

J U L Y 1 9 8 8

NETWORK SERVICES

A Study For
BP International LTD.

Information Services
Systems Department

By

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Abstract

This report documents a study carried out in the first quarter of 1988 for the Information Systems Services Department of BP International Ltd. (ISS).

The key focus of the study was the identification of the Network Services market (voice/telex/facsimile/data) and its size and growth within the United Kingdom. A comparison with the ISS business mix is included, as are estimates of the market size for Western Europe.

The report places the Network Services opportunity (the operational management of networks) within the context of the more widely defined market for Network Management Services and Network Management Products.

The report discusses the market opportunity in this sector and references the management issues that it presents.

The report contains 48 pages, including 28 exhibits.

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Introduction







Introduction

A

Objective

The objective of this study was to provide the management of BP International's ISS Department (referred to in the remainder of this report as ISS) with an analysis of alternative strategic directions for the business communications segment (i.e., telephone, telex and networks) of the Department's activities.

The key focus of the study was thus to identify the market for Network Services (voice/telex/facsimile and data), provide an estimate of that market in the United Kingdom and predict its expected growth rate. The nature of this market thus identified would enable ISS Management to assess the possible strategic direction for this segment of business.

The term 'Network Services' is used in this report to specifically identify the activity of providing services related to the operational management of networks. These Activities are sometimes variously referred to as Managed Network Services or Communications Facilities Management.

This report uses the term 'Network Management' to imply all business activity, both the provision of services and the sales of software and hardware products that relate to the function of network management. Within that coverage the term 'Network Management Services' includes all services related to 'Network Management'—that is:

- 'Network Services' (the operational management of networks).
- Systems Integration and Professional Services related to the development and implementation of networks.



B

Scope

Originally the scope of the study was intended to provide an evaluation of ISS's potential market with regard to telephone, telex, and network services, together with a review of possible scenarios for future development.

Specifically, it was to cover the following issues:

- A comparison of the ISS business mix with the market at large in the United Kingdom
- The feasibility of the ISS Department's genuinely providing added-value services
- The viability of turning this segment into a commercial business stream for ISS
- An analysis of alternative strategies for addressing this area of business opportunity.

In an early stage of the analysis it was agreed by ISS and INPUT that the study should highlight the potential market opportunity for network services in the BP Group. It was further agreed that the tactics for developing and exploiting that opportunity would then be left to the relevant ISS operational service.

C

Methodology

The study commenced with detailed discussions between ISS and INPUT to formulate a detailed framework for the research. INPUT undertook consultancy-level interviews with 6 senior ISS management personnel. INPUT reviewed its own independent research on this subject both in Europe and in the United States in order to develop the resulting conclusions and recommendations.

D

Report Structure

The remaining chapters of this report are organised as follows:

- Chapter II contains an Executive Overview, which provides a concise summary of the entire report.
- Chapter III describes the Communications Network environment, draws the distinction between network management and the control and organisation of the traffic on networks and identifies a definition of Network Management and the specific areas of Network Management Services and Network Services.
- Chapter IV takes this definition, provides INPUT's estimates of the size of the market and draws a comparison between ISS and the total UK market.



- Chapter V references the business, commercial and management issues associated with the development of the Network Management market sector in general.
- Chapter VI draws together the principal conclusions and recommendations that emerge from this study.



Executive Overview







Executive Overview

A

Network Management— Challenge and Opportunity

The key conclusion that emerges from this study is that Network Management does represent an important challenge and opportunity for ISS and BP. Exhibit II-1 indicates the principal key points that support this contention. The remainder of this executive overview provides a more detailed summary of the contents of the entire report.

The study identifies 'Network Management' as a range of products and services distinctly separate from those concerned with the management of the 'Traffic' that is transmitted across networks.

A broad range of functions can be encompassed within the definition of Network Management. These can be categorised as either:

- Hardware and software products (tools) that facilitate network management functions.
- Network Management Services that can either be carried out internally or bought in as a third-party service.

Three important Network Management service categories are identified:

- Network Services (which could also be described as Communications Facilities Management or Managed Network Services).
- Systems Integration for Communications Networks.
- Professional Services associated with Communications Networks—for example, consulting or software development.

Network Management is a key concern to organisations like BP for reasons such as cost containment and the control of what is in effect a strategic asset. It represents an opportunity for BP and ISS because there exists internally a considerable body of communications skills and there

exists externally only a limited range of products and services that address the Network Management function.

EXHIBIT II-1

NETWORK MANAGEMENT— CHALLENGE AND OPPORTUNITY

- Network Management
 - Hardware/Software Products
 - Services
- Services Opportunity
 - Managed Network Services
 - Systems Integration
 - Professional Services
- Market Opportunity
 - Cost Containment
 - Control of Strategic Asset
 - Available Skills
 - Limited Third-Party Capability

B

Business Network Development

The factors that are of most significance in the development of business networks and that are thus creating an environmental need for network management are shown in Exhibit II-2.

One of the most significant developments in the continued progress of computer applications has been the convergence of computer and telecommunications technology.

This trend has been accompanied by increasing liberalisation in respect of the monopoly powers of the PTTs, pressure on tariff structures and an increasing demand for standards to facilitate the exploitation of the emerging possibilities. The sheer complexity of these developments for practical applications has opened up many opportunities for new computer/communications products and services.



EXHIBIT II-2

BUSINESS NETWORK DEVELOPMENT

- Convergence
 - Liberalisation
 - Tariff Structures
 - Standards
 - Complexity
 - Product and Service Opportunities
- Network Integration
 - Voice
 - Data
 - Graphics
 - Image
- Network Management Environment
 - Complexity/Choice
 - Drive/Push
 - Needs/Pull
- Business Pressure
 - Organisational Flexibility
 - Competition

Further complexity is heralded by the prospect of network integration. This is the use of a single network to handle voice, data, graphics (e.g., facsimile) and images (e.g., video).

These broad trends create an environment in which the need for network management becomes more pressing. The increasing complexity is driven by the ever-wider choice of options for users wishing to implement communications systems. The developing technology drives the need for network management. The developing users' needs create the demand. These needs arise through the business pressures being placed on organisations (for example the need for organisational flexibility), and external competitive pressures.

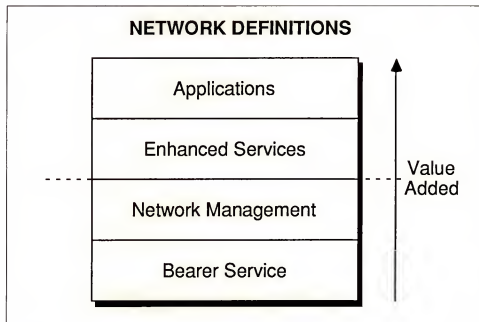


C

Network Definitions

Four levels of activity can be broadly defined within the overall concept of a communications network, and these levels are shown in Exhibit II-3. The basic platform consists of the bearer services, essentially the physical communications pipelines that make up the network and are exclusively operated by the relevant telecommunications authority. In the U.K. this essentially means BT and Mercury.

EXHIBIT II-3



Network Management is that set of functions concerned with the control of the network itself and not the traffic that is transmitted over it.

Enhanced services is that set of services that 'add value' in some way to the basic transmission of signals across the network.

Applications represents that set of services concerned with the fundamental purpose or objective for which traffic is transmitted over the network.

In general the higher the level (applications being the highest), the more value added to basic transmission. This relationship is indicated by the arrow in Exhibit II-3.

These four levels of function can be clearly divided into two groups—those concerned with the network itself, the bearer service and network management; and those concerned with the traffic that is transmitted across the network, the enhanced services and the applications.

It is important to note that these two functional groups (network and traffic) both demand different management and marketing perspectives in relation to the provision of services. These considerations relate to levels



of investment and their payback period, the different types of service requirements for users and the rate of change of service products.

D

Network Management— Analysis

No general or standardised agreement exists within the marketplace in respect of what 'Network Management' really means, or what services make up 'Network Management Services'.

At the broadest level Network Management can be defined as making up a set of products and services that fulfill network-related functions. These can be broadly categorised as shown in Exhibit II-4.

EXHIBIT II-4

NETWORK MANAGEMENT - ANALYSIS

- Telecommunications Analysis
- Engineering and Design
- Project Management
- Implementation
- Operations
- Customer Services
(Field Maintenance)

The first four of these are fundamentally professional services associated with the planning, design and installation of networks. The last two on the list are continuous services concerned with the day-to-day running of communications networks.

Two major issues revealed in this analysis are:

- The extent of the availability of hardware and software product tools to support network management functions.
- The extent to which third-party network management services are available and the extent of their acceptance in the marketplace.

It is INPUT's observation that today there exist few products or tools that support network management, and given that such tools are likely to facilitate cost containment, it is unlikely that this area will be pursued by the PTTs with any vigour. Innovation is more likely to emanate from independent organisations.

E**Network
Management—
Services Opportunity**

Exhibit II-5 provides a classification for the structure of the Network Management Services Opportunity. This list excludes hardware products.

EXHIBIT II-5

**NETWORK MANAGEMENT
SERVICES OPPORTUNITY**

- Network Management Software Products
- Network Management Turnkey Products
- Network Services (Communications Facilities Management)
- Systems Integration
- Professional Services
 - Consulting
 - Education and Training
 - Software Development
- Customer Service (Field Maintenance)

It can be seen that within INPUT's overall classification of these different types of services are identified three areas of relevance to the objectives of the study:

These three areas are:

- Network Services, which could also be described as Communications Facilities Management.



- Systems Integration, the assumption of complete responsibility on a contract basis for the development, installation and commissioning of a communications network.
- Professional Services—services like consulting, education and training and software development or any other people-related services provided on a contracted basis.

F
**Network
Management—
Services Market Size**

Exhibit II-6 shows the estimated market size for the three key areas defined in section E above. It shows estimates for both the specific Network Management Services market and for the total services sector within the U.K., namely all services that can be included under these generic headings.

EXHIBIT II-6

| MARKET SECTOR | U.K. 1987 (£ Millions) | | |
|---------------------------------------|---------------------------|-------------------------|--------------|
| | TOTAL SECTOR | NETWORK MANAGE- MENT | POTENTIAL BP |
| Operations (Facilities Management) | 75 | 10 | 0.5 |
| Systems Integration | 180 | 30 | 1.5 |
| Professional Services | 1,190 | 100 | 5 |
| Total | 1,445 | 140 | 7 |

These market estimates clearly underline the limited development of the operations management (facilities management) subsector to date.

In total the network management sector represents a substantial opportunity (£140 million in the U.K. in 1987), but it can also be clearly seen that the vast majority of this is accounted for by the provision of professional services.

If it is assumed that BP itself (the assumption being that BP is a microcosm of the economy at large) represents about 5% of this market, the total Network Management opportunity for BP amounts to about £7 million revenues per annum. This represents the maximum level of opportunity for ISS within BP.

G

Network
Management—
Services Market
Forecast

Exhibit II-7 shows INPUT's estimate of the five-year forward growth for the Network Management Services Market. This forecast is value based, not volume based, and is shown in 1987 pounds sterling.

EXHIBIT II-7

| NETWORK MANAGEMENT— SERVICES MARKET FORECAST | | | |
|---|----------------------|-------------------|----------------------|
| | U.K. (£ Millions) | AAGR (Percent) | U.K. (£ Millions) |
| | 1987 | | 1992 |
| Network Services (Facilities Management) | 10 | 15 | 20 |
| Systems Integration | 30 | 26 | 95 |
| Professional Services | 100 | 20 | 255 |
| Total | 140 | 22 | 370 |

Overall this market is expected to develop at an annual average growth rate (AAGR) of 21% per annum. This overall growth rate for Network Management Services can be reviewed in the light of INPUT's view of the other principal volume growth parameters in telecommunications:

- Voice Traffic - 5% AAGR
- Data Traffic - 20%+ AAGR
- Telex - 2-3% AAGR
- Facsimile - 40% AAGR

It should also be noted that within the overall Network Management Market it is the Network Services subsector (communications facilities management or managed data networks) that is forecast to grow at the slowest rate, 15%.

H

Conclusions

Exhibit II-8 outlines the key conclusions from this study. This study has in INPUT's opinion clearly identified the existence of a market for Network Management Services. This overall market is relatively substantial (of the order of £140 million in the U.K. during 1987) and is expected to grow at a relatively high rate, 21% per annum.

EXHIBIT II-8

CONCLUSIONS

- A Network Management Services Market Exists
- Substantial Market over Five-Year Forecast Period
- Network Services Market (Communications Facilities Management) Relatively Small
- Network Management Key Concern for User Management
 - Cost Cutting/Containment
- Networks/Applications Traffic Are Separate Functions
- Involvement in Network Management
 - Few Vendors
 - Lack of Supportive Product
 - In-House Skills Availability
- Participation Important in Professional Services
- Software Base Needed (Reluctance of Telecomms Suppliers)
- ISS/Outside Vendor Partnership?

However, within that market the Network Services subsector (Communications Facilities Management or Communications Operations Management) is relatively small, representing only some 7% of the sector.



Further, its rate of growth is also expected to be lower (15%) than for the whole sector.

From a user management perspective Network Management Services are of vital importance principally because of their implication for cost cutting (or at least cost containment). The strategic significance of networking is also a vital consideration.

An important observation is that 'networks' and the 'traffic' that is carried over them are distinct and separate functions. They should each be approached independently in terms of assessing their market potential.

At the current stage of market development, INPUT would characterise Network Management in the following way:

- Few vendors are currently active in this market to any great extent, and this is particularly true for the network services subsector.
- There exists a dearth of supportive hardware and software products that can support the provision of network management services in general.
- The vast majority of service provision in this sector is provided in-house, where large organisations like BP have the skills availability.

These are all arguments for BP (and ISS in particular) to give serious consideration to an involvement in network management services. It is, however, INPUT's opinion that a fairly broad-based approach to this total sector is required, particularly for entry to the network services subsector.

Further, there is probably a significant advantage to be gained from an investment in the necessary software tools that are required to support network management functions. It is noted that because of cost containment potential it is unlikely that the PTTs will be overly active to progress this area of development.

The implication of this conclusion is that an opportunity exists for BP (ISS) to consider a partnership with an outside vendor for the development of such a supportive infrastructure. BP could gain from the competitive advantage to be obtained from utilisation of such infrastructure and its accompanying services, and the outside vendor could gain from the rights to market the resulting systems and services.





Managed Networks





Managed Networks

A

Introduction

One of the key trends over the last few years has been and continues to be the convergence of computer and communications technology.

Whereas the previous focus was on computing, the emphasis in many systems has now shifted to the communications element. This emphasis takes the form of:

- International communications with and among work groups and between geographically distributed divisions
- External communications with trading partners and other outside bodies—for example, government and trade associations

A result of this overall trend towards the convergence of computer and telecommunications technology is the movement towards systems of increasing complexity. Key features include:

- The deregulation/liberalisation of telecommunications leading to competitive market forces
- Changing tariff and pricing structures
- Evolving standards
- The complexities of internal communications
- The emergence of new vendors and services

More specifically, distributed processing is being increasingly incorporated into data networks with a mixture of programmable concentrators, statistical multiplexors and sophisticated data modems.

These elements make up a heterogeneous network environment. Instead of just the point-to-point and multipoint networks of previous years, we now have the more sophisticated topologies of bus, star and tree networks.

In addition, automated testing, diagnostic microprocessors and central network management processors are all being tied into these networks and are thus becoming an integral part of modern network management and control systems.

A further level of complexity is being ushered in by the prospect of network integration.

Network Integration is defined as the use of a single network to transmit a combination of voice, data, graphics and image information between multiple sites of an enterprise and/or to sites of different enterprises.

These separate elements are defined as follows:

- Voice is represented by telephone communications and is generally connected to and routed by a voice-only PABX.
- The data stream is represented by the communications generated by personal computers, terminals and distributed computers connected to other computers by local-area networks (LAN's) or wide-area networks (WAN's).
- Graphics is represented by a facsimile unit and implies the output of a digital data stream that is not computer compatible.
- Image is represented by video-camera or projector equipment typically connected to a slow-scan device to reduce bandwidth requirements.

Although there is a considerable level of press comment and vendor marketing activity for network integration, particularly in the form of ISDN, it is only now getting serious attention from users.

It is generally considered that genuine voice/data value-added services are unlikely to appear much before 1995. Voice/data shared networking is a likely possibility in the 1990s or even earlier depending upon the rate of installation of plant by the telecommunications suppliers.

This latter scenario opens up the possibility of cost containment for the network user.

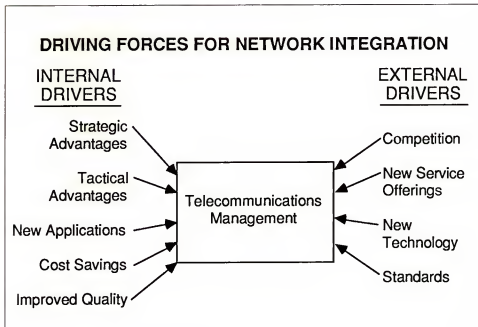
The larger the communications network, the greater the case for integration. The large networks will have the most interaction and the most traffic. However, the full process of network integration is one that will take years of continuous effort to fully implement.

INPUT believes that this long-term trend is being driven by factors both internal and external to the organisation. The main factors are summarised diagrammatically in Exhibit III-1.

In any event there seems to be no question that networks are becoming increasingly more complex in terms of their configuration and the traffic they are expected to carry.

The conclusion is that there is a strong need for a network management system that can handle this complex environment

EXHIBIT III-1

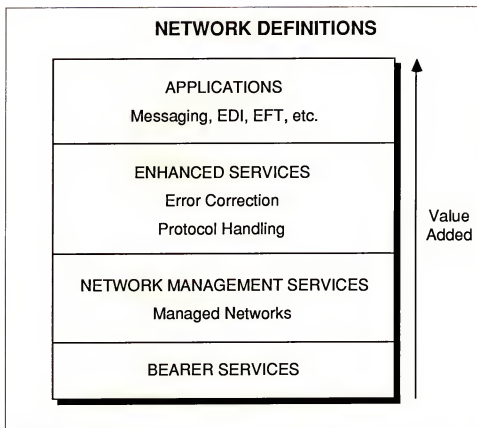
**B****Network Definitions**

Having established the basic trends underlying the need for network management in Section A above, it now becomes necessary to define exactly what is meant by this term. However, it is necessary first to clearly define the separate entities:

- The Network—the inter-connected telecommunications pipelines through which traffic is passed
- The Traffic—that set of data, voice, telex, facsimile messages etc. that is transmitted across the network

Exhibit III-2 shows the basic model that was used in researching this study with ISS personnel to focus attention on this distinction and explore the potential for network services. As can be seen from this diagram, four levels of activity are delineated:

EXHIBIT III-2



- **Bearer Services**—effectively the services provided by the authorised telecommunications operators. Within the UK this essentially means BT and Mercury.
- **Network Management**—the focus of this study are discussed separately in Section C below.
- **Enhanced Services**—these are services that 'add value' in some way, over and above basic point-to-point transmission, to the traffic being transported through the network pipelines. These enhanced services, often referred to as Value-Added Network Services (VANS), include such functions as:
 - error connection
 - protocol handling
 - store and forward
 - packet switching
- **Applications**—these services concern and are involved with the objective of the traffic transmission. Typical examples are such applications as:

- EDI (Electronic Data Interchange)
- EFT (Electronic Funds Transfer)
- E-Mail (Electronic Messaging)

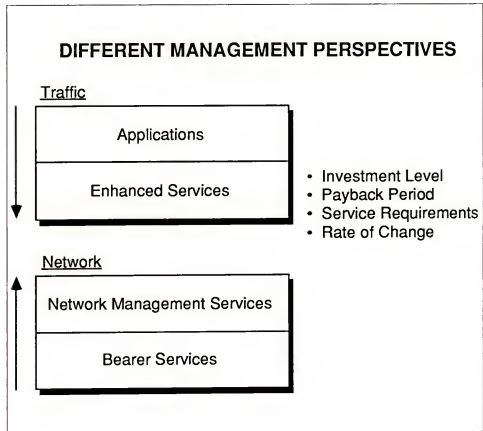
In general, the higher the level (applications being the highest), the more value that is added over and above basic transmission. This is indicated by the arrow in Exhibit III-2.

The reader may wish to note that in the course of the study, in attempting to establish a better understanding of what Network Management was, it was found helpful to draw the analogy between a communications network and a road and/or rail transport network. For the interested reader this analogy is described in Appendix A.

The distinction between the 'network' and the 'traffic' that runs on it is further emphasised in Exhibit III-3. This exhibit is designed to draw attention to the different management/marketing perspectives that are concerned with the provision of network and traffic-related services.

This is a particularly important point for ISS, and indeed for the scope and objective of this project, because Enhanced Services and Applications have already been defined as a business development area by ISS.

EXHIBIT III-3



In addressing the business management and marketing issues for network-related as opposed to traffic-related services, there exist quite different and opposing challenges. These are principally:

- **The Level of Investment.** Network-related services (particularly the installation of network equipment) implies relatively high capital investment. A traffic-related service will tend to require much less investment.
- **Payback Period.** Because of this difference in the required level of investment, network-related services will require a much longer pay-back period than traffic-related services.
- **Service Requirements.** These will be very different. Network services will need to remain transparent to the user; in contrast, traffic-related services will probably require a high level of visibility through such methods as '24-hour help desks' etc.
- **Rate of Change.** Traffic-related services are likely to change and adapt much more quickly than the basic network pipelines over which they are transmitted. High levels of competition and rapidly developing user needs will propel new developments.

C

Network Management

The term 'Network Management' is being widely used throughout the telecommunications industry. Unfortunately there appears to exist no general or standardised agreement as to what Network Management really means, or what services make up Network Management Services.

However, in the previous section, Network Definitions, all those functions that are not Network Management services were described. In consequence we are well placed in this Section of the Report to attempt a definition of Network Management in general and Network Management Services in particular.

At the broadest level Network Management can be defined as comprising a set of products and services that fulfil the following network-related functions:

- Telecommunications Analysis Activities
- Engineering and Design Activities
- Project Management
- Implementation
- Operations
- Customer Services

The first four of these are fundamentally professional services associated with the planning, design and installation of networks.

The last two are ongoing services concerned with the day-to-day running of networks.

Network Management Products categorises that set of hardware and software products that specifically carries out or assists in the provision of services related to the management of the network and falling within the list of broad functions provided above.

Each of these main functional groups can be further broken down into subcategories of activity. Exhibits III-4 through III-9 list the network management service activities within each of these groups.

An alternative diagrammatic view of the relationship between the operational Network Management functions is provided in Exhibit III-10.

EXHIBIT III-4

TELECOMMUNICATIONS ANALYSIS ACTIVITIES

- Requirements Definition
- Network Capacity Analysis
- Network Performance Analysis
- Voice Usage Analysis
- Data Usage Analysis
- Technology Assessment
- Tariff and Regulatory Analysis and Reporting
- Contingency Planning
- User Help Desk Analysis



EXHIBIT III-5

ENGINEERING AND DESIGN ACTIVITIES

- Network Design
- Network Control Centre Design
- Facilities Design

EXHIBIT III-6

PROJECT MANAGEMENT

- Specification Preparation
- RFP Preparation/Analysis/Source Selection
- Project Management
- Procurement

EXHIBIT III-7

IMPLEMENTATION

- Installation
- Software Development
- Integration
- Test and Acceptance
- Facility Wiring and Cabling



EXHIBIT III-8

OPERATIONS

- Network Monitoring
- Trouble Identification, Isolation and Diagnostics
- Trouble Ticket Issuing and Tracking
- Vendor and PTT Trouble Management
- Network Restoral and Problem Escalation
- Equipment and Link Maintenance
- Network Modification/Expansion
- Terminal Installations
- Facilities Management
- Network Operations Staffing
- Performance Analysis and Reporting
- Configuration Control and Resource Management



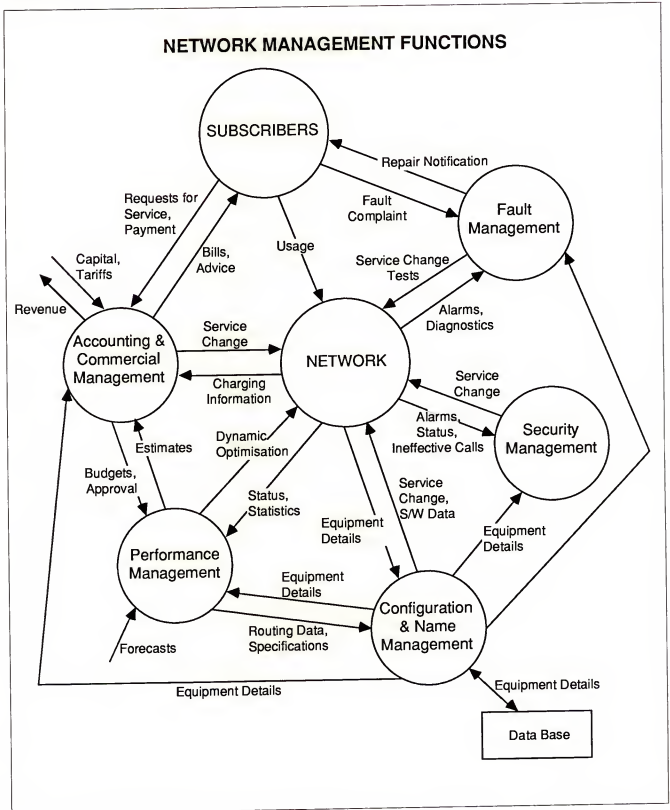
EXHIBIT III-9

CUSTOMER SERVICES

- Service Level Analysis and Reporting
- User Help and Trouble Desk Support
- Service or Equipment: Adds, Moves and Changes
- Voice Message Detail Recording (MDR)
Collection and Processing
- Session Record Collection and Processing
- Vendor Invoice Verifications
- Voice Billing and Chargeback
- Invoice Payment
- Order Entry for PTT Services
- User Access Control and Validation
- Inventory Management
- International Services
- Technical Training
- End-User Training
- Procedures and Methods Development



EXHIBIT III-10





The functions listed and grouped in these exhibits give a list of capabilities that are needed by the telecommunications manager to support his or her set of responsibilities.

It is clear that this list of potential network management functions can be categorised as already indicated, as follows:

- Hardware and software products (tools) that enable network management functions to be carried out.
- Network Management Services that can either be carried out internally or bought in as third-party services.

Defining Network Management in this way exposes two major issues:

- The degree to which hardware and software tools are available in the market to enable network management to be carried out
- The level at which third-party services (as opposed to services provided in-house) are available and have penetrated the market

The latter of these two issues is addressed separately in Section D below and in Chapter IV. The degree to which hardware and software tools are available affects this issue, since their relative scarcity or abundance affects the degree to which users may adopt a development path, either in-house or bought in.

INPUT's observation is that though there appears on the market a plethora of managed network products (hardware/software), they are, at this stage of development, in no way comprehensive and only meet various fragmented aspects of the potential need.

Indeed, it could be further postulated that telecommunications operators and communications equipment vendors will if anything have a negative attitude towards the development of network management products.

Network management facilitates the best use of telecommunications by the user, and this, at least in the short term, is not in the telecommunications vendor's direct interest since it lowers potential revenue.

It is most likely that the greatest level of innovation will come from independent organisations (an example would be Communications Design Corporation in the United States).

Telecommunications vendors will only respond to the need for Network Management at a rate compatible with maintaining a competitive edge in comparison with each other at the behest of user pressure.

D**The Services Opportunity**

The level at which third-party services (as opposed to services provided in-house) are available and have penetrated the market is the major issue at the centre of this research study. It is the purpose of this section to identify and classify those potential third-party services.

INPUT's classification for the structure of the Information Services Industry consists of five major groups:

- Processing/Network Services
- Software Products
- Professional Services
- Turnkey Systems
- Customer Services

Using this structure we can classify Network Management Services and Products. We can first remove products and turnkey products (combined hardware and software offerings specifically aimed at solving a defined but generic network management problem) from further consideration. These do not fall within the scope of the study.

Similarly, any software products sold as tools for Network Management functions are outside ISS's interest and the scope of this study.

Professional Services on Networks does potentially fall within ISS's span of potential interests. From the previous section it is possible to see that there are a considerable number of services that are covered by this category.

Consultancy services could be provided, for example, for the following technical functions, in addition to the important role of business and organisational consultancy:

- Network Requirements Definition
- Technology Assessment
- Tariff and Regulatory Analysis
- Network Design
- Network Control Centre Design
- Facilities Design
- Specification Preparation
- R F P Preparation/Analysis Source Selection
- Procedures and Methods Development

System Development Professional Services could include:

- Project Management
- Procurement
- Installation
- Software Development

- Integration
- Test and Acceptance
- Facility Wiring and Cabling

Professional Services would also include Technical and End-User Training, and Network Operations Staffing.

The potential services remaining from all those linked in Exhibits III-4 through III-9 fall into one of the remaining two categories—Processing/Network Services and Customer Services.

INPUT's definition of Customer Services focuses on only a small part of the functions listed under the same title in Exhibit III-9. INPUT's definition refers specifically to field maintenance of equipment and closely associated functions. These services comprise:

- Trouble identification, isolation and diagnostics
- Trouble ticket issuing and tracking
- Network sectoral and problem escalation
- Equipment and link maintenance
- Network modification/expansion
- Terminal installations
- Service level analysis and reporting

Exhibit III-8 and III-9 list a variety of discrete service elements that constitute the provision of 'network services' in part or as a total Communications Facilities Management service. These service elements are:

- Network monitoring
- Vendor and PTT trouble management
- Performance analysis and reporting
- Configuration control and resource management
- User help and trouble desk support
- Service or equipment: adds, moves and changes
- Voice Message Detail Recording (MDR) collection and processing
- Session record collection and processing
- Vendor invoice verifications
- Voice billing and chargeback
- Invoice payment
- Order entry for PTT services
- User access control and validation
- Inventory management
- International services
- Procedures and methods development



ISS/Total Market Comparison





ISS/Total Market Comparison

A

ISS Business Structure

Exhibit IV-1 shows the planned revenue breakdown for ISS in 1988, highlighting that part made up of services from telecommunications.

Exhibit IV-2 shows in diagrammatic form INPUT's overall structuring of the Information Services Business and its relation to adjacent markets (principally hardware sales and telecommunications bearer services) not measured by INPUT.

EXHIBIT IV-1

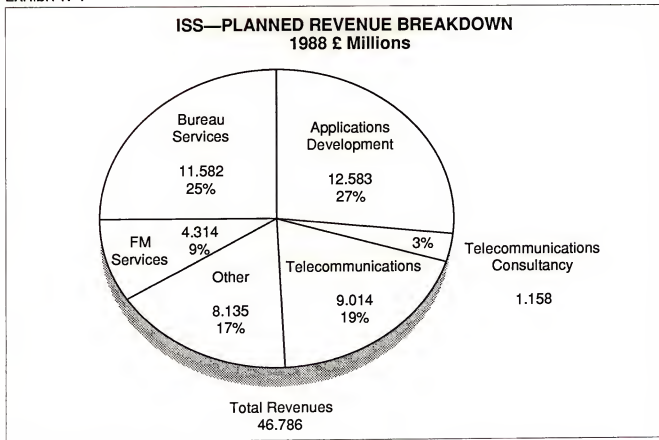


EXHIBIT IV-2

INFORMATION SERVICES INDUSTRY ANALYSIS

| | COMPUTERS | TELECOMMUNICATIONS | |
|-----------------------|--|--|----------------|
| Measured by INPUT | Software Products | <ul style="list-style-type: none"> • Application Products, e.g. EDI • Enhanced Services Products • Network Management | |
| | Processing Services | | |
| | <ul style="list-style-type: none"> • Transaction/Utility | | |
| | <ul style="list-style-type: none"> • Facilities Management (FM) | <ul style="list-style-type: none"> • Communications Facilities Management (CFM) (Network Services) | |
| | | Network Services <ul style="list-style-type: none"> • Applications • Enhanced Services (VANS) | |
| | Turnkey Systems | | |
| | Systems Integration | | |
| | Professional Services | | |
| | Customer Service | | |
| Not Measured by INPUT | Captive Services | | |
| | Internal Services | | |
| | Hardware Rental/Lease | Equipment | Bearer Service |
| | Hardware Purchase | e.g. PABX | |

It can be seen that about 81% of ISS's planned 1981 revenues map into INPUT's definition of Information Services. The remaining 19% for Telecommunications do not.

The reason behind this is the special position that ISS has within BP, where it is responsible for managing substantial telecommunications facilities within BP. This compares to an outside services company that is prohibited from reselling voice and other bearer services, the province of BT and Mercury.

It should be noted, however, that within these planned telecommunications revenues for ISS lies an element of revenue charged to BP users for the management of the networks.

This is the manifestation of the existence of a Network Services market within BP and can be measured as the gross margin on this business element—namely, the difference between the revenues obtained by ISS from its BP customers and its costs in this area.

B**Network
Management Services**

Exhibit IV-3 provides, in the same broad format set out in Exhibit IV-2, the context of the market for Network Management Services within the Information Services Industry as a whole.

It can be seen that INPUT's overall assessment of the U.K. market for Network Management Services in 1987 was £170 million representing just under 5% of the total market for Information Services. It can also be noted that the majority of these revenues were gained in professional services (some 60%).

Two of the market sectors, Software Products and Turnkey Systems, do not match ISS's business charter and thus must be excluded from further consideration.

We are thus left with the profile of the Network Management Sector set out in Exhibit IV-4. This shows clearly that in INPUT's assessment the total U.K. Network Services market is embryonic, being around £10 million in 1987 and representing only 7% of the more widely defined Network Management Services Market.

C**Market Comparison
with ISS**

Exhibit IV-5 provides a comparison between the overall U.K. market as assessed by INPUT and the potential market for BP and ISS.

The potential market for BP is derived simply on the basis of the assumption that the total company represents about 5% of the U.K. GNP. It is thus assumed that if BP can be considered as a valid sample of the U.K.'s total economic activity, a principle already used by ISS for planning

EXHIBIT IV-3

**INFORMATION SERVICES AND
NETWORK MANAGEMENT MARKETS—U.K.
(£ Millions 1987)**

| MARKET SECTOR | MARKET ESTIMATE (£ Millions) | |
|-----------------------------|---------------------------------|------------------------------------|
| | INFORMATION* SERVICES | NETWORK MANAGEMENT SUBSECTOR |
| Processing/Network Services | 695 | 10 |
| Software Products | 930 | 10 |
| Turnkey Systems | 680 | 20 |
| Systems Integration | 180 [†] | 30 |
| Professional Services | 1,190 | 100 |
| Total | 3,675 | 170 |

*Customer Services (Field Maintenance) not shown.

†Includes relevant hardware and other product items.

EXHIBIT IV-4

**NETWORK MANAGEMENT SERVICES—U.K.
(£ Millions 1987)**

| RELEVANT MARKET SECTORS | MARKET ESTIMATE (£ Millions) | |
|---|---------------------------------|------------|
| | 1987 | PERCENT |
| Network Services (Communications Facilities Management) | 10 | 7 |
| Systems Integration | 30 | 21 |
| Professional Services | 100 | 72 |
| Subtotal | 140 | 100 |

EXHIBIT IV-5

**NETWORK MANAGEMENT SERVICES
ISS/BP/TOTAL MARKET COMPARISON**

| MARKET SECTOR | 1987 ESTIMATE (£ Millions) | | |
|---|-------------------------------|--------------|---------------|
| | TOTAL U.K. | POTENTIAL BP | POTENTIAL ISS |
| Network Services (Communications Facilities Management) | 10 | 0.5 | 0.075 |
| Systems Integration | 30 | 1.5 | 0.225 |
| Professional Services | 100 | 5 | 0.75 |
| Subtotal | 140 | 7 | 1.05 |

Note: Potential BP is calculated as 5% of total U.K. market.
Potential ISS market is calculated as 15% of the potential BP market.

purposes, then it should represent 5% of the total market.

It can then be postulated further that if ISS currently achieves about 15% of the total Information Services business within BP, that ISS's expected market share would be as shown in the right-hand column of Exhibit IV-5.

In fact, ISS has a larger level of Network Management business than shown in this exhibit since it provides far more than 15% of BP's U.K. telecommunications needs.

D**Market Forecast**

This section of the report contains INPUT's assessment of the development potential for Network Management Services over the next five years. These market forecasts assess the value of the potential market to third-party vendors and not the projected volume of services.

In reviewing growth and forecast parameters it is clear to INPUT that the market for network-management-related services is growing far more quickly than the network capacity itself. This is not surprising in view of the potential for significant cost cutting by means of a more effective network management capability.

It is useful to review INPUT's view of the main volume growth parameters in telecommunications:

- Voice—5% AAGR
- Data—20%+ AAGR
- Telex—2-3% AAGR
- Facsimile—40% AAGR

Exhibit IV-6 shows INPUT's forecast of the Network Management Services market in the U.K. over the next five years. This forecast is made in 1987 pounds sterling.

EXHIBIT IV-6

| NETWORK MANAGEMENT SERVICES FORECAST—U.K. (£ Millions) | | | |
|---|--------------------------------------|-------------------|------|
| MARKET SECTOR | MARKET FORECAST (£ Millions) 1987 | | |
| | 1987 | AAGR (Percent) | 1992 |
| Network Services (Communications Facilities Management) | 10 | 15 | 20 |
| Systems Integration | 30 | 26 | 95 |
| Professional Services | 100 | 20 | 255 |
| Subtotal | 140 | 21 | 370 |

Exhibit IV-7 shows INPUT's forecast for the same market for the whole of Western Europe. This is shown in 1987 U.S. dollars for the purpose of currency consolidation.

EXHIBIT IV-7

**NETWORK MANAGEMENT SERVICES
FORECAST—WESTERN EUROPE
(\$Millions)**

| MARKET SECTOR | MARKET FORECAST (\$ Millions) 1987 | | |
|---|---------------------------------------|-------------------|-------|
| | 1987 | AAGR (Percent) | 1992 |
| Network Services (Communications Facilities Management) | 60 | 11 | 100 |
| Systems Integration | 135 | 31 | 520 |
| Professional Services | 750 | 21 | 1,950 |
| Subtotal | 945 | 22 | 2,570 |



Management Issues





Management Issues

This chapter addresses the overall management challenge presented to ISS by the development of the Network Management Sector.

In particular note is taken of ISS's unique role as a service supplier within BP. In order to present a coherent picture this particular aspect is considered at two levels—first, an assessment of the overall situation for BP as a corporate whole, and second, the particular opportunity presented to ISS.

A

Management Perspective

Not surprisingly, communications networks and systems are a key concern for management today as the rapid development of technology and the accompanying liberalisation open up new methods and new opportunities for business.

The prime objective of this study was to identify the market for Network Services and thus to identify whether this was a key area of strategic opportunity for BP.

It was seen in Chapter III above that INPUT defined this market within the wider context of Network Management Services in general. An analysis of these markets was provided in Chapter IV. This demonstrated that in the general market, whilst Network Management Services is a relatively substantial (£140 million in 1987) market growing at about 22% per annum, the more narrowly defined Network Services (or Communications Facilities Management) market is small (an estimated £10 million in 1987), probably growing over the next five years at the lower rate of 15%.

However, as was seen from Exhibit IV-1, ISS's special position in providing telecommunication services to the group makes this area of far greater interest than might otherwise be the case.

BP undoubtedly has a considerable need for and commitment to networks and communications services to support its business aims. Clearly it is of considerable importance that such a strategic resource as this network be run in the best and most cost effective manner to meet those needs.

It is Network Management that is the means by which this good house-keeping can be achieved.

Given that the case for involvement in Network Management has thus been made, the lack of incentive to provide 'Network Management' capability on the part of the telecommunication bearer service suppliers, and the piecemeal offerings from other vendors in an essentially embryonic market, the conclusion must be drawn that this area represents a key opportunity for BP.

As a footnote to this management perspective it is interesting to note some other concerns that emerged in the course of the research. The issues raised were:

- Is it necessary to 'manage' or operate your own network in order to be able to provide applications services? The answer would appear to be NO. They are quite different types of activity and need to be separated functionally.
- Are there any strategic reasons why BP should manage its own network—e.g., security? The answer is YES, in the main because of the potential to gain economies in the use of communications networks.
- Are there any technological reasons that influence the desirability of providing network management services? The lack of sophisticated network management software and other tools indicates that an opportunity exists for a large telecommunications user like BP to play a significant role in forwarding the development of this area.

B

**Network
Management Sector
Assessment**

In attempting to assess the attractiveness of the Network Management Services area, INPUT has used the 'competitive forces' model used elsewhere by ISS in other market assessment studies.

Exhibits V-1 through V-3 show the 'competitive forces' analyses for the three subsectors identified within Network Management as of concern to BP, namely:

- Network Services (Communications Facilities Management)
- Systems Integration
- Professional Services

EXHIBIT V-1

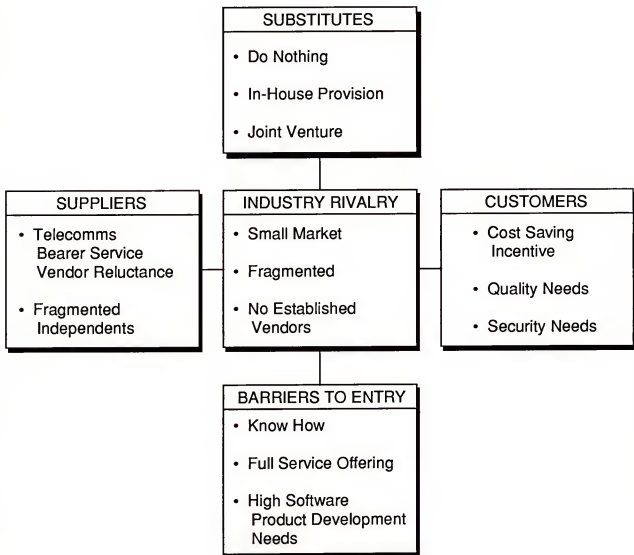
**NETWORK SERVICES—
ANALYSIS OF COMPETITIVE FORCES**

EXHIBIT V-2

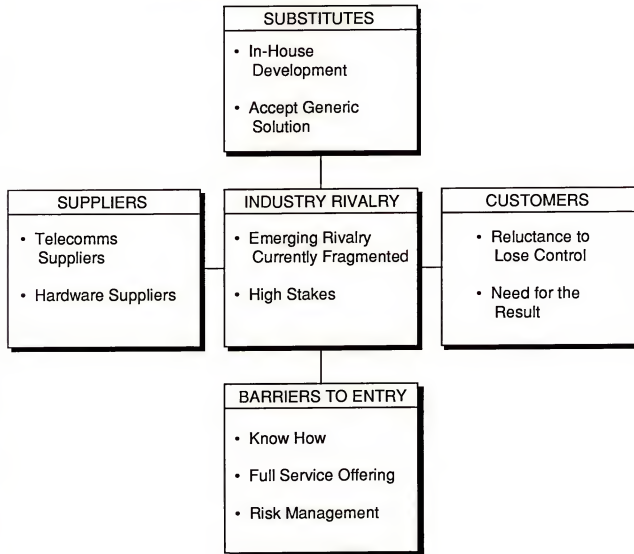
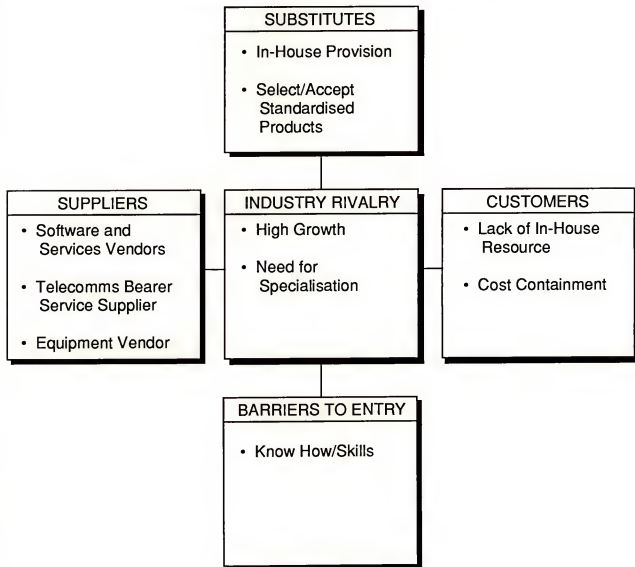
**SYSTEMS INTEGRATION NETWORK MANAGEMENT—
ANALYSIS OF COMPETITIVE FORCES**



EXHIBIT V-3

**PROFESSIONAL SERVICES NETWORK MANAGEMENT—
ANALYSIS OF COMPETITIVE FORCES**





Conclusions





Conclusions

The key conclusions that emerge from this study can be reviewed as follows. First, INPUT has identified the existence of market potential for Network Management Services and within that market has identified the specific area of Network Services or Communications Facilities Management.

The Network Management Services market is relatively substantial and will grow at a fairly high rate. However, the Network Services market appears to be a very small and embryonic market. Growth in this sector is likely to be lower than that for Network Management Services as a whole.

From a user management perspective the whole area of Network Management Services is an important one principally because of its cost-cutting (or at least cost-containment) potential and its role in providing the means to control a vital strategic corporate asset.

Networks and the Applications Traffic that runs on them are quite separate functions and should be treated in this way. The provision of applications services should not be used as the reason for entering the Network Management Services area.

Given the size of BP and its extensive commitment to networking, there seems to exist a good case for BP's involvement in network management services. This can be supported by a number of arguments:

- The limited availability of vendors offering such services
- The lack of software and hardware products to support network management services in general
- The availability of telecommunications skills within the organisation



However, INPUT concludes that it is probably going to be necessary to participate in Network Management on a fairly broad basis if one is to have a viable position within the market.

At one level the provision of professional services and increasingly systems integration skills and capabilities will be necessary in order to gain entry to the Network Services market. Note particularly the Government Data Network contract.

At a deeper level the vendor that is able to invest in the development of a significant software product base of network management tools will place himself in an enviable competitive position.

It would appear that the suppliers of the bearer services are only adopting limited forms of network management services, since it is not in their short- and medium-term interests to assist users in lowering their telecommunications expenditure.

Consequently, the field appears relatively open to that vendor (or set of vendors) that can exploit this opportunity. In this area it is possible that a very large user could play an innovative role within some teaming arrangement with a services vendor or group of services vendors.

The market for Network Services (Communications Facilities Management) is considered to be fragmentary and generally beset by strong resistance to apparent loss of control of a strategic resource. This situation is predicted to continue even in the face of high costs and skills shortages.

In summary, Network Management overall has to be a major priority for BP and a development with important strategic implications for the organisation.

Although the narrowly defined Network Services market is small at the general U.K. or Western European market level, the special position occupied by ISS within BP, and in particular the fact that the organisation is already generating revenues in this sector (albeit captive within BP), implies that this is an important opportunity to develop.

Additionally, an opportunity exists to team with a major professional services company to develop a software environment for Network Management. BP would gain from subsidised development costs and the vendor from the rights to market the resulting systems as products.





Appendix:
Communications/Road-Rail
Network Analogy





Appendix: Communications/Road/Rail Network Analogy

In Chapter III Section B, Network Definitions, it was stated that in the course of this study it was found helpful to draw the analogy between a communications network and a road or rail transportation network. The purpose of this analogy was to help focus more clearly on what Network Management and thus Managed Network Services is. The analogy is described below.

According to this analogy, the four levels can be designated as follows:

- The Bearer Services represents the physical road or rail system (permanent way) that is the foundation for that particular transportation system.
- The Network Management system can be considered to be all those auxiliary functions put in place to maintain and control that network and manage the traffic without actually affecting that traffic physically. Thus, in a road/rail network, network management would concern such functions as:
 - permanent way maintenance
 - toll accounting
 - signalling/rerouting
- Enhanced Services is the set of functions that affects the traffic that passes over the network (i.e., cars, trucks, railway wagons, etc.) but does not directly concern the network itself. This could imply marshalling yards, the collection of containers for more-efficient transportation, etc.
- The application would be that set of objectives for which the transportation activity across the network was a facilitator—i.e., the purpose to which transported goods are to be put or the reasons why human passengers made their journey.







Appendix: The Proposal







Appendix: The Proposal

Business Communications Services
BP International—ISS Department

A

Objectives

The objective of this study is to provide the management of BP International's ISS Department with an analysis of alternative strategic directions for the business communications segment (i.e., telephone, telex and networks) of the division's activities.

B

Scope

This study will include an evaluation of BP ISS Department's potential market with regard to telephone, telex and network services, together with a review of possible scenarios for future development.

Specifically, it will address the following issues:

- A comparison of the ISS business mix with the market at large
- The feasibility of the ISS Department genuinely providing added-value services
- The viability of turning this segment into a commercial business stream for ISS
- An analysis of alternative strategies for addressing this area of business opportunity

In the course of the study it was agreed by ISS and INPUT that the study should place more emphasis on an assessment of the Network Services opportunity for the whole of the BP organisation and not just from an ISS standpoint. Further, it was agreed that the study should not place emphasis on investigating strategies through which ISS could potentially develop or exploit that opportunity.



C**Methodology**

The study would commence with detailed discussion between ISS and INPUT to formulate a detailed framework for the research. INPUT would undertake consultancy-level interviews with five or six senior BP management personnel. The possibility of augmenting this could be explored by a discussion workshop to review alternative strategic scenarios.

D**Deliverables**

INPUT will prepare a report to present its findings to ISS.

E**Responsibility**

The responsibility for this study will be held by Mr. Peter Lines, an INPUT Principal Consultant and Director of INPUT's European research programmes.

