

Dear Respondent:

I am an MBA student at the University of Montana. In conjunction with the Butte Local Development Corporation and the Butte Small Business Incubator I am researching computer use and applications in the mining industry.

As you are aware, technological advances have permitted relatively inexpensive computer systems to be installed in virtually any setting for any type or combination of applications. The Personal Computer has furthered still one's access to automation. Technology can have a significant impact on the efficiency of mining operations. I am interested in learning the types of information system applications currently being used in your industry as well as your expectations of future information needs.

Your firm is one of a small number in which knowledgeable personnel are asked to discuss their experiences and attitudes toward automation in the mining industry. Your firm was selected randomly from a list of all U. S. mining companies. In order that the results of this survey will truly represent the thinking of the industry, it is important that each questionnaire be completed and returned.

You may be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off of the mailing list when your questionnaire is returned. Your firm's name will never be placed on the questionnaire.

I would like to stress that your opinion is important to this research. A prompt reply to the survey will be most appreciated. Thank you for your time.

Sincerely,

Diane Nalty

QUESTIONNAIRE

For questions 1 through 5 please respond in the space provided according to the following code:

1 = Mainframe programs are used in my firm to perform this function.

2 = PC applications are used in my firm to perform this function.

3 = A combination of PC and mainframe software used in my firm to perform this function.

X = The function described is not computerized in my firm but is being considered for future installation.

= My firm does not currently perform the function using a computer and does not expect to install this application in the future (blank).

1. Please indicate, as described above, your firm's current position regarding the following accounting functions:

_____ Accounts payable processing

_____ Accounts receivable aging

_____ Accounts receivable collection

_____ Accounts receivable accumulation

_____ Financial reporting

_____ Budgeting

_____ Tax returns

_____ Inventory issues

_____ Inventory receipts

_____ General ledger details

_____ General ledger summary

_____ Bank reconciliations

_____ Payroll

_____ Payroll tax determination

_____ Deferred reclamation received

_____ Royalty reconciliations

2. Please indicate, as described above, your firm's current position regarding the following engineering functions:

_____ Reserves or deposits estimation

_____ Estimated reclamation costs

_____ Special equipment or part design and specification

_____ Geological data

_____ Land survey records

_____ Reserves mined

_____ Water quality monitoring or evaluation

_____ Soil quality monitoring or evaluation

_____ General engineering statistics

_____ Core sample analysis

3. Please indicate, as described above, your firm's current position regarding the following Maintenance and Operating functions:

_____ Vehicle maintenance scheduling

_____ Parts use by machine or equipment number

_____ Fuel use by vehicle or equipment number

_____ General mine plans

_____ Equipment traffic control

_____ Transportation scheduling

_____ Shift Scheduling

4. Please indicate, as described above, your firm's current position regarding the following Purchasing functions:

_____ Purchase requisitions

_____ Purchase orders

_____ Direct purchase from vendors

5. Please indicate, as described above, your firm's current position regarding the following Miscellaneous functions:

_____ Investor records

_____ Consultation with field offices or operations

_____ Lease records

_____ Personnel records

6. For the computer software currently used in your firm, what percentage was acquired from each of the following sources? Please be sure all sources total 100 percent.

_____ In-house data processing department

_____ Commercial PC software packages purchased through retail establishment

_____ Commercial PC software packages purchased through mail order firm

_____ Independent computer consulting firm

_____ Temporary programmer employees

_____ PC software purchased through computer hardware supplier

_____ Mainframe software purchased through computer hardware supplier

7. Please indicate with an "X": Which of the following emerging computer applications do you think your firm might be interested in installing in the future.

_____ Direct links to vendors for purchasing purposes

_____ Local area networks using any combination of computer hardware devices

_____ Wide area networks using any combination of computer hardware devices

_____ Computerized consulting services

_____ Specialized engineering software

_____ Income tax applications to calculate tax deferrals

8. Please indicate with an "X": Which of the following types of outside consultants has your firm contracted in the past year?

_____ Surveyors

_____ Computer specialists

_____ Reclamation specialists

_____ Certified public accountants

_____ Environmental engineers

_____ Geologists

_____ Hydrologists

_____ Safety specialists

_____ Chemists

_____ Metalurgists

9. Does your firm have in-house programming or other data processing services available? If so, please indicate how many employees perform the following functions.

_____ Programming

_____ Hardware maintenance

_____ Special projects

_____ User instruction and interface (system coordination)

_____ Managerial

_____ Total employees in data processing department

10. What would you estimate your firm's annual telephone chages are for the procurement function?

_____

11. What percentage of income did your firm spend on consulting services during the past year?

_____

APPENDIX C

FINAL VERSION OF SURVEY MATERIALS
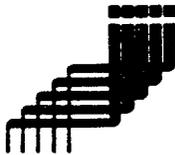
BUTTE - SILVER BOW
BUSINESS DEVELOPMENT CENTER

January 25, 1989

Diane Nalty, CPA
2002 Oregon
Butte, MT 59701

Dear Respondent:

I am an MBA student at the University of Montana. With assistance from the Butte Local Development Corporation and the Butte-Silver Bow Business Development Center, I am researching computer use and applications in the heavy equipment industries. My research includes an analysis of responses received to questions contained in the attached survey. Please route the questionnaire to the individual or individuals (Data Processing or Engineering) within your firm who can best answer the survey questions.

As you are aware, technological advances have permitted relatively inexpensive computer systems to be installed in virtually any setting for any type or combination of applications. Technology can have a significant impact on the efficiency of equipment and maintenance operations. As part of my Master's thesis, I am conducting a survey to learn the types of information system applications currently being used in your industry as well as your expectations of future information needs.

Your firm is one of a small number in which knowledgeable personnel are asked to share experiences and attitudes toward automation in the heavy equipment industries. In order that the results of this survey will truly represent the thinking of the industry, it is important that each questionnaire be completed and returned.

You can be assured of complete confidentiality. The questionnaire has an identification number for mailing purposes only, so that we may check your company off of the mailing list when your questionnaire is returned. Your firm's name will never be placed on the questionnaire.

I would like to stress that your opinions are important to this research. A prompt reply to the survey will be most appreciated. If you would like to receive the results of this research, please so indicate on the returned questionnaire. Feel free to contact me at the above address if you have any questions regarding the survey.   Thank you for your time.

Sincerely,

Diane Nalty, CPA

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305 West Mercury Street   Butte, Montana 59701   406-723-4061

HEAVY EQUIPMENT MINING INDUSTRIES QUESTIONNAIRE

1. This part of the questionnaire requests an overview of your firm's computer operations. Please circle the number corresponding to the type or types of computers your firm uses in each of the areas listed below. The computers can be Mainframes, Mini-Computers, Personal Computers, Work stations (PC/WS), or Portable Computers. If an operation is not presently computerized, please mark in the NONE column.

TYPES OF COMPUTERS USED

BUSINESS FUNCTIONS & COMPUTER APPLICATIONS	Main frame	Mini	PC/ WS	Port- able	None
ENGINEERING					
● Equipment Component Testing	1	2	3	4	5
● Time and Motion or Other Productivity Studies	1	2	3	4	5
● General Mine Planning	1	2	3	4	5
● Geological Analysis	1	2	3	4	5
● Bidding and Estimating	1	2	3	4	5
● Parts Performance Studies Relative to Increasing Machine Uptime	1	2	3	4	5
● Other: _____ please identify	1	2	3	4	5
MAINTENANCE					
● Vehicle Maintenance Scheduling	1	2	3	4	5
● Parts Use by Machine or Equipment	1	2	3	4	5
● Shift Scheduling	1	2	3	4	5
● Independent Component Tracking	1	2	3	4	5
● Other _____ please identify	1	2	3	4	5
ACCOUNTING					
● General Ledger	1	2	3	4	5
● Inventory Control	1	2	3	4	5
● Payroll	1	2	3	4	5
● Job Costing	1	2	3	4	5
● Other: _____ please identify	1	2	3	4	5

2. Given that inexpensive computer systems can be installed in virtually any setting for any type or combination of applications, for each business function listed below, please relate how important it is to improve upon, or purchase for the first time, computer software to help you company function in a more cost efficient manner. To the right of this answer, please indicate, based on the following code, where the software was acquired

WHERE ACQUIRED:

A - In-house Data Processing

B - Trade Journals

C - As a Package with Hardware

D - Visiting Sales Representative

E - Computer Retail Store

F - Discount Mail Order House

G - Not sure

H - Other: _____

please identify

BUSINESS FUNCTIONS AND COMPUTER APPLICATIONS	Very Important	Moderately Important	Not Important	Where Acquired
ENGINEERING				
• Equipment Component Testing	☐	☐	☐	_____
• Time and Motion or Other Productivity Studies	☐	☐	☐	_____
• General Mine Planning	☐	☐	☐	_____
• Geological Analysis	☐	☐	☐	_____
• Bidding and Estimating	☐	☐	☐	_____
• Parts Performance Studies Relative to Increasing Machine Uptime	☐	☐	☐	_____
• Other: _____ please identify				
MAINTENANCE				
• Vehicle Maintenance Scheduling	☐	☐	☐	_____
• Parts Use by Machine/Unit	☐	☐	☐	_____
• Independent Component Tracking	☐	☐	☐	_____
• Other: _____ please identify				
ACCOUNTING				
• General Ledger	☐	☐	☐	_____
• Inventory Control	☐	☐	☐	_____
• Payroll	☐	☐	☐	_____
• Job Costing	☐	☐	☐	_____
• Other: _____ please identify				

3. Who in your firm is involved in computer software purchase decisions under $2500? Please give title, department, or both.

    _____
    _____
    _____
    _____
    _____

4. Please indicate approximately how many IBM or compatible Personal Computers and Work stations you currently have installed.

    ☐ NONE   ☐ 2-4   ☐ 11-25   ☐ Over 50
    ☐ 1   ☐ 5-10   ☐ 26-50

5. Are your Personal Computers presently networked into local or wide area networks?

    ☐ Yes   ☐ No   ☐ Not Sure

6. Are modems used with your computers to communicate with computers at different locations?

    ☐ Yes   ☐ No   ☐ Not Sure

7. Does your firm use any of the existing data base services such as Compuserve, Source, Dialog or others?

    ☐ Yes   ☐ No   ☐ Not Sure

8. Please rate the following factors with respect to how important a part they play in the decisions to purchase software for your company.

FACTORS	Very Important	Moderately Important	Not Important
• Ease of Use	☐	☐	☐
• Short Learning Period	☐	☐	☐
• Portability (Use at a Variety of Different Computer Stations)	☐	☐	☐
• Performance Speed	☐	☐	☐
• Training and Support Services	☐	☐	☐
• Compatibility with Other Software Already in Use	☐	☐	☐
• Error Trapping and Routines and Data Integrity Checks	☐	☐	☐
• Price	☐	☐	☐
• Vendor Reputation	☐	☐	☐
• Flexible Reporting Formats	☐	☐	☐
• Graphics	☐	☐	☐
• Documentation and User Manuals	☐	☐	☐

9. At any time during the past twelve months, did your firm contract outside consultants to work on:

- Accounting Functions   ☐ YES   ☐ NO   ☐ NOT SURE
- Engineering Functions   ☐ YES   ☐ NO   ☐ NOT SURE
- Operations and Maintenance   ☐ YES   ☐ NO   ☐ NOT SURE

10. Is your firm planning to purchase a maintenance software package during the next twelve months?

☐ Yes   ☐ No   ☐ Not Sure

11. What is the number of total employees at your location:

☐ Under 25   ☐ 51-100   ☐ 251-500   ☐ Over 1000
☐ 25-50   ☐ 101-250   ☐ 501-1000   ☐ Not Sure

12. What was the annual revenue of your entire company in the last fiscal year?

☐ Under $1M   ☐ $5M-$19.9M   ☐ Over $100M
☐ $1M-$4.9M   ☐ $20M-$99.9M   ☐ Not Sure

13. Which best describes your job responsibilities?

☐ General Management   ☐ Research and Development

☐ Corporate Planning   ☐ Finance/Accounting

☐ MIS/Data Processing   ☐ Production/Operations

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