FOURTH PARTY MAINTENANCE OPPORTUNITIES

WESTERN EUROPE

1983 TO 1984

INPUT

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FOURTH-PARTY MAINTENANCE OPPORTUNITIES

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Abstract

This report presents the results of INPUT's survey of the fourth-party maintenance market in Western Europe. INPUT defines the fourth-party maintenance market as non-end-user revenues that result from the maintenance or repair of computer systems hardware. Delivery modes are defined together with an appraisal of user and vendor attitudes to the development and growth of fourth-party maintenance.

The report discusses a number of factors influencing market dynamics and the manner in which the market can be segmented by product type and activity.

In addition, the report identifies the leading vendors within Western Europe and assesses the development of fourth-party maintenance markets within the major economies of France, West Germany, Italy, the Benelux, and the United Kingdom.

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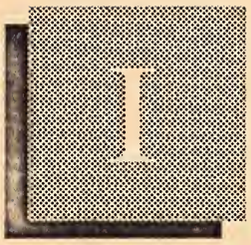
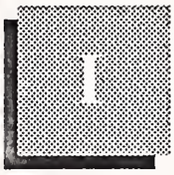


Introduction



Introduction

This report has been produced by INPUT as part of its 1989 Customer Services Programme in Western Europe.

A
Objectives and Scope

In this report, INPUT identifies and defines the fourth-party maintenance market in Western Europe, and forecasts market size and growth opportunities in five major European economies:

- The United Kingdom
- The Benelux countries
- France
- Italy
- West Germany

Additionally, the report discusses factors that are influencing the market and summarizes a consensus of opinion from fourth-party maintenance vendors related to the forces that are driving the dynamics of the market and controlling development.

B
Methodology

The data presented in this report was researched from direct communication with computer manufacturers and service vendors supplemented by a review of press articles and other public domain information. More specific data was compiled from:

- Focused telephone interviews with 26 fourth-party maintenance vendors to compile vendor profile information and obtain views on market characteristics, growth factors, segmentation, delivery modes and product offerings. The vendor questionnaire is included in Appendix F.

- Discussion with three users of fourth-party maintenance services to obtain user perspectives of market related issues and factors

C

Definitions

The terminology used in this report is explained as follows:

- *FPM* - fourth-party maintenance, defined as maintenance revenue that results from non-end-user maintenance activities by companies, independent of product sales

- *TPM*- third-party maintenance, defined as maintenance revenue that results from end-user maintenance activities by companies independent of equipment sales

- *Computer System Supplier* - supplies a complete ready-to-use computer system to the end user. These suppliers include:

  - Computer hardware manufacturers
  - Systems integrators
  - OEMs (Original Equipment Manufacturers)
  - Turnkey suppliers
  - VARs/distributors/retailers

- *Computer Hardware Component Manufacturers* - supplies components of the system hardware such as disc drives, VDU/monitors, and peripherals

- *FRU* - Field replaceable unit, a subassembly or system component that is defined as not being serviceable/repairable on the end-user site. Functional FRU's are usually exchanged with faulty units to return the end user's computer system to working condition.

D

Report Structure

The remaining chapters of this report are organised as follows:

- Chapter II is an executive overview that highlights the major findings of the report.

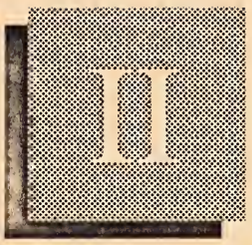
- Chapter III defines and discusses the methods by which fourth-party maintenance is delivered and contracted.

- Chapter IV discusses both user and vendor attitudes to the development of the fourth-party maintenance market.

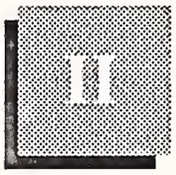
- Chapter V provides a market forecast for Western Europe and five major economies for the period from 1988 to 1994.

- Appendices A through E contain profiles of some FPM vendors that operate within Western Europe.

- Appendix F contains the vendor questionnaire used for the field research.



Executive Overview



Executive Overview

A

The Fourth-Party Maintenance Market Defined

The position of the fourth-party maintenance market in relation to other maintenance markets is illustrated in Exhibit II-1. INPUT defines this market as follows:

- The fourth-party maintenance market results from the generation of non-end-user revenues from the maintenance, repair and refurbishment of computer systems hardware and hardware components.

- Fourth-party maintenance revenues result from work undertaken on behalf of either computer system hardware suppliers or third-party maintenance companies. The hardware supplier or the third-party maintainance provider collects the resulting end-user revenue.

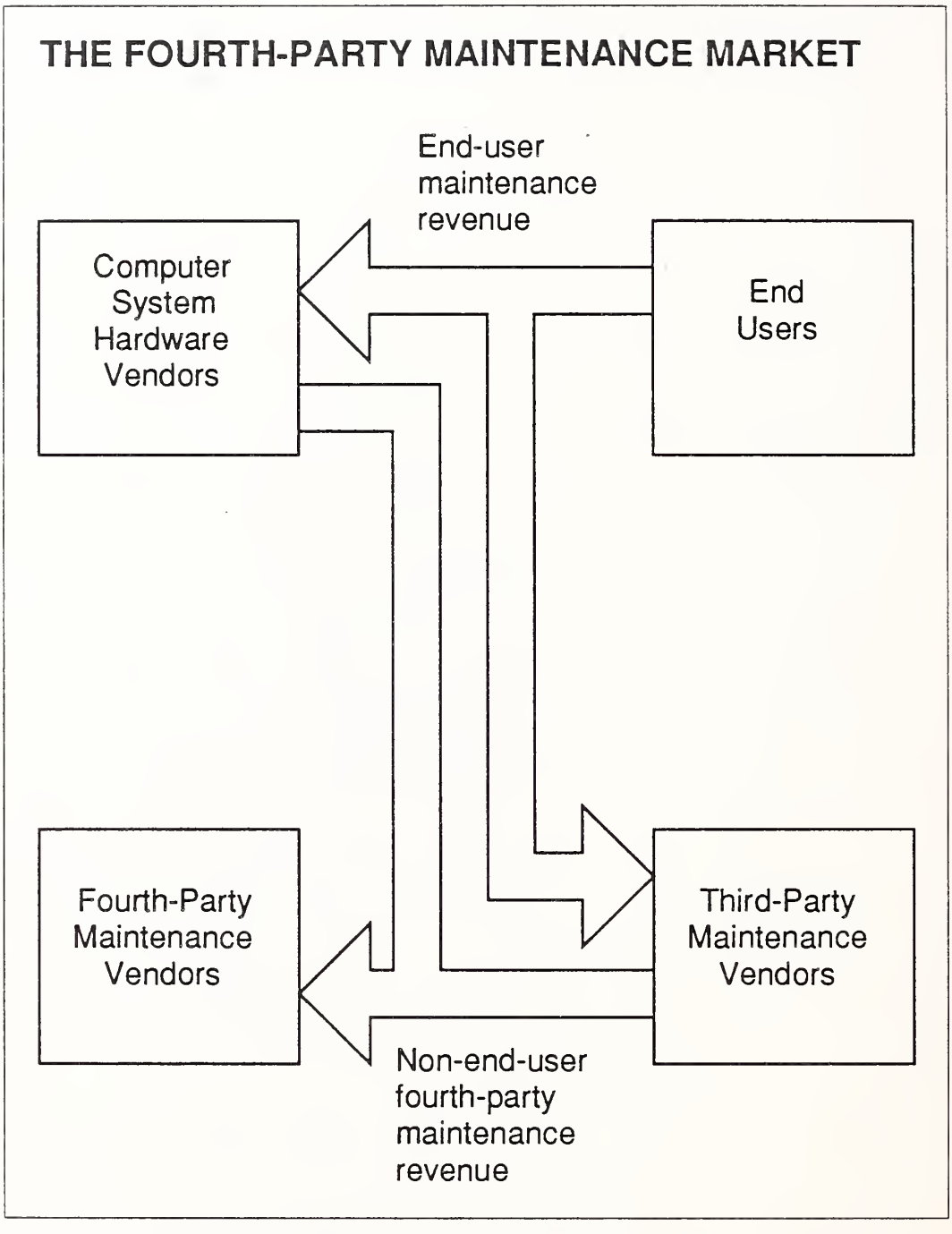
There are a number of computer systems hardware suppliers that may use the services of a fourth-party maintenance vendor. These are:

- Computer hardware manufacturers
- Computer system hardware component manufacturers (i.e., disc drives)
- System integrators/OEMs
- Turnkey suppliers
- VARs/retailers/distributors
- Third-party maintenance vendors

The need for fourth-party maintenance arises from either the hardware supplier or third-party company requiring specific resources or skill levels that are beyond the vendor's normal capability or capacity. The prime vendors of service to end users are specialists in providing mainly on-site repair and maintenance of computer systems. However, many system components are serviced by installing exchange units as a first line activity to return the user's system to an operational level (i.e., disc drives, monitors, printed-circuit boards, etc.). Faulty units returned from the field are then repaired "off-site" at a base workshop. It is within this

niche of the service market that the fourth-party maintenance companies operate. They offer specialised skills in the depot repair of faulty units returned from the field.

EXHIBIT II-1

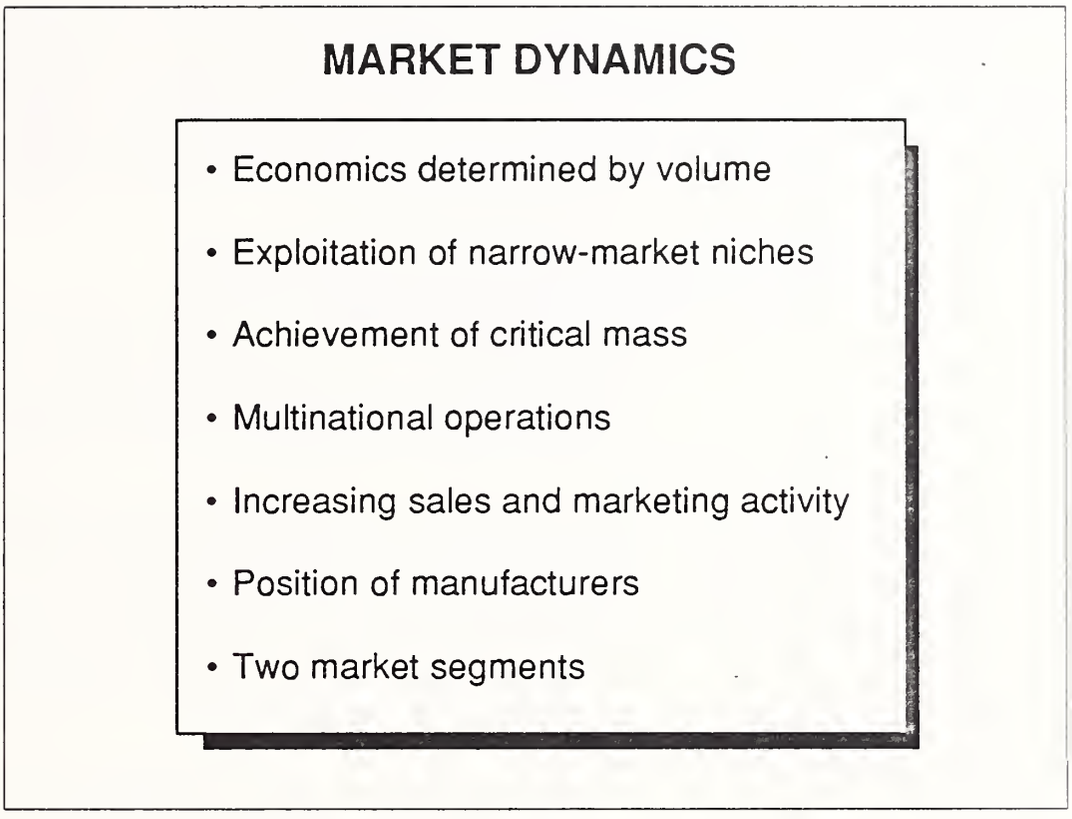


B
Market Dynamics

The factors identified by INPUT as influencing the dynamics of the fourth-party maintenance market are listed in Exhibit II-2.

A third-party maintenance company or a computer systems supplier can accumulate a large volume of different types of faulty system components due to the exchange of units at the end user's site. There are in excess of 50 suppliers of disc drives in capacity ranges of 1 Megabyte to

EXHIBIT II-2



1 Gigabyte or more, and even more varieties of printed-circuit boards and other system components. The variety of hardware can cause serious repair problems for vendors maintaining end-user systems. The fourth-party maintenance company, by specialising, can provide the repair facilities required. As a result of undertaking work for many vendors, the FPM can achieve a higher volume of repair, related to the area of specialisation, otherwise unattainable.

Through the exploitation of relatively narrow niche markets, a particular FPM vendor can accumulate an economic volume of repair units by providing services to a number of companies. This specialisation reduces the number of different types of units the FPM would handle and allows development of the necessary skill levels, controls and logistics to provide efficient and economic control of costs. Typically, a field-service organisation may use a number of fourth-party maintenance companies to support service activities.

The economics of fourth-party maintenance are influenced by a "critical mass," represented by the relationship between volume of repairs and cost structure. Achieving critical mass allows the FPM to implement repair processes that are related to the original manufacturing process in terms of both "production" equipment and technology. However, the definition of critical mass is dependent on the specific activities undertaken. For example, a fully-outfitted disc repair facility could require a $500 thousand investment compared with a printed-circuit board repair facility requiring $50 thousand or less.

The need to achieve high volumes in order to optimize costs has motivated a number of FPM companies to operate on a multinational level. The repair volumes, certainly at present, may not be achievable by operating in just one country. Further, operating at a multi-national level provides both additional volume and a higher degree of security in terms of volume fluctuations.

In order to promote the service, a number of FPM companies currently employ both sales and marketing personnel. Others, when operating in a multinational mode, may elect to work with local agencies. Examples of companies that employ sales and marketing personnel are Memory Maintenance Ltd. (MML) and Norman Magnetics.

The position of the hardware component manufacturers is a key element in the success and growth potential of fourth-party maintenance. It is generally the case that hardware components are purchased by the system manufacturers and integrated during the manufacturing phase. These manufacturers may choose a position of cooperation or non-cooperation, as follows:

- Some manufacturers may cooperate due to perhaps not having support facilities within the country or due to preferring not to return units to the factory for repair. Most component manufacturers are located either in the U.S.A or the Far East.

- Non-cooperation can become an issue when the manufacturers either view repair of units as a revenue source and have local organisations to provide support and logistics, or due to an unwillingness to release technology for competitive reasons.

- Cooperation from the manufacturer is not mandatory to success, but it does reduce pressure on the FPM. The alternative of "reverse engineering" can prove expensive. Also, cooperation from a manufacturer can aid future planning and provide the basis of economic volumes.

INPUT's survey of the fourth-party maintenance market has identified two segments of the market.

- Disc drive repair and refurbishment requires specialist skills and ideally high levels of investment. A fully-implemented disc repair operation can require a $500 thousand investment, or more.

- PCB and other repair and refurbishment requires a different set of specialised skills and knowledge, and a relatively lower investment.

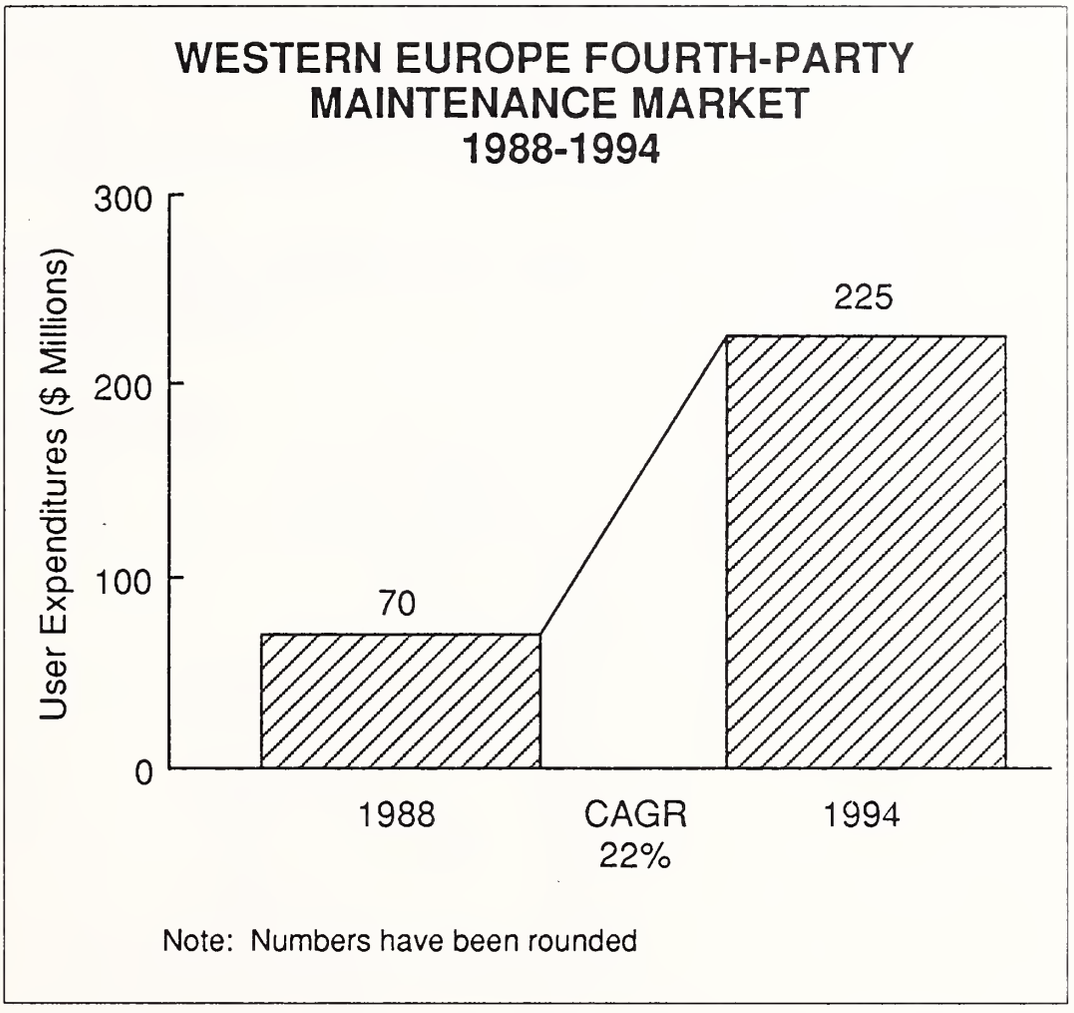
Some FPM vendors cover both sectors in their operations, but those that fully implement disc repair facilities tend to specialise within this segment.

C

Market Analysis

Exhibit II-3 illustrates INPUT's estimates for the fourth-party maintenance market for 1988 and projected growth forecasts up to 1994. In 1988, the market was estimated to have achieved a user expenditure level of $70 million and is forecast to grow at a 22% CAGR to an estimated $225 million by 1994. These forecasts are inclusive of inflation.

EXHIBIT II-3



In developing these forecasts, a number of influencing factors have been taken into account:

- The disc drive sector is considered to offer the best potential for growth but investment levels are high.
- Countries with more geographic centralisation have an advantage in terms of cost and efficiency of logistics.
- Although INPUT believes that the potential for growth is relatively higher than that forecast, the realisation is dependent on the position of and competition from the manufacturers. This aspect of FPM remains an open question.

Analysis has indicated that the U.K. is currently the most developed market, with other European markets lagging behind. The U.K. market

has estimated user expenditures of $34 million in 1988 and is forecast to grow at 25% CAGR. Compared with the U.K., for example, is the French market with figures of $5 million and 20% CAGR.

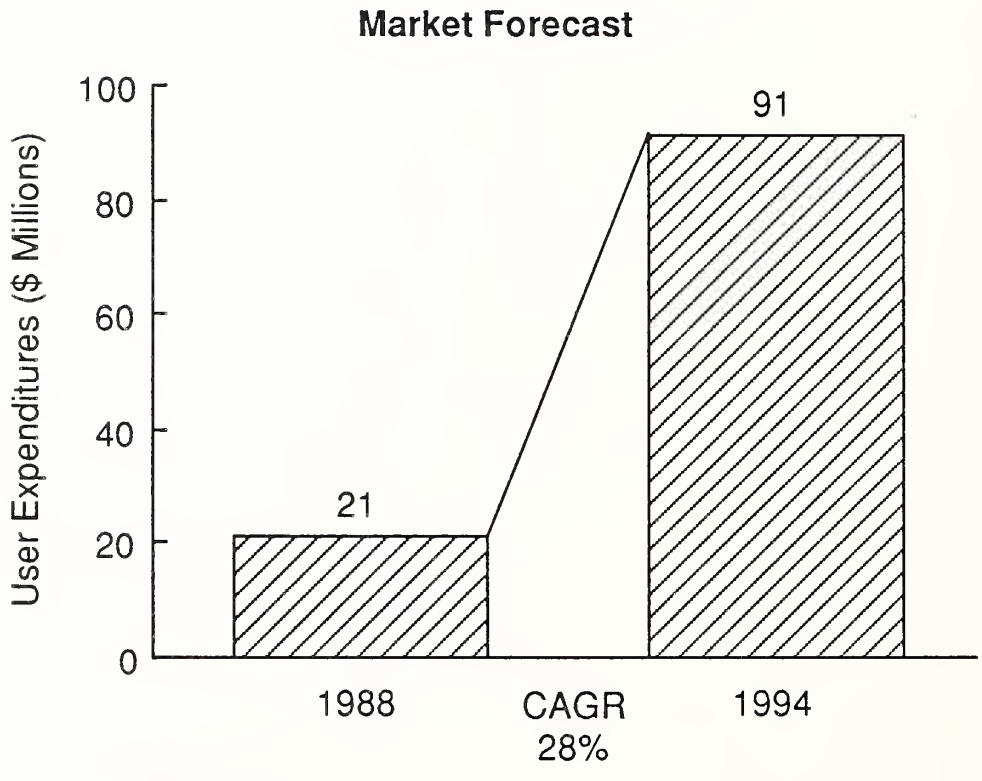
D

The U.K. as a Model

The U.K. market, due to its more highly developed state, can be used as a model to illustrate how other markets may develop. Exhibits II-4 and II-5 provide data on the two segments of the U.K. market. Development of the U.K. market has suggested a number of characteristics that could influence the development of other country markets.

EXHIBIT II-4

U.K. DISC DRIVE REPAIR AND REFURBISHMENT REVENUE SOURCES



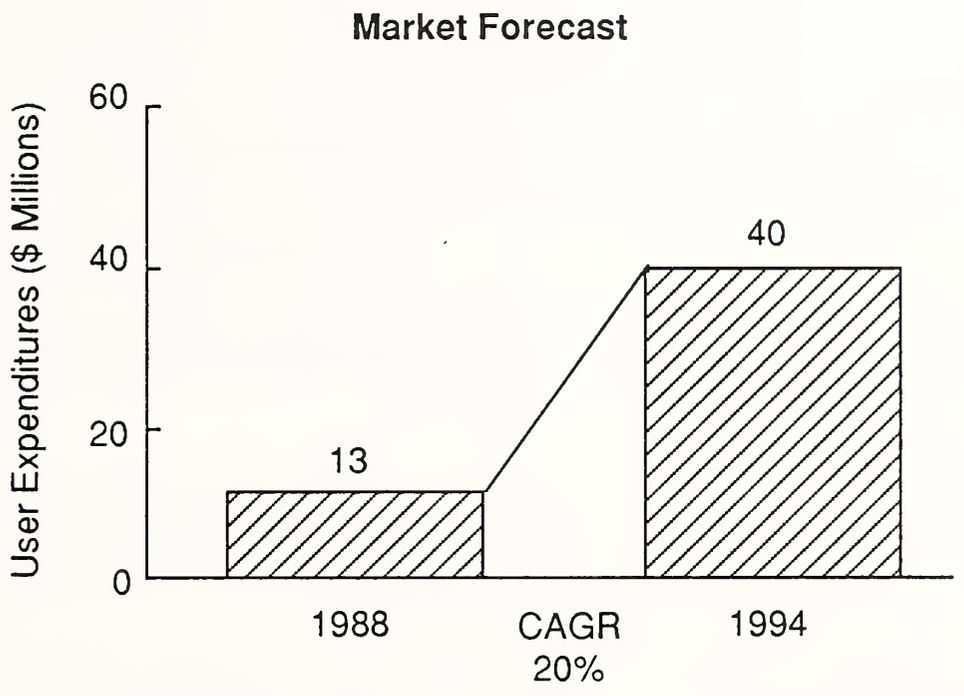
Market Sectors

Manufacturer	58%
TPM	31%
VARs/Distributors	3%
End User	7%

Note: Numbers have been rounded

EXHIBIT II-5

U.K. PCB AND OTHER REPAIR AND REFURBISHMENT REVENUE SOURCES



Market Sectors

Manufacturer	56%
TPM	29%
VARs/Distributors	12%
End User	2%

Note: Numbers have been rounded

- Revenues from the disc drive segment account for almost two-thirds of the total user expenditure in the U.K. market.
- The manufacturing sector provides almost 60% of total revenue, suggesting that FPM work for manufacturers is a dominant source of income, irrespective of the general position of manufacturers with regard to FPM.
- The manufacturing and TPM sectors account for 80% or more of total revenues, suggesting that end user and VAR/distributor revenues are relatively insignificant and also that FPM companies do not actively compete in the end user market. This indicates that the FPM niche is relatively well defined.

INPUT considers that other country markets are likely to develop similar characteristics. The reasoning for this is as follows:

- The disc drive sector requires a higher-level of investment and is therefore more likely to be populated by larger companies that have the ability to fund the necessary investment.
- The PCB and other sector requires relatively lower levels of investment and provides opportunities for smaller companies.
- The impact of technology on PCBs (printed circuit boards) in particular, due to complex integrated circuit technology, could become a restriction on growth in this sector. Independent FPM companies may find competing with manufacturers' technology and capability a limiting factor.

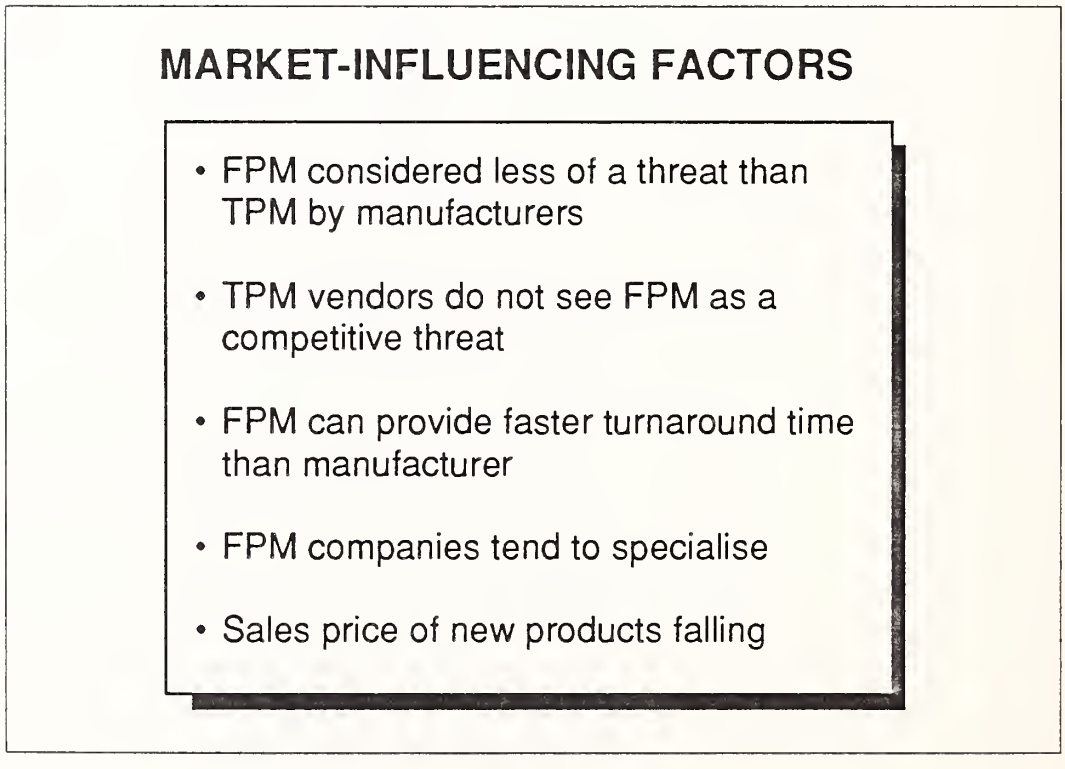
Third-party maintenance in Western Europe commenced development within the U.K. which currently remains the most developed TPM market. A similar situation may be repeated for the fourth-party maintenance market.

E

Competitive Environment

Exhibit II-6 lists the factors influencing the competitive environment within which fourth-party maintenance companies operate.

EXHIBIT II-6



Fourth-party maintenance vendors do not believe that computer system manufacturers view them as a competitive threat. Computer system manufacturers' service revenues originate from the end user market and the FPM companies do not appear to compete within this market to any significant degree. The TPM company competes directly for end user service revenues and is therefore considered a much more significant threat. Due to the market position of fourth-party maintenance companies, the computer system manufacturers can utilize FPM resources and capabilities to support their end user service activities. The fourth-party maintenance companies are a greater potential threat to system component hardware manufacturers.

A similar situation exists between the TPM and FPM companies; third-party maintenance companies also operate within the end user market and therefore do not see fourth-party maintenance as a competitive threat.

Due to the more "local" presence of fourth-party maintenance companies, they have the potential to provide a faster turnaround time on repairs than the manufacturer. A manufacturer would invariably need to return a faulty unit to the manufacturing facility (normally located in the U.S.A. or the Far East) for repair. Apart from the independent fourth-party maintenance companies, there are very few specialist repair facilities within Western Europe. Also, because FPM is usually the sole business of the FPM companies, repair of units does not have to be planned around busy manufacturing schedules.

One competitive aspect of the fourth-party maintenance market is the relationship between repair cost and the new price of a replacement unit. The impact of this is to influence economic repair pricing levels. In particular, the price of disc drives, for example, is continually being driven downwards by competitive pressure in the market. The FPM company needs to be selective in the choice of products it repairs so that adequate margins can be maintained on repairs or refurbished items.

Exhibit II-7 lists the major fourth-party maintenance companies operating within Western Europe that have been identified by INPUT. This listing includes FPM vendors in three country markets, somewhat indicating the international nature of the market.

EXHIBIT II-7

LEADING FOURTH-PARTY MAINTENANCE VENDORS IN WESTERN EUROPE

Vendor*	1988 Revenue ($ Millions)
APT	6.0
AL TEC	5.2
NORMAG	3.1
VAS	2.4
GDC	2.2
MML	2.1

* See vendor profiles in appendices A to E for full listing of vendors and full names

F

Future Directions

INPUT has identified a relatively significant association of third-party maintenance companies with the fourth-party maintenance market. Discussions with vendors indicated that this situation is likely to develop towards more direct involvement in the near future. At least one of the major TPM vendors is considering FPM as a marketing opportunity. Others are likely to follow in the pursuit of continued growth and diversification.

In addition to TPM activity, one system component manufacturing company is known to be considering plans for entry into the independent FPM market. This approach may be exceptional; however, others could follow. More likely, the majority of system component manufacturers are likely to concentrate on the more strategic company needs of mainstream business.

Entry into the market is likely to be via one of two routes. Firstly, by merger and acquisition activity, similar to trends within the independent maintenance market in the last two years. Secondly, by raising funds for investment to implement new facilities.

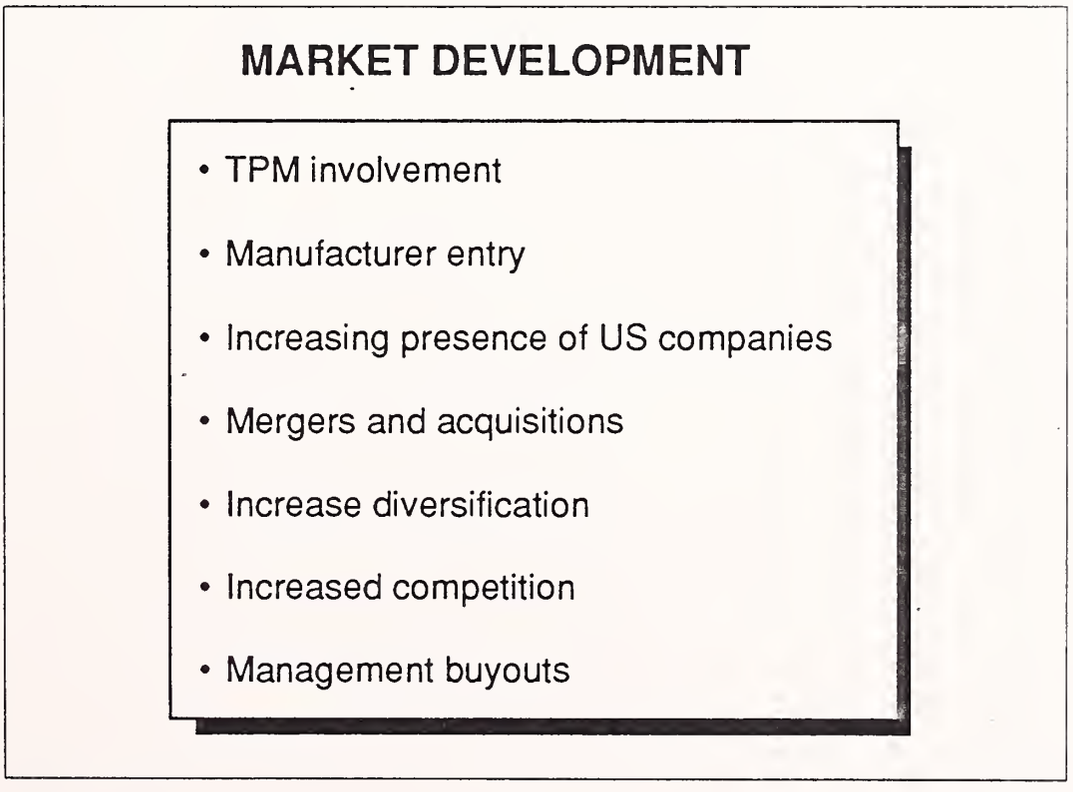
Increasing presence by U.S. companies is a likely possibility, with three U.S. companies having already invested heavily within Western Europe. These are APT, GDC, and Premier, all of which operate within the disc drive sector. The knowledge and technology required for disc drive repair and refurbishment is well-established in the U.S.A as a consequence of product design and manufacturing capability. Exporting technology to Western Europe is also well-established and has been demonstrated by the transfer of subsidiary manufacturing operations.

At present, the FPM vendors do not view the market as being particularly competitive. A view expressed was that the potential market size was sufficient to reduce competitive pressures between FPM vendors. However, previous developments mentioned will likely increase competitive pressure, particularly in developing segments of the market. Increasing competition will be likely to spread the degree of diversification as FPM vendors seek new opportunities. The entry of TPM companies and possibly of manufacturers will increase the competitive pressures on the independent vendors.

Recently (April 1988), the repair and refurbish facilities of Rank Xerox in the U.K. were subjected to a management buyout. The new company, 4PM LTD, will initially provide services to Rank Xerox but will also extend these to include other vendors' products. This change allows Rank Xerox to concentrate more on core businesses. Management buyouts are a further potential direction of market development.

Exhibit II-8 summarizes the future directions of FPM market development.

EXHIBIT II-8



Market Definition and Delivery Modes

III

Market Definition and Delivery Modes

A

Market Definition

The evolution and growth of fourth-party maintenance (FPM) over the last eight to ten years has some similarities with the development of third-party maintenance (TPM) which preceded it, and some differences. Fourth-party maintenance has created a separate market and environment characterized by:

- Tending towards a more multinational bias
- Offering a relatively wide range of service products
- A potential for relatively high growth and further development

INPUT defines the FPM market as non-end user revenues that result from the maintenance, repair, and refurbishment of computer systems related hardware and hardware components. However, due to the apparent diverse nature of some FPM vendor activities, occasional reference is made to areas outside this strict definition to present a more comprehensive understanding of the organic nature of the market environment.

The primary activity modes engaged in by FPM companies are listed in Exhibit III-1.

EXHIBIT III-1

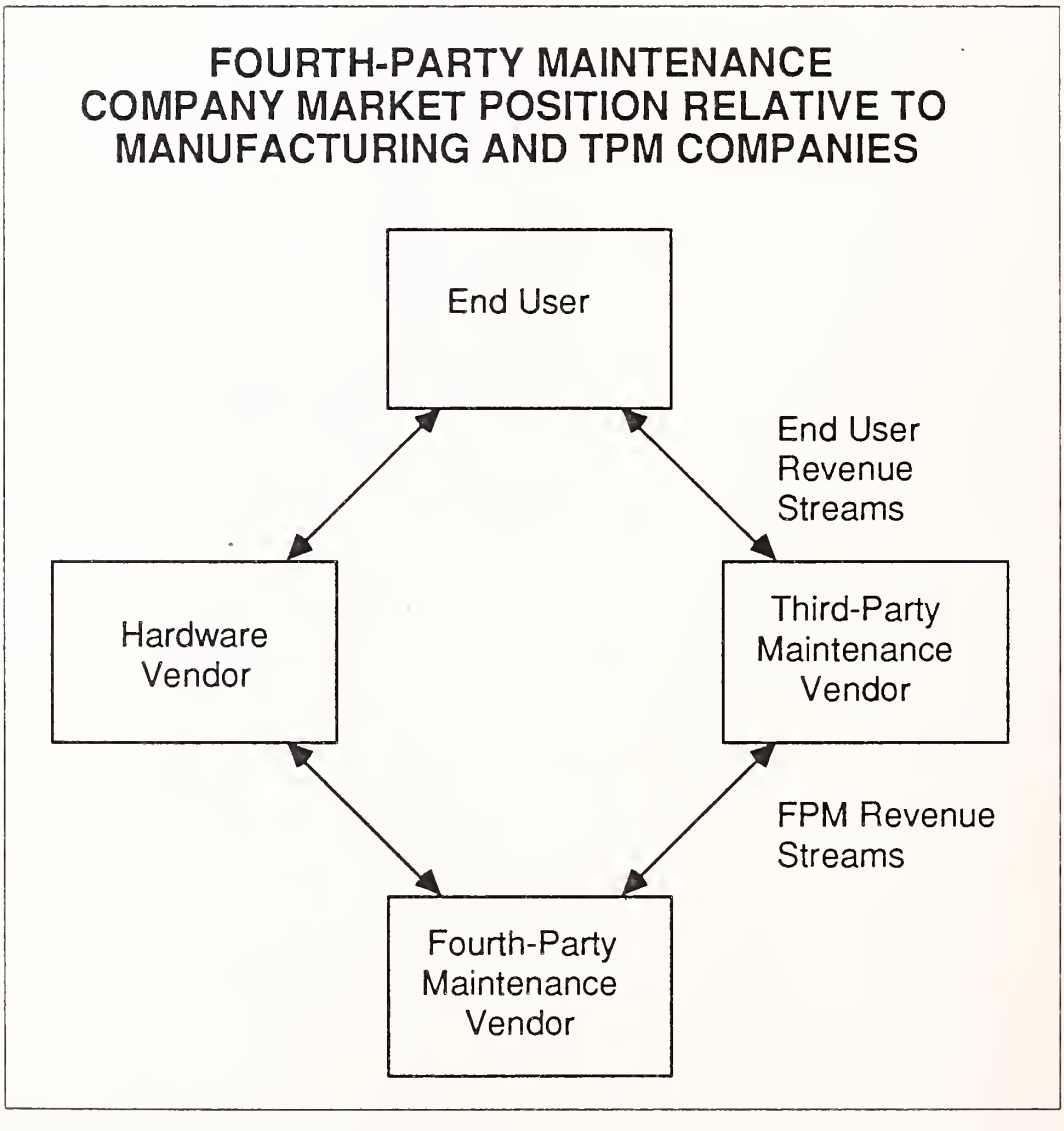
FOURTH-PARTY MAINTENANCE VENDOR PRIMARY ACTIVITY MODES

- Repair
- Refurbishment
- Remanufacture

"Repair" is defined as bringing an unserviceable system component, assembly or field replaceable unit to a reliable working state. "Refurbishment" takes a worn unit and brings it to an "as-new" working condition. "Remanufacture" usually applies to whole machines and involves the replacement of all worn parts by new parts so as to create a unit which, in all respects, looks and acts like new.

Exhibit III-2 illustrates the positioning of FPM companies with respect to their primary market—the hardware vendor and TPM companies. These organisations retain stocks of serviceable field replaceable units (FRU) on inventory, to provide for the needs of their hardware maintenance contracts with end-users. When hardware failure occurs, an unserviceable FRU is removed from the end-user machine and becomes the property of the hardware vendor/TPM maintenance organisation. A replacement serviceable unit is installed in the user's system and becomes the property of the end user.

EXHIBIT III-2

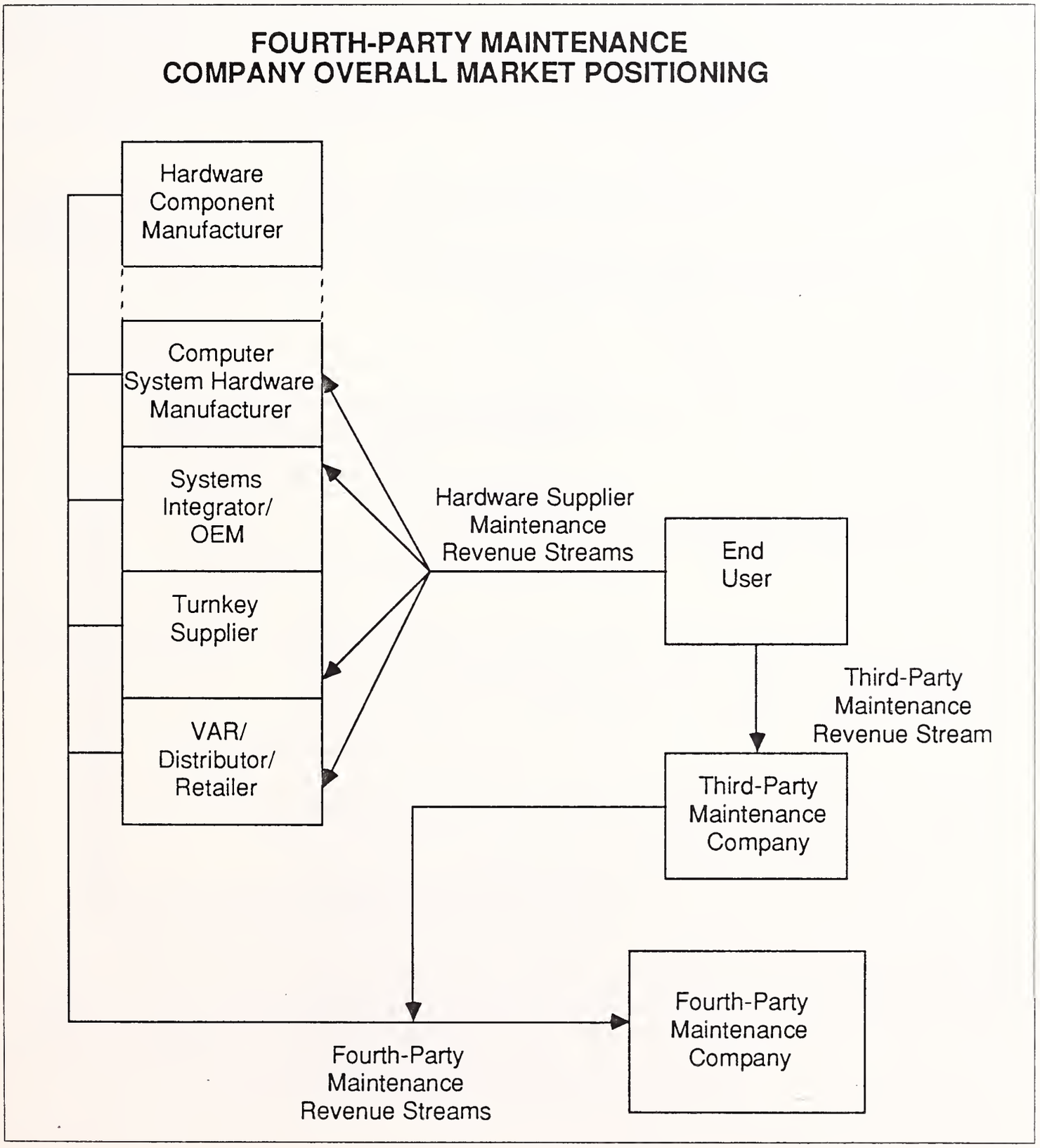


Many FRUs are not economically repairable in the hardware vendor and TPM environments and these units are batched together and despatched to a FPM company. Here repairs are effected in a given turnaround

period, normally at a fixed price, and are returned to the hardware vendor/TPM company. At this point, FRUs enter the inventory as serviceable stock with the appropriate valuation being placed upon them.

Exhibit III-3 illustrates the market positioning in an overall context, with manufacturing and distribution channels added.

EXHIBIT III-3



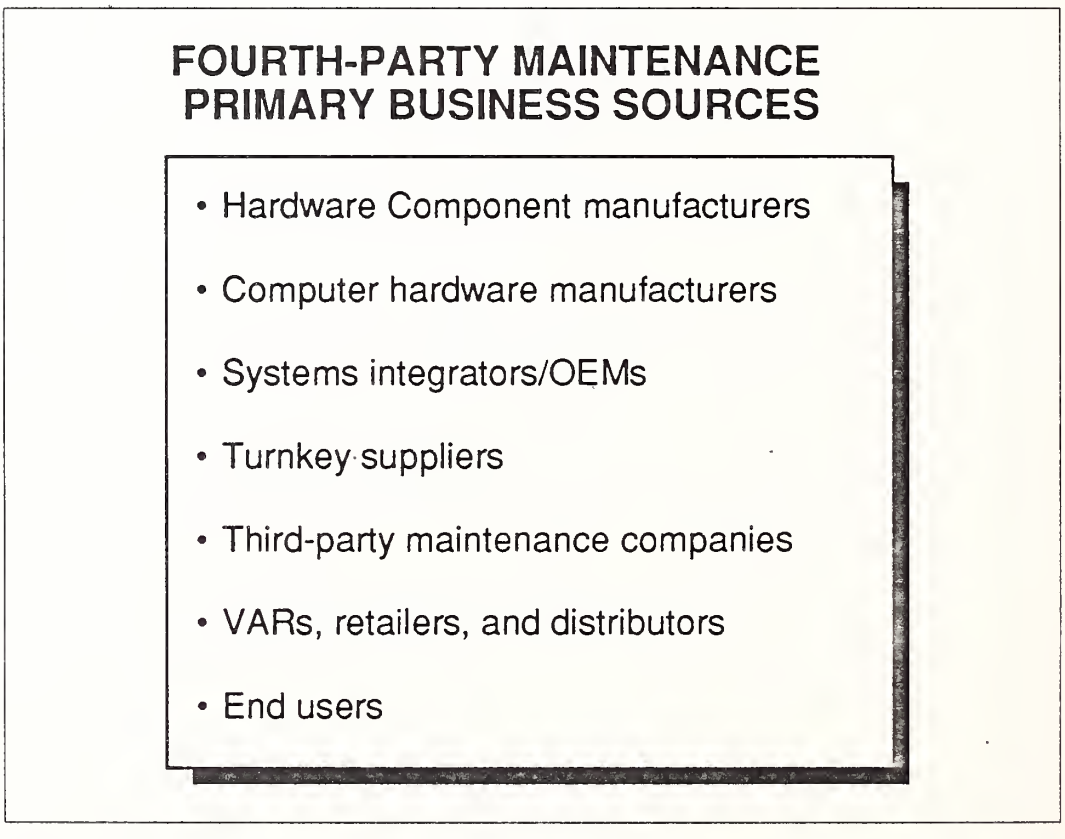
Frequently the system component manufacturer, being owned and based outside of Europe, has no repair facility in the host country. New system components for use in equipment supplied by the system hardware manufacturers/suppliers are subsequently sold to the end-user through either direct or distribution channels.

It is quite usual for a VAR/retailer/distributor to provide a hardware maintenance service, and hence, to have an inventory holding of their own. The flow of repairable units to the FPM will either be direct from the distribution channel or via a hardware manufacturer or supplier. The system component manufacturer may receive repairable units from anywhere along the manufacturing and distribution chain and occasionally from the TPM.

Although not included within the definition of the fourth-party maintenance market, some FPM companies are also obtaining small additions of incremental revenue from end users. Often, this source of revenue originates from end users involved in "self maintenance".

Exhibit III-4 summarises the FPM company's total revenue sources.

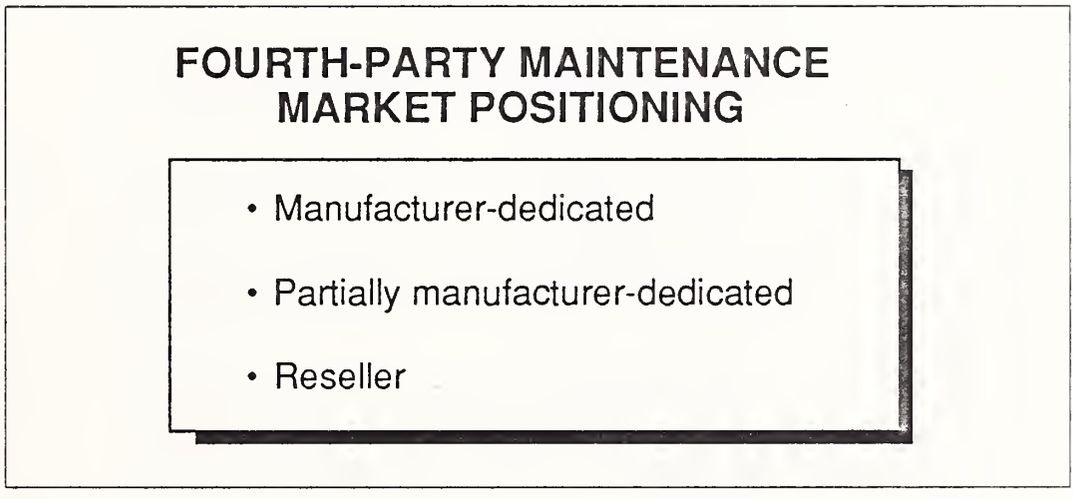
EXHIBIT III-4



Although recognising the different revenue streams, many FPM respondents were unable to provide figures differentiating between hardware manufacturers, system integrators and hardware component manufacturers. Therefore, data complied for this report covers all three types of companies under the one heading of manufacturer.

Exhibit III-5 defines the types of market positioning adopted by FPM companies. Manufacturer-dedicated companies wholly dedicate their resources to the services of hardware and system component manufacturers; any work undertaken on other types of clients is only with the agreement of the manufacturer. Partially manufacturer-dedicated FPM companies will act as the authorized repair and refurbishment centres on behalf of certain selected manufacturer companies, but they will also compete against other manufacturer companies. The last type of FPM, the reseller, is a company that sells a wide variety of products from other FPM companies—in some ways acting as an agent. Repair activity, although present, is relatively low. Generally, reselling will include consumable products, for instance, filters and certain types of media. In practice, the nature of FPM means that, apart from dedicated manufacturer FPMs, many companies operate as an amalgam of the the last two types—a mixture of partially manufacturer dedicated, and reseller.

EXHIBIT III-5



B

Market Segments

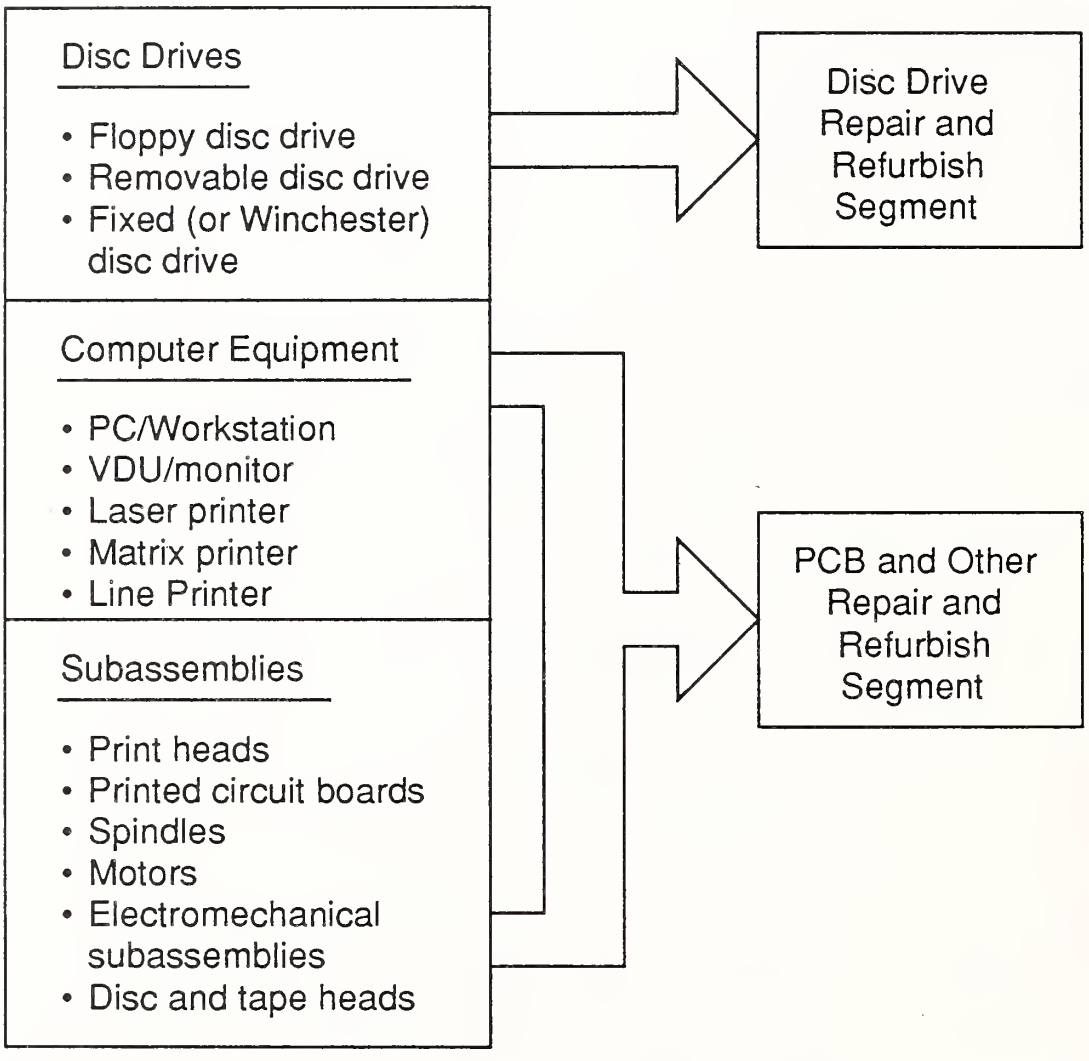
A relatively large range of hardware items are included in the repair and refurbishing activities of FPM companies, exhibiting product diversification that ranges from complete computer hardware systems to individual detailed hardware subassemblies.

Some vendors operate in relatively narrow niche markets; for example, the repair and refurbishment of print heads. Whereas, some vendors operate across a relatively wide range of hardware items; for example, from printed circuit boards (PCBs) and mechanical subassemblies to personal computers and workstations.

Due to the complexity and diverse nature of FPM activities, INPUT has derived two market segments, illustrated in Exhibit III-6. Also shown in Exhibit III-6 is a listing of the repair and refurbish activities undertaken by FPM vendors.

EXHIBIT III-6

FOURTH-PARTY MAINTENANCE MARKET SEGMENTATION



Segmenting the market into the two sections shown in Exhibit III-6 is based on the following rationale.

- Disc drive repair and refurbishment requires specialist skills, and in the case of fixed (Winchester) disc drives, relatively high levels of investment. For example, to repair the sealed module on a Winchester disc drive requires ideally a clean room certified to Class 10 (or turbidity index 3/4) and servo track writing equipment. Investment at this level can be as high as $500 K (or more dependent on specific models).

- The PCB and other market segment most likely requires a different mix of skill levels, and the investment required can be substantially lower.

- FPM vendors indicate a tendency to polarise into one of the two segments, specifically those fully repairing Winchester discs. Without the investment in Winchester capability, the pressure to polarise activities reduces with the less-complex disc technology. For example, investment to repair floppy disc drives is relatively low—up to $20 K may be sufficient.

C

Contractual Modes

The most commonly encountered contractual modes for FPM companies are displayed in Exhibit III-7. Of these three, fixed price repair and exchange units were cited by vendors as being the most common type.

EXHIBIT III-7

FOURTH-PARTY MAINTENANCE CONTRACTUAL MODES

- Fixed price repair per unit, inclusive of time and materials, with guaranteed turnaround time
- Exchange units at a fixed price
- Repair on a time and materials basis without guaranteed turnaround time
- Straight sales of refurbished parts/units

Vendor literature specifies the manufacturer makes and models repaired with the terms and conditions attached. These normally state that the price of repair is inclusive of parts and labour, whether carriage is included or not, and the turnaround period in elapsed working days from the receipt of the repairable unit.

Quoted turnaround periods for repair vary but are usually five or ten working days or alternatively, if indeterminate, are referred to as "extended periods." Emergency repairs are undertaken at most establishments—but at premium rates.

Repair warranty is generally comprehensive, extending to the whole unit repaired, and includes time and materials. Typical warranty periods are 90, 120, 180 days or one year in certain circumstances. Indications suggest that extended periods may be obtained by paying a premium—it is likely that the opposite also applies. The above warranty conditions apply equally to exchange units.

Quantity discounts are available for given volumes of repairable items—this being subject to negotiation and not normally revealed in literature. The larger FPM organisations specialise in this area, as their business is geared to larger volume repair methods.

An FPM company may enter into a sophisticated subcontractual arrangement with a TPM company related to volumes of equipment on contract with an end user. Here the TPM company provides stocks of FRUs for a first line swap-out; repair and defective items are sent back to the FPM company. The contract is for a fixed period, and a percentage of the TPM's revenue stream services its contract with the FPM, which accepts the risk of uncertain quantities of FRUs needing repair in the contract period.

Further contractual arrangements provide for the maintenance of fixed levels of inventory at manufacturer/TPM stores, and others provide a guaranteed turnaround for inventory levels under pressure.

Discussions with smaller FPM vendors indicated that it is not unusual to state prices that include cash with order, but in most companies, normal credit arrangements are available, subject to trade references, and extend to thirty days.

D
Vendor Diversification

Product diversification in the FPM marketplace is not confined to the central activity. A variety of related opportunistic activities, products and services are also provided by vendors, and are listed in Exhibit III-8

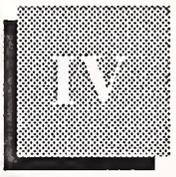
Much of this activity falls outside of the normal definition of FPM. However, in the interest of completeness and in providing an overall view of the FPM environment, these extra activities are referred to in accompanying discussions.

EXHIBIT III-8

FOURTH-PARTY MAINTENANCE VENDOR DIVERSIFICATION

- Reselling other FPM company products
- Diagnostic software program sales
- Media and bench mark media sales
- Second user equipment sales
- Computer consumable and accessory sales
- Training and support
- Sales of new system components
- Sales of second-hand parts
- Data recovery facilities
- Consultancy
- Sales of specialist test equipment

Market Development and Growth Opportunities in Fourth-Party Maintenance



Market Development and Growth Opportunities in Fourth-Party Maintenance

A

The Development of Fourth-Party Maintenance

An increasing number of companies operating within the FPM environment indicates a potential for relatively high growth. In the late 1970s and early 1980s, there were a small number of companies operating within Western Europe, mainly in the U.K.. Currently, INPUT estimates that about one hundred companies of varying sizes are operating within Western Europe.

INPUT has identified a number of reasons for this growth, which depends on the chosen market niche and the demand for FPM services based on market need and opportunities presented by the market environment.

1. Computer System Hardware Suppliers

Computer system manufacturers, OEMs and system integrators under competitive pressures, produce systems that include a variety of peripherals and system components which are of non-proprietary origin. Field service departments effect repair of faulty components by exchange of field replaceable units (FRUs), for example disc drives, returning the faulty units for repair "off-site." The system supplier may not have the economic and logistical resources to handle the non-proprietary products. FPMs having skills in these market areas can offer the computer system supplier cost-effective methods of handling this problem of repair.

One FPM user, a manufacturer company respondent, said that he would use FPMs if they were cost-effective and had a good reputation. This represented an attractive option in a competitive market and allowed concentration on strategic products, commenting that the investment to move into large-capacity disc drive repair and refurbishment was extraordinary and far beyond the company's capacity .

One view expressed by a manufacturer-dedicated FPM vendor was that manufacturers are adopting a pragmatic attitude to external repair of even their own products—provided that the products were deemed to be non-

strategic. The economics of repairing such things as workstations is dependent on volumes and low overheads. Manufacturers' repair departments can rely on the former but their overheads generally reflect those of the entire manufacturing operation—unlike the FPM vendor, which has the whole focus of its activity based on a repair function alone. The FPM vendor felt that if an FPM company could be discreet about this activity and demonstrably provided a quality product, then it would be in a competitive position to obtain this type of business.

Opinions expressed during an interview with a hardware manufacturer respondent took this point further. It was stated that his products required a great deal of investment to design, develop and manufacture, and that revenue streams from maintenance, over a period of time, helped re-investment. Vital feedback from the field and workshop helped the designers improve the serviceability of enhanced and future versions of the product. FPMs, having management systems that provide this type of feedback, could have an advantage in competing for a manufacturer's non-strategic repair activity.

2. System Component Manufacturers

One FPM market opportunity identified—particularly by vendors in disc drive repair and refurbishment sector is system component manufacturers. These organisations would be typified by a Japanese or American maker of a small hard disc drive for use by a PC manufacturer. Providing repair and refurbishment facilities from the country of manufacture, whilst sometimes done, can result in extended turnaround times, and, unless done by a very large and resourceful company, the economics of setting up a European repair operation could be difficult to justify. A number of system component manufacturers take a more pragmatic view and form agreements or arrangements, giving the FPM companies of its choice Authorized Repairer status. This could include repair of warranty items. It is possible that a manufacturer may give this status to more than one company in the interest of security and flexibility.

Apart from economic considerations, FPM vendors have their own perceptions as to why manufacturers in general may not be competitive. This stems, they believe, from the fundamental reason for the manufacturer's existence—to design and manufacture products, with the attendant philosophy being unfriendly to a service-based approach. Particularly, they allege, long turnround times and, a "take it or leave it" attitude, reflect the belief that the quality of the product is being held in question. This being a common theme presented by partially manufacturer-dedicated vendors in the PCB and disc repair sectors.

3. TPM Companies

Previous INPUT reports related to the third-party maintenance market, highlight the competitive benefits of offering multivendor service. TPM

companies may be presented with opportunities that involve contracts beyond their normal range of capacity or capability, but at the same time, be unwilling to reject the opportunity outright. One solution to this situation is the possibility of sharing the contract or subcontracting part of the requirement to another TPM. This has two disadvantages—firstly, it introduces another TPM into the customer environment with the risk of compromise this implies, and secondly, the economics of subcontracting are not very favorable, as subcontracted TPMs tend to be unwilling to discount too heavily. A more effective proposition could be to provide a field service response using spare system components and FRUs, with workshop repair of defective items being made by a FPM company—the option being exercised when its own workshop does not have the necessary resources or skills to perform the task in-house.

An interesting by-product of this situation, revealed by INPUT FPM vendor research, is that when TPM companies have speciality workshop repair skills, they also offer these services in the FPM market. In some cases, this is taken further, and a separate autonomous company is set up for this purpose whilst continuing to carry out repairs from the associated TPM company. INPUT research from vendor interviews identified that 33% of U.K. respondents indicated that they had links with a TPM company.

One FPM vendor operating with a high level of reselling activity stated that he had agreements with both manufacturer and TPM companies to supply his products direct to their customers as field service departments demanded it. This required a fast response by the FPM company but has the advantage to the manufacturer and TPM companies of reducing inventory overheads—in effect a "Just In Time" ordering system.

4. VARs, Retailers and Distributors

VARs, retailers and distributors have also continued to expand the range of services offered to their end-user customers to provide a one-stop solution to their needs. Hardware maintenance is one of these services and the economics and logistics of doing this can be made more attractive by involving the services of a fourth-party maintenance company

5. End Users

One large partially manufacturer-dedicated vendor in the disc drive sector of the market responded that, until just recently, about one-third of his work was obtained from end-user PC maintenance activities—the more sophisticated systems being maintained by manufacturers and TPM service organisations.

B

Factors Contributing to Growth

Samples of vendor responses relating to factors contributing to growth, are listed by market sector in Exhibits IV-1, IV-2, and IV-3.

EXHIBIT IV-1

FACTORS CONTRIBUTING TO THE GROWTH OF FPM DISC REPAIR SECTOR

- Mixture of devices too big for TPM to handle alone
- TPM's commitment to diversity
- Manufacturers expensive and slow
- Overseas manufacturers—cost of setting up in Europe
- FPM marketing
- Cost control by manufacturers
- Manufacturer prices and turnround
- Value for money of FPM
- Cost effectiveness of FPM
- Antipathy by customers to manufacturers
- Manufacturers lack a service-oriented approach
- Number of disc devices being sold coming out of warranty

EXHIBIT IV-2

FACTORS CONTRIBUTING TO THE GROWTH OF FPM PCB AND OTHER REPAIR SECTOR

- Expensive inflexible manufacturer
- Growth of TPM
- Response time of FPM
- Lack of manufacturer quality
- Manufacturers' "take it or leave it" attitude
- Explosion of information technology—PC market
- Manufacturers' use of non-proprietary equipment
- Advanced technology—cannot be fixed easily
- Requirement for fast turnround with quality
- FPM keeps manufacturer overheads down—better inventory control

EXHIBIT IV-3

FACTORS CONTRIBUTING TO THE GROWTH OF FPM RESELLER SECTOR

- Growth of TPM
- Market awareness of manufacturers, TPMs and FPMs
- Diversity of TPM maintenance product
- Pursuit of diverse markets by FPM company

The most commonly quoted contributory factor for the growth of FPM was price and value for money. Respondents range of discounts varied widely between discounts of 20% to premiums of 200% on the manufacturer's price for the equivalent repair—the latter figure being chargeable because of a very fast turnround compared with the manufacturer.

Turnround times in FPM are probably analogous to response times with TPM and could be a significant factor in the perceptions of FPM user satisfaction. It is apparent that good turnround times on repairs and exchanges allows FPM users to hold smaller inventories than would otherwise be the case, resulting in considerable savings. This is an important selling point of FPM. MML cited a situation where one manufacturer, at any one time, could have 56% of its inventory in the repair cycle. Hulcote provide special contract arrangements to manufacturers that have inventory under pressure, with turnround tailored to meet the situation.

Quality was recognised as being of prime importance. Nothing could be worse, as one respondent expressed, than for an item, having been repaired at a FPM workshop, to fail when used by a field engineer in the customer environment. Hulcote already has BSI 5750/ISO 9000 certification and a number of other FPMs are either working towards it or claim to work to the necessary standards already. Many now see this as the way forward. One respondent felt that the fact that these standards were being sought by him now, gives an entry into places he would have had difficulty in accessing, and in two to three years, the absence of these standards will rule out FPMs from certain sectors of the market.

The growth of TPM, with the competitive pressures it creates in the hardware maintenance market, is a primary reason for the growth of FPM. It is likely that many hardware maintenance suppliers are seeking more cost-effective solutions—which can be provided through the use of FPM companies.

The reason TPM companies frequently have recourse to FPM is because their multivendor activities frequently produce low volumes of complex unserviceable system components and field replaceable units that are uneconomical to repair in-house. The FPMs, by undertaking specialised volume-orientated production methods, can reduce unit repair costs to an attractive level. One vendor respondent believed that he had achieved "critical mass" for the purposes of using industrial standard volume production techniques. This allowed greater efficiency than before.

The FPMs perceived view of manufacturers, obtained from customer feedback apparently, is that many are insufficiently reactive to the needs of market requirement for value for money and speed of turnround. Two respondents in the partially manufacturer-dedicated PCB repair sector also added that certain manufacturers' repaired products left much to be desired in terms of quality.

Another significant contributing growth factor frequently commented upon was the relatively high growth of information systems—typified by the PC market. This was expressed in terms of the traditional sources of repair/maintenance being incapable of dealing with the large volumes of defective equipment. The PC market itself had opened up relatively good market opportunities for FPM—but more in terms of volume —"a numbers game" is a frequently quoted expression in connection with this type of business.

An illustration of the investment and opportunity offered to FPM activity was provided by one vendor in the disc drive repair and refurbishment market sector. He stated that larger capacity disc drives using more recent Sealed-Enclosure Technology (sometimes called Head Disc Assemblies or HDA's and taking over from Removable Technology) if defective, must be opened up in a Class 100, or better, clean room environment. In addition, sophisticated equipment to write essential positional information on the surface of the disc is also required. Substantial investment is needed to obtain these items, which would normally be beyond the capability of smaller FPMs. The installed base of high storage capacity disc drives, using Sealed Enclosure Technology, is substantial and they continue to be produced in large numbers. Annual failure rates between 1% to 10% were quoted, yielding significant revenue streams to those that can compete successfully and undertake such work.

Nearly all respondents could identify some potential competitors, but professed that the rate of growth and phase of the market still allowed sales to be made without apparent competitive pressure. In general this was slightly less true in the U.K., where FPM is more established, than in Germany, where few identifiable FPMs operate. Another factor identified during INPUT's interviews with FPM vendors is that, with such a diverse market, the selection of particular product type, manufacturer and model will, if carefully selected, ensure that competitive elements remain low in the earlier stages of the market development.

C

Factors Inhibiting Growth

The largest single factor that inhibits the development of FPM, most FPM vendors felt, was the non-disclosure, by manufacturers, of technical information and specifications of their products. This was particularly pronounced with Japanese manufacturers, and in general, was felt likely to become more significant in the future as products became smaller and more specialised. FPM vendors indicated that if co-operation could not be obtained, their reaction would be to "reverse engineer" the product.

Manufacturers, in general, seemed well aware of these activities and apparently make the process of reverse engineering difficult . Two respondents, one in the disc drive sector and the other in the PCB, believed that manufacturers put hardware and software design traps into

designs to make it more difficult for FPMs; although it is more likely that these might be introduced to make it difficult for competitors to copy the design.

Another particular ploy cited by one respondent was when a manufacturer made a hard disc drive for PCs, which was made difficult to repair, and put a correspondingly high price on exchange products. It became more economical to exchange an entirely different plug-compatible replacement, resulting in loss of after-sales revenue by the original manufacturer.

FPM companies designating themselves as manufacturer-dedicated, because of working exclusively with the manufacturer, will not have the problem of lack of information. Most FPMs being partially manufacturer-dedicated, however, will compete with a wide range of manufacturers and liaise with a few to obtain official authorized repair status. Vendors felt that, because of the increasing complexity of products, the lack of information would be an increasing problem. INPUT feels that these pressures could lead to the formation of more alliances between FPMs and manufacturers.

Next to the disclosure of information, the lack of availability of small spare parts to effect repairs posed the major problem, according to vendors, particularly because many manufacturers were including custom built components in their designs. In France, one vendor specialising in the repair of older equipment; no longer of interest to manufacturers, indicated that it was particularly difficult to obtain parts for old machines from the manufacturers, and long delays in their supply were normal.

Another inhibitory factor to growth cited by many vendors was restrictive practices —a process that apparently includes elements of non-disclosure and not supplying parts, but in addition, describes obstructive attitudes in general by manufacturers.

Some vendors responded that there were a small number of FPM companies that had dubious reputations and this could adversely affect the development of FPM if this became more widespread. There was wide acceptance that quality standards need to be high, and as important, are seen to be high, for business to flourish.

Other vendors stated that, "FPM is booming now, but like TPM, there will be a shakeout as there are too many people all doing the same thing." INPUT considers that certain narrow sections of the market could become more competitive. Another vendor respondent felt that the synergistic nature of the relationship between FPM and TPM could invite richer TPMs to take over FPM companies with complimentary skills. A reseller who majored in TPM outlets, reported that "TPMs wanted something for nothing." This comment may refer to certain TPMs flexing their negotiating muscle.

Within the U.K., where skill shortages seem to be manifesting themselves in areas where high technology is concentrated, one vendor felt that his business was being constrained by "just not enough educated people." INPUT feels that with future demographic employment patterns showing smaller pools of skilled labour, this is likely to be an increasing trend and may explain the location of some U.K. FPMs away from areas of concentrated technology.

Certain sections of the smaller end of the disc drive market posed problems for some vendors. The manufacturing cost of these devices is decreasing, resulting in such low sale prices that it is becoming uneconomical to repair them. The method employed to overcome this seems to be to take a number of items, strip them down, and create a few working units from the serviceable parts—a practice not apparently confined to the lower end of the market. One FPM vendor commented on having received a large consignment of disc drives for repair from a manufacturer—only to find that every single item had a multiplicity of faults on it. It transpired that another FPM had taken the business previously, knowing that it did not have the resources to effect a complete repair, and had employed the method described earlier to produce a few serviceable units—the rest were described as being "beyond economical repair" and found their way to the respondent.

D

The International Nature of Fourth-Party Maintenance

One key to profitable business in FPM companies lies in the ability to undertake volume repair activities economically, and this requires large markets. Many FPM vendors reported high levels of business outside their own country, within Europe, further abroad into the communist block and even as far as Australia. In particular, the disc drive repair and refurbishment market sector, possibly because it is more developed, requires high volumes, high capital investment, and tends to operate internationally.

Certain factors have made international trade easier and more economical over the past few years. The most frequently voiced reason given by respondents was that the cost of transportation, due to competition, had reduced and eased the economics and logistics of moving goods.

Broad strategies to sell in international markets fall into two categories. The first is a high-profile approach using the company's own name, strategically sitting sales offices in the target country and employing locally recruited management and staff. The second strategy has a lower profile and lower cost. This involves the appointment of agencies in selected countries that will effect the necessary sales and normally deal with the logistics of transportation. A major vendor in the disc drive repair market sector reported having set up a network of agencies in 1988 that gave initial indications of turning in high levels of business. INPUT considers that the implementation of marketing and sales in FPM will likely influence which companies will become leading vendors in the 1990s.

Some FPM vendors expressed opinions indicating an expectation of significantly increased volumes of European-wide business. These opinions were from vendors that already exported and by those that were just starting. The effect of 1992 European harmonisation was frequently referred to as a stimulant because of the removal of trade barriers.

E

Diversification and Ancillary Activities in the Fourth-Party Maintenance Market

Ancillary activities may be seen as as an opportunity for FPM companies to maximise the use of their existing resources and match them to the needs and demands of their customers. The range of these activities covers the sales of:

- Services
- Products
- Manufacturing facilities

The sales of services generally stem from the primary sources of their specialisation and include consultancy, support and training. A specific example of consultancy is provided by Hulcote, who advises clients on setting up a repair centre and the serviceability of products. An array of support services are offered by most vendors. In the disc market this covers data recovery from damaged discs—as much as 70% of data, or more, can be recovered. Emergency response to a disc head crash is provided by another vendor. Many companies will provide physical technical support to TPM companies on a product of their specialisation. This may take the form of an ad-hoc call, or by means of a retainer agreement—which provides a guaranteed response at a more favorable hourly rate. Some FPM vendors offer training services covering hardware and software. These are provided by PCB repairers when they have system knowledge of a particular manufacturer's product range.

New product sales and upgrades can be a spin-off from a relationship with a manufacturer, often taking the form of distribution rights and being sold through the medium of a separate company. It is stressed that many FPM companies adopt a market position that restricts such activities, as they feel these practices prejudice their dealings with other manufacturers.

Spare parts sales include filters, disc and tape heads, which form the major part of Leeway Data Product's business. It has agency agreements with a number of major suppliers.

The sales of second-user tested or refurbished equipment forms a significant part of many FPM companies' business.

A variety of software products are sold by FPMs. For example, Hulcote, (through an agency) markets a Repair Centre Management System and VAS market diagnostic software for use on Digital hardware. Repair

centres use sophisticated test equipment that requires programming for a particular product. These programs are available for sale from certain FPMs whilst others seek to purchase such items.

Manufacturing activity generally operates on a small scale in FPM. One respondent indicated he had set up such a facility to manufacture "hard cards" for PCs.

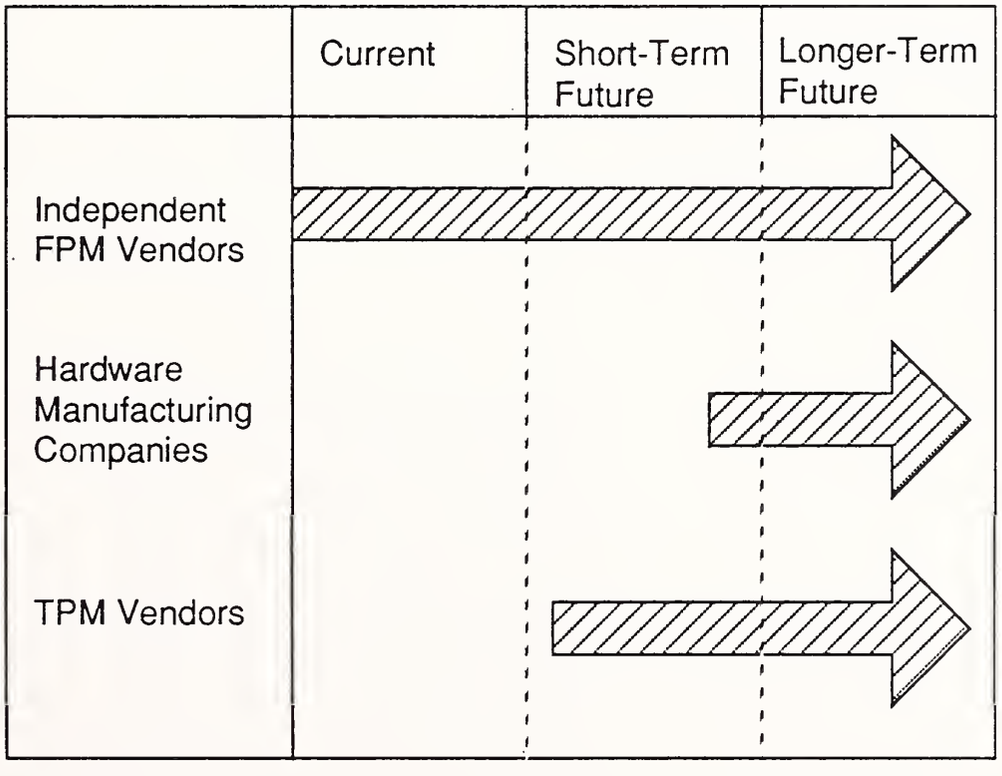
F

Changes in the Structure of the Fourth-Party Maintenance Market

A factor previously noted in the report is the frequent presence of TPM companies closely associated with FPM companies. In 1989, this situation is likely to gather momentum, when at least one large TPM vendor is expected to enter the market. Manufacturer-originated FPM activity is also expected to increase in the coming year. The trend of structural changes in the fourth-party maintenance market is illustrated in Exhibit IV-4.

EXHIBIT IV-4

CHANGES IN THE FOURTH-PARTY MAINTENANCE MARKET

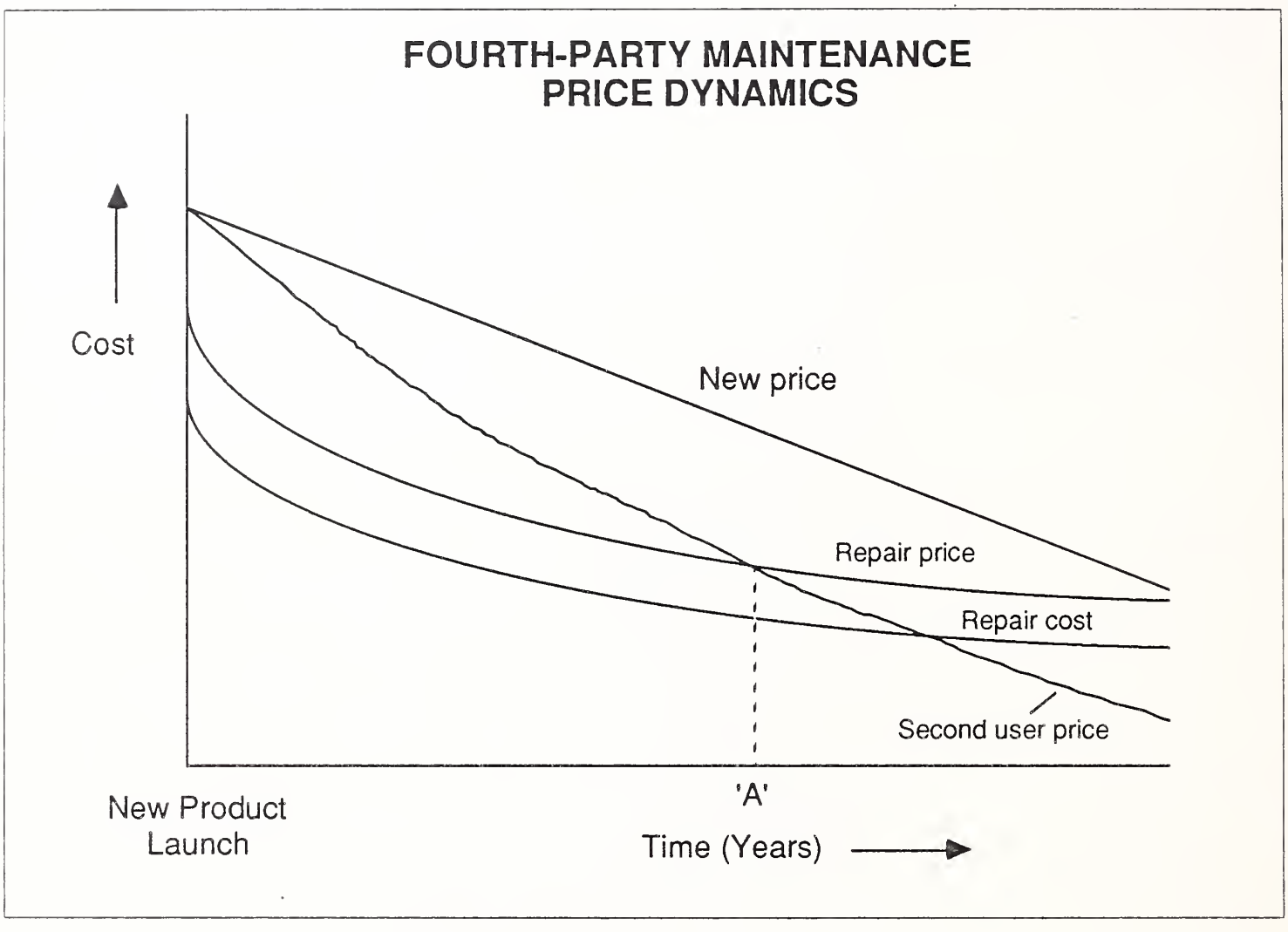


G

The Economics of Fourth-Party Maintenance Repair Activity

Exhibit III-5 compares diagrammatically the relationship between repair cost/price versus new-price and second-user price. This is subject to variation dependent on whether the item in question has a finite life, such as a disc drive, or has a theoretical infinite life, such as a printed circuit board.

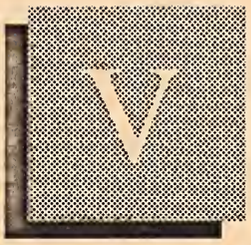
EXHIBIT IV-5



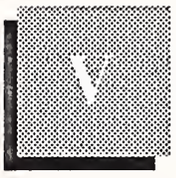
When a new product is introduced, the costs of repair start high due to start-up costs and then decline steadily over a number of years. With wearable items such as disc drives, and due to the competitive nature of the market the cost of manufacture and price decline over a period of years. This results in a new price which declines toward the cost of repair, which in turn depresses repair price, therefore margins are squeezed. If the new price declines further, and the product becomes no longer economical to repair, then the "throw away" syndrome commences. A factor contributing to "throw away" is the longer warranty periods reported to be given by manufacturers—which make it more attractive to buy new rather than repair an item. INPUT considers that this may be one reason why many disc drive repair and refurbishment vendors are also increasing their warranty periods. This may indicate a trend.

With non-wearable items, the second-user price has the greatest influence. When this declines, it also depresses the margin between repair cost and price. At point "A," when the second-user price equals the

repair price, it no longer becomes economical for FPMs to repair, and they may develop second-user sales themselves—this perhaps explains why second user sales is a common diversionary activity of FPMs.



Fourth-Party Maintenance Market in Western Europe



The Fourth-Party Maintenance Market In Western Europe

This section of the report contains INPUT's analysis of the Western European fourth-party maintenance market. Section A provides a forecast for Western Europe overall, and Sections B to F provide analysis of the major country markets where fourth-party maintenance operations are in progress and have developed a measurable presence.

A

Western Europe Market Forecast

The forecasts provided in this section of the report are based on an assessment of the total fourth-party maintenance market in Western Europe in 1988. Forecasts cover a period 1988 to 1994 and refer to estimated user expenditures in the FPM market. The forecasts have been made in local currency and converted into U.S. dollars for comparative purposes and all forecasts have been made at current rates and include inflation. Exhibit V-1 lists the conversion rates and inflation that have been included in projected forecasts.

Exhibit V-2 illustrates INPUT's overall forecast for the Western European FPM market. In 1988 this market was estimated at $70 million with a projected growth of 22% compound annual growth rate (CAGR) to reach $225 in 1994. A reconciliation of the market forecasts for each of the five major economic regions is listed in Exhibit V-3. The U.K. is indicated as being the largest and the most developed market in Europe and also has the highest growth projection at 25% CAGR. Development of the fourth-party maintenance markets in the other four economies analysed are lagging behind the U.K. by varying degrees. For example, the market size in West Germany is estimated as being one-tenth of the U.K. market in 1988.

However, INPUT considers that an early stage of evolution does not necessarily concur with higher future growth. The fourth-party maintenance market has a number of unique characteristics that influence potential development and growth. These are:

- The disc drive sector is considered to offer the best potential, but ideally a company needs access to relatively significant investment funds.
- Due to the high investment required for the disc sector, relatively high unit volumes are necessary for investment recovery. Hence, operation at the pan-European level is a likely ingredient of success.
- The cost and efficiency of logistics at the pan-European operations level favour more centralized geographic locations.
- One key element of success in fourth-party maintenance is formal agreement with the manufacturers of the hardware being repaired and refurbished. Agreements that include release of technology, documentation and component-level spare parts. Whether this type of agreement will be successfully achieved remains an open question.
- Market growth is forecast as being higher during the period 1988-1992 than the overall forecast growth. This is mainly due to the entrepreneurial nature of the FMP vendors and also uncertainty regarding the introduction of new technology later in the overall forecast period.

EXHIBIT V-1

U.S. DOLLAR CONVERSION RATES AND INFLATION RATES BY COUNTRY

Country	Currency	Exchange* Rate	Annual** Inflation Rate (Percent)
United Kingdom	£ Sterling	0.6	7.9
Benelux Countries			
Belgium	BF	39.7	3.0
Netherlands	DFl	2.14	1.0
France	FF	6.4	3.4
West Germany	DM	1.89	3.0
Italy	Lira	1393	6.7

* Source: National Westminister Bank, June 1989 exchange rates

** Source: The Economist, 12-month period up to end of April 1989

EXHIBIT V-2

WESTERN EUROPE FOURTH-PARTY MAINTENANCE MARKET FORECAST 1988-1994

Country	$ Millions		
	1988	1994	CAGR (Percent)
United Kingdom	34.0	131	25
Benelux Countries	13.5	36	18
France	5.5	16	20
West Germany	3.5	8	16
Italy	8.5	19	15
Rest of Europe	5.0	15	20
TOTAL	70.0	225	22

Note: Numbers have been rounded

WESTERN EUROPE FOURTH-PARTY MAINTENANCE COUNTRY MARKET FORECAST 1988-1994

Country	Currency	1988	1989	1990	1991	1992	1993	1994	CAGR (Percent)
United Kingdom	£(K)	20600	26800	34300	43200	53500	65300	79300	25
Benelux	$(K)	13500	16300	19500	23000	26800	31500	36400	18
France	FF(K)	33300	41300	51200	62500	75000	88500	99400	20
West Germany	DD(K)	6000	7300	8800	10200	11600	13000	14500	16
Italy	Lira(M)	11400	13500	16000	18500	21000	23700	26400	15
Rest of Europe	$(K)	4900	6000	7400	8900	10500	12400	14500	20

Note: Numbers have been rounded

These factors have influenced INPUT's growth predictions relative to the development of fourth-party maintenance in Western Europe. The potential for high growth is considered to exist, but at present the key factors involved in achieving this potential remain unresolved.

B

United Kingdom

1. Major Vendors

INPUT's research indicates that the U.K. FPM market is the largest and most developed in Western Europe. With an estimated total of approximately 60 companies operating within the U.K., segmentation is possible.

- Disc drive repair and refurbishment market sector with clean room facilities.

- PCB and other repair and refurbishment market sector. This includes repair and refurbishment on tape drives and streamers, printers and print heads, VDUs, workstations, and electromechanical assemblies.

Of these two sectors, the disc drive market is indicated as being the largest revenue earner and contains an estimated 15 companies of which the following, alphabetically arranged, are considered to be the most significant vendors:

- Kode
- Meltek
- MML
- Norman Magnetics
- Premier
- Pulse

The PCB and other repair and refurbishment sector in the U.K. is estimated to contain the largest number of companies, with an estimated 45 vendors operating in a diversity of activities and special market niches. INPUT researches have identified the following significant vendors, which are listed alphabetically:

- AIDL
- Hulcote
- Phase
- Sysmatic
- VAS

2. Country Profile

In a similar manner to the development of third-party maintenance, FPM within the U.K. is now developing into a established market with only initial signs of competitive pressure appearing—most respondents

claimed that they had few direct competitors—except in certain narrowly defined situations.

The results of INPUT's survey suggest that the U.K. FPM market opportunities are being recognised by manufacturers and major TPMs. This point was reinforced during an interview with a major international TPM who intends to actively market FPM services in the near future. It's probable that, like TPM, competition will increase as the market continues to develop.

Opportunities within the U.K. FPM market have not gone unnoticed by USA vendors. A relatively significant degree of advertising from USA-based FPMs is evident from trade magazines, and Douglas Computer International and Premier have established physical presence during the past year.

U.K. FPM companies varied in their approaches to marketing and sales. Some respondents stated they achieved sales purely from referrals, whilst others had an organised and developed sales presence with, in their opinion, a clear direction. INPUT considers that formal marketing and sales strategies are more likely to provide for continuing and future success.

In March 1989, it was announced that a U.K. company—Three W's, an FPM in the disc repair business with a turnover of £2.0 million ($3.3 m) in 1988—had gone into voluntary liquidation. This suggests that new high growth markets carry high risk factors as well as offering good opportunities.

The proportion of revenues derived from the disc drive repair and refurbishment market sector are indicated in Exhibit V-4. A relatively significant proportion of revenues, 58%, is obtained from hardware and system component manufacturers. TPM companies account for 31% of the total with end users representing a relatively small proportion at 7%. Distribution channels and others accounted for 3% and 1% respectively.

The activities of those vendors operating within the PCB repair and other market sector vary widely depending on market positioning of individual companies. Some compete actively against a principal manufacturer and focus their activities on TPM and distribution channels. A significant majority, however, obtain business from manufacturers. Exhibit V-4 indicates these proportions based on a sample of five respondents.

EXHIBIT V-4

U.K. FOURTH-PARTY MAINTENANCE REVENUE SOURCES

	Disc Repair Sector (Percent)	PCB & Other Sector (Percent)
Manufacturers	58	52
TPMs	31	29
VARs/Distributors	3	12
End Users	7	2
Other	1	5

3. Activity Types

The range of activities undertaken in the U.K. is indicated as being broad-based and no particular market segment predominates. FPM companies are repairing and refurbishing products covering the entire spectrum of hardware devices used in information technology, including large and small peripherals and CPUs used in the mainframe, minicomputer and PC markets to office equipment and small handheld computers.

The selling of goods and services complimentary to FPM are widely undertaken in the U.K. and include:

- Data recovery
- Benchmark media
- New and second-user equipment
- Equipment upgrades
- Training and support
- Repair centre consultancy
- Software for repair centre systems
- Diagnostic software
- Test equipment sales

4. Market Forecast

Exhibit V-5 indicates INPUT's market forecast for the U.K. fourth-party maintenance market, showing that user expenditures reached £21 M ($34 M) in 1988. The market is forecast to grow at 25% compound annual growth rate (CAGR) to reach £79 M ($131 M) in 1994.

EXHIBIT V-5

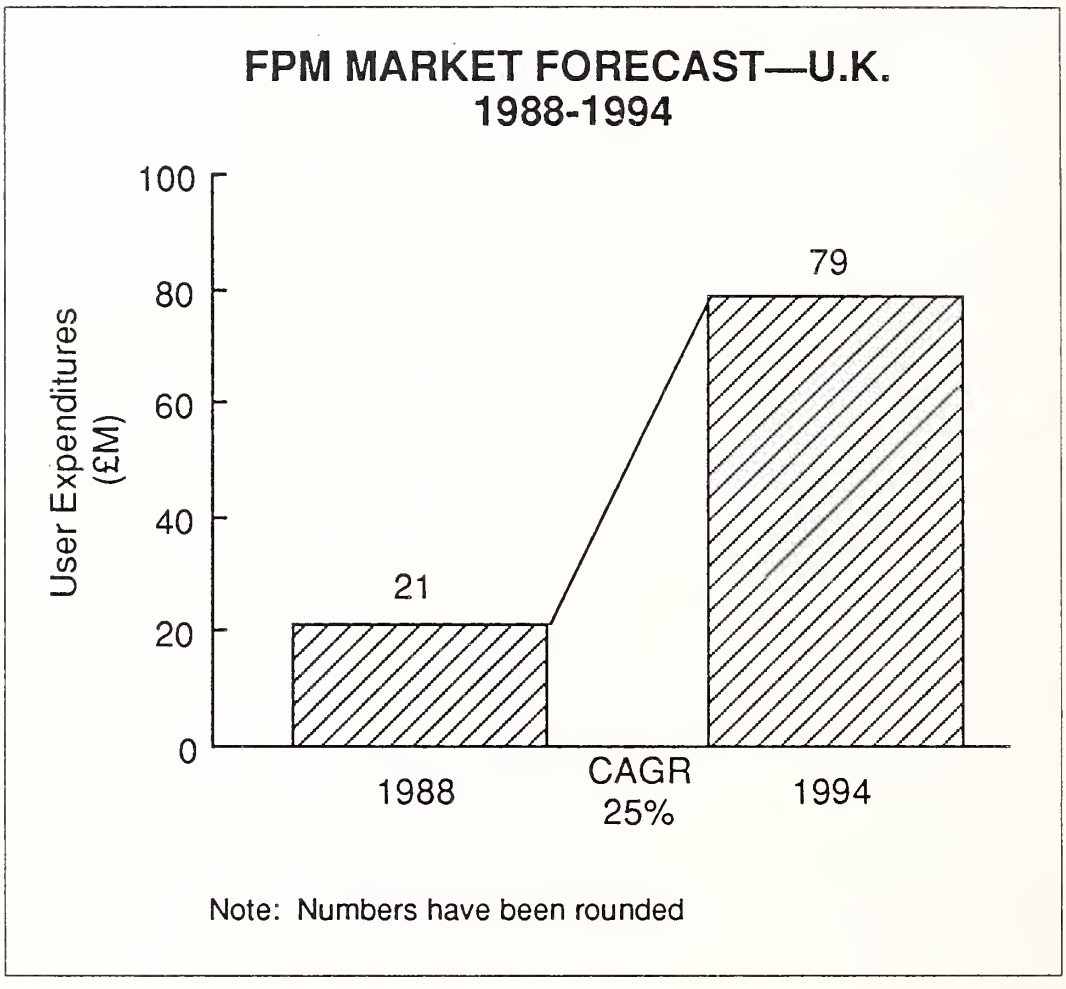
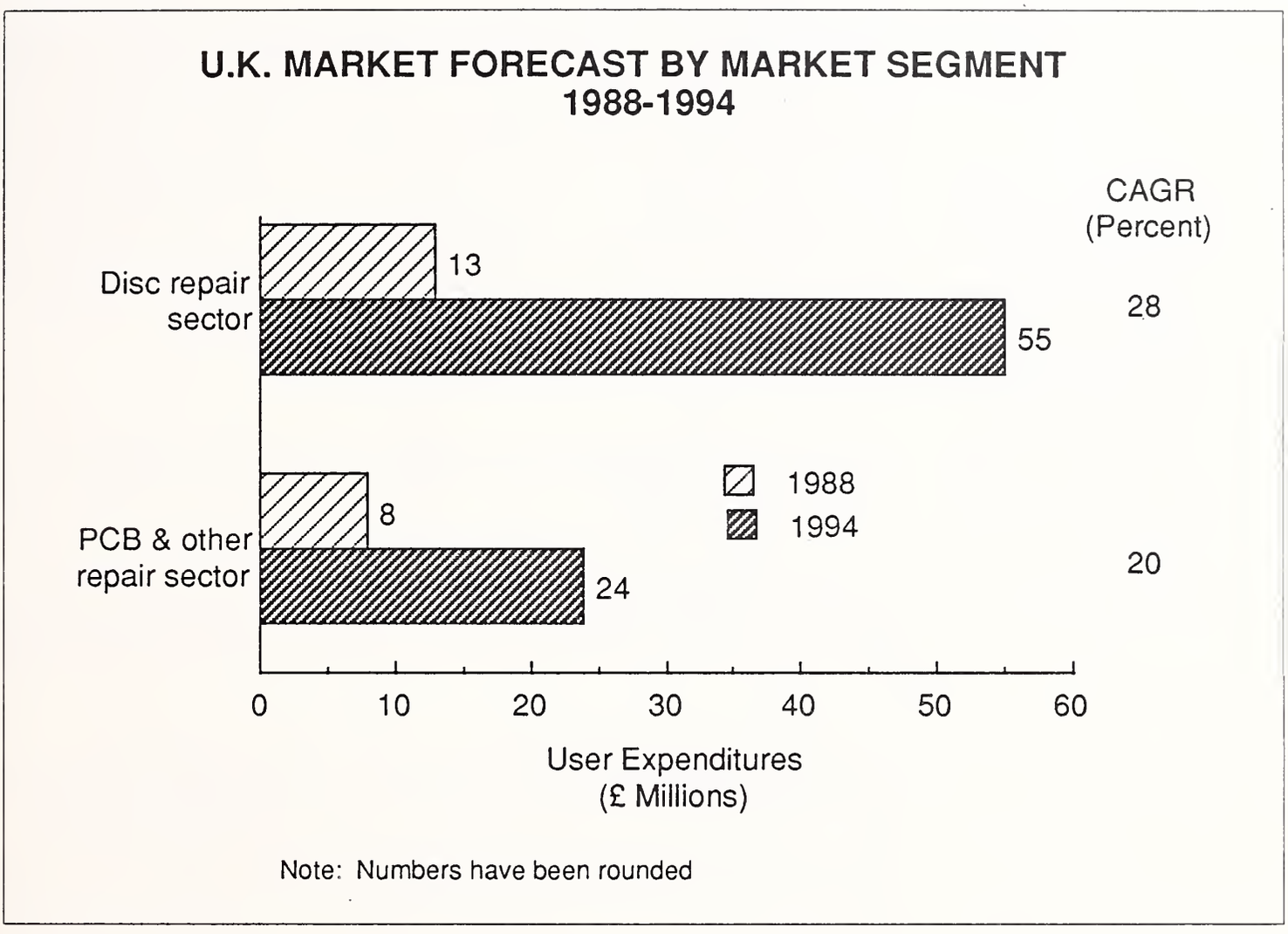


Exhibit V-6 illustrates the market forecast for both the disc repair and the PCB and other repair segments of the market. The disc drive repair and refurbishment sector of the market is estimated as having reached £13 M ($21 M) in 1988 and is forecast to grow at 28% to reach £55 M ($91 M) in 1994. The PCB and other segment of the market is estimated as having reached £8 M ($13 M) 1988 and is forecast to grow at 20% to reach £24 M ($40 M) in 1994.

EXHIBIT V-6



Note: Numbers have been rounded

C

The Benelux Countries

1. Major Vendors

Research reveals that fourth-party maintenance in the Benelux countries is in a state of relative infancy with few major vendors outside Belgium. INPUT estimates that approximately 12 FPM companies operate within the Benelux countries and identifies the following as being the more significant vendors.

- Applied Peripheral Technology (APT)
- General Disc Corporation (GDC)
- Lupac
- Rotating Memory Technology (RMT)

APT, GDC and Lupac are based in Belgium, and RMT in the Netherlands.

2. Country Profile

The development of FPM in a country tends to begin with the introduction and commencement of disc repair and refurbishment activities. APT and GDC in Belgium and RMT in the Netherlands fall within this category and have been established for some years. APT, a major vendor in the European context, is associated with a complimentary magnetic disc and tape head manufacturer at the same location. Both APT and GDC are of American parentage, and GDC exports some of its repair work to the USA. Lupac repairs small disc drives, sells magnetic recording heads and undertakes a degree of reselling activities. It has acquired a 50% holding, and has a joint venture, with Sigma; a magnetic recording head manufacturer in the USA.

Similarly to other disc repairers that invest heavily and require high volumes, APT in particular has a significant sales presence in most major European countries.

The next stage of FPM development tends to involve a small, but growing number of PCB repairers. This phase, based on INPUT's research, has not yet evolved to any relatively significant degree within the Benelux countries.

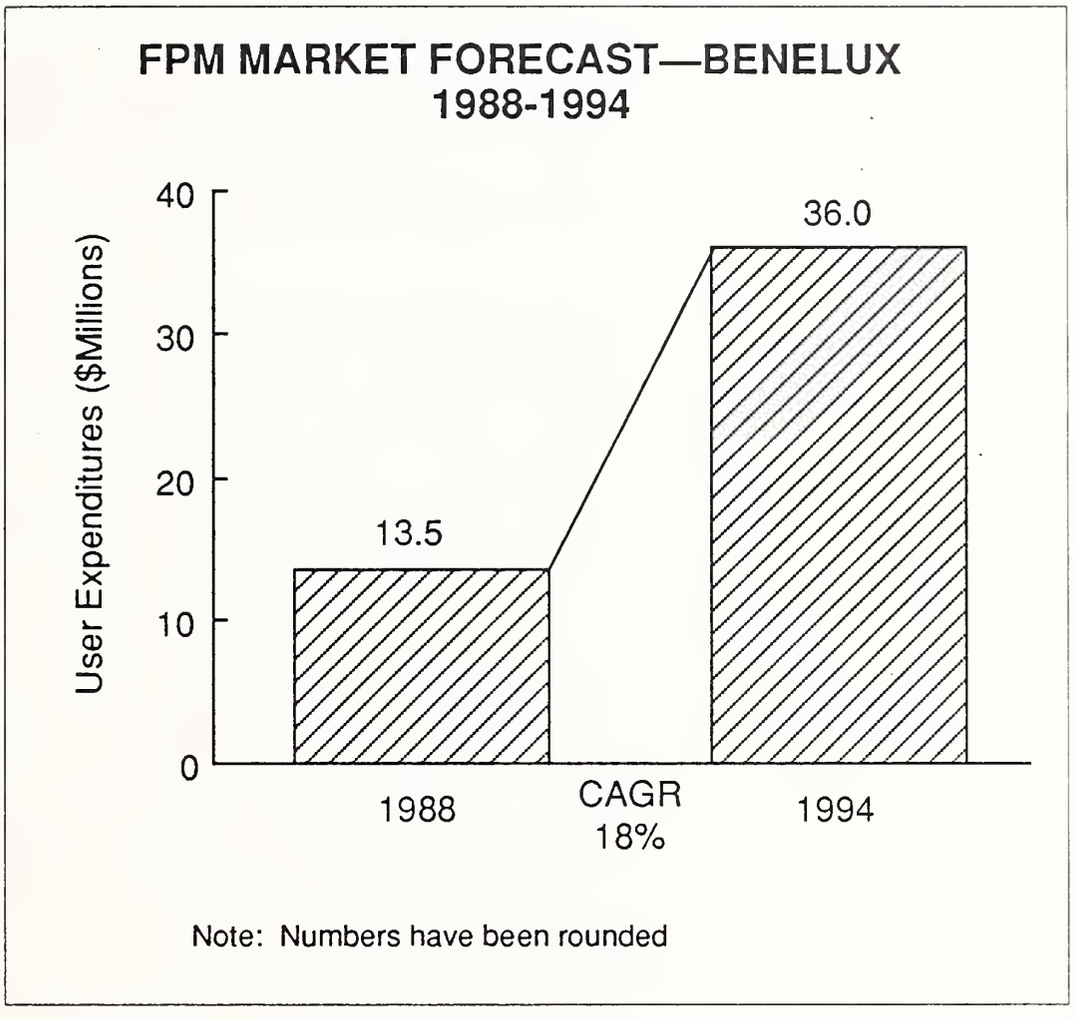
The FPM disc repair sector business development has not always achieved progressive growth in the Benelux countries, and past history indicates a degree of variability in some companies' growth patterns. This is likely to be due to relative immaturity of the market and the relatively high investment levels often required.

The predominant activity within the Benelux countries is in the disc drive repair and refurbishment sector with a bias towards manufacturer outlets by APT and RMT and towards TPM outlets by GDC.

3. Market Forecast

Market forecasts for the Benelux countries are illustrated in Exhibit V-7. User expenditures are estimated as having reached $13.5 M in 1988 and are forecast to grow at 18% CAGR reaching $36 M in 1994.

EXHIBIT V-7



D

France

1. Major Vendors

INPUT estimates there to be 30-40 small FPM companies in France, each with revenues in excess of FF 1.0 Million. Of these, SEMSI and CRM were identified as being relatively significant with Societe Generale de Assistance being typical of a smaller vendor. Vendors identified by INPUT are:

- CRM
- SEMSI
- Societe Generale de Assistance

2. Country Profile

FPM exists in France but most participants seem to be relatively small. Vendors interviewed estimated that 30 companies with revenues greater than FF 1.0 Million are operating. It is believed that some of the established TPM companies are offering a FPM service, and there is a suggestion that some manufacturers are also involved.

The limited number of respondents indicated that they recognised the importance of marketing and sales, and one in particular was actively involved in a recruitment campaign to increase its sales force—they saw it as the key to future growth. The numbers of sales staff relative to total staff was quite large, suggesting an aggressive approach that parallels INPUT reports of the French TPM environment.

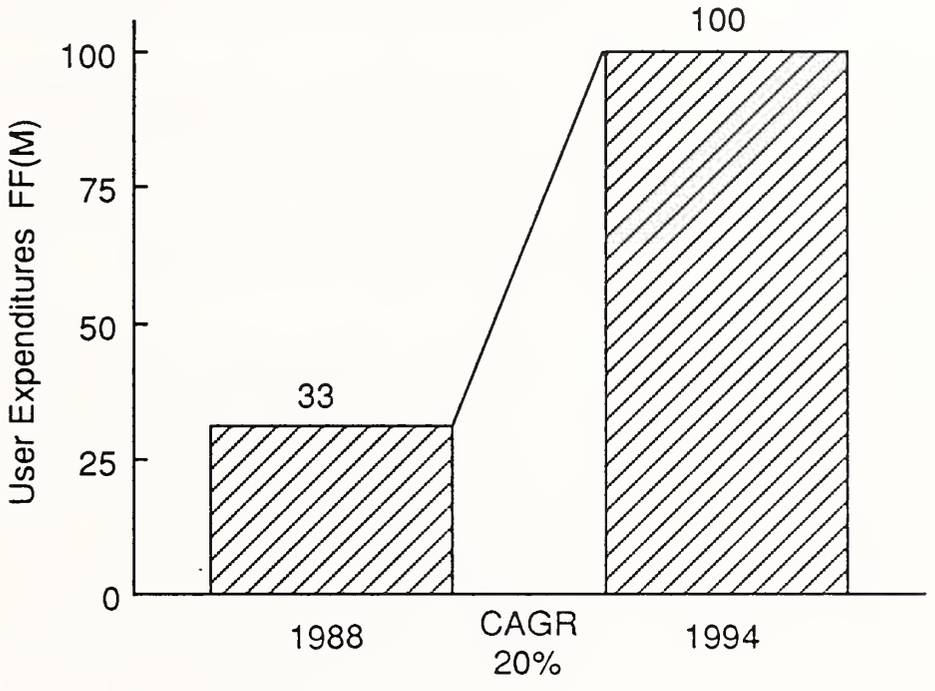
The competitive environment varies according to the market niche occupied. The number of companies offering services in the printer and print head repair sector seemed to be high—a total of five vendors were identified by respondents—CRB in particular exports to a number of U.K. reseller outlets. In another sector, a manufacturer-dedicated company, specialising in older items of equipment, reported no competition whatsoever, but that older spare parts were difficult to obtain—it used U.K. FPM contacts to obtain these parts.

It may be symptomatic of certain sections of French commercial culture that one respondent intended to stay small. A larger company could anticipate problems from the high level of bureaucracy involved. From the sample of respondents polled, the FPM market in France seems to have a relatively high population of printer and print head repairers. However, the market is at a relatively early stage of development, and further expansion may parallel that in other markets.

3. Market Forecast

Market forecasts for the French market are illustrated in Exhibit IV-8. User expenditures are estimated as having reached FF 33.0 M ($5.5) in 1988 and are forecast to grow at 20% CAGR reaching FF 100 M ($16) in 1994.

EXHIBIT V-8



Note: Numbers have been rounded

E

West Germany

1. Major Vendors

INPUT has identified only one significant FPM vendor in West Germany, which operates within the disc drive repair and refurbishment sector from premises located near Munich.

- Raparaturzentrum Nue Technologien (RNT)

In addition, it is estimated that approximately ten small companies are also active within West Germany, performing repair work on a wide variety of equipment types and selling upgrades and features for computer systems.

2. Country Profile

Germany has a traditionally conservative culture, and the relatively low penetration of FPM parallels that of TPM. This situation is considered likely to continue although, it is believed, some American-based companies may be considering repair centre activity. Developments are still at a preliminary stage. The FPM respondent indicated the current level of competition for FPM business to be very low—there was no locally based opposition and he expected to treble in size in four years.

Additional FPM activity is considered to be a relatively minor part of other company operations. An example of this could be Forum—a TPM company operating in the DEC market that maximises existing facilities by using its repair centre for Digital PCB repair work. There is reason to believe that this is done by other organisations in Germany.

One major German printer manufacturer, apart from performing matrix print head repair on its own products, was reported to be actively marketing a service that extended to other manufacturers' products. This may be seen in the above context of a more effective use of existing resources to produce incremental revenue.

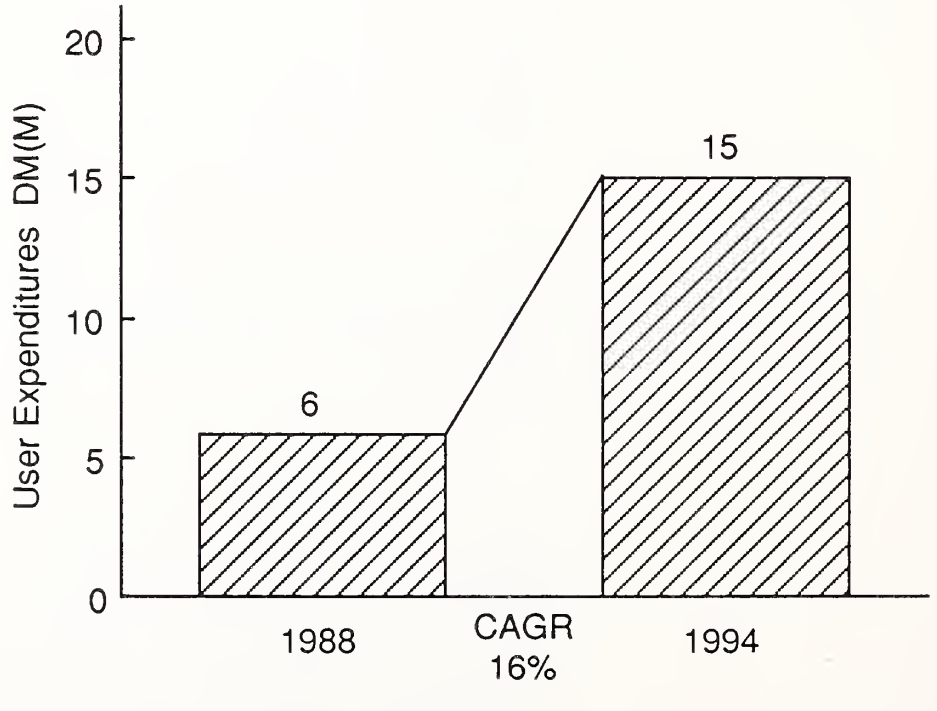
The one relatively significant FPM activity identified in Germany is the disc repair market sector and is believed to be represented by RNT alone. The nature of RNT outlets is interesting in that although manufacturer work predominates, a higher proportion of revenue is derived direct from end-users compared with other disc repair companies.

3. Market Forecast

INPUT estimates that FPM user expenditure is West Germany reached DM 6.0 M ($3.5 M) in 1988, as indicated in Exhibit V-9, and will grow at a forecasted 16% CAGR to DM 15 M ($8 M) in 1994.

EXHIBIT V-9

FPM MARKET FORECAST—WEST GERMANY 1988-1994



Note: Numbers have been rounded

F

Italy

1. Major Vendors

The results of INPUT's survey has indicated that the Italian FPM market consists of an estimated 20 small companies—mostly with three to eight employees. Examples of the smaller vendors are:

- Start Technology
- Coas
- Datatech

In addition, one larger FPM vendor was identified

- AL TEC

2. Country Profile

The early phases of FPM market development have commenced within Italy with a few small companies already operating—the socioeconomic environment is considered friendly to such enterprises. It was widely reported, through discussions with respondents, that a "black market" also exists and is estimated at being equal to 10-20% of the total market measured by revenue.

Apart from the facilities of manufacturers, about four or five clean room environments exist in Italy. Some of these are reported as being operated by the following companies:

- Comprel
- Computer Support
- PC Mind

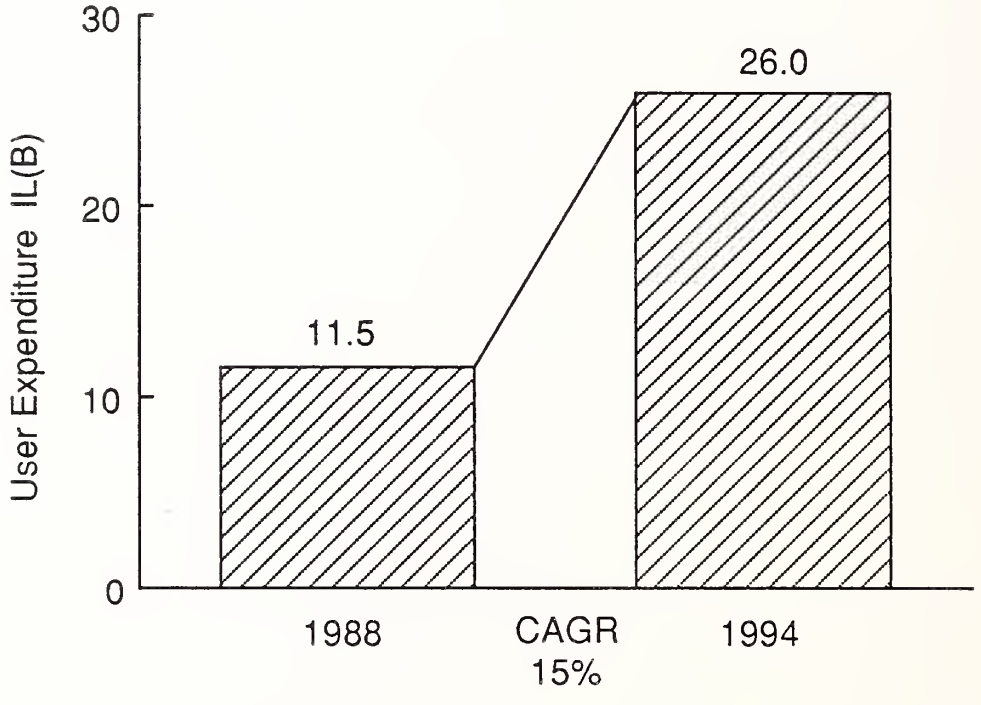
Although the fourth-party maintenance market within Italy is at a relatively early stage of development, sufficient data was obtained to suggest that most sectors of market activity are being pursued and considered by vendors. The activities of AL TEC and Start Technology cover a relatively wide range of activities. AL TEC in particular is dedicated to the manufacturer sector.

3. Market Forecast

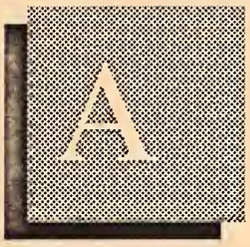
The market forecast, illustrated in Exhibit V-10, indicates that FPM user expenditures reached IL 11.5 B ($8.5 m) in 1988 and will grow at an estimated 15% CAGR reaching IL 26 B ($19 M) in 1994.

EXHIBIT V-10

FPM MARKET FORECAST—ITALY 1988-1994



Note: Numbers have been rounded



Appendix: Profiles of U.K. FPM Vendors

COMPANY PROFILE

4PM LTD.

United Kingdom
Lea Green Road
Lea Green
St. Helens
Merseyside WA9 4QF
Country Code (44) Area Code(0744)
Number: 814645

Company Information

Location/s of repair centre:	St. Helens
Number of employees in FPM:	61
Number of engineers (Total)	
- Bench engineers	5 (I.T. sector)
- Support engineers	N/A
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	*£600 K
- 1989 Forecast	*£810 K
Business Focus or Repair Activity	
PCB repairs:	Rank Xerox
CPU's:	Rank Xerox

Notes: * I.T. revenues only, also involved in copiers and office electronics (FAX)

Total 1988 revenues - £2.00 M

Management buyout of Rank Xerox repair facility

COMPANY PROFILE

AIDL

United Kingdom
7, Prospect Way
Rugby
Warwickshire
CV 21 3UU
Country Code (44) Area Code (0788)
Number: 79028

Company Information

Location/s of repair centre:	Rugby
Number of employees in FPM:	N/A
Number of engineers (Total)	
- Bench engineers	17
- Support engineers	N/A

Revenues derived from Fourth-Party Maintenance

- 1988 Revenues	£800 K
- 1989 Forecast	£1.2 M

Business Focus or Repair Activity

PCB repairs: Huskey, Amstrad, NRC, NEC

Notes: Specialist PCB repair company; also offers consultancy on PCB repairs

COMPANY PROFILE

COMPUTER DISC DRIVE SERVICES

United Kingdom
CDS House
London Road Industrial Estate
Baldock
Hertfordshire SG7 6NG
Country Code (44) Area Code (0462)
Number: 896111

Company Information

Location/s of repair centre:	Baldock
Number of employees in FPM:	10-12
Number of engineers (Total)	
- Bench engineers	4-5
- Support engineers	2
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	£600 K
- 1989 Forecast	£700 K
Business Focus or Repair Activity	
Disc Drives:	Atasi, IBM, NEC9 BASF, Olivetti, CDC, IMI, Quantum, CMI, MMI, Rodime, Densei, Maxtor, Seagate, Disctron, Micropolis, Shugart, Epson, Microscience, Syquest, Fujitsu, Miniscribe, Tandon, Honeywell, Mitsubishi, Vertex
Clean Rooms:	Class 10

COMPANY PROFILE

COMPUTER PERIPHERAL MAINTENANCE

United Kingdom
Unit 2
9 Wilkinson Road
Cirencester
Gloucester GL7 1YT
Country Code (44) Area Code (0285)
Number: 659806

Company Information

Location/s of repair centre:	Cirencester
Number of employees in FPM:	17
Number of engineers (Total)	
- Bench engineers	6
- Support engineers	2
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	£500 K
- 1989 Forecast	£900 K
Business Focus or Repair Activity	
Terminals/ VDUs:	Most makes except IBM, Telex, Memorex
	CPUs: IBM PCs
Tape Streamers:	Archive, Cipher, Alloy, Wangtek, Memtec, Iomega
Disc Drives:	Seagate, Miniscibe, Rodime, NEC, Epson, Fujitsu, Y-Data, CDC, Memorex, Shugart, Tandon, Remex, Hoshin, Sony, Teac, Mitsumi, Mitsubishi, NEC, Weltec, Storagetek, Siemens, BASF, Canon, Pertec
Clean Rooms:	Class 1000, Class 100

COMPANY PROFILE

HULCOTE ELECTRONICS

United Kingdom
The Gatehouse
Igranic Works
Elstow Road
Bedford MK42 9LH
Country Code (44) Area Code (0234)
Number: 44206

Company Information

Location/s of repair centre:	Bedford
Number of employees in FPM:	30
Number of engineers (Total)	
- Bench engineers	17
- Support engineers	4
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	£400 K
- 1989 Forecast	£1.5M
Business Focus or Repair Activity	
PCB Repairs:	Yes - But manufacturers unspecified
Printers/ Printheads:	Yes - But manufacturers unspecified
Terminals/ VDU's:	Yes - But manufacturers unspecified
CPU's:	Yes - But manufacturers unspecified
Floppy Disc Drives:	Yes - But manufacturers unspecified
Mechanical Assemblies:	Yes - But manufacturers unspecified
Specialist services:	Repair Centre Consultancy

Notes: Hulcote is a manufacturer-dedicated repairer

COMPANY PROFILE

LEEWAY DATA PRODUCTS

United Kingdom
Headway House, Christy Estate
Ivy Road
Aldershot
Hampshire GU12 4TX
Country Code (44) Area Code (0250)
Number 314445

Company Information

Location/s of repair centre:	Aldershot
Number of employees in FPM:	5-6
Number of engineers (Total)	
- Bench engineers	N/A
- Support engineers	N/A
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	*£1.2 M
- 1989 Forecast	*£1.5 M
Business Focus or Repair Activity	
Printers/ Printheads:	Spares & printheads for numerous manufacturers
Tape Drives:	Spares for various manufacturers
Disc Drives:	Spares for various manufacturers
Recording Heads:	Tape & disc heads sold
Specialist services:	Test equipment sales

* Leeway Data Products is an agent and reseller

COMPANY PROFILE

MELTEK DATA

United Kingdom
Unit 1
Felthambrook International Centre
Feltham
Middlesex TWI 3 7DP
Country Code (44) Area Code (01)
Number 751444 1

Company Information

Location/s of repair centre:	Feltham
Number of employees in FPM:	20
Number of engineers (Total)	
- Bench engineers	8
- Support engineers	4
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	*£2.8M
- 1989 Forecast	*£3.64M
Type of Repair Activity	
Terminals/ VDUs:	Sun, Tanberg
Tape Streamers:	Archive, Wangtech, Cipher
Disc Drives:	CDC, Maxtor, Fujitsu, Micropolis, Seagate, Rodime, Priam, Vertex, Siemens, Conners.
Clean Rooms:	One Class 10000, One Class 10

Notes: Rodime & CDC spares sold.
*Revenue from all sources including non-FPM, FPM revenues not disclosed

COMPANY PROFILE

MEMORY MAINTENANCE (MML)

United Kingdom
16 Westmead Industrial Estate
Westlea
Swindon
Wiltshire SN5 7YT
Country Code (44) Area Code (0793)
Number: 616999

Company Information

Location/s of repair centre:	Swindon
Number of employees in FPM:	60
Number of engineers (Total)	
- Bench engineers	45
- Support engineers	2

Revenues derived from Fourth-Party Maintenance

- 1988 Revenues	£1.25M
- 1989 Forecast	£1.5M

Business Focus or Type of Repair Activity

Disc Drives:	Ampex, Atasi, CMI, IMI, Micropolis, Microscience, Miniscribe, NEC, Priam, Rodime, Seagate, Tandon, Texas, Vertex, Maxtor.
Clean Rooms:	Two Class 100s

COMPANY PROFILE

NORMAN MAGNETICS (NORMAG)

United Kingdom
Invincible Road
Farnborough
Hampshire GU14 7NP
Country Code (44) Area Code (0252)
Number: 515066

Company Information

Location/s of repair centre:		Farnborough
Number of employees in FPM:		15
Number of engineers (Total).		
- Bench engineers		15
- Support engineers		N/A
Revenues derived from Fourth-Party Maintenance		
- 1988 Revenues	US Dollars	3.0M
- 1989 Forecast	US Dollars	3.5M
Business Focus or Type of Repair Activity		
Printers/ Printheads:		Kyocera
Disc Drives:		CDC/Imprimis, Century Data
Recording Heads:		1/4" and 1/2" tape head refurbishment
Clean Rooms:		One Class 1000, Two Class 100s

Notes: Norman Magnetics is a magnetic media manufacturer

COMPANY PROFILE

PHASE

United Kingdom
Beacon Lodge
Texas Street
Morley
Yorkshire LS27 OHG
Country Code (114) Area Code (0532)
Number: 380515

Company Information

Location/s of repair centre:	Leeds
Number of employees in FPM:	14
Number of engineers (Total)	
- Bench engineers	9
- Support engineers	2
Revenues derived from Fourth Party Maintenance	
- 1988 Revenues	£640 K
- 1989 Forecast	£800 K
Business Focus or Repair Activity	
PCB Repairs:	DEC, Emulex, Systime, Natsemi, CDC, Dilog
Printers/ Printheads:	DEC, Epson
Terminals/ VDUs:	DEC, Esprite
CPUs:	DEC VAX 785, Microvax, PDP, LSI
Tape Streamers:	DEC, SE Labs, Cipher
Disc Drives:	DEC, CDC
Specialist services:	DEC hardware & software training, support

COMPANY PROFILE

PREMIER COMPUTER CORPORATION

United Kingdom
Western Wood Way
Langage Science Park
Plympton
Plymouth LP7 5BG
Country Code (44) Area Code (0752)
Number: 341555

Company Information

Location/s of repair centre:	Plymouth
Number of employees in FPM:	35
Number of engineers (Total)	
- Bench engineers	12
- Support engineers	6
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	U.K. Establishment in mid-1988
- 1989 Forecast	£2.5M
Business Focus or Repair Activity	
Disc Drives:	Micropolis, Miniscribe, Maxtor, CMI, Rodime, Seagate, CDC/Imprimis, Fujitsu, NEC, Tandon
Clean Rooms:	Class 1000, Class 100

COMPANY PROFILE

PULSE SERVICES

United Kingdom
Maesglas Industrial Estate
Newport
Gwent, NP9 2NN
Country Code (44) Area Code (0633)
Number: 246922

Company Information

Location/s of repair centre:	Newport
Number of employees in FPM:	20
Number of engineers (Total)	
- Bench engineers	10
- Support engineers	2
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	£900 K
- 1989 Forecast	£1.5 M
Business Focus or Repair Activity	
Tape Streamers:	Archive, Cipher, Digidata, Irwin, DEI, Kennedy, Wangtek
Disc Drives:	Ampex, Amstrad, Atari, BASF, Bull, CDC, CMI, Cognito, Compaq, DEC, Densei, Fuji, Epson, Hitachi, IBM, IMI, Lapine, Maxtor, Micropolis, Microscience, Miniscribe, Mitsubishi, NEC, Olivetti, Quantum, Rodime, Seagate, Shugart, Syquest, Teac, Tulin,Vertex, Priam
Clean Rooms:	One Class 1000, Two Class 100

COMPANY PROFILE

SYSMATIC

United Kingdom
Arkwright Road
Reading
Berkshire RG2 OLS
Country Code (44) Area Code (0734)
Number: 311011

Company Information

Location/s of repair centre:	Reading
Number of employees in FPM:	19
Number of engineers (Total)	
- Bench engineers	14
- Support engineers	2
Revenues Derived from Fourth-Party Maintenance	
- 1988 Revenues	£400 K
- 1989 Forecast	£600 K
Business Focus or Repair Activity	
Printers/Printheads:	All Laser Printers
Tape Streamers:	Perex, 3M, Archive, Cipher, DEC, IBM
Disc Drives:	Fuji, Micropolis, Maxtor (Electronics only, not HDAs)

Notes: Part of an independent maintenance company

COMPANY PROFILE

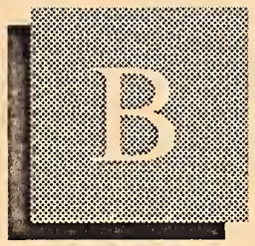
VAS COMPUTERS

United Kingdom
Unit 5
The Pilton Estate
Croydon CRO 3RY
Country Code (44) Area Code (01)
Number 6860518

Company Information

Location/s of repair centre:	Croydon
Number of employees in FPM:	20
Number of engineers (Total)	
- Bench engineers	8
- Support engineers	2
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	£1.36 M
- 1989 Forecast	£1.9 M
Business Focus or Repair Activity	
PCB Repairs:	IBM PC, DEC VAX 8000 to MicroVax
Printers/ Printheads:	DEC, Epson, Star Laser
Terminals/ VDUs:	DEC, Wyse
CPUs:	IBM PC & PS/2
Tape Drives:	DEC—by exchange
Disc Drives:	DEC, CDC, Tandon, Seaquest, Seagate
Specialist services:	DEC Training, Support & Diagnostic Program Sales

Notes: Agent for TRW



Appendix: Profiles of Benelux FPM Vendors

COMPANY PROFILE

APPLIED PERIPHERAL TECHNOLOGY (APT)

Belgium
Manhattan Centre
21 Avenue du Boulevard Box 23
B-1210 Brussels
Country Code (32) Area Code (2)
Number: 2197944

Company Information

Location/s of repair centre:	Turnout, Belgium
Number of employees in FPM:	95
Number of Engineers (Total)	
- Bench Engineers	69
- Support Engineers	6

Estimated revenues derived from Fourth Party Maintenance

- 1988 Revenues	U.S. Dollars 6.00 M
- 1989 Forecast	U.S. Dollars 6.96 M

Business Focus or Repair Activity

Tape Streamers:	Various manufacturers
Disc Drives:	Amcodyne, Ampex, Archive, BASF, Bull, Burroughs, Cipher, CMI, CDC, CDS, Data General, DEC, Disctron, Hitachi, IMI, Irwin, Microscience, Miniscribe, Micropolis, NEC, Maxtor, Olivetti, Priam, Quantum, Rodime, Seagate, Shugart, Syquest, Tandon, TEAC, Texas, Wangtek
Recording Heads:	Tape & disc
Clean Rooms:	Class 100

Notes: Associated with major manufacturer of disc & tape heads

COMPANY PROFILE

GENERAL DISC CORP. (GDC)

Belgium
Park Industrial
Des Hauts-Sarts
4400 Herstal
Country Code (32) Area Code (41)
Number: 481818

Company Information

Location/s of repair centre:	Herstal	
Number of employees in FPM:	10	
Number of engineers (Total)		
- Bench engineers	3	
- Support engineers	4	
Revenues derived from Fourth-Party Maintenance		
- 1988 Revenues	US Dollars	2.20 M
- 1989 Forecast	US Dollars	2.44 M
Business Focus or Repair Activity		
Disc Drives:	IBM, CDC, Storagetek	
Recording Heads:	Via U.S.-owned Company	
Clean Room:	Class 1000, Class 10	

Notes: Some repair work cycled to USA

COMPANY PROFILE

LUPAC

Belgium
Rue Edith Cavell 230
1180 Brussels
Country Code (32) Area Code (23)
Number: 749042

Company Information

Location/s of repair centre:	Brussels
Number of employees in FPM:	32
Number of engineers (Total)	
- Bench Engineers	8
- Support Engineers	-
Revenues derived from fourth-party maintenance	
- 1988 Revenues	* Bf 300 M
- 1989 Forecast	* Bf 310 M
Business Focus or Repair Activity	
Printers/ Printheads:	Printheads for various manufacturers
Disc Drives:	Small Winchesters for various manufacturers
Recording Heads:	Disc & Tape

Notes: Major part Lupac's business is agency work & reselling

* Total revenues

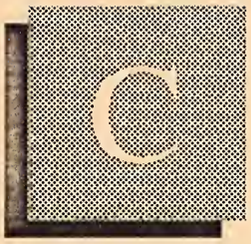
COMPANY PROFILE

ROTATING MEMORY TECHNOLOGY (RMT)

Netherlands
Marlcant 12
Almere
Netherlands
Country Code (31) Area Code (32)
Number 4034900

Company Information

Location/s of repair centre:	Almere
Number of employees in FPM:	25
Number of engineers (Total)	
- Bench Engineers:	12
- Support Engineers	-
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	Dutch Guilders 2.0 Million
- 1989 Forecast	-
Business Focus or Repair Activity	
Terminals/ VDUs:	IBM
CPUs:	IBM PC, XT, AT, PS/2
Tape Streamers:	DEI
Disc Drives:	Ricoh, DMA, Ampex, CMI, IMI, NEC, Olivetti, Quantum, Rodime, Seagate, Shugart, Tandon
Clean rooms:	Class 100
Specialist services:	Repair centre consultancy, temporary manpower for manufacturer repair centre



Appendix: Profiles of French FPM Vendors

COMPANY PROFILE

SEMSI

France
Rue de Bitche
2400 Courbevoi
Country Code (33) Area Code (1)
Number: 47880427

Company Information

Location/s of repair centre:	Courbevoi
Number of employees in FPM:	30
Nurnber of Engineers (Total)	
- Bench Engineers	12
- Support Engineers	2

Revenues derived from Fourth-Party Maintenance

- 1988 Revenues	FF 6.0 M
- 1989 Forecast	FF 10.0 M

Business Focus or Repair Activity

Printers/ Printheads:	IBM, DRI, NEC, Honeywell, Dataproducts, Centronics, Mannesman Tally, EDS, OKI, Genicom, DEC, Hermes, Texas, Philips, Citoh, Compaq
Terminals/ VDUs:	Various manufacturers
CPUs:	IBM PCs

COMPANY PROFILE

SOCIETE GENERALE DE ASSISTANCE

France
7 Rue Pierre Metaire
78120 Rambouinnet
Country Code (33) Area Code (l)
Number: 34857014

Company Information

Location/s of repair centre:	Rambouinnet	
Number of employees in FPM:	7	
Number of engineers (Total)		
- Bench engineers	3	
- Support engineers	2	
Revenues derived from Fourth-Party Maintenance		
- 1988 Revenues	FF	2.0M
- 1989 Forecast	FF	2.0M
Business Focus or Repair Activity		
PCB repairs:	Yes - Unspecified	
Specialist services:	Test equipment programing	

Notes: Manufacturer-dedicated FPM—specialisation on older equipment.

Appendix: Profiles of West German FPM Vendors

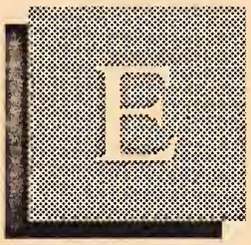
COMPANY PROFILE

RAPARATURZENTRUM NEU TECHNOLOGIEN (RNT)

Germany
Munich 50
Gaerpner 45
Country Code (49) Area Code (89)
Number: 1412071

Company Information

Location/s of repair centre:	Munich
Number of employees in FPM:	-
Number of engineers (Total)	
- Bench engineers	7
- Support engineers	-
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	DM 2.0 M
- 1989 Forecast	DM 2.5 M
Business Focus or Repair Activity	
Terminals/ VDUs:	Commadore, Atari
CPUs:	IBM PC, Commadore, Atari
Tape Streamers:	Perex
Disc Drives:	Shugart, BASF, Maxtor, Seagate, Miniscribe, Tandon, Micropolis, Priam
Clean Rooms:	Class 100
Specialist Services: Consultancy	
Notes: Associated TPM activity takes place	



Appendix: Profiles of Italian FPM Vendors

COMPANY PROFILE

AL TEC SRL
Italy
Via Dei Lavoratori, 17
20092 Cinisello Balsamo
Milan
Country Code (39) Area Code (261)
Number: 86102/85546

Company Information

Location/s of repair centre:	Cinisello Balsamo
Number of employees in FPM:	55-60
Number of engineers (Total)	
- Bench engineers	47
- Support engineers	8
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	IL 7 B
- 1989 Forecast	IL 8 B
Business Focus or Repair Activity	
PCBs:	*Yes
Terminals/VDUs:	*Yes
CPUs:	*Yes
Tape drives:	*Yes
Disc drives:	*Yes

Notes: 100% dedicated to manufacturers/OEMs

* Manufacturers not disclosed

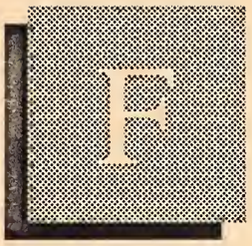
COMPANY PROFILE

START TECHNOLOGY

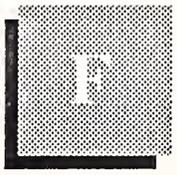
Italy
Via Cairoli, 26
28069 - Tregate
Country Code (39) Area Code (321)
Number 74780

Company Information

Location/s of repair centre:	Tregate
Number of employees in FPM:	6
Nurnber of Engineers (Total)	
- Bench Engineers	4
- Support Engineers	-
Revenues derived from Fourth-Party Maintenance	
- 1988 Revenues	-
- 1989 Forecast	-
Business Focus or Repair Activity:	
Printers/Printheads:	Mannesmann-Tally, OKI, IBM, Honeywell-Bull
Terminals/ VDUs:	Honeywell, IBM, ARIS, Memorex/ telex
CPUs:	IBM PCs
Tape Streamers:	Archive
Disc drives:	IBM FD
Specialist services:	Sales of test equipment



Appendix: Vendor Questionnaire



Appendix: Vendor Questionnaire

I. General

QU: 1 Respondent Name _____

QU: 2 Title _____

QU: 3 Company _____

QU: 4 Address _____

QU: 5 Country _____

QU: 6 Telephone No. _____

II. Company Profile

QU: 7 Number of Workshop Centres _____

QU: 8 Locations of Workshop Centres _____

QU: 9 a. Number of Employees in FPM _____

b. Total Number of FPM Workshop Engineers _____

c. Total Number of FPM Support Engineers _____

QU: 10 Equipment Repaired/Refurbished - By Manufacturer

a. PCBs _____

_____

QU: 10 b. Printers _____

_____

c. Terminals/VDUs _____

_____

d . CPUs _____

_____

e. Tape Drives_____

_____

f. Disc Drives_____

_____

g. Recording Head_____

_____

h. Mechanical Assy_____

_____

i. Others/Specialist Services_____

_____

QU: 11 Classes and Areas of Clean Rooms_____

_____

III. Financial Information

		1988	1989	Currency
QU: 12	a. Total Revenues	_____	_____	_____
	b. Total European Revs.	_____	_____	_____
QU: 13	a. FPM Revenues	_____	_____	_____
	b. European FPM Revs.	_____	_____	_____

c. Approximate annual revenue growth rates anticipated

_____

QU: 14 What proportion of your FPM business is done with:

a. Hardware vendors/manufacturers/OEMs _____

b. Independent maintenance companies _____

c. Leasing & second-user suppliers/distributors _____

d. Others (i.e., Agents) _____

e. If Agents, who do they deal with? _____

QU: 15 Who owns your company, and have you any associate companies?

_____

QU: 16 What, in your opinion, are the factors contributing to the growth of FPM?

_____

_____

QU: 17 What, in your opinion, are the factors hindering the growth of FPM?

_____

_____

QU: 18 Has your company been involved in a merger or acquisition? If so, when?

a. Merger

Name of company merged with _____

Date of Merger _____

Price Paid _____

Please indicate name of newly merged company, if applicable.

_____

QU: 19 b. Acquisition

Company Acquired _____

Date of Acquisition _____

Price Paid _____

QU: 20 Who do you consider to be your main competition in the FPM market? Who, in your opinion are the major players?

_____

_____

QU: 21 What services does your company offer other than pure fourth-party maintenance?

_____

_____

QU: 22 Are you planning to expand these services in future? If so, give details.

_____

_____

QU: 23 Do you hold stocks of spare parts for sale to maintenance organisations? If so, give details.

_____

_____

QU: 24 What warranty do you provide on your repair work?

_____

_____

IV. Pricing Services

QU: 25 In general, how do your prices compare with the manufacturer's repair/exchange prices?

_____

_____

QU: 26 Do you do any FPM contract repair work? If so, give details.

_____

_____