

PRODUCTIVITY AND MOTIVATION
IN FIELD SERVICES

INPUT

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1981

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PRODUCTIVITY AND MOTIVATION IN FIELD

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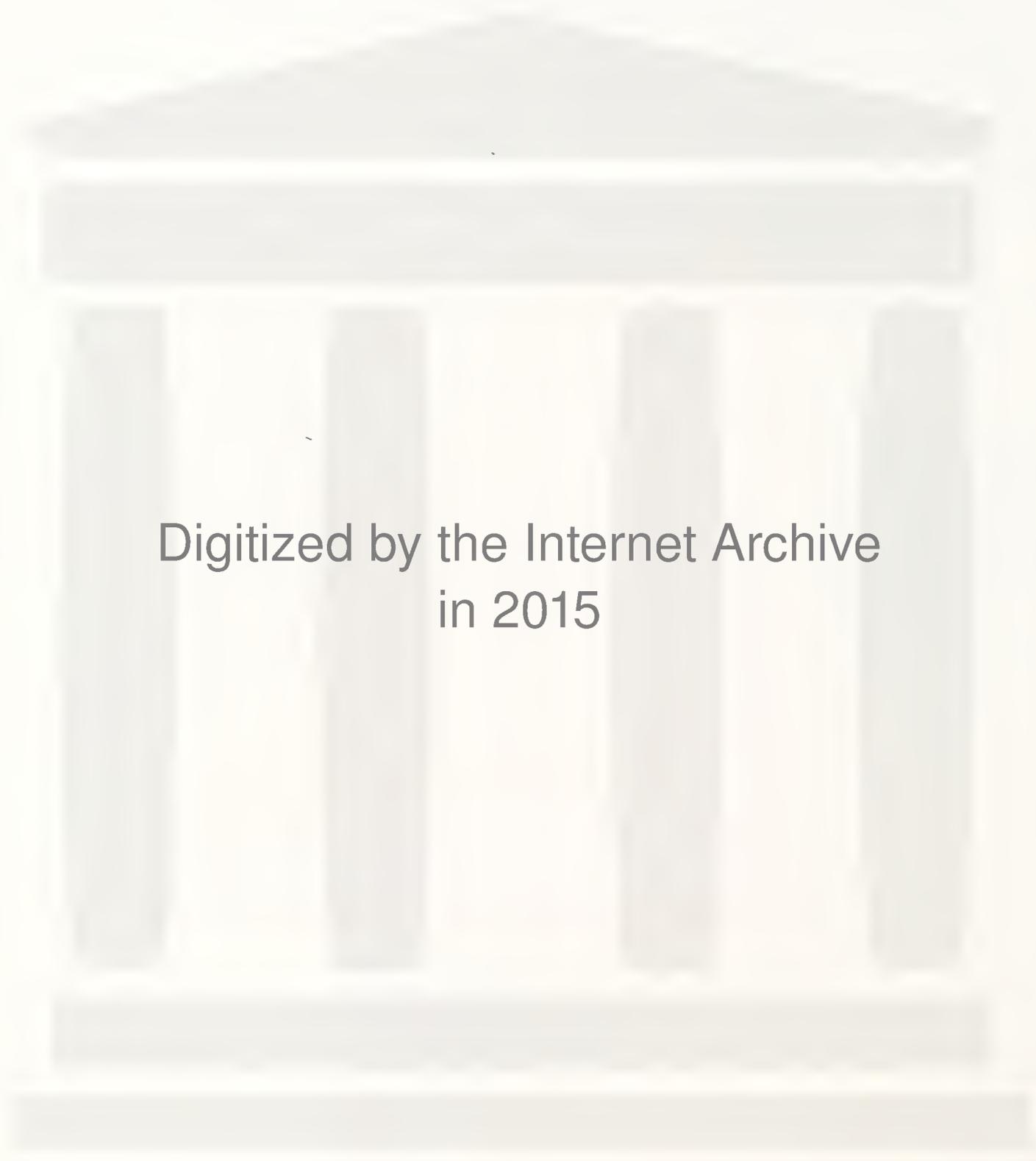
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I INTRODUCTION

I INTRODUCTION

A. SCOPE

- This report is produced by INPUT as part of the 1981 Field Service Planning Information Program in Europe.
- This major issue report under the subscription service deals with the current state and future expectations of productivity and the motivation of engineers in field service organisations. This subject was selected because of high client interest, the acute need to improve productivity in the industry, and a growing awareness that motivating one's engineers is critical to success.

B. METHODOLOGY

- Research carried out for this report included 17 interviews with major vendors of data processing equipment.
 - The interviews were conducted with field service executives, normally the country or regional manager.
 - Because of the nature of the information provided, INPUT agreed to keep the names of the companies interviewed confidential. However, in

the section on vendor practice, the type of company and principal operating areas are tabulated.

- A copy of the questionnaire is presented in Appendix D.
- The subject of productivity is particularly complex in that it involves a mix of quantitative measures such as revenue per field engineer, and qualitative elements such as employee motivation. To provide a more complete treatment of the total subject, appendices are included which cover areas beyond the basic research carried out in the project.
 - Appendix A is a discussion of motivation. Taken from a fund of information on the subject, it provides readers with a summary of professional thinking on the subject which can be applied to their own management situations.
 - Appendix B is a discussion of management action on motivation. This section includes a review of past and current techniques and focuses on the current trends in what can be referred to as the 'Enlightened Management' approach.
- Comments and inquiries from clients are welcome.

II EXECUTIVE SUMMARY

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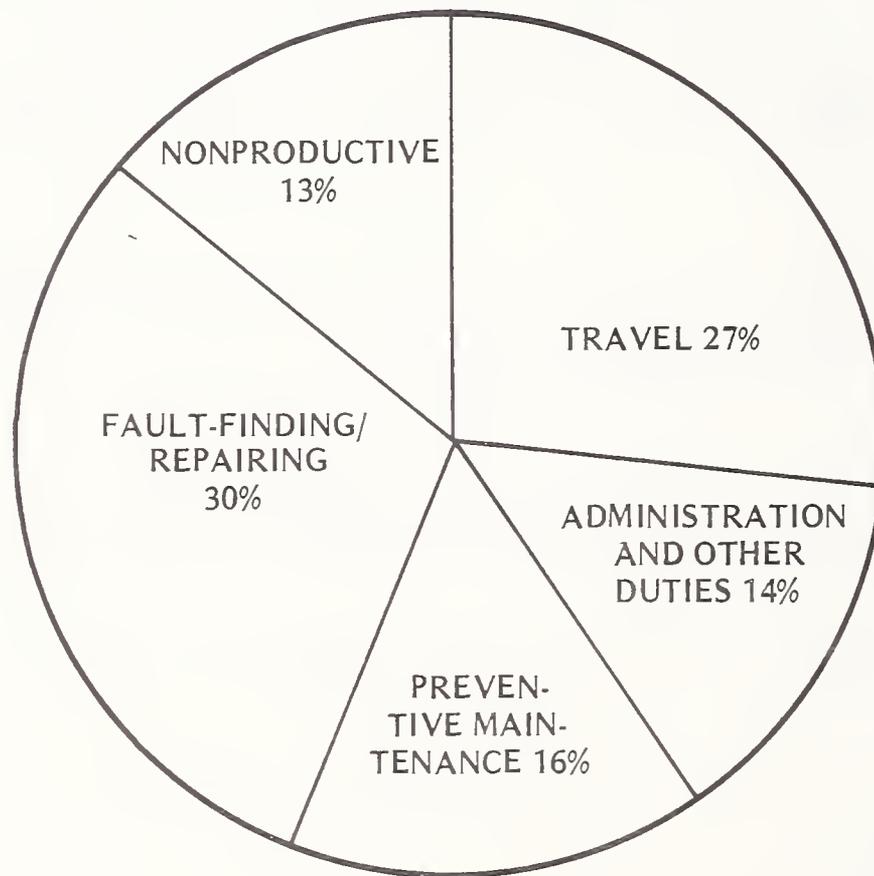
A. FIELD SERVICE INDUSTRY VERSUS PRODUCTIVITY

- Field service is a customer-event-driven industry and despite recent technical innovation remains basically unchanged. It is still engineers responding to customers' needs, repairing their equipment, and getting them back on line.
- This study deals with the issue of improving the productivity of field engineering in getting the job done at the individual field engineer level, at the field engineering organization level, and at a combination of the two, accepting the acute need to understand the management technique of motivation.
- Traditionally in field service, the employment of more engineers has been used to resolve a problem, improve response times, and satisfy market needs.
- With the cost of engineers outstripping increases in revenue, a shortfall in qualified people, and the need to improve profit level (or become profitable), field service management has had to adopt new methods and techniques. The cycle of falling productivity relative to sales is shown conceptually in Exhibit II-1. Once started on the cycle it becomes increasingly difficult to break out since the wheel is self-accelerating.

- The net result has been the need to make the individual engineer and the field service organization as a whole more productive, and improve the return on investment within the industry.
- The immediate question is how to measure productivity in a labour-intensive event-driven industry. It could be measured by revenue per engineer, calls per engineer, preventive maintenance accomplished, or even basic bottom line profit. A standard definition within the industry does not exist.
- The need for a definition is paramount if productivity is to be effectively measured and subsequently improved upon. However, INPUT accepts that each vendor must establish his own definition that relates to his own circumstances. Chapter V, 'Standards for Field Service,' has been included as an aid.
- The pie chart in Exhibit II-2 shows a typical field engineer's average week, based on INPUT research statistics.
 - Thirteen percent of an engineer's week is spent in nonproductive activity such as waiting for people or materials.
 - Twenty-seven percent of an engineer's time is spent travelling.
 - Thus, from a revenue standpoint, a total of 40% of an engineer's time is lost.
- Bearing in mind the reluctance of most engineers to report nonproductive time, it can be assumed that this figure is on the conservative side and understates the nonproductive time.
- Of the remaining 60% of time available, only 46% is actually spent generating revenues by:
 - Repairing the equipment (30%).

EXHIBIT II-2

ANALYSIS OF TIME SPENT BY FIELD ENGINEERS
DURING AN AVERAGE WEEK



- Carrying out preventive maintenance (16%).
- The remaining 14% of an engineer's time is spent on administration, engineering changes, and other duties such as meetings, training, and personnel.
- It is a sobering thought that out of every eight engineers employed, one is normally doing nothing.

B. IMPORTANCE OF PRODUCTIVITY

- Seventy-six percent of the respondents to the productivity questionnaire stated that either productivity was a major issue (53%) or top priority (23%) reflecting the acute awareness among management groups of the need to improve the revenue per engineer.
 - In comparing the point of view of field engineering to that of the whole company, the respondents considered that field engineering management takes productivity more seriously than company management as a whole, as shown in Exhibit II-3.

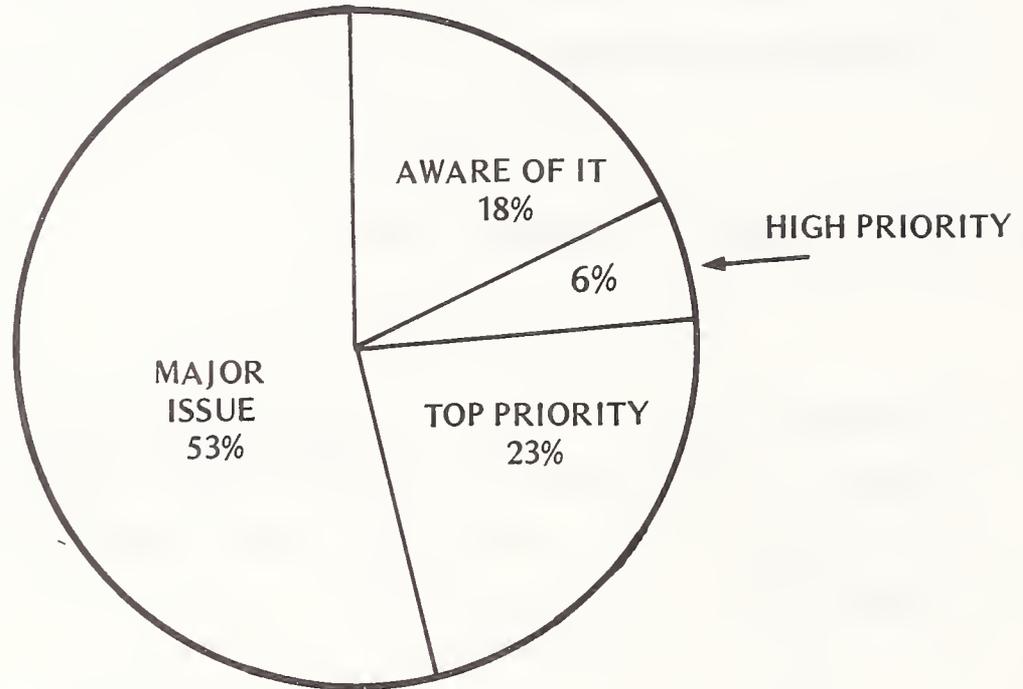
C. PRODUCTIVITY IMPROVEMENT PROGRAMS

- In the past 12 months various programs have been implemented to improve the productivity performance of field service organisations. These programs can be classified under the following headings:
 - Management control methods.
 - Information gathering and research.

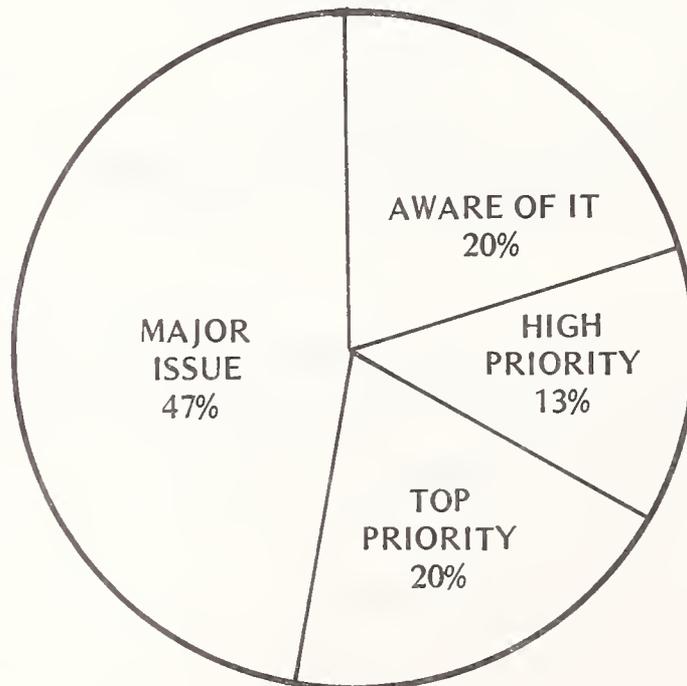
EXHIBIT II-3

RECOGNITION OF THE IMPORTANCE OF PRODUCTIVITY

BY FIELD ENGINEERING MANAGEMENT



BY COMPANY MANAGEMENT

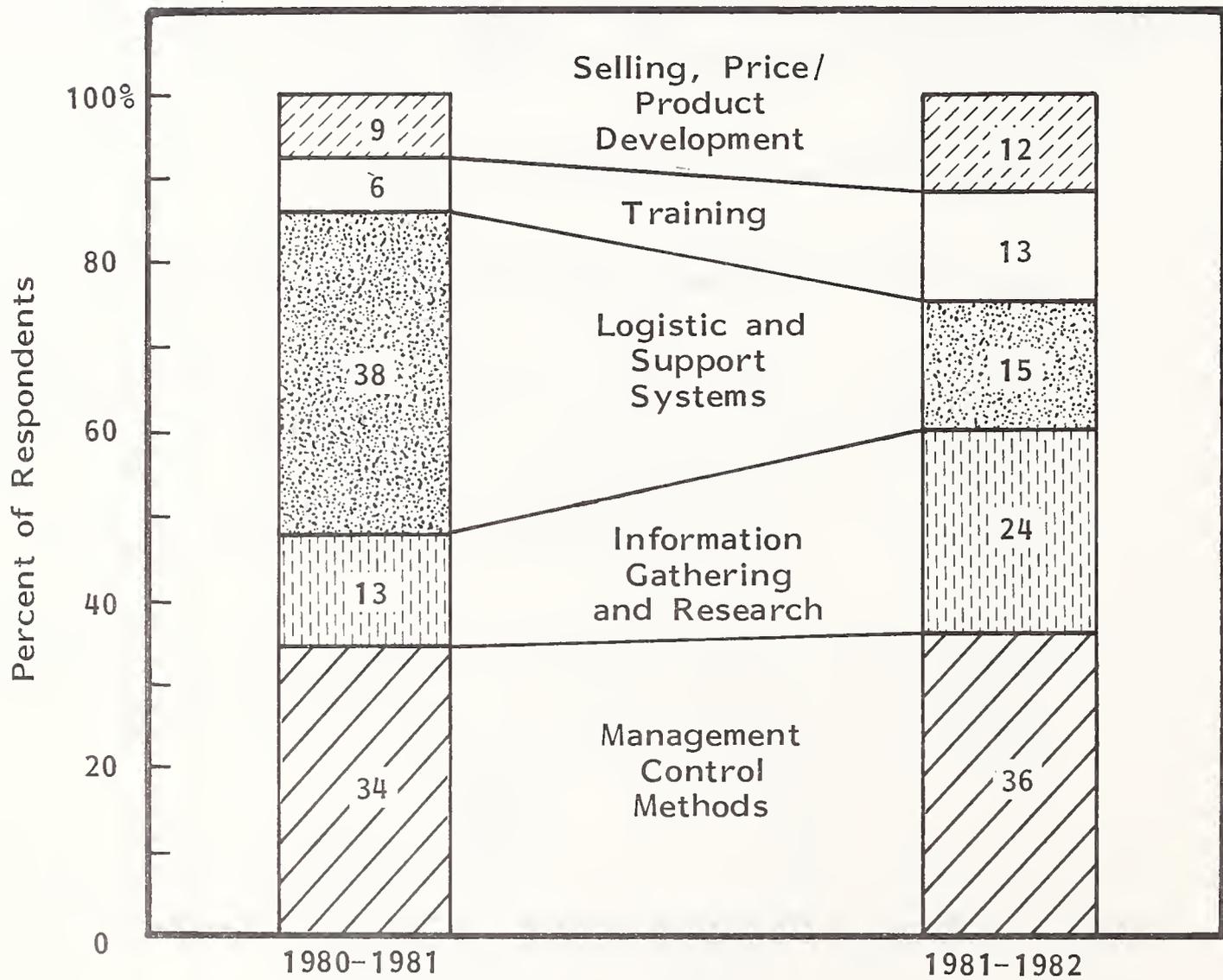


- Logistical and support system changes.
 - Training programs.
 - Other, including price increases and product development.
- In Exhibit II-4, respondents' implementation of productivity improvement methods are shown, reflecting the shift in emphasis from one type of program to another from the 1980-1981 to the 1981-1982 periods. Mentions were weighted according to whether they were first, second, or third.
 - Management control methods had the highest incidence of mentions over both 12-month periods. The improvements in this category included:
 - Giving autonomy to country/local management.
 - Automating the customer engineer (CE) dispatching system.
 - Reworking the 1981 manpower plan to achieve a productivity target, and refusing to hire according to a previous budget.
 - Assigning goals to each country/local field service management.
 - Implementing a method of assigning a dollar value to equipment to be maintained by each CE (copied by local management in cases where there is an American parent organization).
 - While information gathering and research programmes appear to be more frequent this year than last, logistic and support system changes are on the decline. Information and research programs included:
 - Obtaining data on in-house productivity.
 - Designing and installing in phases a Field Service Information System (FSIS).

EXHIBIT II-4

EMPHASIS GIVEN TO FIELD ENGINEERING
PRODUCTIVITY IMPROVEMENT PROGRAMS

(Weighted By Priority of Mentions)



- Evaluating remote diagnostics (RD).
- Consulting with INPUT.
- Logistic and support system changes consisted of:
 - Proposing field stocking levels from the centre.
 - Introducing regional resource control centres.
 - Introducing remote diagnostics.
 - Decentralising spares stocks into three field districts, keeping only a reserve at the centre.
 - Introducing better tests.
 - Centralising support in one central office, leaving the areas with only spares depots.
- Other improvement methods mentioned were:
 - Unbundling site planning and software maintenance services.
 - Increasing training levels.
 - Improving training courses with less classroom instruction and more self-paced on-site courses.
 - Designing maintainability into products.
- The benefits quoted for all these programmes of improvement comprised:
 - Inventory reduction of between 25% and 30%.

- With field engineering's greatest asset and investment being people, this major area of productivity improvement will be unattainable until motivation is understood and the techniques of motivation applied.

E. THE DRIVING FORCE

- It is important to realise that once a goal has been achieved it is no longer a motivating factor.
 - The importance of salary and monetary rewards declines as security and basic living standards are reached.
 - Desires for higher position and status reach a plateau that at a point in a person's life is acceptable.
 - Field engineers, reasonably rewarded and with an inherent need to be professional, do not respond strongly to monetary incentives, and any such response is very short lived.
- A field engineer is more likely to encounter demotivation or frustration in the form of:
 - Spares shortages.
 - Inadequate test equipment.
 - Paperwork.
 - Poorly designed equipment.
 - Pressure to repair by short cuts.

- Board swapping and lower level involvement.
- These frustrations lead to counterproductive activities which deflect the available energy and perhaps direct it towards less desirable goals.

F. MOTIVATIONAL APPROACHES

- Over the years various motivational approaches have been tried from time to time. One lesson learned is:
 - There is no one right solution to the problem of motivation and there is no guarantee that if management finds a solution on one occasion it will remain the right solution indefinitely.
- There are a number of practical elements and considerations which characterise the modern approach to motivation. The underlying general principles are:
 - The limited motivational effect of money rewards - money is important to the majority of the working population not for itself but because it can be exchanged for things that satisfy needs. When those needs are satisfied money ceases to motivate.
 - Motivation lies in job content - it is important to recognise that people will work harder and produce more if they feel that they are doing challenging and interesting jobs.
 - Measurement of output can still be motivating - provided that it is carried out with the involvement of all participants (e.g., agreeing on work targets and suggesting ways of monitoring performance to provide a work challenge) and is not imposed by management as part of a system of reward and punishment.

- Company policies and procedures are significant - not in achieving motivation as a direct result, but because lack of the appropriate ones will seriously demotivate and depress productivity.
- In a survey of 1,500 workers in the data processing industry in Europe the top 10 significant elements in job selection, assuming salary and job contents equal, were:

<u>Rank</u>	<u>Factor</u>
1	Active career development
2	Holidays
3	Pension plan
4	Regular performance appraisal scheme
5	Relocation policy
6	Easy local commuting
7	Training programmes
8	Company reputation as a secure employer
9	Professional reputation of company
10	Reputation of company as a fair employer

- There is ample evidence to show that direct payment for results is, in the 1980s, less of a motivational element than factors more directly associated with the development of jobs and careers.

G. RECOMMENDATIONS

- People are a company's greatest asset, yet in the areas of motivation and greater productivity, company policies are often counterproductive. Field service managers must come to grips with the whole question of motivating their staff and understanding their needs, goals and expectations.
 - Managers are often too dependent upon the personal, 'all-in-it-together', mode of operation, hoping loyalty and field service camaraderie will prevail.
 - A policy of quality hiring and effective career development should be pursued. Alternative career paths, either management or technical, should be established with equal attractiveness, reward and status.
- In motivating staff a number of practical elements must apply.
 - Motivation lies in job content.
 - Demotivation can occur without fair, appropriate and meaningful company policies and procedures.
 - There is a limit to the motivational effect of monetary rewards and any effect is often short lived.
- Field service organisations should conduct a critical evaluation of their current productivity policies and procedures, answering the questions:
 - Do we measure productivity? Is it the right measurement? Is it a realistic measurement? If not, measurement guidelines and definitions should be established.

- If productivity can be improved, how does this translate into an effect on engineers, customers, and profit levels?
- Companies should consider a greater use of management techniques and models.
 - Generally, too little attention is paid to ensuring that the field service manager is equipped with the right education, training and personnel skills. All too often the good engineer is expected to become a good manager by metamorphosis.
 - Models, such as queuing theory, can be used to further increase (and appreciate) their position in the marketplace and those factors affecting their overall productivity.
- Managers should remember that there is no single, definitive strategy applicable to all organisations. Successful strategies take time to implement and there is no guarantee that if management is successful on one occasion it is going to remain successful.

III PRODUCTIVITY - CURRENT VENDOR PRACTICE
AND ATTITUDES

III PRODUCTIVITY - CURRENT VENDOR PRACTICE AND ATTITUDES

A. INTRODUCTION

- To build a database on the subject of productivity in field service a total of 17 telephone interviews were conducted with European field service managers of major computer vendors during May 1981.

- The interviews by type of company were as follows:

- Mainframe companies	4
- Minicomputer companies	5
- Small business system companies	2
- Word processor company	1
- Peripheral companies	3
- Distributor of peripherals/small systems	1
- Third-party maintenance company	<u>1</u>
Total	17

- The profile of the sample by country markets covered was:

-	U.K.	5
-	France	3
-	West Germany	4
-	Benelux	1
-	Scandinavia	1
-	European headquarter operations	<u>3</u>
	Total	17

- The questionnaire used for this research is included in Appendix D. It was designed to investigate attitudes toward productivity within the companies and within the field service division, to research how productivity was defined and measured, and to examine how vendors were using different approaches to the productivity problem. Included were:

- The management approach.
- The people-oriented or motivational approach.
- The 'give us the tools and we'll finish the job' approach.

- Data, where applicable, were also drawn from the current survey of field service managers being conducted for the 1981 European Field Service Annual Report to be published by INPUT in the next few months.

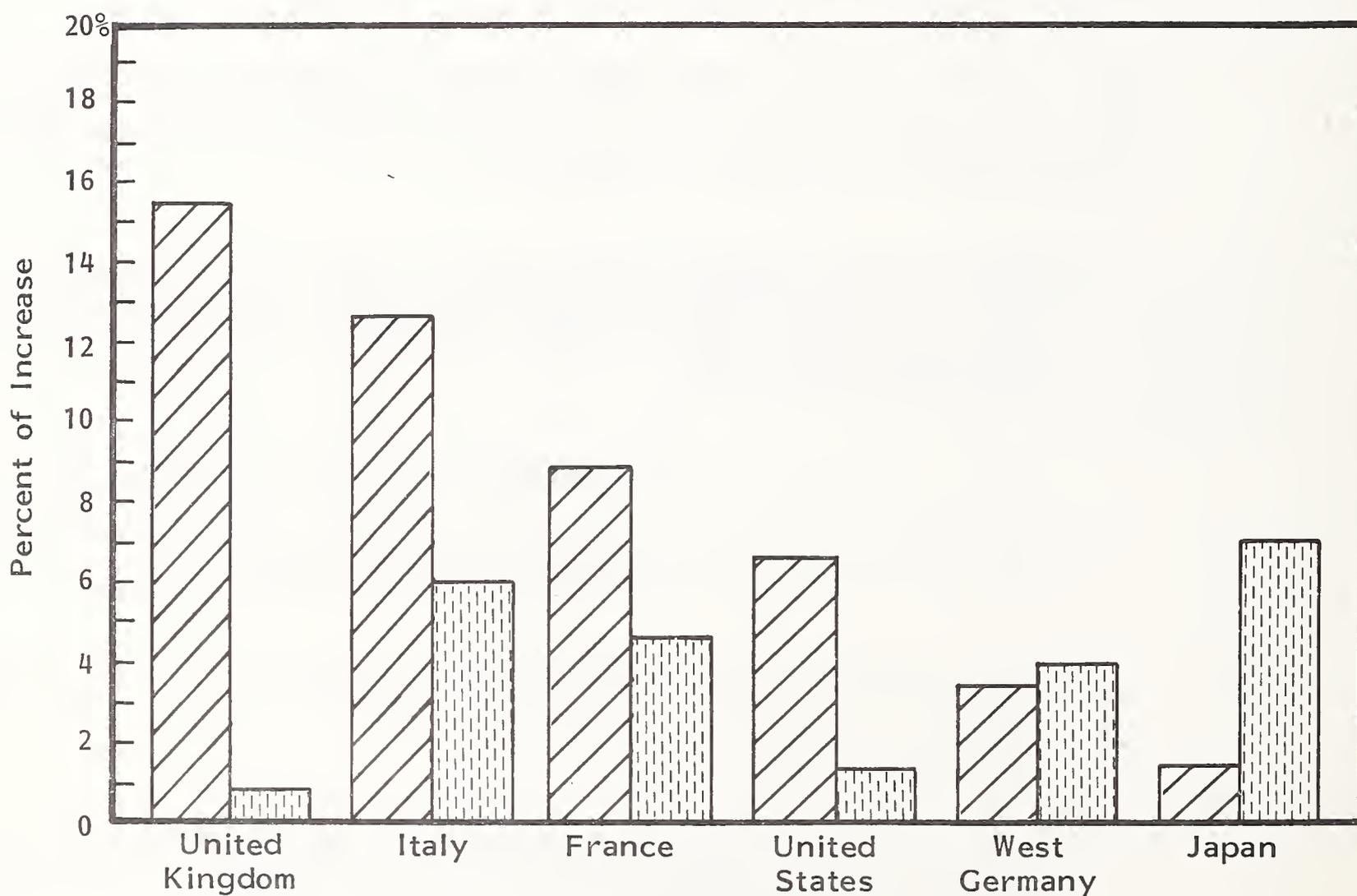
- While the focus of this study is on field service, some comment on the global productivity problem is appropriate to put the field service aspects in perspective. This global view is discussed in the following section.

B. MACROECONOMICS - SUCCESS IS HARD WORK WORLDWIDE

- The overriding concern of the majority of respondents was how to motivate engineers in the current economic climate of Western Europe to ensure productivity keeps pace with growth and expectations of performance.
- This is no easy task when the overall European relation of productivity to labour cost is slipping as the national unit labour cost accelerates at a faster rate than productivity, as shown in Exhibit III-1.
 - Britain has the greatest deficit, with unit labour costs increasing at over 15% annually (over the past five years) while productivity is increasing less than 1%.
 - On the other hand, Japan's unit labour cost rose by an average of just over 1% per year, with its productivity increasing about 7.5%. The gap in productivity between Britain (and others) and Japan is widening.
 - West Germany is the best performer in Europe but even in this case productivity is only just ahead of labour costs.
 - In the U.S., historic increases in productivity have been absent in the last 10 years and industry is suffering the consequences. The motor industry is a prime example.

EXHIBIT III-1

AVERAGE INCREASE OF
PRODUCTIVITY AND LABOUR COST
BY COUNTRY, 1975-1980



 Unit Labour Cost
 Productivity

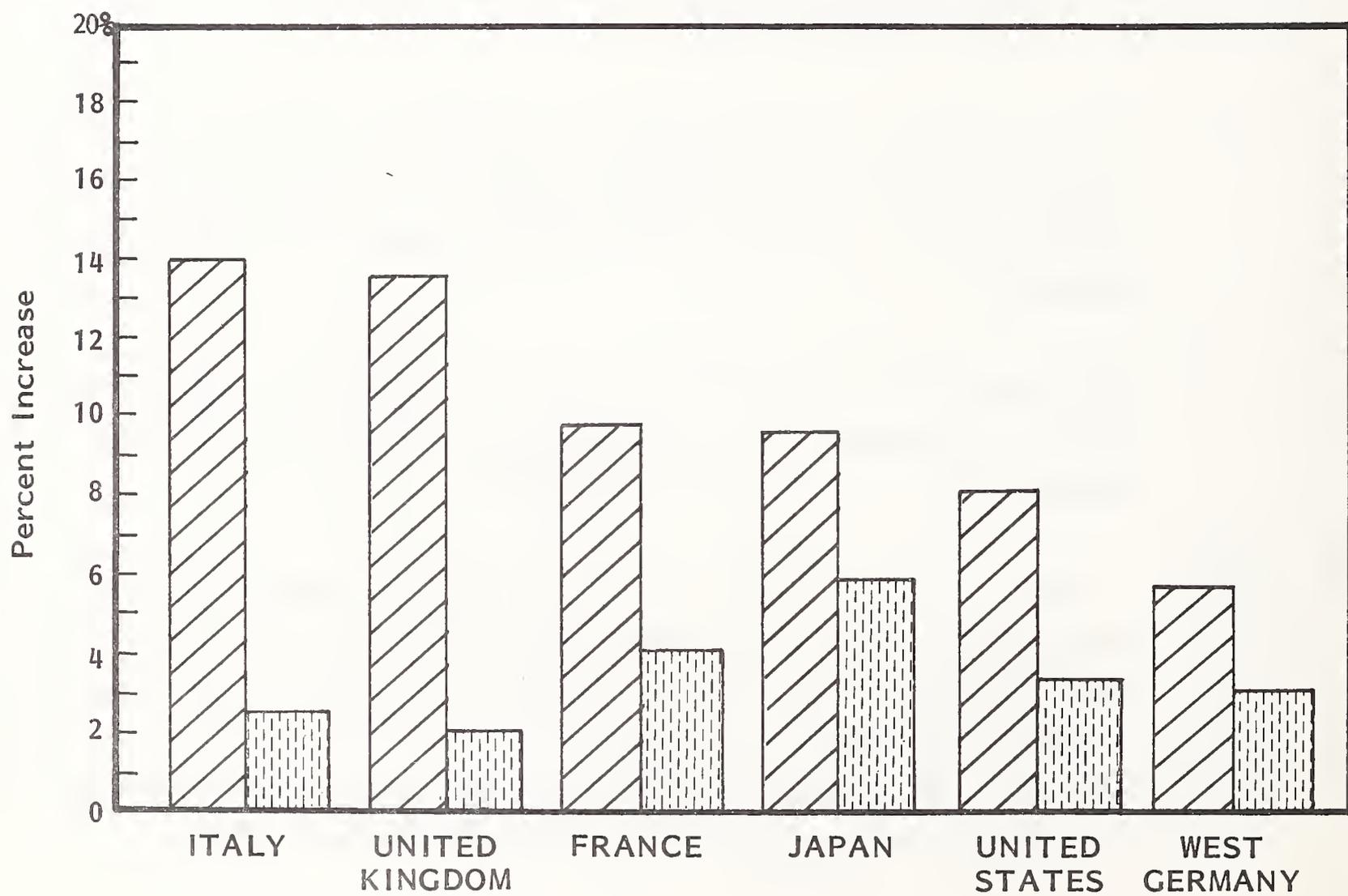
- The average inflation rates over the years 1970-1979, illustrated in Exhibit III-2, shows the U.K. and Italy as the leaders at nearly 15%. Japan is suffering from a higher rate of inflation than West Germany which has an average of just over 5%.
 - Italy possesses very little natural energy resources and has suffered more from OPEC activity than the rest of Europe.
 - The United Kingdom, saved from far worse figures by its oil and coal resources, has to a large degree increased public spending, with little effort being made to link wage rises to higher productivity in either the private or public sectors.
- A key to national competitiveness is productivity, just as it is a key to competitiveness between industries and companies. Improving productivity, is complex, however, starting with achieving agreement on the meaning of productivity.
- The computer industry has felt the effects of inflation to a lesser degree, but for some companies, such as International Computers Limited (ICL) and Memorex, the real impact now has to be faced.
- In Japan, a recent survey has shown that the biggest single factor in determining its workers' basic wage rates is a firm's performance. Since the mid-1970s the basic wage rates have become more dependent upon the success of the firm and less on the old 'going rate' for the job or even 'cost of living' uses. The Japanese have accepted the concept that personal financial success is dependent upon hard work and the profitability of the company.

C. DEFINITION OF PRODUCTIVITY

- By design, INPUT made no attempt to force a particular definition of productivity onto vendors. This would have distorted the data gathering

EXHIBIT III-2

AVERAGE ANNUAL INCREASE OF
INFLATION AND GROSS DOMESTIC PRODUCT GROWTH,
BY COUNTRY, 1970-1979



 Average Inflation Rate
 Real Gross Domestic Product (GDP) Growth

exercise. Instead, INPUT suggested, or rather implied, that a number of important parameters might need to be measured in order to determine a quantitative measure of productivity. At this stage, the research was aimed at discovering:

- How many vendors thought in quantitative terms about productivity.
 - What quantitative factors (algorithms or simple measurements) were in use.
 - What key factors were monitored in any way and to what extent this was done quantitatively.
 - How intimately productivity improvement, in the minds of vendor management, was bound up with other types of performance improvement.
- Exhibit III-3 shows the respondent's rating of parameters for measuring productivity. Only 3 of the 17 responding vendors had a fixed quantitative view of productivity, reflecting the confusion and lack of understanding that exists in the measurement of productivity. The definitions given were:
 - 'We define a value which says that the CE will spend approximately 50% of his time on actual site work. Therefore, a CE with a 180-hour month¹⁵ expected to spend 90 hours on site. Secondly, we regularly set a standard number of hours to each machine type (reviewed each half year). If a machine had a standard somewhere between 40 and 50 hours, our 90-hour-a-month CE would be expected to look after two, and so on'.
 - 'A productivity factor is negotiated with management depending on the size of the installed base. Each machine has a number of standard house hands-on time allowance per year or month. The factor against

EXHIBIT III-3

RESPONDENTS' RATING OF PARAMETERS
FOR MEASURING PRODUCTIVITY IMPROVEMENT

PARAMETER	PERCENT RELATING PARAMETER TO PRODUCTIVITY
Lower Staff Turnover	35%
Lower Training Cost	35
Lower Preventive Maintenance	41
Lower Engineering Change Activity	35
Lower Repair Time	77
Fewer Recurring Faults	47
Fewer Customer Visits	47
Higher Customer Satisfaction	53

Number of Respondents = 17

which performance is monitored is the total number of standard hours in the installed base divided by the headcount of staff in the department. For this purpose, the headcount consists of CE and managers, but excludes spares engineers and people working on refurbishing units in repair centres'.

- 'We insist on a tight definition of productivity related to the percentage amount of time an FE spends on "productive" work; 173 hours per month productive hands-on time equals 100% productivity'.
- These definitions have a common element in that they monitor or control the time an engineer spends productively or with his hands on the equipment.
 - The first definition is designed to monitor individual staff performance.
 - The second definition monitors the field service department as a whole.
 - The third definition has the capability to measure both the individual and the department yet leaves the word 'productive' undefined and therefore vulnerable.
- The remaining 14 respondents had no defined measurement and related to productivity with statements such as:
 - 'Productivity is product orientated; getting the product right; staff levels'.
 - 'Customer satisfaction is the ultimate test.'
 - 'Cut repair time'.
 - 'Keep in touch with staff'.

- Of the three companies who gave quantitative measurements of productivity, two stressed other aspects:
 - One emphasized the importance of getting the combination of all the listed factors just right.
 - The other saw customer satisfaction as the ultimate criterion of whether everything was in place correctly.
- The percentage of remaining 15 respondents who felt a stated parameter was relevant to measuring productivity is shown in Exhibit III-3. Only lower repair time is clearly associated with productivity in the minds of most respondents.
- For 14 respondents it was necessary to attribute a general qualitative answer based on the synthesis of their reactions to the suggested parameters. The breakdown for the 17 respondents was as follows:

	<u>Number of Replies</u>
- Definite quantitative algorithm/formula	3
- Productivity stems from a balance between all of these factors in the question	2
- Productivity is product orientated: getting the product right; training staff correctly on it, etc.	5
- Customer satisfaction is the ultimate test	2
- Others, including:	

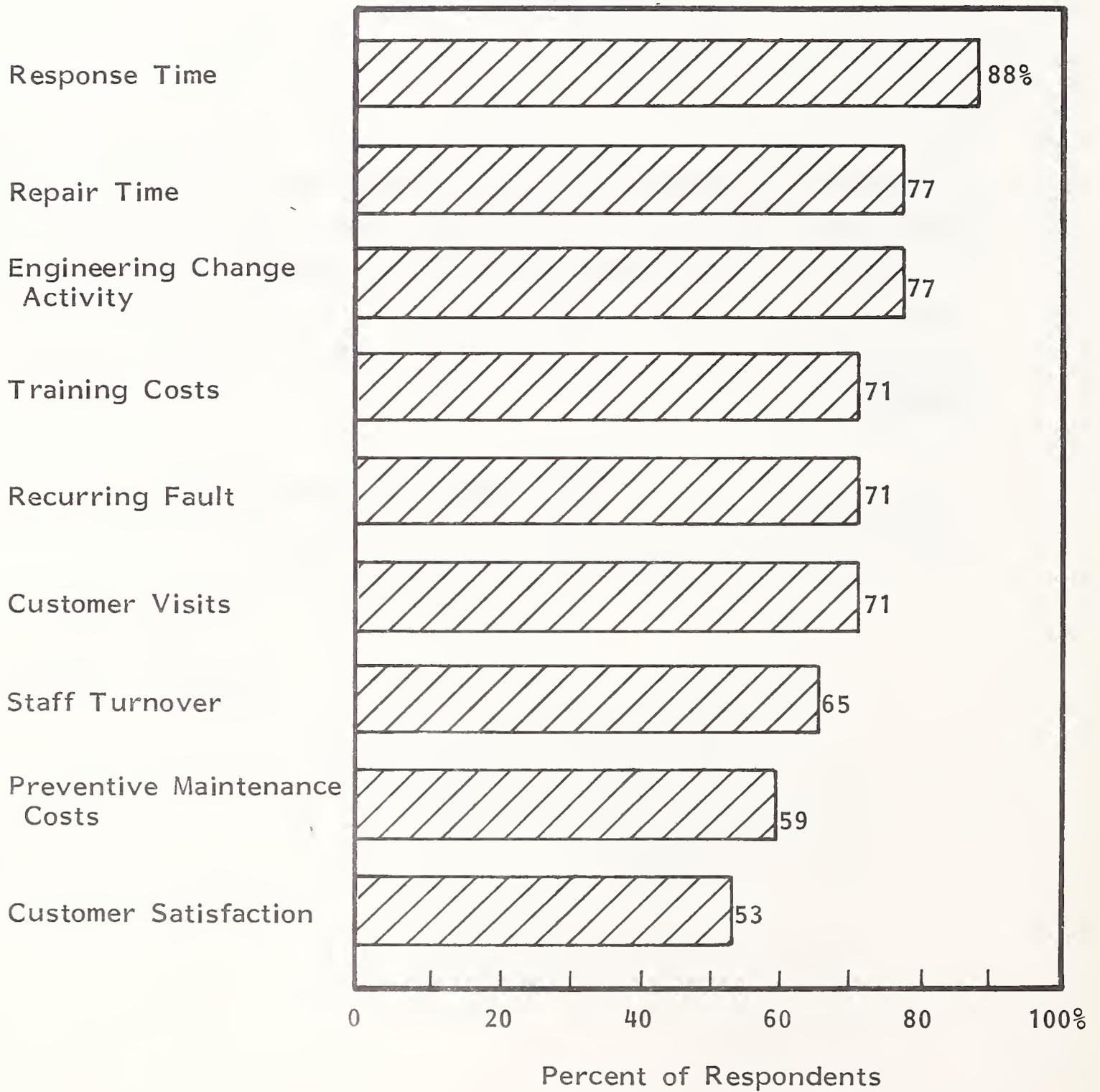
•	Correct installation is crucial and saves time later	
•	Cut down repair time	
•	Keep salaries under control	
•	Keep in touch with staff at a personal level	
•	Too young a company to know	<u> </u>
	Total	17

- Exhibit III-4 shows the analysis of the incidence of measurement of the major parameters traditionally associated with the field service industry. In general, a high level of monitoring is being pursued. One weakness appears in the level of sensitivity to customer satisfaction. Just over half (53%) of the respondents measured customer satisfaction and in a number of cases this was purely subjective related to the number of irate customers calling the field service manager.
- Analysis of the extent to which support statistics are gathered to measure productivity improvement yielded the following table:

	Respondents	
	<u>Number</u>	<u>Percent</u>
- Using a comprehensive on-line reporting system (usually called a field service information system)	3	18%
- Using a large amount of computerised reporting (usually not integrated and run in batch mode)	4	23

EXHIBIT III-4

RESPONDENTS' METHODS OF MEASURING PRODUCTIVITY



- Only partly computer-based; still relying on key manual systems (one currently implementing a real-time system)	2	12
- Mainly manual reporting systems (usually concentrating on equipment/site stories)	6	35
- None or hardly any (one a young company, the other busy grappling with the problems of 35%+ growth)	<u>2</u>	<u>12</u>
Total	17	100%

- On the question of a numeric quantified annual productivity increase figure, it was rather surprising that, despite the fact only three respondents had a definition of productivity, a total of 12 respondents quoted a figure for their increased productivity.
- The average productivity achieved was 11% with a standard deviation from this mean of 4%.
- The three companies that had a definition of productivity reported an average achievement of 12.5%.
- Reasons given for not having a precise numeric target included:
 - 'Our productivity is high now; we are a small specialist and we haven't developed to the stage where we need such formal monitoring'.
 - 'Looking at it a different way, we are attempting to increase our revenue while at the same time containing our headcount'.
 - 'Not quantified in this way, we look at the revenue earned per engineer and the number of sites serviced per CE'.

- 'Not quantified thus; inventory availability is a current concern'.
- 'We don't have such an objective. It all hinges on the product. We have a centralised support group which works with the design staff to build in maintainability from day one.

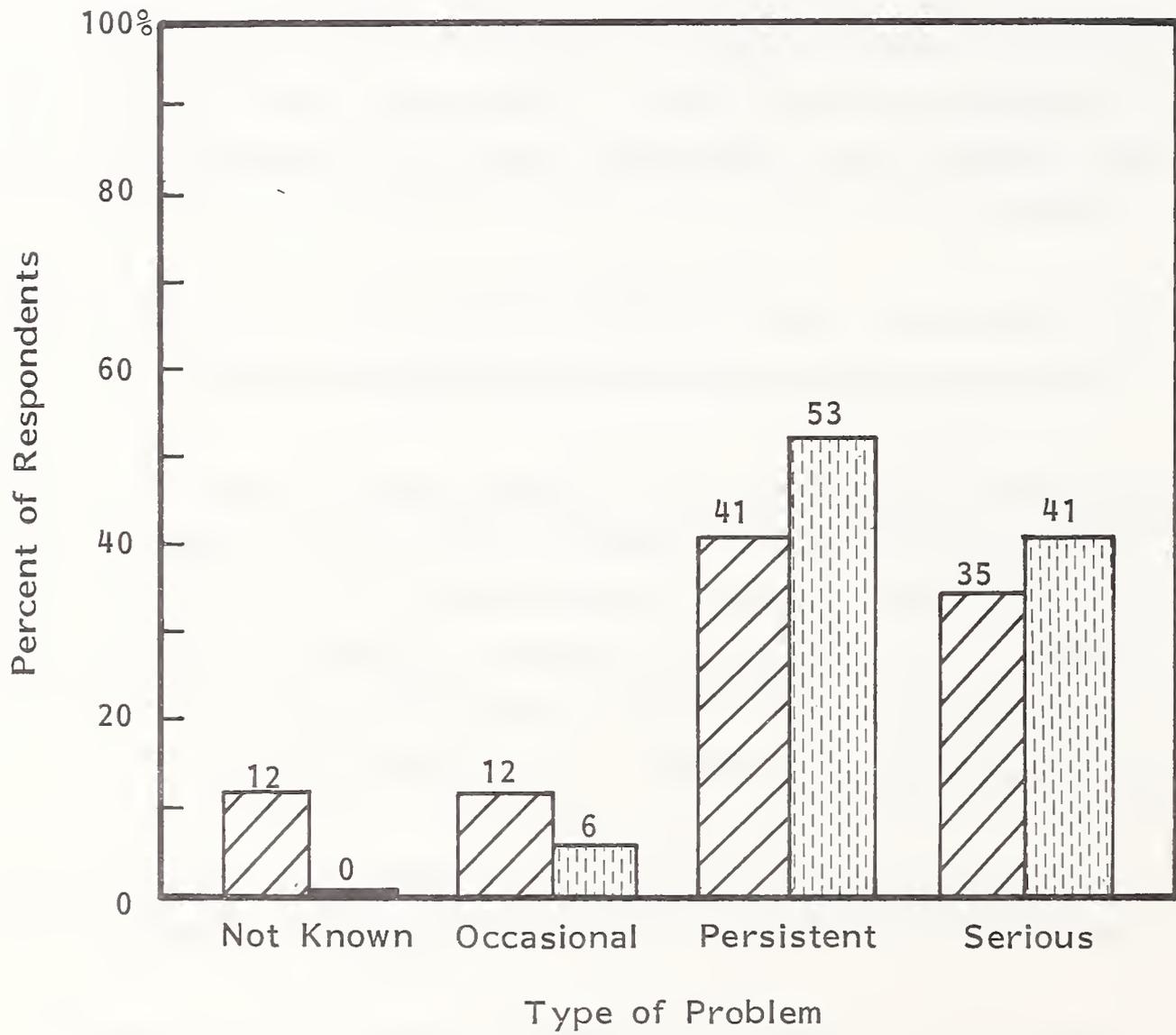
D. FIELD SERVICE RATING OF PRODUCTIVITY AS A TOP PRIORITY

- As stated earlier, more than half of the respondents considered that productivity was a major issue. A further 32% rated productivity as top priority. Field service managers considered that productivity was of greater concern to the field service organisation when compared to the rest of the company.
- Comments made by field service managers were:
 - 'After profit, productivity is the most important factor'.
 - 'We have been cushioned by lack of competition and lack of experience of users'.
 - 'Increases at 8% per year - not good enough'.
 - 'We say we are getting more productive - thank God no one checks!'
 - 'It gets a lot of discussion at meetings but we are not sure how to measure productivity'.
 - 'Unless we become more productive we are in real trouble'.
 - 'I'm under great pressure for field service to improve productivity'.
 - 'Productivity - we just have too many men'.

- 'Becoming prime measurement for field service'.
 - 'Not good enough, but management training will help us understand the problem'.
- Currently, 7 of the 17 respondents consider they have a serious problem with productivity while six other vendors have had problems in the past but have come a long way in removing bottlenecks and improving productivity. The remaining four vendors gave hesitant and doubtful answers, often regarding productivity as a persistent problem which must be continually watched.
 - In the past, start up problems have been the major difficulties in achieving respectable productivity levels. As the industry has matured the need to use the engineers more productively has become paramount with 76% of the respondents stating that the correct motivation of engineers was essential.
 - This motivational effort should be coupled to a cost control program with attention being paid to staff skills and management training.
 - To quote one respondent, 'No matter how good the tools, if the engineer is not correctly motivated it is a waste of time'. This respondent went on to state that he realised the need to understand motivation but lacked the management technique or understanding to effectively handle the problem. This was an underlying view of the majority of respondents and prompted INPUT to devote a section of this report to the whole question of motivation.
 - Exhibit III-5 compares the frequency of productivity problems now and in the past. The trend is towards more frequent persistent and serious problems.
 - Excluding the motivation of engineers, Exhibit III-6 cites comments received from respondents on other causes of productivity problems.

EXHIBIT III-5

COMPARISON OF PAST AND CURRENT
FREQUENCY OF PRODUCTIVITY PROBLEMS



-  Current Problem
-  Past Problem

EXHIBIT III-6

RESPONDENTS' VIEWS ON THE CAUSES OF PRODUCTIVITY PROBLEMS

COST CONTROL

- 'This is a constant problem; it's not an on-off thing. We pursue an even and steady policy'.
- 'Our costs are constant, but our revenues are decreasing. We need new sources of revenue'.
- 'There are too many heads throughout the organisation, but particularly in field service'.
- 'The labour cost is just too high!'
- 'Our engineers are held up by lack of spares. Production of spares is the top priority'.

START-UP TROUBLES

- 'For our first five years we hadn't sorted things out'.
- 'We had been cushioned by lack of competition, and lack of experience made us weak'.
- 'We did have a revenue gap after tooling up'.
- 'We have still not established our goals'.

SKILL LEVELS

- 'Training will help us reach our productivity improvement target'.
- 'Our main problem is lack of skills to service our new and our old ranges together'.

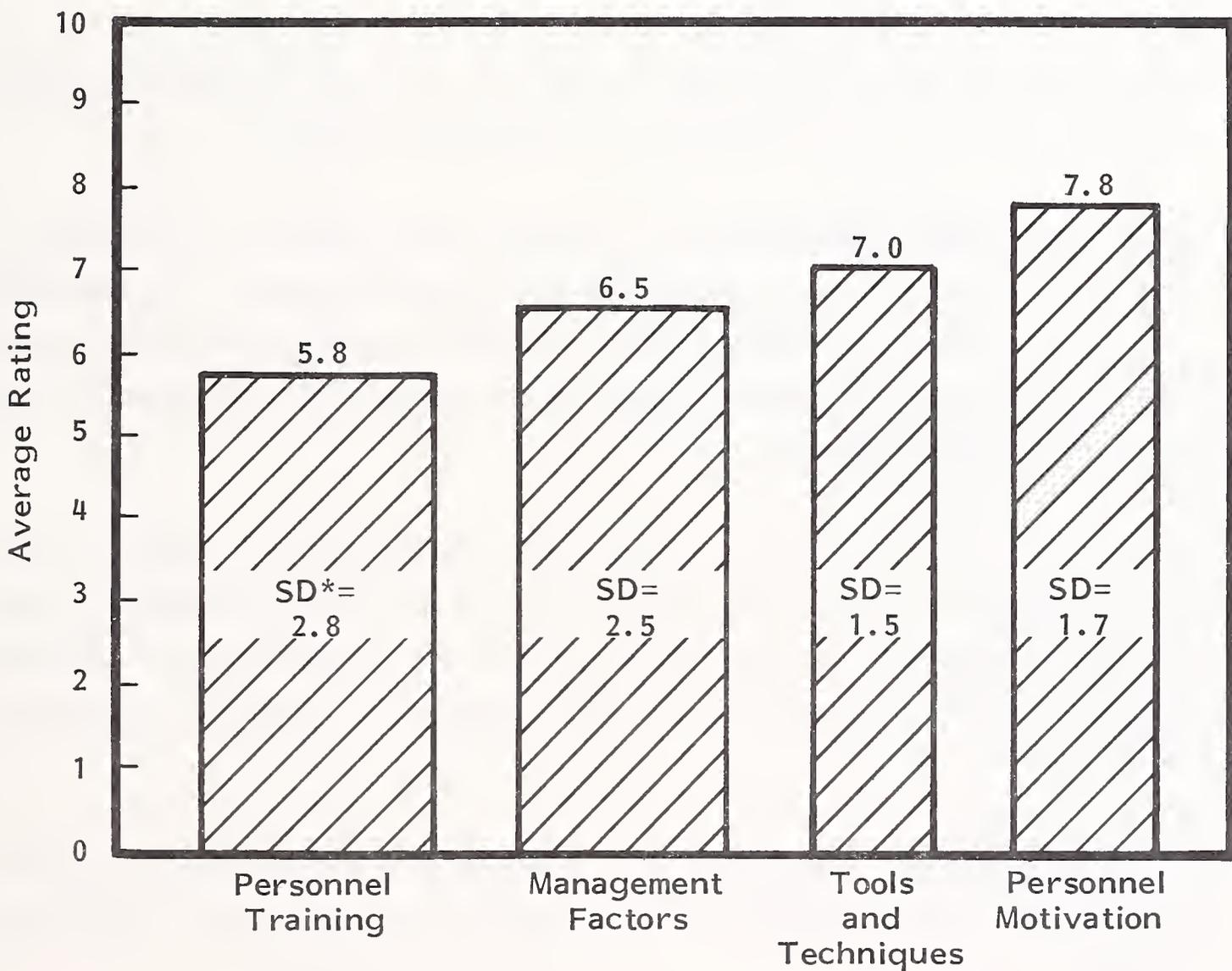
- Care must be taken with the definition of improvement in response time. From the standpoint of productivity, extending response time is an improvement but this must be offset by the other facets of response.
- Exhibit III-7 illustrates respondents' ranking of the importance of certain factors in achieving greater field service productivity.
 - The bars are drawn to scale with the height representing the average rating of each factor, and the width representing the standard deviation of the response to it.
 - Motivating and capitalizing on individual motivation is considered the prime factor in improving productivity by responding vendors. The majority admitted that this was no easy task and would need greater understanding and appreciation from all levels of management within field service.
 - 'Good communication' was the only factor mentioned under 'other', though that is normally thought of as a management skill.
- Comments made by respondents included:
 - 'These factors are interdependent'.
 - 'Careers must be visible'.
 - 'Engineers' individual motivation is high, therefore don't overmanage them'.

E. HOW IMPROVEMENT IS TO COME

- While the majority of respondents believed that positive motivation and effective use of the engineer's skills would have definite positive effects on

EXHIBIT III-7

RESPONDENTS' RATING OF FACTORS
CONTRIBUTING TO GREATER PRODUCTIVITY

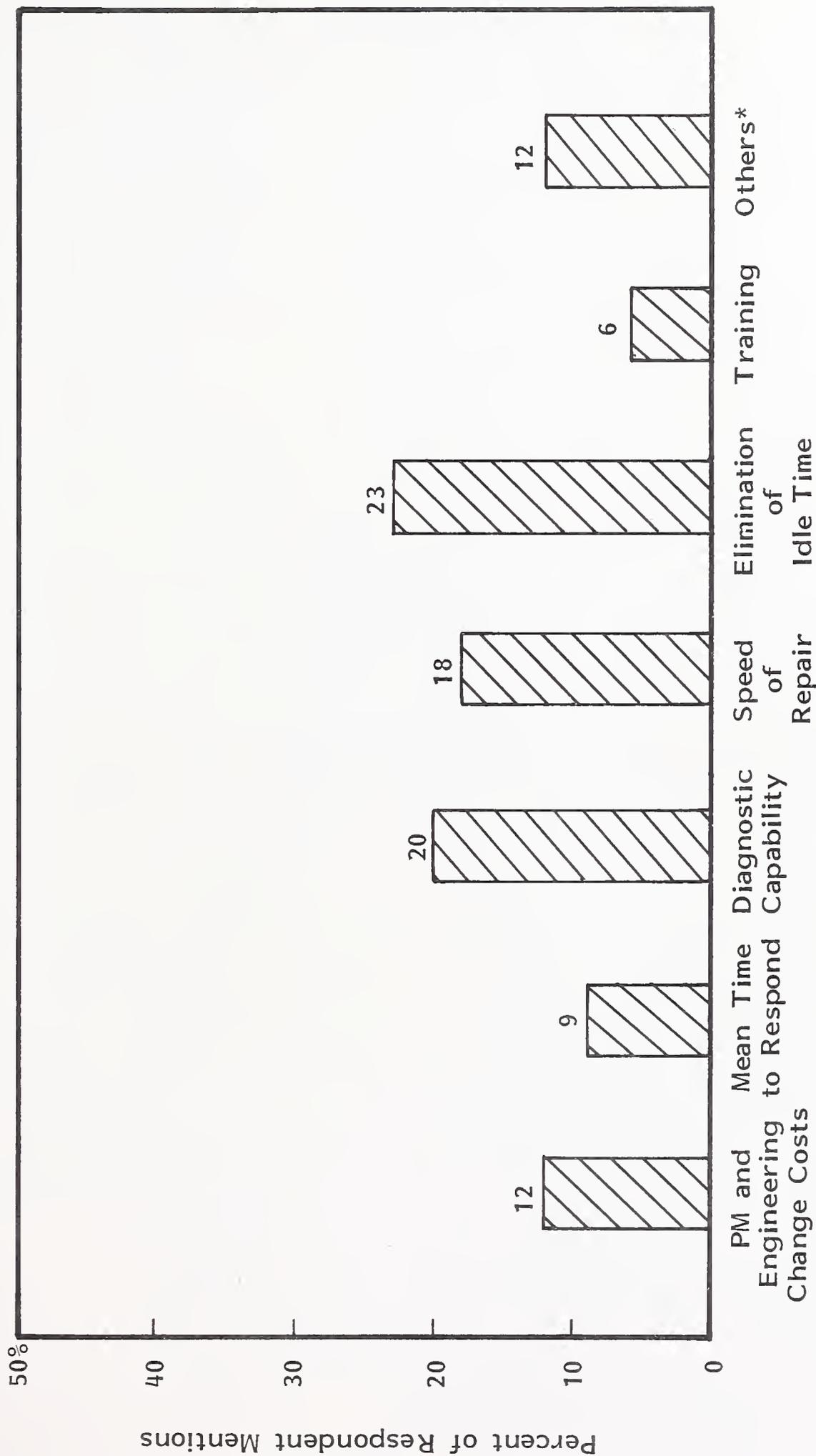


RATING 0 = LOW, 10 = HIGH
* SD = STANDARD DEVIATION

the whole of field service productivity, they also mentioned a number of other specific approaches to the problem. Work areas in which respondents wished to see improvements are illustrated in Exhibit III-8.

- The elimination of idle or nonproductive time along with an improvement in diagnostic capability were the prime contenders for attention.
 - These two areas were closely followed by the need to improve the speed of repair, which is dependent on equipment becoming more maintainable. As one respondent pointed out, 'it's about time designers realised the equipment does go wrong!'
-
- Despite the fact that travel time amounts to 27% of an engineer's activity only one respondent mentioned this as an area for attention.
 - One major vendor stated that his company had embarked on a program of management training in personnel skills and understanding of motivational techniques; however his major concern was that this skills training had started one management level down and consequently was not fully appreciated by the ultimate decision maker.
 - It is INPUT's opinion that in an industry so dependent upon engineers being 'self motivated' a manager is ignoring his duties unless he addresses the whole question of motivation. The problem does not go away; the better engineers leave taking the investment and skills necessary for improved productivity with them.
 - In the next chapter motivation will be explored in more depth as the focus of the analyses concentrates on the personnel portion of the productivity equation.

AREAS IN WHICH RESPONDENTS
WISH TO SEE IMPROVEMENTS



*ONE MENTION EACH FOR:
EQUIPMENT QUALITY
KNOWLEDGE OF SOFTWARE
MODULARITY OF KIT
TRAVEL TIME

IV PERSONNEL MOTIVATION AND MEASUREMENT
IN FIELD SERVICE

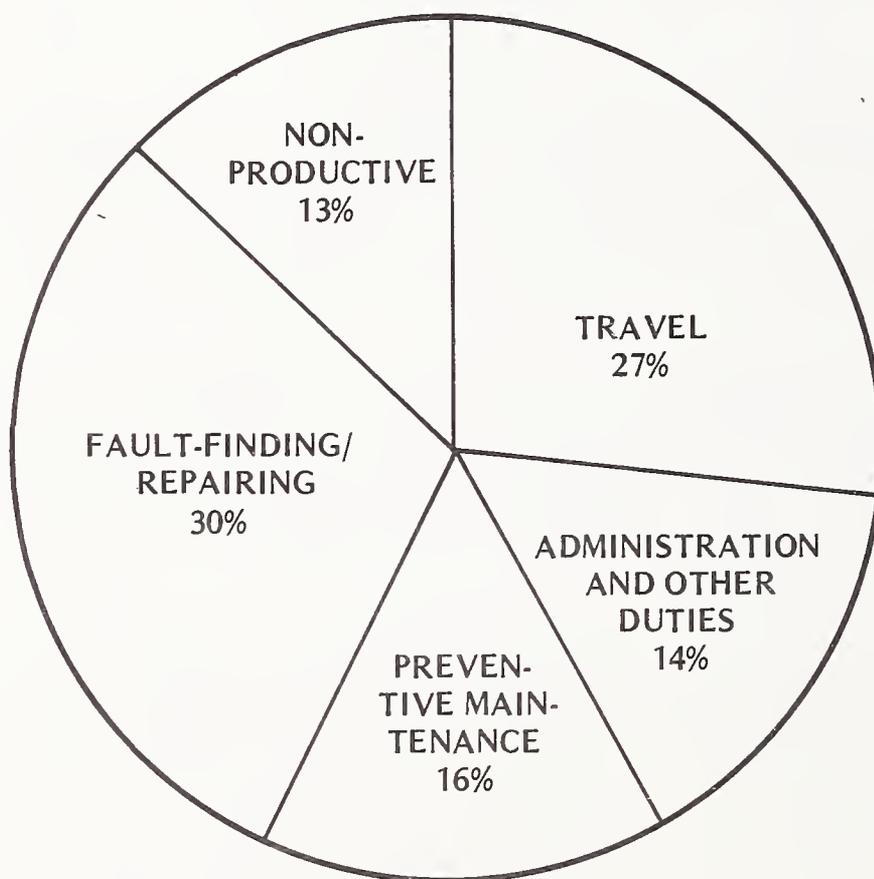
IV PERSONNEL MOTIVATION AND MEASUREMENT IN FIELD SERVICE

A. THE FIELD ENGINEER AND MOTIVATION

- Few jobs offer the degree of freedom and independence to relatively junior staff as field engineering. An engineer's performance is very dependent upon his frame of mind, motivation, and expectations.
- Exhibit IV-1 shows how a typical field engineer's time is spent during an average week. A total of 40% of an engineer's time is spent either travelling (27%) or on totally nonproductive activities such as waiting for a call or waiting for parts (13%).
- Remembering the reluctance engineers have in reporting nonproductive time, these figures could well be on the conservative side and understate the actual nonrevenue producing time spent by engineers. Only 46% of an engineer's average week is spent actually working at a customer site producing revenue.
 - Thirty percent of the time is spent in fault-finding and repairing.
 - Sixteen percent of the time is spent in preventive maintenance.
 - Administration, installing engineering changes, attending meetings, and handling personnel matters account for the remaining 14% of the engineer's week.

EXHIBIT IV-1

ANALYSIS OF TIME SPENT BY FIELD ENGINEERS
DURING AN AVERAGE WEEK



- Respondents report that on average 82% of their engineers work a normal one-shift day; the remaining 18% was split as follows:
 - Shift working 11%
 - Flexitime 6%
 - Standby or rotation 1%

- As more and more mini- and microterminals and ancillary equipment are installed, the traditional shift system of working is giving way to a system based on the normal working day.

- All the respondents had access to the time breakdown of their engineers but only 64% (11) of the respondents used this information as a major input to their planning and budgeting activity. A further 18% (3) used the information partially, while the remaining 18% (3) did not make any use of it.

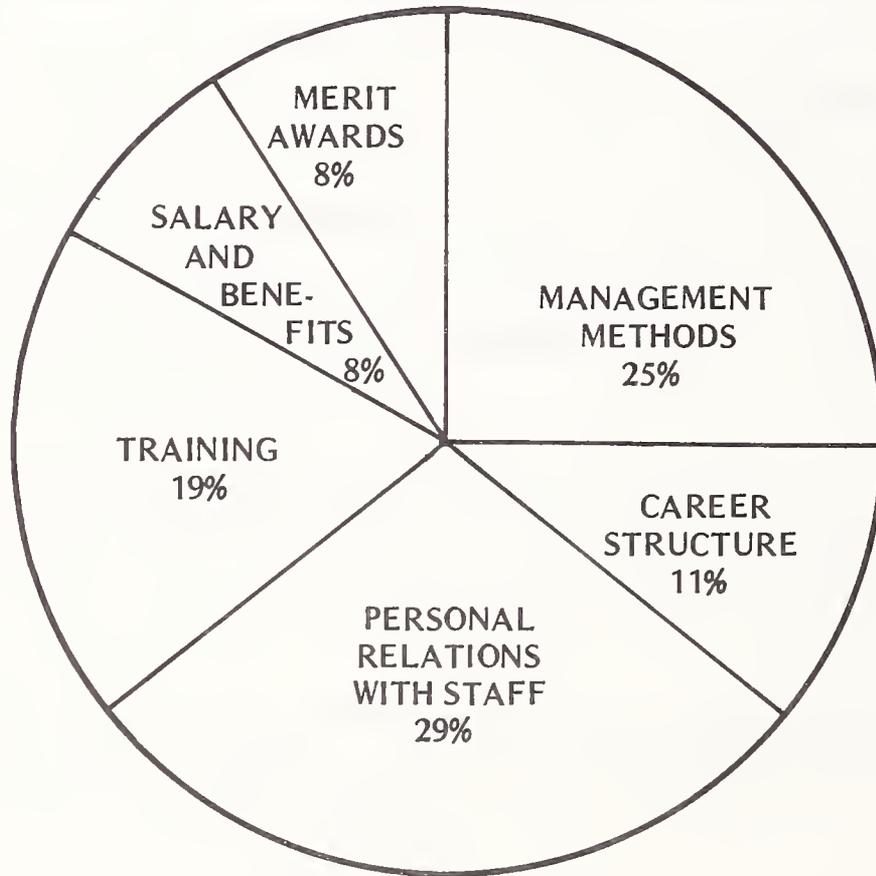
- Comments on the utilisation of this information included:
 - 'Thirty percent productive on-site work is not acceptable'.
 - 'We are trying to improve on 55% productive time, but it is very hard'.
 - 'We use it as an accounting tool; producing tabulations against each product line'.
 - 'It is being used to monitor the performance of products. We don't put pressure on the CE, as we know he can record anything on his timesheet'.
 - 'They provide an element of input into the planning cycle'.

- 'We use them as a test for the reasonableness of our assumptions. They are used in forecasting and in product planning'.
- 'We try to use them, but it is very much a function of the reliability of the reporting. No field service engineer can be more than 90% reliable'.
- 'We will use them even more next year'.
- 'No. The company is very good at budgeting. Budget is set according to sales growth and incorporates an inflation factor'.
- Respondents surveyed indicated that less than 5% of maintenance work is performed by subcontracted or third-party effort. The two major reasons for the use of noncompany labour were:
 - The remoteness of certain customers.
 - Servicing of obsolete equipment.
- Reasons for not using third parties included:
 - 'Can't risk allowing the third party an entry point to our customer base'.
 - 'We know our equipment best'.
 - 'Customers don't like third parties'.
- The techniques used to motivate personnel by field service managers reflected a high dependency on personal relationships with staff.

- Exhibit IV-2 shows motivational techniques as reported by the respondents. It highlights the concern expressed by over one-third of the sample that as the field organisation grows the field service manager loses contact with the lower level of field engineers.
- Three respondents expressed concern as to the career structure in field service. Considerable emphasis had been placed on promoting from within field service; the premise that a good engineer makes a good manager is far from sound, according to the experience of many vendors.
 - To quote one major mainframe vendor, 'We have destroyed more good engineers by making them managers than we have gained "good managers."
 - There still seems a reluctance in field service to establish equal career paths in both technical and management abilities. The problem is further compounded by the de-skilling that is the current trend.
 - One major national vendor is suffering severe problems with the 'mature' engineer. His comment was, 'just what does one do with the 55+ aged engineer?'
- Some usage is being made of incentive programs and these are illustrated in Exhibit IV-3. Bonus and incentive programs are the prime incentives used.
- The whole question of motivation is further discussed in Appendix A, 'Factors Affecting Motivation'.

EXHIBIT IV-2

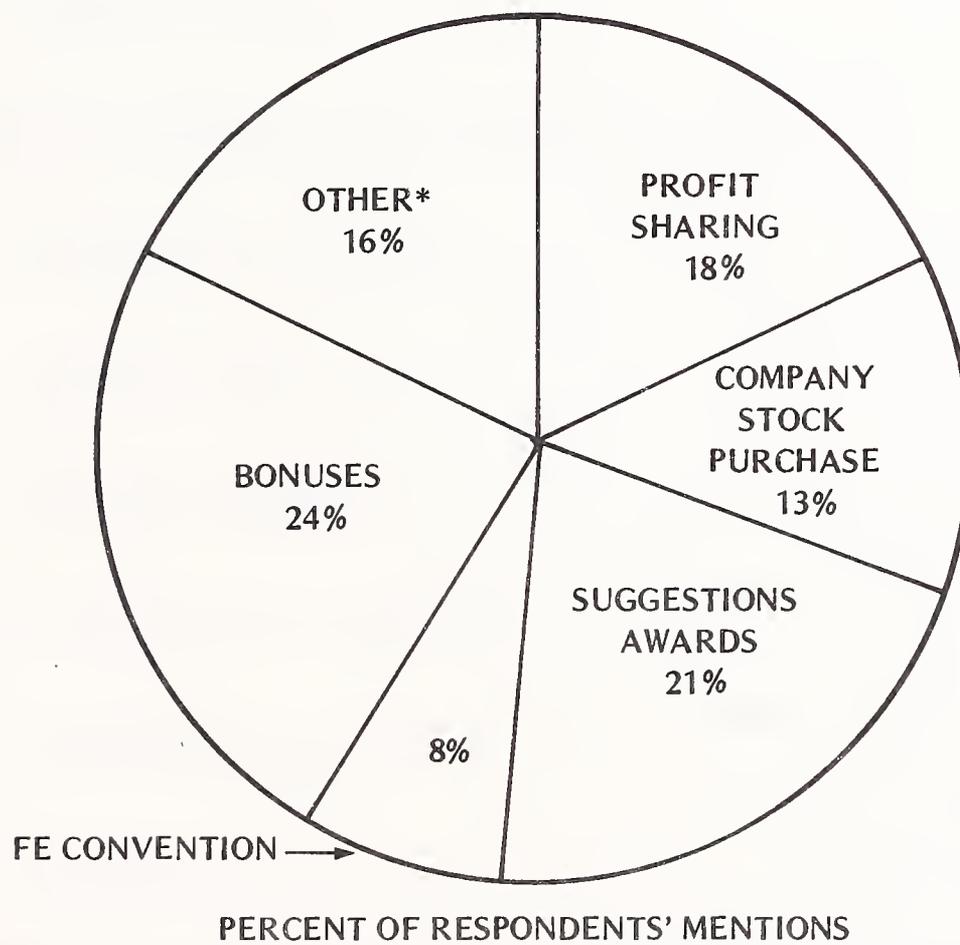
RESPONDENTS' TECHNIQUES FOR MOTIVATION OF
FIELD SERVICE PERSONNEL



Percent of Respondents

EXHIBIT IV-3

USE OF INCENTIVE PROGRAMS
BY RESPONDING VENDORS



*INCLUDES: GOOD WORKING CONDITIONS
MEDICAL INSURANCE
CARS
LOANS

B. USAGE OF TOOLS AND TECHNIQUES

1. INVENTORY CONTROL

- Of the 17 respondents, 13 had some form of automated inventory control system and only one of the remaining four was not planning to have such a system working in the next 12 months. The level of sophistication varied but in the majority of cases the field service managers had high expectations, covering areas of:

- Usage reporting.
- Minimum order levels.
- Asset reduction.
- Spares tracking.
- Emergency ordering.
- Unfulfilled orders.

2. FINANCIAL MODELS

- Financial models and reporting systems had the next highest number of mentions (11). These covered a whole range including:

	<u>Number of Mentions</u>
- Budget information	9
- Expenses	9

- Invoicing 3
- Five-year planning 2
- Asset management 2
- Revenue forecasting 1
- Sales forecasting 1
- Financial analysis 1

- The other models and reporting systems mentioned were:

- Management information.
- Engineer time.
- Incident reporting.
- Maintenance pricing model.
- Installation planning.
- Dispatch.

- Again, these systems are at different levels of sophistication. Only one mention was made of a more advanced technique such as queuing theory modelling.

3. TECHNIQUES OTHER THAN ON-SITE MAINTENANCE

- Vendors are expecting productivity improvements in the use of new maintenance techniques. User self-maintenance is one, and has a good following but is capable of very elastic definition ranging from:

- The user giving fault details over the phone.
 - The user carrying out basic preventive maintenance, tape head cleaning, filter cleaning, and the like.
 - The user running diagnostic programs.
 - Limited user replacement of failed modules.
- Remote diagnostics are used in one form or another by six respondents and in another form are being seriously considered or almost implemented by several respondents. Little consideration seems to be given to how they are to be 'sold' to the customer or to any financial endorsement to encourage participation.

4. PROFIT CENTER ORGANISATION

- The majority, 14 out of 17 respondents, were operating as a profit centre and had been doing so for more than two years. Two other respondents were firmly recognised as cost centres and had no immediate plans to change.
 - One did not expect to change before 1983 (if even then) as the field service department was running very smoothly and efficiently.
 - The other, due to its point in development and being a vendor of specialized equipment, considered its problems more technical than commercial.
 - One respondent would not disclose its policy in this matter.
- None of the profit centred organisations had any plans to become cost centres. However, two major vendors saw themselves as a combination of both.
 - 'We look at it both ways'.

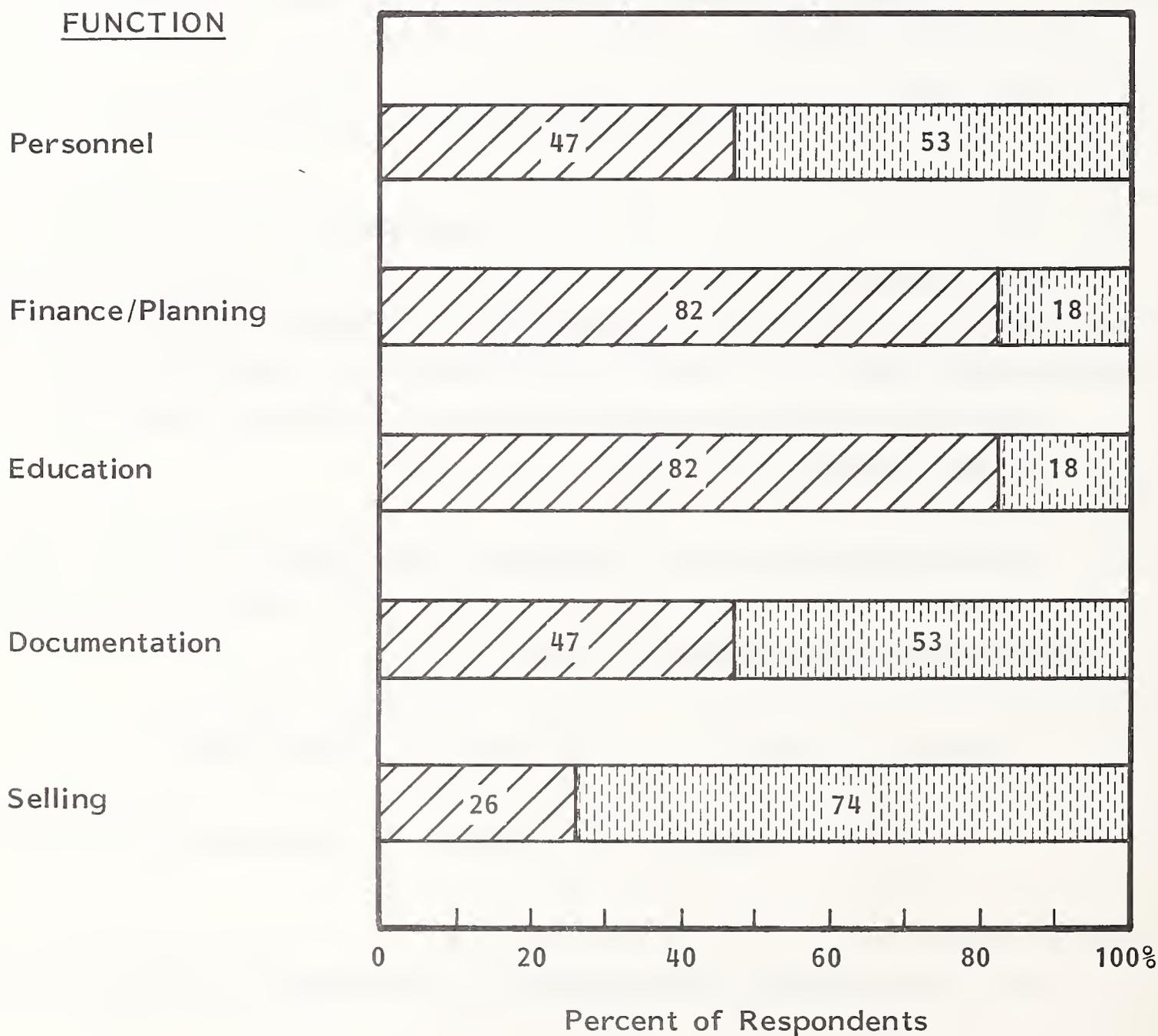
- 'In some countries we are profit centres, in others a cost centre'.

5. FUNCTIONAL RESPONSIBILITIES

- Analysis of the functional responsibilities of field service management, illustrated in Exhibit IV-4, shows that:
 - Education and finance/planning are frequently under the field service organisation.
 - Personnel and documentation functions are close to a 50:50 division of responsibility.
 - Sale of maintenance is only included in one case out of four.
- There is a very obvious incompatibility between the answers to this and the previous question. One is led to question the wisdom of company management which sets field service up as a profit centre without giving it responsibility for the selling function. True profit and loss responsibility must include control over all factors which influence a unit's destiny. Sales is one of the primary functions in this regard.
- The dilemma facing general management is well illustrated in the analysis of current and future functions that the field service manager had or expected, as is shown in Exhibits IV-4 and IV-5.
- In Exhibit IV-5, new functions mentioned under 'other' included:
 - 'Remote diagnostics will be used for our larger mainframes; later for minis'.
 - 'We are going to be aggressive in our selling of facilities planning and management with sales of accessories and supplies thrown in'.

EXHIBIT IV-4

FUNCTIONS REPORTING TO FIELD SERVICE MANAGEMENT AMONG RESPONDING VENDORS



-  Part of Field Service Responsibility
-  Outside Field Service Responsibility

EXHIBIT IV-5

RESPONDING VENDORS' WILLINGNESS TO TAKE ON NEW FUNCTIONS

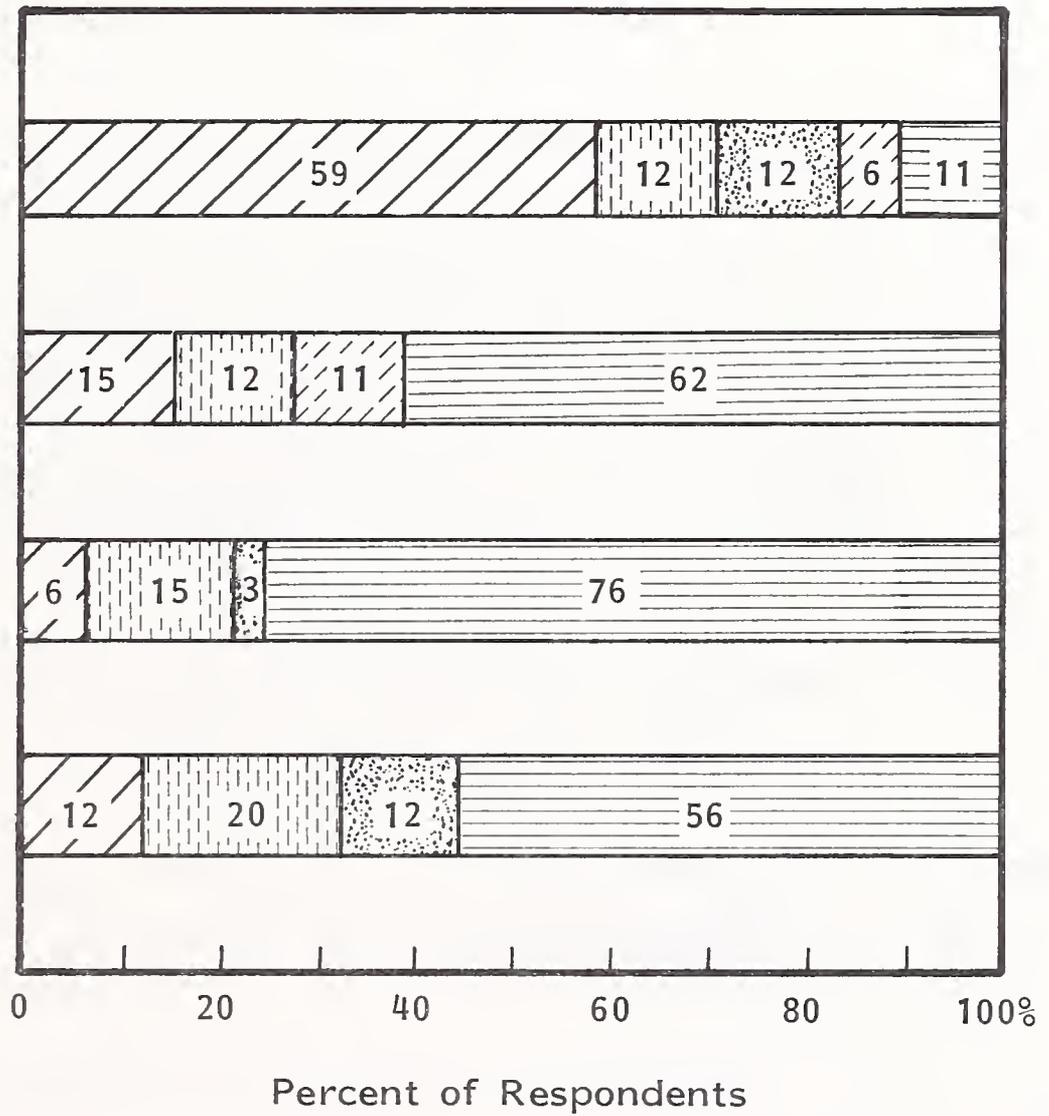
FUNCTION

System Software Maintenance

Application Software Maintenance

Third-Party Maintenance (TPM)

Other: User Training
Interface Design
Facility Design



-  Already doing
-  Starting 1981
-  Starting 1982
-  Starting 1983 on
-  No Plans

- 'We will start influencing the product quality assurance and get maintainability designed in'.
- 'CEs will be allocated to customer sites'.
- 'We shall take over the field service training and use computer assistance'.
- 'The trend is to sell maintenance ourselves'.
- The effect of introducing new maintenance techniques on the morale of the engineer is, in INPUT's opinion, being underestimated by vendors. Of the 17 respondents only one considered it as a problem while five vendors considered it only a small problem. Six respondents considered there would be no impact and three others stated new techniques would have hardly any effect on engineers' morale. As the introduction of new maintenance techniques continues, the de-skill effect on the engineer will accelerate.
 - Two vendors saw solutions to the problem by increasing the engineers' interest in their work, by encouraging the repair of modules and boards, and widening expertise over a broad range of products.
 - Eight vendors saw a solution in emphasis of the career structure although when pressed the majority did not quite know how to do this.
 - Three vendors noted the potential difficulty but would live with it.
 - Two other vendors saw no long term solution to the morale problem.
- In view of the glaring lack of a career structure in many companies, the fact that almost 50% of the respondents in the sample see this as a solution to the present dilemma is significant. INPUT research is discovering that there is a real gap in current vendor practice. Filling this gap could alleviate a trend which is causing concern.

C. CURRENT AND FUTURE ORGANISATION STRUCTURE

- The structure and organisation of field service have a direct bearing on the ability of the field service manager to motivate his staff and control the factors affecting productivity.
- Organisations planning to implement new field service functions indicated that:
 - By the end of 1981 over two-thirds of vendors will be supporting system software.
 - In contrast, by 1983 only one-third will have taken on support of applications software.
 - Third-party maintenance will be offered by only one-quarter of the vendors at the end of 1982, and will not grow as a service thereafter.
- However, the implications are that certain functions will remain a responsibility of field service organisation.
 - Vendors are firmly wedded to servicing the hardware aspects of systems and are reluctant to take on the systems responsibility of servicing applications software; this includes their own applications software.
 - As long as hardware servicing remains the chief preoccupation, field service will remain an adjunct of hardware sales in corporate eyes even though it takes an ever-growing slice of revenue and is called a 'profit centre'.
 - While staying as an adjunct to sales, it is not likely to raise the importance of third-party maintenance or take over responsibility for setting maintenance prices.

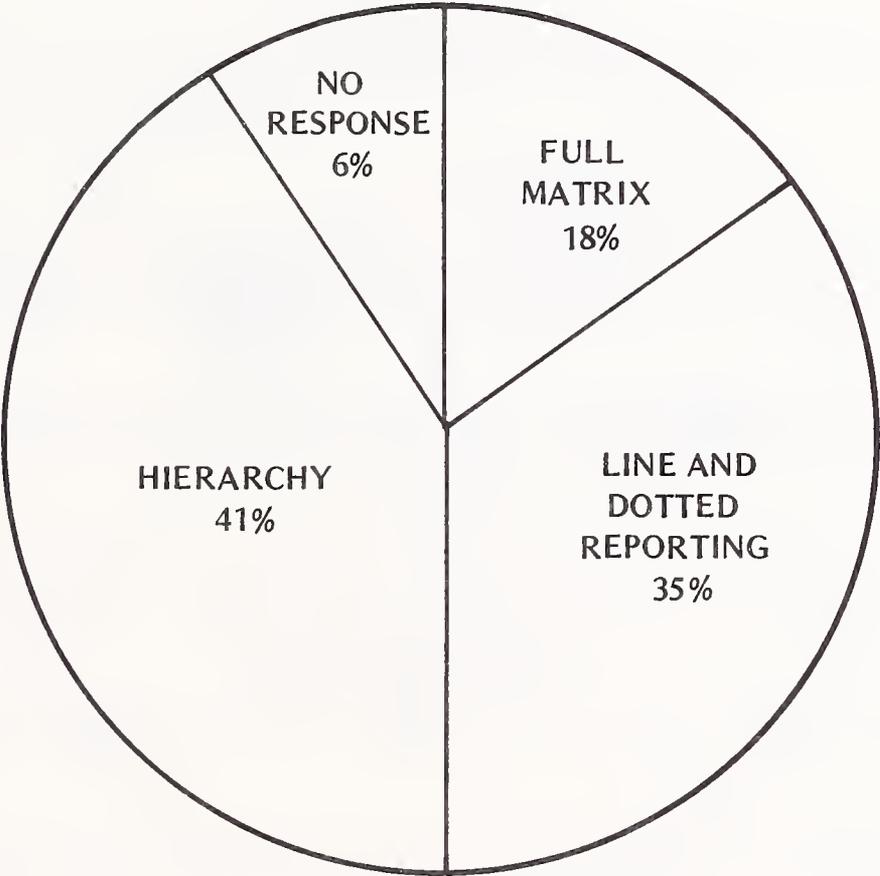
- Exhibit IV-6 illustrates the spectrum of organisation structure types encountered in the sample.
 - Three-fourths of those responding either had a hierarchy organisation or a line and dotted reporting system.
 - One field service manager commented, 'I have learned to live with two bosses often demanding opposing action'.
- In the past, field service has typically functioned under marketing but now only two field service managers out of the 17 said they reported to marketing. This shift to reporting directly to either the country or European manager reflects the growing importance of field service.

D. PRODUCTIVITY MEASUREMENT TECHNIQUES

- Exhibit IV-7 analyses the types of approach taken by respondents in applying productivity measuring techniques. The most common method is information gathering and monitoring (47%).
 - Another 23% had developed management control systems.
 - Eighteen percent were at the stage where product and technical considerations were the most relevant, while 12% were staying as they were.
- Some of the typical comments made by field service managers on the application of measurement to field service productivity were the following:
 - 'I don't think we can do much more. This system took a long time to implement'.

EXHIBIT IV-6

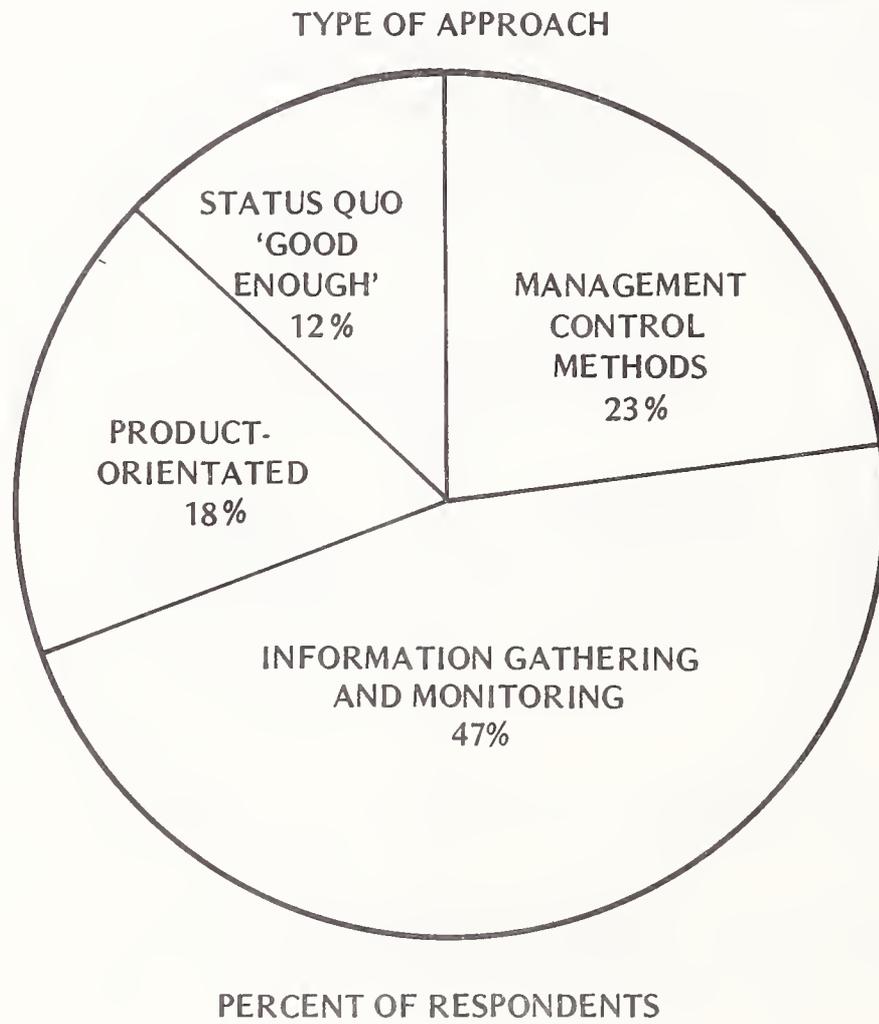
FIELD SERVICE ORGANISATION STRUCTURES
OF RESPONDENT VENDORS



PERCENT OF RESPONDENTS

EXHIBIT IV-7

PRODUCTIVITY MEASUREMENT TECHNIQUES
USED BY RESPONDENT VENDORS

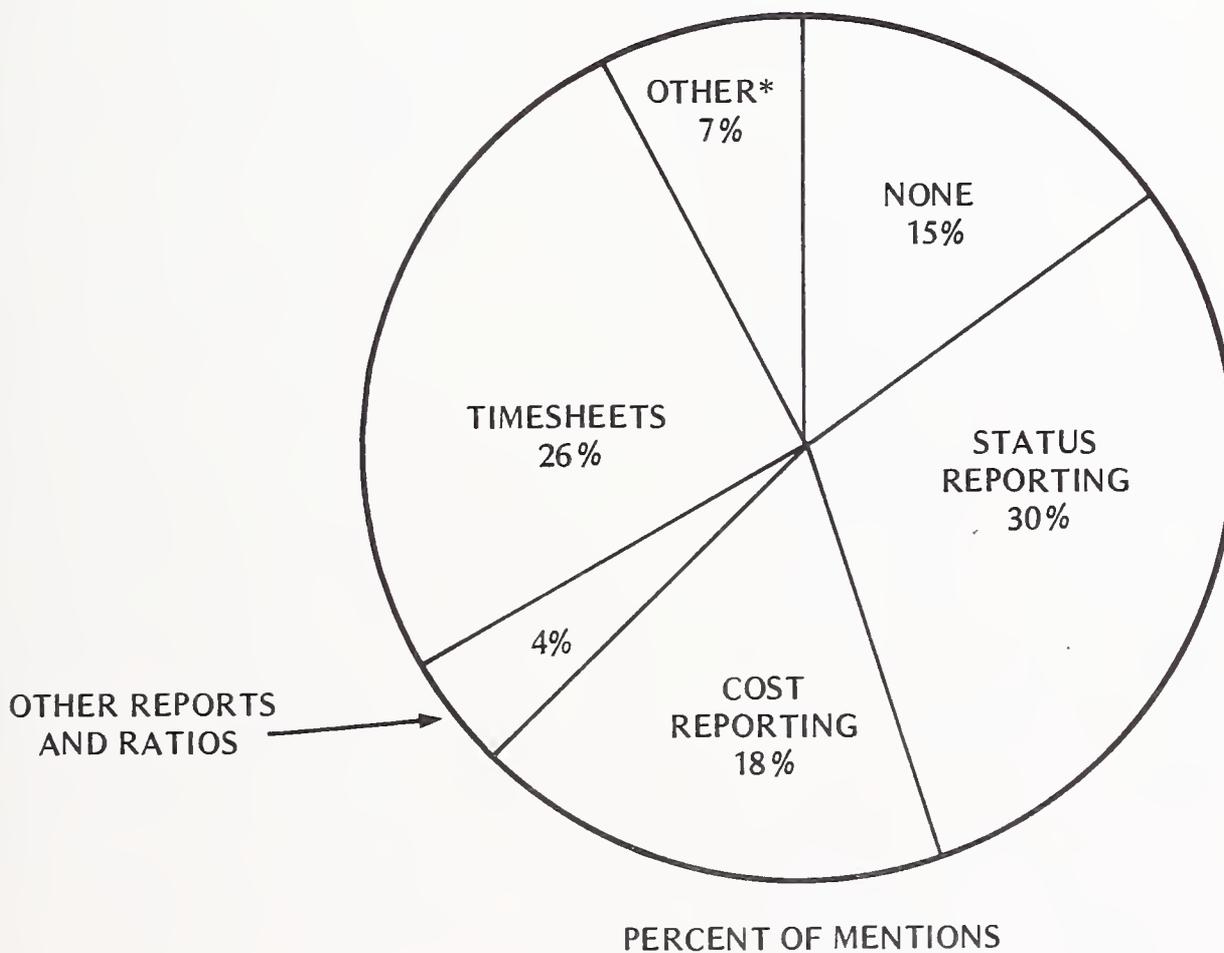


- 'Of course we would like to know more things, but we must concentrate, inevitably. Topmost importance goes to gauging the effect of the new diagnostic techniques and to keeping up our survey on customer satisfaction'.
- 'Things will be formalised in time for our new remote diagnostics'.
- 'Though it's all manual and batch now, we will start to get "real-time" data capture via our service centres, of which there will be 12 by this year end'.
- 'The old method of assessing productivity against projected sales has been found wanting'.
- 'We are concentrating on technical improvement. Our financial performance has been good for some time now'.
- 'We will improve and computerise our site status reporting'.
- 'We have to start from the base upwards as we don't have any statistics'.
- 'The field information system will be extended to cover depot repairs'.
- 'Management should be monitored. Support and management indirect costs get very burdensome'.
- 'Our reporting system is moving to distributed data processing'.
- 'Within our field service information system there are planning parameters which can be used to adjust the operation on a daily basis'.
- 'Don't constrain the engineer with forms; give him responsibility and a commercial sense'.

- 'We shall run with our current philosophy through 1982. (Our customer service report has only been going for two months.) Later we shall be looking at equipment reliability on a historical basis'.
- Status reporting, as seen in Exhibit IV-8, is the key measuring device, closely followed by timesheets. Cost reporting, including revenue per engineer, is among the key measurements. It is this area that will gain attention in the near future and become a major key indicator for field service.

EXHIBIT IV-8

KEY PRODUCTIVITY MEASUREMENT TOOLS
USED BY RESPONDING VENDORS



*CUSTOMER SATISFACTION; OVERALL PROFIT PERFORMANCE

V STANDARDS FOR FIELD SERVICE

V STANDARDS FOR FIELD SERVICE

A. CRITERIA FOR STANDARDS

- Productivity must be measured against clearly defined standards.
- Standards should meet five criteria: they should be written, understandable, measurable, challenging, and achievable.
 - Putting the words in writing achieves permanency, repeatability, and accuracy of communication.
 - Understandable means that everyone interprets the standards the same way.
 - The measurable criterion assures that the goal can be identified in quantifiable terms.
 - Challenging and achievable are two edges of the same sword. The standards should be worthy of attainment, but should require an extra stretch to reach.
- An example of a poor goal is: 'Respond as necessary to satisfy customers'.

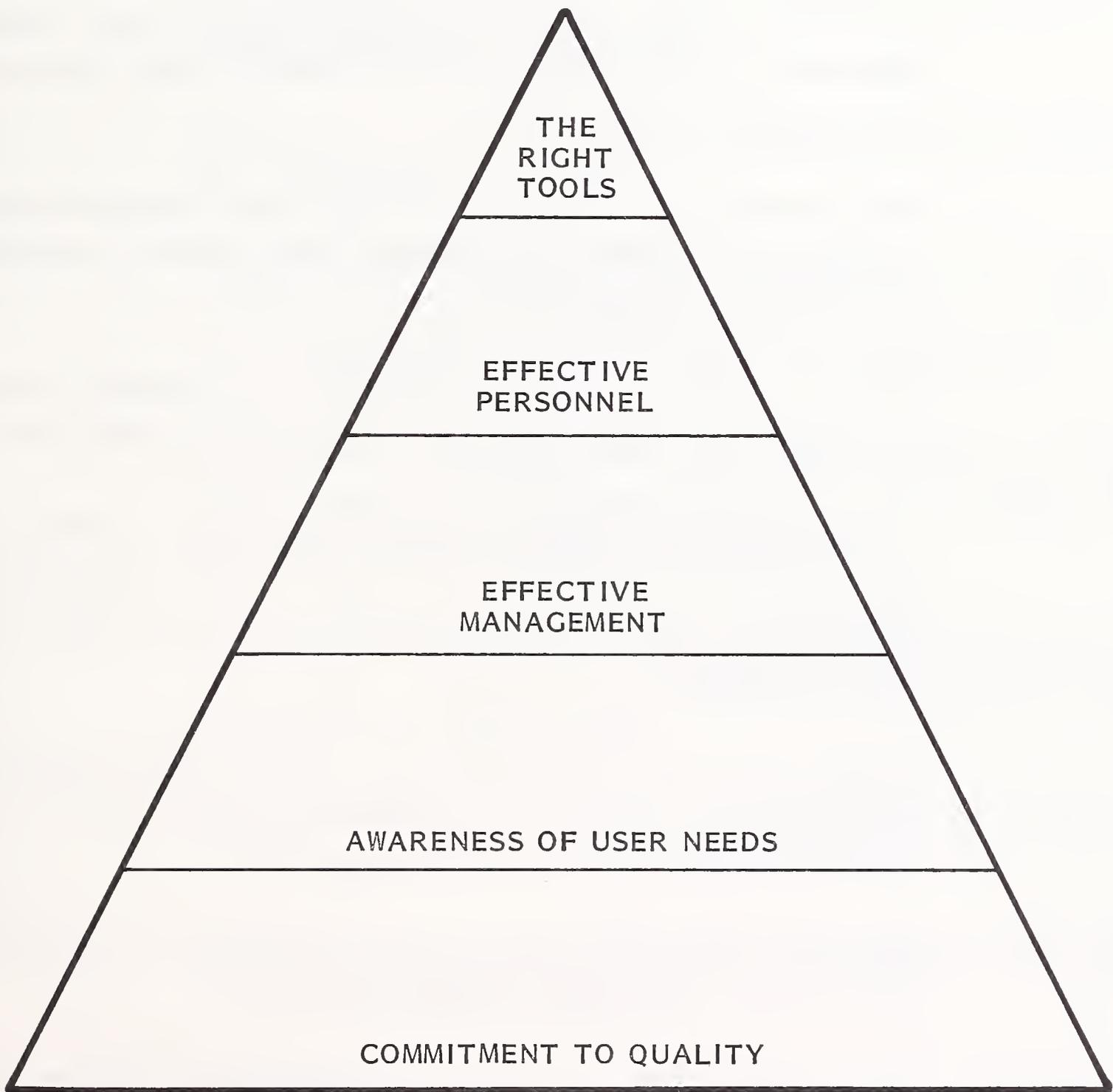
- A better goal that meets the above criteria is: 'Achieve response time of two hours or less on 95% of all service calls, as measured by the Customer Service Activity Report'.
- Standards should be established for the items that have the largest influence on productivity.
- Some goals should be communicated to customers.
- The tools must be available to achieve productivity goals. Chasing parts is wasteful for both the field engineer and other involved personnel, including managers, stockroom staff, delivery people, and other FEs who may have to go out of their way to deliver parts. However, tools are only the final block in the productivity pyramid, as shown in Exhibit V-1.

B. TYPICAL STANDARDS

- This section includes typical field service standards. Individual organizations will of course adjust these standards to meet their own objectives.
- Time and ratio standards should include:
 - Availability (Ao); e.g., the system will be operational 95% of the time from 8 a.m. to 12 p.m.
 - Mean Time Between Maintenance (MTBM); e.g., the system will average at least 100 hours between requirements for any preventive or corrective maintenance actions. (Note this includes MTBF.)
 - Response Time; e.g., response time from receipt of request for service until the field engineer arrives at system site will average less than four hours.

EXHIBIT V-1

THE PRODUCTIVITY PYRAMID



- Mean Downtime (MDT); e.g., mean downtime from receipt of request for service until the system is again operational will average less than five hours.
- Maximum Downtime (MDT max 00.95); e.g., the downtime measured at the 95th percentile will not exceed 16 hours. Stated differently, downtime will be 16 hours or less 95% of the time.
- Mean Time to Repair (MTTR); e.g., average time to correct system malfunctions will not exceed one hour from the time the FE arrives at the system until it is operational.
- Mean Installation Time (MIT); e.g., the FE will arrive within three days of request for installation and the average installation will be complete in less than eight working hours.
- Maximum Installation Time (IT max 00.95); e.g., installation on-site time measured at the 95th percentile will not exceed 24 working hours.
- Callback Rate; e.g., callbacks - defined as requests for service on equipment for the same or a related problem within three days of corrective, preventive, or installation service - will occur on less than 4% of all service calls.
- Overtime Hours/Total Regular Hours; e.g., overtime hours will average less than 10% of normal work hours, and will be paid only with prior management approval.
- Active Work Hours/Paid Hours; e.g., the percentage of revenue-producing hours to paid hours will be at least 65%.
- Corrective Maintenance (CM) Time/Total Maintenance Time; e.g., CM hours will be less than 30% of total time. Or, the ratio of CM to PM (preventive maintenance) time will be less than 1 CM to 2 PM.

- Maintenance Hours/Operating Hours; e.g., no more than one hour of maintenance will be required for 100 hours of system operation.
- Out of Territory Calls; e.g., effort will be made to dispatch FEs only to service calls within their assigned territories, and no more than 10% of calls will be out of normal territory.
- Travel; e.g., travel will be controlled to average less than 100 miles per day. (This obviously depends on distance between equipment, and can generally be reduced through control.)
- Calls Per Day; e.g., a FE is expected to average at least three calls per day, measured over a work week.
- Contract versus Time-and-Materials Customers; e.g., the number of customers for contract and warranty service will be at least 70% of total customers, allowing less than 30% for time-and-materials.
- Level of Part Service; e.g., parts will be carried by FEs to fill 80% of needs. Additional parts to provide another 15% will be available within four hours, and the remaining 5% within 24 hours.
- Administration/Production Ratio; e.g., there will be no more than one field service administrative or managerial person per every four revenue-producing field engineers.
- Average Maintenance Cost; e.g., maintenance cost will average less than \$1,000 per month for the specified system.
- Warranty Costs; e.g., cost of providing warranty service for the initial 90 days will average less than \$3,500.
- Expense/Revenue; e.g., service expenses will not exceed 10% of revenues. (This is most applicable to leased equipment.)

- Labor Cost; e.g., labor cost will be less than 40% of total service costs, and will not exceed \$2.00 per system operating hour.
- Parts and Materials Cost; e.g., parts and service consumables costs will be less than 20% of total service costs, and will not exceed \$1.00 per system operating hour.
- Production Loss; e.g., cost of lost production due to system malfunction will not exceed \$500 per week.
- Revenue Per Person; e.g., each field engineer is expected to produce annual billings of at least \$75,000.
- Return on Investment (ROI); e.g., ROI on service projects must average at least 30% a year for the initial three years.
- Inventory Per FE; e.g., the value of inventory carried by an FE will not exceed \$3,000 at cost.
- Inventory Turnover; e.g., measured at cost, inventory will turn over at least 3.5 times a year.
- Fixed Assets; e.g., fixed capital assets per FE will not average over \$20,000, including car, test equipment, tools, and facilities.
- Profit Margin; e.g., service is expected to produce a profit margin of at least 20% before taxes.

VI MOTIVATION - A MANAGEMENT TOOL

VI MOTIVATION - A MANAGEMENT TOOL

A. INTRODUCTION

- One of the key factors affecting the productivity of any organisation is the motivation of its staff.
- The three most highly rated factors contributing to productivity identified during INPUT's survey of field service managers were, in order of importance:
 - Motivation.
 - Tools and techniques.
 - Management and organisation.
- Management and organisation structure are key determinants in setting the motivational or demotivational level of a working group. Therefore, two of the top three productivity factors are related to motivation.
 - This section, which discusses the basis and effectiveness of different motivational approaches, points out the importance of a positive management attitude in achieving a high degree of self-motivation.

- Leadership, communication, and career structuring, which were identified as key motivators by the field service respondents, are all management dependent.
- Exhibit IV-2 showed that a total of 54% of the respondents rated local management methods and personal staff relations as the most important motivational approaches towards increasing field engineer productivity. Salary and merit awards received the lowest ratings.
- Motivation of the individual is more important and more difficult in field service organisations than in many other professions. Commission compensation plans have been refined to where they are a valuable motivational force for sales personnel, however, FEs respond differently to financial incentives.
 - FEs working on-site can easily develop a stronger loyalty to the organisation managing the data processing site than to their employer.
 - An exceptionally high level of trust is required of FEs:
 - Who are working remotely.
 - To prepare accurate time reports.
- Appendix C contains a description of techniques and procedures which have been found effective in motivation improvement.

B. A DEFINITION OF MOTIVATION

I. INTRODUCTION

- The term 'motivation' as related to the way people do their work, the level of productivity they achieve, and the results they produce, has eluded complete understanding and has not been easy to define.

- The importance of motivation is clear. It is easy to see what happens when motivation is low or even absent altogether.
 - As productivity declines, morale goes with it, and individuals and companies fail to achieve planned output.
 - Recognising the results of poor or low motivation does not go very far in helping to understand what motivation really is.
 - While the peripheral factors relating to motivation, the stimulating effect of rewards and the depressing effects of deprivation, are recognised, the central core of motivation still escapes understanding.

- The main reason is that the basis of motivation lies within the complex system which makes up the human being and his or her individual personality.
 - It is only comparatively recently that the psychological forces that maintain and drive humans in carrying out their functions effectively have begun to be understood.
 - Although this understanding is far from complete, there is now a recognised basic awareness, based on extensive research, of the psychological ingredients of motivation.

2. NEEDS AND GOALS

- Two fundamental and related factors which in every human being have a profound influence on motivation are needs and goals.

- All of us, at all times, have within us needs that we want to satisfy.
 - Some of these needs are easy to recognise such as our need for food (hunger), or our need for sleep.

- Other needs are more complex and sometimes less easy to recognise such as the needs for status and position, or the need to exercise power and authority.
- In any one person at any one time a number of these needs are present.
 - The strength and nature of these needs will vary from person to person, and even from time to time within the same person.
 - This is the main reason why getting a grasp on the true nature of motivation is such a difficult thing as it is based on an ever-changing pattern of needs, and on a pattern which is unique to every individual.
- A goal achieved represents the satisfaction of one or more needs.
 - If the need is hunger then an appropriate goal for satisfying that need would be to eat food.
 - If hunger is severe the need will become dominant and could affect much or all of our behaviour until it is satisfied. On the other hand if it is not very severe it will not become a significant driving force.

3. MOTIVATION - THE DRIVING FORCE

- Motivation is defined as the driving force that propels each one of us towards the goal which will satisfy that need.
- It is important to realise that once a goal has been achieved, and the relevant need has been satisfied, that need ceases to become a motivating factor.
 - This may only be a temporary situation. We get hungry and we eat food to satisfy that hunger, but we are going to get hungry again.

- In other instances the need may become more stable. At one stage in our career we may achieve a status and position beyond which we do not want to progress, and this situation may continue until we retire or leave our job and company.
- The importance of salary and monetary rewards declines as basic subsistence and security needs are reached.
- Field engineers, as a result of a relatively high remuneration level and an ingrained desire to achieve a higher level of 'professionalism', do not respond strongly to monetary incentives.
- All individuals have a wide range of needs at any one time and since many of us will only be partially or temporarily satisfied during our lifetime every one of us is motivated towards some goal or other all the time.
- Barriers encountered in trying to achieve a goal result in frustration and demotivation.
 - In practice this can lead to counterproductive activities which will use the available motivating energy and perhaps direct it towards other goals.
 - In management terms these goals may be seen as less productive or useful but they may still satisfy some need for the individuals concerned.

C. THE EVOLUTION OF MOTIVATIONAL APPROACHES

I. INTRODUCTION

- Management techniques evolved through four stages before adopting the practices followed by today's more sophisticated firms. These were:

- Scientific management.
- Hierarchy of human needs.
- Job enrichment.
- Enlightened management.

2. SCIENTIFIC MANAGEMENT

- The first approach to harnessing motivational energy to increase productivity, which dominated management thinking and practice at least until the 1960s, was that of Scientific Management as expounded by F. W. Taylor and J. K. Galbraith.
- This approach was that if the job was correctly structured and organised, and if the physical layout of the working elements was correct, one would have the best conditions for getting maximum productivity.
 - This led to a measurement of how much could be done or produced in a working day, and to an offer of financial rewards as the prime motivational factor to achieve output.
 - The rewards were directly related to how much an individual achieved in relation to a previously agreed target based on the measurement of the activities involved.
- This approach tended to regard the human being as a machine. In practice it was found in many situations that the actual output never came near to the anticipated output, not because people could not achieve the output, but because they would not.
- The three significant elements of the Scientific Management approach in relation to motivation were:

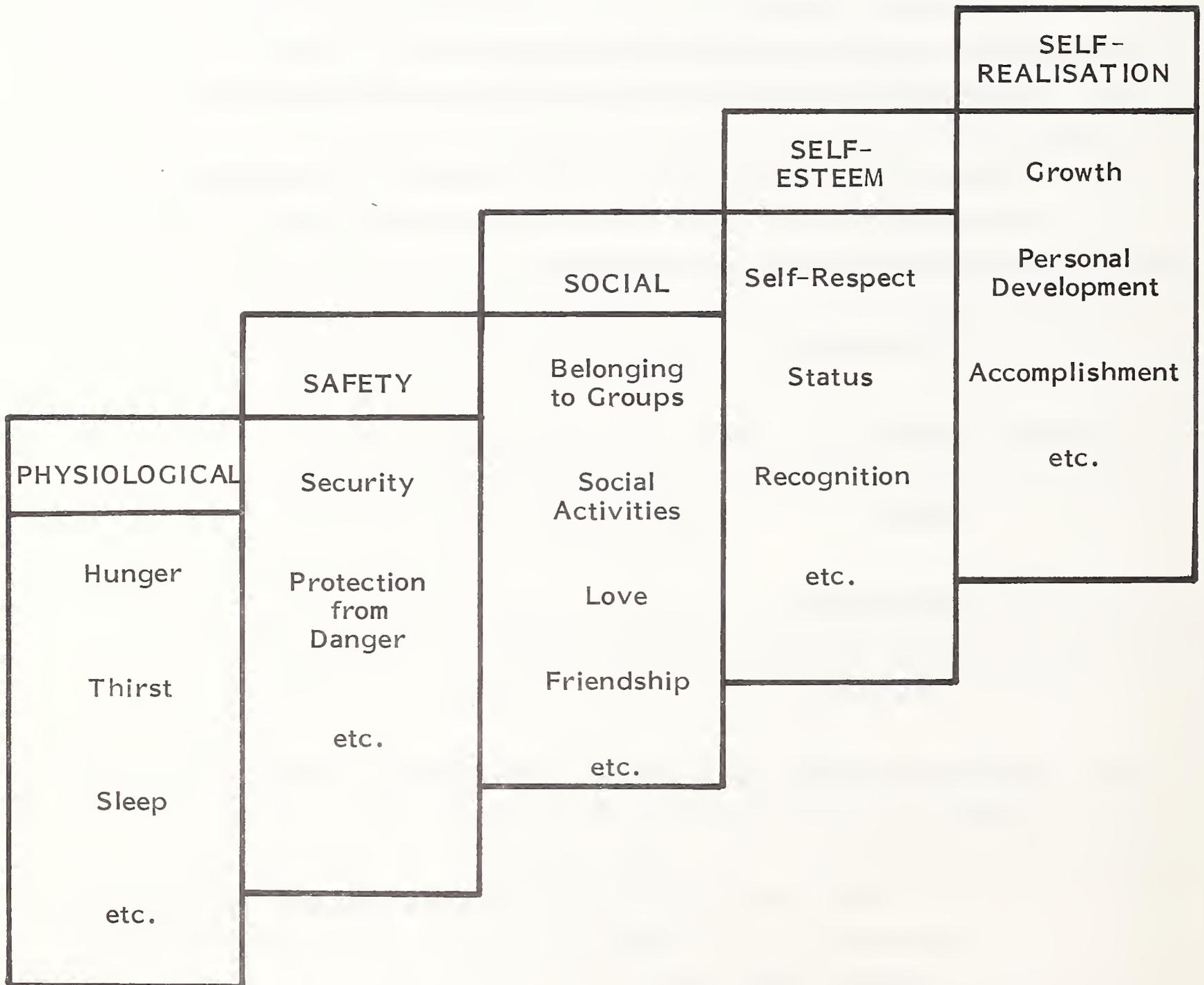
- The emphasis on the external factors relating to the work; e.g., layout of the workbench, etc.
- The measurement of output and setting of targets.
- The emphasis on financial rewards.

3. A HIERARCHY OF HUMAN NEEDS

- Following the realisation that a human being cannot be treated as a machine, it was natural to involve industrial psychologists in studying what governs human activity at work and what, in particular, affects peoples' motivation.
- Abraham Maslow concentrated on trying to define more specifically the needs which dominate every human being's motivation and produced an analysis of the significant needs in five categories:
 - Physiological.
 - Safety.
 - Social.
 - Self-esteem.
 - Self-realisation.
- Exhibit VI-1 shows this structure with additional detail in each of the categories.
 - The diagram also illustrates that these five categories are arranged as a hierarchy with the physiological needs at the bottom and the self-realisation needs at the top.

EXHIBIT VI-1

THE HIERARCHY OF HUMAN NEEDS



- The implication of the hierarchy is that when needs at one level are almost, or completely, satisfied then the next level becomes the dominant motivation.
 - For example, when a human being is extremely hungry the physiological needs are dominant.
 - When he is not hungry he will be more concerned with safety needs; e.g., job security. If he is not hungry and has a secure job, the social needs will become dominant.
- The pattern of dominance will always be changing. Even if all the lower levels are satisfied, and an individual is working to satisfy his needs for self-realisation the situation could change dramatically if he loses his job.
 - Using Maslow's model means analysing, at a point in time, the dominant needs and designing policies and practices to satisfy them.
 - It is perhaps not surprising in a western industrial culture that physiological needs are less in evidence. It might not be so in an underdeveloped country, and managers seeking to establish operations in such countries would need to examine in detail the local motivational patterns.

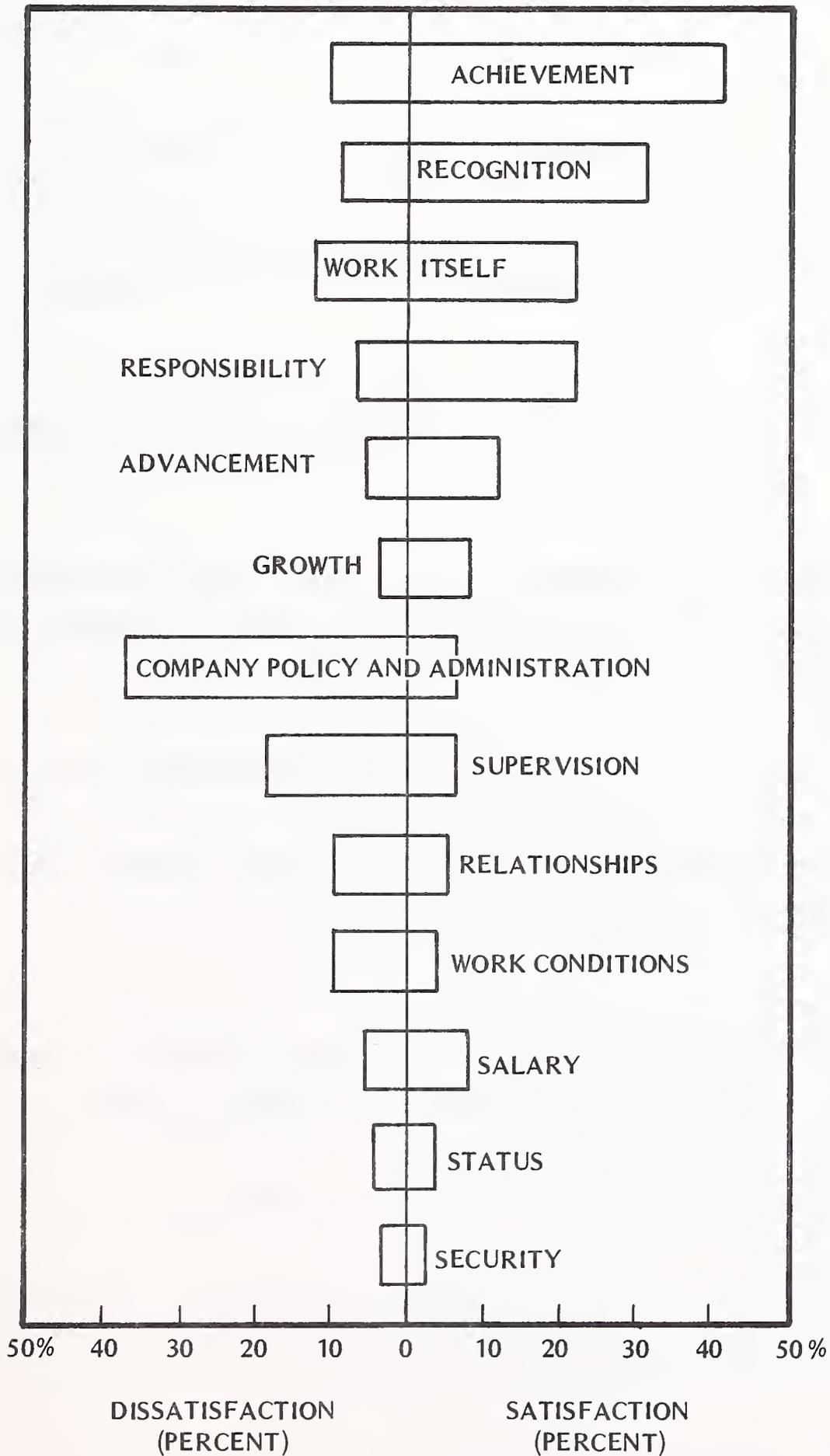
4. JOB ENRICHMENT APPROACH

- The next evolutionary step, and one of the most influential pieces of motivational research carried out in recent years, was done by Frederick Herzberg.
- He conducted a series of studies on a wide range of employment categories which included managers, engineers, and scientists as well as teachers and administrators.

- All respondents were asked to describe what factors in the work situation gave them most satisfaction and what gave them most dissatisfaction.
- The results of 1,685 interviews yielded a composite of the factors causing job satisfaction and dissatisfaction; it is presented in Exhibit VI-2.
- The results led Herzberg to deduce that in motivating people in a work situation there were really two sets of contributory factors to consider.
 - The first set he called 'hygienic' factors which he defined as:
 - Company policies and administration.
 - Supervision.
 - Pay and benefits.
 - Relationships with others.
 - Status.
 - Security.
 - He pointed out that these factors are part of the 'working environment' in which people do their jobs. They are 'hygienic' in the sense that if they are present and adequate, nobody takes much notice of them, but if they are absent and inadequate they create dissatisfaction and demotivation.
 - Herzberg identified a second set of items which he called the true 'motivation' factors. These are:

EXHIBIT VI-2

FACTORS AFFECTING SATISFACTION AND DISSATISFACTION AT WORK



- Opportunities for achievement.
 - Opportunities for personal recognition.
 - Interesting jobs.
 - Opportunities for demonstrating responsibility.
 - Opportunities for personal growth and advancement.
- In contrast to the hygienic factors, the motivation factors are concentrated in the actual jobs that people do rather than in the environment in which they work.
 - This led to the adoption of a motivation technique known as job enrichment.
- Basically, this technique requires a close examination of what a job consists of in terms of the motivation factors and redesigning the job to build in more of these factors.
- The tendency of the Scientific Management approach was to break a job down into simpler component parts to facilitate measurement and increase productivity, the purpose of job enrichment was to build up jobs and increase productivity that way.
 - There have been a number of very successful and well documented examples of how job enrichment works, and how effective it can be in improving motivation and increasing productivity.

5. THE 'ENLIGHTENED MANAGEMENT' APPROACH

- Following all this experimentation, knowledge, and practical experience, management today has adopted a composite approach to motivation.

- There is no one right answer to the problems of motivation and there is no guarantee that if management gets it right on one occasion it is going to remain right indefinitely.
- There are a number of practical elements and considerations which characterise the enlightened management approach. The underlying general principles are:
 - The limited motivational effect of money rewards - money is important to the majority of the working population not for itself but because it can be exchanged for things that satisfy needs. But when those needs are satisfied money ceases to motivate.
 - Motivation lies in job content - it is important to recognise that people will work harder and produce more if they feel that they are doing challenging and interesting jobs.
 - Measurement of output can still be motivating - provided that it is carried out with the involvement of all participants (e.g., agreeing on work targets and suggesting ways of monitoring performance to provide a work challenge) and is not imposed by management as part of a system of reward and punishment.
 - Company policies and procedures are significant - not in achieving motivation as a direct result, but because lack of the appropriate ones will seriously demotivate and depress productivity.
- Appendix C describes a number of management practices and policies that have been found to be significant in creating the right motivational 'climate', and suggests steps that can be taken to apply them where they do not already exist.

D. EUROPEAN SURVEY RESULTS

- A recently completed U.K. survey, conducted within the data processing industry, illustrates some of the complexities involved in motivational research.
- The basis of the study was to examine what features attracted employees to work for one company in preference to others.
 - Salary in itself is an important ingredient in motivation but it also confuses and covers up other equally important ingredients and was artificially excluded in this study.
 - It was also assumed that the content of the jobs that the respondents were doing would be roughly comparable from one company to another.
- Respondents were asked the question, 'Assuming the salary level and job content were the same in a range of prospective employers, what are the most significant elements in an employment situation which would determine whether or not you would work, or continue to work, for a particular company?'
- More than 1,500 responses were received which covered a wide range of opinions. There was, however, significant agreement shown on a number of items. The 20 most significant items are shown in Exhibit VI-3, in order of preference.
- Some of the results illustrated here do reflect some interesting features relating to motivation which confirm the results of other similar surveys.
 - The motivational element of a bonus or profit-sharing scheme appears very low in the table.

EXHIBIT VI-3

MOTIVATIONAL FACTORS AFFECTING CHOICE OF
EMPLOYMENT OF DATA PROCESSING PERSONNEL

RANK*	FACTOR
1	Active career development
2	Holidays
3	Pension Plan
4	Regular performance appraisal scheme
5	Relocation policy
6	Easy local commuting
7	Training programmes
8	Company reputation as a secure employer
9	Professional reputation of company
10	Reputation of company as a fair employer
11	First impressions of people
12	Provision of cheap loans/transport
13	Growth potential of the company
14	Clearly defined organisation structure
15	Bonus/profit share scheme
16	Expenses policy
17	Variety of applications/hardware
18	First impressions of environment
19	Inexpensive housing
20	Provision of medical facilities

*BASED ON 1,583 RESPONSES TO SURVEY

- There is ample evidence to show that direct payment for results is, in the 1980s, less of a motivational element than factors more directly associated with the development of jobs and careers.
 - This is supported in this particular study where items such as 'active career development', 'regular performance appraisal scheme', and 'training programmes' appear in first, fourth, and seventh places in the ranking order.
 - This study was carried out in Europe at the end of 1980 and will, inevitably, reflect wider social and economic concerns among younger employees (the majority of the sample were under 35 years of age) at that time.

APPENDIX A: FACTORS AFFECTING MOTIVATION

APPENDIX A: FACTORS AFFECTING MOTIVATION

A. INTRODUCTION

- Previous sections of this report have focused on the major developments in management theory and thinking about motivation.
- A number of practical issues have been raised and this section will look at important factors which affect motivation and will pose questions which should be seriously considered by companies seeking to improve motivation and productivity.

B. COMPANY POLICIES AND IMAGE

- Company policies and image are inextricably linked, and both are highly significant in the effect they have on motivation.
- Company policies, particularly those policies related to the selection, retention, and development of staff, and the way they are administered were discovered to be the most important of the 'motivation' factors by Frederick Herzberg.

- The way those policies are seen and judged by employees and potential employees is also extremely important. In the study carried out among 1,500 European data processing employees, the following factors were highly rated in eighth, ninth, and tenth places respectively:
 - Company reputation as a secure employer.
 - Professional reputation of company.
 - Reputation of the company as a fair employer.

- The following questions need to be asked by any company seeking to consider its policies and image:
 - Are our policies, particularly relating to employment and personnel management, in accordance with the best of current practices?
 - If they are, are they seen to be so by our current and potential future employees?
 - What image as an employer do we have (a) internally and (b) externally?
 - What professional reputation do we have?
 - What can we do to improve that professional reputation?

C. REWARDS

- A company's reward system consists not only of its basic salary and pay policy, but can include an increasing number of fringe benefits. Examples of these are provision of company cars, health insurance coverage, pension schemes, holidays, etc.

- Rewards received for work done are undoubtedly very significant factors relating to motivation. But, as the relatively low value placed on bonus schemes in the study already referred to shows, their effect is confusing.
- There is no doubt that if employees do not feel that they are being adequately rewarded for the work and effort they put into their job they will become demotivated.
- On the other hand, if employees feel that they are adequately rewarded they may not necessarily be motivated in any positive function.
- Rewards are only motivating in a rather negative way - they demotivate if they are inadequate but they will not specifically motivate if they are right. They are 'hygienic' in Herzberg's terminology.
- Questions to be considered include:
 - What are the basic elements in our rewards?
 - How much emphasis do we give to standard pay scales?
 - How much to fringe benefits?
 - How much to variable elements; e.g., bonuses or incentive schemes?
 - Do we have the most appropriate 'mix' of all these elements?
 - If not, what changes should be made?

D. WORKING CONDITIONS

- Working conditions usually refer to the physical environment in which people do their jobs, and in the way that that environment relates to the community in which people live who are to be employed.

- There have been many examples of companies who have moved to new 'green field' sites where they have built modern, up-to-date buildings only to find that no one wishes to move to and live in the area.
- Working conditions are hygienic. If they are pleasant, employees will tend to take them for granted. If they are unacceptable, employees will become dissatisfied and demotivated.
- Environmental questions to be considered include:
 - Do we provide the best physical working conditions possible?
 - If not, what improvements should be made?
 - Do we need additional space?
 - Can we make better use of the space we already have?
 - Are lighting, heating, air-conditioning, etc. always adequate?
 - Are we sited conveniently in relation to where our staff live?
 - Are we well served by public transport?
 - Do we have enough car parking space?
 - Do we have proper canteen facilities, medical and first aid facilities, and sports and social club facilities?

E. TRAINING

- While most employees apply for, and are selected for, specific jobs with a company, they may not necessarily have all the skills and knowledge required for those jobs.
 - The acquisition of technical skill is usually the result of some kind of training.
 - This may be formal, involving attendance at some training sessions conducted by a qualified instructor, or it may be informal and part of regular 'on the job' supervision.
- Employees tend to regard training as an important part of their employment, particularly in areas of rapid technological change where training is essential if only to keep abreast of all the changes taking place.
 - If no training is taking place, or no facilities for undertaking training are offered by the company, employees will become dissatisfied and may leave the company.
- Recruitment and training issues to be addressed include:
 - What are the training needs of our employees?
 - Should we recruit fully trained staff or should we recruit partially trained or untrained staff?
 - How should we satisfy these training needs?
 - Should we establish 'in house' training facilities?

- Should we rely on supervisors to do training as part of their responsibilities?
- Should we allow our staff time off from work to attend external training courses?
- How much time and money should we allow in our operating budget for training staff?

F. CAREER DEVELOPMENT

- A potential employee when being interviewed for a job will not only be interested in the job itself, and the training and experience necessary to do it, but he will also want to know what career opportunities are available.
- The cost of labour turnover and of replacing employees who leave is rapidly increasing.
 - A company can achieve considerable savings by ensuring that an employee has the opportunity for a successful career with the company as well as having a job with it.
 - This is a major field service problem where the primary source of new employees is from competitors.
- Reducing labour turnover costs involves two major considerations for a company.
 - First of all it must ensure that plans for the growth and development of the business will be sufficient to offer genuine careers for its employees.

- Second, it must make sure that its employees are equipped to take advantage of the career opportunities that are likely to be offered.
- The matching of career opportunities with the development of individual members of the staff is the planning process usually referred to as 'career development'.
 - Career development is not an exact science as there are far too many unknown factors in the situation; that is no excuse for neglecting the issue.
 - If employees do not see career opportunities as well as job opportunities they will become dissatisfied and demotivated.
- The planning process should consider the following questions:
 - What are our business growth plans for the next five years?
 - What staff resources will we need to achieve them?
 - What opportunities for career growth and promotion will result from our business plans?
 - Have we sufficient people to meet these?
 - What do we have to do to develop them to satisfy our future requirements?
 - Alternatively, are we going to have to recruit people from outside the company, bearing in mind that this may seriously demotivate those currently employed by us?

G. JOB CONTENT

- The motivational technique of job enrichment, which developed directly from Herzberg's investigation into motivation described earlier, emphasises the extreme importance of job content.
 - The success of applying job enrichment in a variety of situations and for a number of different jobs confirms its importance.
 - It can now be claimed with some confidence that what people actually do in the jobs and how they are asked to carry out their tasks are fundamental to their motivation.
- But it goes further than that, because it is what people feel about what they do that matters. If they feel that the job they do is dull, boring, and meaningless they will be dissatisfied and demotivated. However, if they feel that the job is interesting, challenging, and worthwhile they will be motivated and productivity will increase. The main problem with this approach is that what people feel about their jobs is a highly subjective issue. A job that one person finds interesting another person may find boring, and vice versa.
- There has been a strong tendency, stemming from the scientific management approach in the past, to break jobs down into smaller and smaller elements for measurement purposes thus making them simpler and, to the majority of workers, more boring.
- In spite of people's subjective feelings about their work there is considerable scope for changing the content of jobs to make them more interesting. This increased interest leads to increased productivity.
- Job content questions to be answered include:
 - Do we know how our staff feel about their jobs?

- Do they find them interesting? boring? repetitive? dull?
- What can we do to alter the content of jobs to make them more interesting?

H. PERFORMANCE CONTROL/SETTING TARGETS

- Not only do people respond better to interesting jobs and work harder at them, they also work harder at jobs that provide them with a challenge.
 - One of the most effective ways of building an element of challenge into a job situation is to set up performance controls and agree on performance targets.
 - Setting up controls automatically implies an element of measurement.
 - It may not be possible to measure all elements in a job situation, as many of them will be qualitative; e.g., degree and standard of service required; while others will be quantitative; e.g., number of units serviced/number of calls made per day.
- For those elements which can be quantified it would be possible to set performance targets. However, in order that these targets really motivate, three elements must be present:
 - Targets must be realistic. If the job holder feels that they cannot be attained however hard he works, the target will demotivate rather than motivate.
 - Targets must be agreed with the job holder. This ensures that not only does he agree that they are realistic but he is also more personally committed to trying to achieve them.

- Targets must be reviewed regularly. There are many factors relating to work output over which the job holder has no control and yet which can seriously affect his ability to achieve his agreed targets.
- Questions to be answered in setting and evaluating job targets include:
 - What elements in the contents of a job are qualitative, and what are quantitative and can they be measured and controlled?
 - Can management establish effective targets in these areas with discussion and agreement with job holders?
 - Does the company have adequate procedures for reviewing targets and performance at regular intervals?

I. PERFORMANCE APPRAISAL

- One of the most common techniques for reviewing agreed targets and performance against those targets, is a system of performance appraisal. This is discussed in more detail in the following section.
- Basically, a performance appraisal is a meeting between an employee and his immediate supervisor during which the main emphasis is on dealing with the following issues which underlie every employee's personal motivation:
 - 'Agree with me on what I should do'.
 - 'Let me do it'.
 - 'Tell me how I am doing'.
 - 'Give me help if I need it'.

- 'Reward me'.

- Questions to be answered include:

- Does the company provide adequate opportunities for supervisors to discuss individual performance with their staff?
- Should the company introduce a more formal system of performance appraisal?

J. SUPERVISION

- One of the main underlying concepts of many of the factors mentioned above is the type of supervision that an employee receives.
 - Herzberg found this factor to be one of the most significant of the hygienic factors.
- By the term 'supervision' we mean the direct relationship between the employee and his immediate boss, rather than the general management of the company.
- An employee's immediate supervisor plays a very significant role in motivation. The responsibilities of a line supervisor include:
 - Planning the work load.
 - Leading the work group.
 - Motivating individual members of it.
 - Controlling the output.

- The way a supervisor carries out those responsibilities determines how effective and productive his subordinates are.
- In evaluating supervisors questions to be answered include:
 - Do our supervisors have a clear understanding of the motivational aspects of their jobs and responsibilities?
 - Have they been given adequate training and development to help them carry out those responsibilities?

K. STATUS AND SECURITY

- Status and security, which are closely related, are again significant hygienic factors.
- When an employee feels that he is working in a situation where there is substantial job security and where the status of his work is recognised by those around him he will be a satisfied and productive worker. However, the immediate result of changes for the worse in either of these factors is a dramatic lowering of morale, and lower morale means lower productivity.
- A change of status is usually associated with what is often referred to as 'demotion' or moving an employee from his present job to one of a lower grade.
 - In many cases the immediate reaction is for the employee to leave the company - the ultimate result of demotivation.
 - If he does not leave he can be remotivated at his new job level by means of careful and sensitive supervision.

- The effect of insecurity is slightly different. While the most effective workers will leave in order to get other jobs, the less effective will tend to stay on in the hope that the company will survive and in the belief that they will find it difficult to find equivalent jobs elsewhere.
- While the motivational effects of status can be controlled within the company the question of job security is more likely to be affected by economic and market factors which may be outside the company's control. The only exception to this is when a company deliberately adopts a rapid hire and fire policy which is almost entirely demotivating.
- Status and security considerations include:
 - Is the company doing all it can to maintain job security?
 - How does the company handle both promotion and demotion?
 - Does the company have a procedure for handling grievances arising out of issues of status and security?

APPENDIX B: MANAGEMENT ACTIONS TOWARDS
MORE EFFECTIVE MOTIVATION

APPENDIX B: MANAGEMENT ACTIONS TOWARDS MORE EFFECTIVE MOTIVATION

A. INTRODUCTION

- The last section reviewed the factors that practical management experience, backed up by independent investigations, has shown to be most significant in their effect on the motivation of staff.
 - This section will examine some of these factors and present practical suggestions for dealing with them.
 - Not all the factors covered in the previous section will be considered here as a number of them; e.g., company image, status, etc. are usually matters over which the immediate line manager has little or no control.

B. REPORTING AND CONTROL SYSTEMS

- One of the main tasks of the line manager is to control directly the work of those reporting to him. He must know what they are doing, how much they are achieving, and how those achievements measure up against previously set standards or budgets.

- In order to do this some kind of reporting system is required, particularly when the manager is not in regular physical contact with his staff, as is often the case in field service organisations.
 - The simplest form of reporting is verbal reporting on the part of a subordinate in response to questions asked him by his manager.
 - If managers and subordinates do not meet regularly, or do not communicate effectively with each other, then some form of written reports are required.
- Most individuals dislike the preparation of any kind of written reports. They consider it boring, time wasting (when they could use their time better by doing their main tasks), and unnecessary. Having to write too many reports can reduce morale and demotivate.
- Managers must have some information to carry out responsibilities for controlling work. To reduce the potential demotivation when designing a reporting system:
 - Keep it simple - the more complicated it is the less easy to understand and the more cumbersome it is. Information required should be kept to the absolute minimum and confined to essentials only.
 - Make it easy to complete - do not expect people to write long comments and express detailed personal opinions. Keep to facts and ask people to tick boxes rather than write sentences.
 - Do not ask for information too often - the frequency must reflect the needs of the manager, but do not ask for daily information if you only want it weekly, or weekly information if you only want it monthly.

- If the information ceases to be useful get rid of it - many companies get swamped in paper from reporting systems that have outlived their usefulness.

C. REWARDS

- While policies on pay and fringe benefits are usually determined centrally, line managers have an important role to play in communicating to top management views of these issues.
- To manage effectively a manager must believe that his staff receives fair rewards for what they do, and that his companies' policies are at least in line with current market rates.
 - Reward is an important part of motivation and if a manager genuinely feels that his staff are being frustrated in this respect, to the extent that they may leave the company, then he must express his views and recommend action.
- To do this effectively a manager must be fully informed about the policies affecting rewards in order to represent those policies to his staff and deal with their questions. Much of the potential demotivation effects over pay and benefits can be reduced by increasing information on these matters.

D. PERFORMANCE REVIEW PROCEDURES

- Most companies have installed formal procedures for reporting on and reviewing the performance of individual workers.

- The first approach to this was to design a form which concentrated on an individual's personal qualities. His performance would be assessed under such headings as 'accuracy', 'intelligence', 'initiative', etc. But such terms are capable of a wide range of interpretation by individual managers and such subjective views led to criticism of the procedure as being biased and unfair.
- Performance review procedures now accepted as being the most effective are based on a review of the key tasks relating to the job in question and for which specific standards can be set.

E. ASSESSMENT AND COUNSELING

- Assessment and counseling usually involves a face-to-face interview between a manager and his subordinate during which the performance review is discussed.
- The ultimate objective of the discussion is to motivate the subordinate to improve performance in the future, but the motivational power of an assessment and counseling interview can only be achieved if the following points are satisfied:
 - Creating the 'right' atmosphere - nothing will be achieved if the interview is seen to be disciplinary, unnecessarily over-critical or destructive. It is the manager's responsibility to establish the correct atmosphere.
 - Sticking to the important issues - interviews that get side-tracked into irrelevant channels and which lose sight of the improvement of performance may turn into 'cosy' conversations but will not motivate.
 - Separating performance, potential, and pay - the assessment interview is about job performance. The rewards given for that performance and the future career opportunities for the individual are important - but

they are separate issues which, although related to performance, should be dealt with on another occasion.

- Setting responsibility areas - the review will demotivate if low performance results from factors for which the individual has no responsibility. An individual must only be assessed on those parts of his job over which he has direct control.

F. SELECTION

- The previous section was about developing staff already employed. Selection is about choosing them for employment in the first place. All efforts at motivating staff will fail if you have hired the wrong people.
- The selection process is designed to collect as much information about a candidate as possible in order to decide whether or not to employ him. The information is gathered from three main sources:
 - The application form - giving full details of the candidate's personal situation, education and qualifications, and job history.
 - The selection interview - allowing opportunities for expanding the information in the application form and assessing personal qualities.
 - Tests and questionnaires - more objective methods of assessing personal attributes; e.g., intelligence, planning ability, management potential, etc.
- The line manager is usually only involved in the second item above. Line managers often feel a lack of confidence and ability in conducting effective selection interviews.

- Research has shown that an ineffective interview is no better in selection than tossing a coin. But this can be improved by training managers in the techniques of effective interviewing.
- To a candidate, the impression he gets of a company is directly related to his impression of the managers who interview him. This emphasises the importance, in motivational terms, of conducting good selection interviews and all managers involved in the selection process should be adequately trained to do so.

G. TRAINING AND DEVELOPMENT

- Responsibility for arranging training and development programmes is usually carried out by a staff department. That department can only do its job effectively on the basis of information provided by line managers.
- Part of the performance review and counseling procedures should concentrate on the analysis of training and development needs. These can be considered under three headings:
 - Technical training - acquiring knowledge and skills directly required on the job.
 - Management techniques - understanding and learning about management practices and techniques that help to relate specific jobs to the running of a totally effective business.
 - Management 'experience' - essentially acquired on the job, but requiring regular feedback and counseling if it is to be effective. Ten years' planned and managed experience is motivating and provides growth opportunities. One years' unplanned experience repeated 10 times is demotivating and leads to stagnation.

H. JOB DESIGN

- Much has already been indicated on the importance of job content on motivation.
- In reviewing a job with a view to improving the motivation interest in it the following questions should be considered:
 - What is the job?
 - Does it contribute to a larger job? If so, how?
 - Where does the work come from and go to?
 - What is the end product?
 - What is it for?
 - What are the work targets?
 - To what extent are goals being achieved?
 - To what extent does the job affect costs?
- Most jobs are capable of being changed in order to provide increased motivation. How they are changed is often a complex and time-consuming process and is neglected as a result.
- More management time given to the consideration of job content has resulted in such dramatic increases in output and motivation that it is difficult to justify further neglect.

APPENDIX C: DEFINITIONS

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- DISTRIBUTED DATA PROCESSING - Distributed processing is the deployment of programmable intelligence in order to perform data processing functions where they can be accomplished most effectively, through the electronic interconnection of computers and terminals, arranged in a telecommunications network adapted to the user's characteristics.
- DISTRIBUTOR - Purchases the small business computer on an OEM basis from the manufacturer and markets it to the end user. It may or may not provide a turnkey system.
- END USER - May buy a system from the hardware supplier(s) and do his own programming, interfacing, and installation. Alternatively, he may buy a turnkey system from a systems house or hardware integrator.
- ENGINEERING CHANGE NOTICE (ECN) - Product changes to improve the product after it has been released to production.
- ENGINEERING CHANGE ORDER (ECO) - The follow-up to ECNs which include parts and a bill of material to affect the change in hardware.
- FIELD ENGINEER (FE) - For the purpose of this study, field engineer, customer engineer, serviceperson, and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

- HARDWARE INTEGRATOR - Develops system interface electronics and controllers for the CPU, sensors, peripherals and all other ancillary hardware components. He may also develop control system software in addition to installing the entire system at the end user site.
- MEAN TIME BETWEEN FAILURE (MTBF) - The elapsed time between hardware failures on a device or a system.
- MEAN TIME TO REPAIR - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.
- MEAN TIME TO RESPOND - The elapsed time between the user placement of a service call and the arrival at the user's location of a field engineer.
- PERIPHERALS - Include all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.
- SMALL BUSINESS COMPUTER - For the purpose of this study, is a system which is built around a Central Processing Unit (CPU), has the ability to utilize at least 20M bytes of disk capacity, provides multiple CRT work stations and offers business-oriented system software support.
- SOFTWARE PRODUCTS - Systems and applications packages, which are sold to computer users by equipment manufacturers, independent vendors and others. Also included are fees for work performed by the vendor to implement a package at the user's site.
- SYSTEMS HOUSE - Integrates hardware and software into a total turnkey system to satisfy the data processing requirements of the end user. System software products may also be developed for license to end users.

- TURNKEY SYSTEM - Composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

APPENDIX D: QUESTIONNAIRE

PRODUCTIVITY

QUESTIONNAIRE

FOR

FIELD SERVICE MANAGERS

IN EUROPE

Your Name

Title

Company

Telephone No.

8. How would you define field service productivity improvement?
(Please tick all that apply)

Method of Measurement

- a. Lower personnel turnover _____
- b. Improved response times _____
- c. Lower engineering change activity _____
- d. Lower repair time _____
- e. Fewer customer visits _____
- f. Lower personnel training costs _____
- g. Lower PM costs _____
- h. Fewer recurring faults _____
- i. Higher customer satisfaction _____
- j. Other _____

9. How do you measure the above (any or all):

10. Do you have any statistics to support your viewpoint? Explain:

11. How much of an increase in F.S. productivity do you need?

- less than 5%
- 5-14%
- 15-24%
- 25-49%
- 50-99
- over 100%

12. Where in the F.S. work cycle does improvement have to come?

- PM
 - MTT Respond
 - Diagnostic capability) MTT repair
 - Speed of Repair)
 - Elimination of idle time
 - Other _____
-
-

13. Please rank the following in their importance in achieving greater F.S. productivity.

1 = Lowest 10 = Highest

- Personnel training
 - Personnel motivation
 - Tools and techniques
 - Management and organisational factors
 - Other _____
-
-

13a. Just how do you motivate your engineers?

PERSONNEL

14. What hours do your F.S. personnel work?

- Mainly prime shift, 9:00 - 5:30
- Mainly shift working
- Flexitime
- Other

15. What percentage of work time is spent?

- _____ Waiting for a call
- _____ Travelling to from a call
- _____ Diagnosing a fault
- _____ Waiting for a part
- _____ Repairing a fault (once part available)
- _____ Other idle

16. Do you use this breakdown in planning/budgetting?

17. Do you use third-party maintenance?

18. Do you use any following incentive programmes for F.S.?

	1981	1982
	Yes/No	Yes/No
a) Profit sharing		
b) Company stock purchase		
c) Suggestions awards		
d) F.E. conventions (100pt. club)		
e) Other		

TOOLS AND TECHNIQUES

19. Do you use any of the following?

() Automated inventory control system. If not, when do you expect to install one?

If yes, please describe it _____

() Queing theory models

() Other models

() User self-maintenance

19a. What is the effect of new techniques/technology on field engineers' morale and hence motivation?

ORGANISATION

20. Is F.S. a:

- () Profit centre
- () Cost centre
- () Other _____

	1981	1982

21. Are certain major functions outside responsibility of F.S. management?

- () Personnel
- () Finance and planning
- () Education
- () Documentation
- () Sale of maintenance

22. Is your company taking on any new functions?

- Software maintenance
- () - System s/w
 - () - Application s/w
 - () - Third-party maintenance
 - () - Other

	Already Do	1981	1982

23. Draw simple sketch of your company's F.S. organisation structure.

MEASUREMENT

24. How do you propose applying productivity measurement techniques to F.S.?

25. Which areas are key?

- None
- Status reporting
- Cost reporting
- Other/ratios
- Personnel timesheets

Thank you for completing this interview.

