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The Usage of MIS Applications to Raise the Efficiency and Performance of the Telecommunications Services in the Kingdom of Saudi Arabia

BY

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ABSTRACT

There are different kinds of requirements on an information system. Of particular concern to this study are non-functional requirements (NFRs). These are aspects of a system independent of any technical capabilities that it may have, which form a series of constraints on how a system will actually perform, and of which an organisation must take account in order to achieve success.

This thesis studies non-functional requirements with particular reference to those that support an organisation in the process of structural change. Particular attention is paid to those non-functional requirements that will be constraints that hinder the performance and efficiency of any organisation if they are not fully understood and incorporated into the new information system. The way in which such non-functional requirements should be handled is illustrated by an extensive case study of the main provider of telecommunications services in Saudi Arabia.

The researcher first took an interest in the Saudi telecommunications industry as a result of the recent moves to transform the country's telecommunications service from the traditional structure to a new system by the introduction of privatisation. The new modified system is called the Saudi Telecom Company (STC), though it is at present still under the effective control of the Saudi Ministry of Post, Telephone and Telegraph (MoPTT), the previous telecommunications service provider. The Saudi telecommunications service has been a monopoly managed through traditional public management systems, typically influenced by a dominant bureaucracy. The researcher's concern has been to study and describe the current management, structure, and operations (in particular the information systems) of the MoPTT in order to identify key issues and potential areas for development which will help the MoPTT, as the STC, to offer a quality telecommunications service in the new competitive market.

The researcher sets the telecommunications industry in Saudi Arabia in its national context by providing the political, cultural, and economic background to the Kingdom of Saudi Arabia. This is of particular importance in view of the significance discovered by his study of non-technical environmental factors in the performance of the telecommunications service in the country.

Using a combination of the qualitative and quantitative research approaches, the researcher examined the literature relevant to his topic and undertook a fieldtrip to Saudi Arabia, when he conferred extensively with MoPTT management and staff, observed MoPTT structures and operations, and consulted other experts in telecommunications.

Reflection on the literature along with extensive fieldtrip consultation and observation reveal that a full account of the operations and potential of the Saudi telecommunications system cannot be provided by a consideration of its technical functions and processes alone. Due recognition must be given to the peculiarly Saudi setting of the service, and in particular attention must be paid to non-functional aspects, such requirements and constraints related to the environment in which the system has to operate.

Culturally related non-functional requirements are of particular interest, and the case of Internet access in Saudi Arabia is examined, since it provides an especially good example of a non-functional requirement which is undergoing change, while still acting as a constraint on telecommunications usage. The case is related to a new conception of Saudisation, whereby Saudi personnel are no longer simply taking over and imitating western skills, but where they are providing Saudi solutions to Saudi questions.

Using information gathered largely during his fieldtrip, the researcher provides a comprehensive description and discussion of the current MoPTT business areas, organisational structures, and information systems. Not only the commercial and technical features of these operations are examined, but also the extent to which they succeed in fulfilling or operating within the non-functional requirements and constraints, especially those of particularly Saudi origin, imposed upon them. Where appropriate, potential new approaches and directions for the MoPTT in relation to handling issues are indicated.

Employing techniques developed by Dr. Michael Porter of Harvard University, an analysis has been provided of the of the MoPTT's enterprise strategy, since it is this which ultimately drives all the operations of the MoPTT, and upon which the MoPTT's telecommunications service will depend for commercial success in the new post-privatisation market. Based upon this analysis, the researcher has put forward explicit operational, managerial, and business proposals which should allow the MoPTT to seize

the opportunities offered by privatisation, and to achieve success in both the domestic and the international telecommunications market.

The researcher has felt able to identify a number of specific factors within the MoPTT which might receive particular attention for revision and improvement, as they impact on all MoPTT operations and are of critical importance for its commercial success. These areas are strategic planning, marketing, training, customer relations, an integrated information system, and workforce management.

As a result of his investigation into the operations of the MoPTT the researcher has been able to identify a new approach to the future of telecommunications in Saudi Arabia. He has designed an information architecture within which the MoPTT information systems might operate, and which takes full account of the role of non-functional aspects in the degree of success of such a complex operation. He offers a comprehensive description of the basis, operational details, and advantages of the implementation of this architecture for the MoPTT's information system operations.

The particular benefits of Saudisation are stressed. It became clear during the research that the concept of Saudisation simply as the taking over and imitation of tasks previously carried out by non-Saudis (because they had the training and experience) was now inadequate. Saudisation has now to be understood as a cultural as well as a technical or business transformation, a dynamic concept relating both to enduring Saudi cultural values and to changing social attitudes and practices.

Indeed this concept of Saudisation would repay further investigation as a suitable topic for future academic research, and the researcher makes this recommendation. He does so principally because the traditional understanding of the concept now seems inadequate and therefore a factor likely to inhibit the truly indigenous development industry and services within Saudi Arabia.

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Chapter One

INTRODUCTION

This chapter provides the background to the thesis in terms the growth and use of telecommunications in the Kingdom of Saudi Arabia.

The history and the current situation of telecommunications in Saudi Arabia are set out and issues such as Saudisation, the opportunities offered by the private sector, and development plans are discussed

The chapter describes the infrastructure of the telecommunications system in Saudi Arabia and lays out the nature and extent of the services which it provides to the Saudi population.

The question of budget is considered in terms of the cost of the telecommunications system and its financial viability, and this is related to the issue or privatisation, which is the force behind moves to streamline the Saudi telecommunications system.

Recent developments in telecommunications, such as the Internet, e-commerce, and the general rise in information technology use in all sectors of the Saudi community, are described and discussed. These are set against government policies and legal matters, and the business opportunities offered in the area of telecommunications by the Saudi market.

1.1 Preliminary Note

In this thesis frequent mention will be made of the Saudi Ministry of Post, Telephone and Telegraph (MoPTT) and the Saudi Telecom Company (STC), the recently privatised company recently formed to run the telecommunications service in Saudi Arabia. However, in practical terms the STC is still largely under the control of the MoPTT. Accounts of the relevant policies, structures, operations, functions, etc. are therefore provided for the most part as the policies, structures, etc. of the MoPTT. The STC will

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primarily be mentioned in its role as a service provider or in anticipation of its future wider role.

1.2   General Introduction

On 15 December 1997, King Fahd Bin Abdul Aziz of Saudi Arabia announced the privatisation of telecommunications services in the Kingdom and the setting up of a private company to run the country's telecommunications facilities for the immediate future.

The researcher's interest in the Saudi telecommunications industry had first been aroused some time previously by the rumours, circulating for some years, of the introduction of privatisation, which came to fruition with this announcement by the king. The aim was the deregulation of the Kingdom's telecommunications service from the existing state monopoly and its conversion to a new management system, which in itself would still be the sole provider. The market was, therefore, not to be opened up: it would still be a monopoly, but a private one rather than a state one. The new agency providing the service was to be known as the Saudi Telecom Company (STC). Before this change the telephone and other telecommunications services had been provided in Saudi Arabia by the Ministry of Post, Telephone and Telegraph (MoPTT), and indeed the STC is still for most practical purposes under the control of the MoPTT.

The intention of this move was to provide benefit for all concerned – in terms of better and wider services for customers, and in financial terms for the company, and indeed also for the state. The privatisation move took place during the period of the implementation of the sixth of the Saudi Nation Five-Year Development plans, which have been underway since 1970. Since privatisation has been mentioned explicitly in the sixth Development Plan there is no reason to doubt that the Saudi government is serious about privatisation and in its perception of such a move as something which would benefit its citizens.

The changes in communication technology which had made themselves felt in government and commercial circles in Saudi Arabia within the previous twenty years, and were now beginning to impact on the lives even of many ordinary citizens, combined

with the weakening of the state monopoly on telecommunications services. meant that there appeared to be the potential for a far-reaching transformation of the whole telecommunications scene in Saudi Arabia. These technological changes included the increasing use of mobile telephones, the growth in the number of computers in the office, the workplace, and the home, and the expansion of Internet use (with its e-mail possibilities).

When the researcher focussed his attention, however, on the Saudi telecommunications sector, it seemed that, despite the major changes, a number of aspects relating to it were still unsatisfactory. The space of a few years may be too short to make a definitive judgement on the success of the new privatised telecommunications system. But it has not been too short a period to appreciate that, despite the incorporation of many aspects of modern technology, the service was delivering less than might have been hoped.

The possibility that research into the structure, management, functions, and operation of the Saudi telecommunications service might uncover the problems and point the way to a more efficient and effective service therefore presented itself.

The researcher thus resolved to make a thorough investigation of all aspects of the national telecommunications service, locating it historically, technologically, and commercially within the development of telecommunications globally and within the Kingdom, and describing its current organisation and operation, particularly relating to its information systems, in detail. In examining it exhaustively in this way, he sought to achieve his primary research goals of identifying the main issues facing the telecommunications service and of suggesting a way forward for the service to fulfil its objectives more fully.

Following a research path involving an examination of the relevant literature, observation of the structures, management, and operations of the STC, and consultations with appropriate individuals concerned with telecommunications provision in Saudi Arabia, the researcher became increasingly aware that the main issues confronting the telecommunications service in the country were related primarily not to its technical capacity, nor to the functional capabilities of its plant and equipment. They were associated more closely with non-functional aspects, such as the attitudes of management to strategic planning, structure, the use of information systems, and internal operations,

and in particular they related to a failure to align the technical resources of the service and its up-to-date technological capabilities with cultural aspects of the environment of Saudi Arabia within which it has to operate. This is sometimes called socio-technical systems analysis, recognition reconciliation and alignment, but here we are particularly interested in the way these aspects generate requirements on an IS.

This study therefore presents an account of the detailed structures, management, information systems and operation of the Saudi telecommunications service set against the discovery of the service's limited success in identifying with the cultural requirements of its clients. The study also, and most importantly, points the way forward for the Saudi telecommunications system by offering an understanding of the Saudisation of the service, not as a taking over and continuation by Saudis of western attitudes and perspectives, but rather as the development of genuine indigenous, Saudi, solutions to Saudi problems.

The thesis consists of ten chapters, the contents of which are outlined below.

Chapter 1, the present (introductory) chapter sets out the background to the researcher's study and prepares the way for material in the following chapters. Chapter 1 presents a picture of the Kingdom of Saudi Arabia, and provides a history of the development of telecommunications in the country.

Chapter 2 discusses the research techniques and procedures used by the researcher. It describes the conduct of his study on his fieldtrip. It focuses on the research methodology and the data gathering technique adopted, with reference to the sample selected, and the analysis of the data.

Chapter 3 and 4 defines the requirements aspects that should the MoPTT consider in order to raise its efficiency and performance.

Chapter 5 defines and assess the current functions (or business areas) and processes of the MoPTT for which information systems are required.

Chapter 6 addresses the MoPTT's main operations, covering the activities of the F&A Division of the MoPTT, the MoPTT Telephone Affairs, the MoPTT Telegraph Affairs, and the O&M Division of the MoPTT.

Chapter 7 describes and assesses the current status of the services and equipment that support the information systems within the MoPTT.

Chapter 8 describes the strategy of the MoPTT, identified from information gathered on the researcher's fieldtrip and from relevant literature. The researcher then applied various analysis techniques to these, in order to gain a full picture of the business aims and parameters of the MoPTT.

Chapter 9 discusses the development of an Enterprise Information Architecture (EIA) and its potential to offer a new approach for the MoPTT. An EIA is the strategic IS and technology vision that will enable, as well as support, the achievement of the MoPTT's business plans and objectives.

Chapter 10 is conclusion and recommendations of the entire thesis.

1.3   The Aims of this Research

The overall aim of this research has been to investigate and analyse the structure and operations, in particular the information systems, of the new Saudi telecommunications company, the STC (still under the control of the MoPTT and often referred to as the MoPTT in this study). The aim encompassed examining all the factors – technical cultural, and political – which are actual or potential contributors to the MoPTT's structure and operations. Such research would develop an understanding of the constraints and opportunities facing the company and identify the way forward in helping it more effectively to serve its purpose.

1.4   Background to the Saudi Environment

Because this thesis involves understanding cultural issues, it is necessary to provide some background, since the cultural context is very different from the western tradition, and underpins all business affairs in Saudi Arabia, including that of telecommunications. An appreciation of this difference is vital to an analysis of the Saudi telecommunications situation and to an understanding of how it might in the future develop. The tension

between western cultural standpoints, imported with western telecommunications technology, and Saudi traditions has played a part in the development of some of the obstacles faced by the MoPTT, and any solutions which the company develops to handle them will involve integrating Saudi cultural requirements with the technology utilised.

1.4.1 Saudi Arabia – General

The Kingdom of Saudi Arabia is located at the southwest end of the Asian continent, at the crossroads between Asia, Africa, and Europe. It is bordered on the north by Jordan, Iraq, and Kuwait, on the south by Yemen, on the east by Bahrain, Qatar, United Arab Emirates (UAE), Oman and the Arabian Gulf, and on the west by the Red Sea.

It is a country of both coastal mountains and arid plateaux as well as vast desert sands and fertile oases. 'It contains the world's largest desert, Rub al-Khali (the 'Empty Quarter'), and perhaps the world's largest oasis, Al-Ahsa'.

Saudi Arabia has four major regions. (These regions, however, do not represent administrative divisions of the country.) The four geographical regions are: (1) the Central Region (Najd); (2) the Western Region (Hijaz); (3) the Southern Region (Asir); and (4) the Eastern Region (Ahsa).

As the largest country in the Arabian peninsula, the Kingdom of Saudi Arabia has an area of two and a half million square kilometres (about 900,000 square miles), approximately eighty percent of the peninsula. Estimates of the total population and of the numbers holding Saudi citizenship have varied widely. Official figures published by the Saudi government indicated a population of 14,870,000 Saudi citizens in 1990. In the same year, however, estimates by one western source inside the Kingdom were as low as 6 million. United Nations estimates were slightly less than the official Saudi figure. Based on the official Saudi figure, at the 1990 rate of growth, a population of 20 million by the year 2000 was projected. The 1992 Saudi census indicated an indigenous population of 12.3 million people and a growth rate of 3.3 percent. The 1992 census gave the number of resident foreigners as 4.6 million.

The composition of Saudi Arabia contains an ethnic mix. Historically, Saudi Arabia has witnessed the influx of thousands of Muslim immigrants from almost all Muslim

countries; some of these immigrants have chosen to settle in some parts of Arabia, especially in the holy cities (Makkah and Madinah) in Hijaz. Now some of them are Saudi citizens. Thus, the Saudi population is a mixture of Arab and non-Arab Muslim groups who share a common ideological background and cultural perspective.

The Kingdom is divided into administrative regions, which in turn are divided into districts. Provincial governors are appointed and are responsible for such functions as finance, health, education, agriculture, and municipalities. The consultative principle operates at all levels of government, including the government of villages and tribes.

The family is the most important social institution in Saudi Arabia, and many families can trace their family records for generations within a tribal group. Members of the family are closely attached to one another and each feels a deep sense of responsibility for the family. For Saudis generally 'the family was the primary basis of identity and status for the individual and the immediate focus of individual loyalty, just as it was among those who recognised a tribal affiliation'. Families formed associations with other families sharing common interests and life-styles, and individuals tended to socialise within the circle of these family alliances.

This has affected the traditional Saudi way of conducting business. To take just one aspect of this, usually a family business has been open to participation by sons, uncles, and male cousins, and functions as the social welfare safety net for all members of the extended family. While Saudi society has undergone significant transformation since the time it was a fully tribal nation, it is clear that social life in Saudi Arabia will continue to centre on the extended family. Family loyalty will continue to pervade all aspects of life, and the traditional way of doing business will continue to form constraints on the way in which many businesses, including public utilities and services (such as a telecommunications service) are able to operate.

1.4.2 Government and Politics

The Basic Law adopted in 1992 declared that Saudi Arabia is a monarchy ruled by the sons and grandsons of King Abd Al Aziz Al Saud, and that the Holy Quran is the constitution of the country, which is governed on the basis of Islamic law (*Share'a*). There are no political parties or national elections, and no trade unions or professional

associations. The King's powers are limited because he must observe the *Share'a* and other Saudi traditions. He also must retain a consensus of the Saudi royal family, religious leaders (*Ulama*), and other important elements in Saudi society. The leading members of the royal family choose the king from among themselves with the subsequent approval of the *Ulama*.

The Crown Prince is the Deputy Prime Minister, and other royal family members are heads of important ministries and agencies. The country's political system is highly centralised, with the judiciary and local officials appointed by the King through the Ministry of Justice and the Ministry of the Interior.

1.4.3 Legislation In Saudi Arabia

Legislation in Saudi Arabia is totally Islamic, and legislation policy is based on two major sources: the *Share'a* (Islamic Law), which is derived from the Quran and the *Sunna* (the sayings of the Prophet Muhammad), and *Ejtihad* (modern interpretation of Islamic law).

1.4.3.1 *Share'a* (Islamic Laws)

The major sources for Islamic laws are the Quran and *Sunna* (the tradition of the Prophet). All legislation in Saudi Arabia should be derived from these two sources, plus interpretation through *Ejtihad*.

1.4.3.2 The Holy Quran

This is the basic source of the *Share'a*. The Quran consists of 114 chapters, divided into verses. Binding principles for the Moslem's life are contained in the Quran.

1.4.3.3 The *Sunna*

The *Sunna*, which explains the teaching of the prophet, is the second source of the *Share'a*. It demonstrates how Moslems should carry out some of the injunctions of the Quran.

1.4.3.4   Modern Interpretation (*Ejtihad*)

Ejtihad is the modern interpretation of the *Share'a* and the *Sunna*, whereby the principles perceived to be behind these are applied to contemporary situations which are not covered directly by the *Share'a* or *Sunna* because such situations did not exist at the time.

1.4.3.5   The Administration of Justice

Justice in Saudi Arabia is administered by a system of religious courts whose judges are appointed by the King on the recommendation of the Supreme Judicial Council, composed of 12 senior jurists. Law protects the independence of the judiciary. The King acts as the highest court of appeal and has the power to pardon.

Share'a courts exercise jurisdiction over common criminal cases and civil suits regarding marriage, divorce, child custody, and inheritance. Cases involving relatively small penalties are tried in summary courts; more serious crimes are adjudicated in general courts. Other civil proceedings, including those involving claims against the government and enforcement of foreign judgments, are held before specialised administrative tribunals, such as the Commission for the Settlement of Labour Disputes and the Board of Grievances.

1.4.4   The Saudi Economy

1.4.4.1   The General Situation

An understanding of the economy of Saudi Arabia is critical for an appreciation of any of the Kingdom's contemporary aspects, including the environment within which a service such as a telecommunications system has to operate. It has been the rapid transformation of the Saudi economy, largely in connection with the discovery and exploitation of the country's oil resources, which has contributed so greatly to the development of Saudi Arabia in terms of infrastructure, educational provision, urbanisation, manpower needs, etc.

1.4.4.2   The Period Preceding the Discovery of Oil

Prior to the discovery of oil, the economy of Saudi Arabia was comparatively basic. The Kingdom's primary source of income was the pilgrimages to Makkah (westernised as 'Mecca'). Next to this, agriculture represented the only other major economic activity in the country. The Kingdom was in a complicated state of underdevelopment with a fairly low standard of living. Being dependent on pilgrimages and on small-scale agriculture, along with some minor trade, fishing, and nomadic herding, the economy was not self-supporting. Nomadic tribes tended their herds, farmers and artisans lived and worked in a society of medieval simplicity, and there was no industrialisation, nor any effort toward it. Factors contributing to the depressed economy included geography, topography, and climate, combined with the socio-economic status of the country.

1.4.4.3   The Economy Following the Discovery of Oil

Oil was discovered in Saudi Arabia in the early 1930s. The exploration for oil began in 1934 and production in commercial quantities started in 1938. The Kingdom has the largest oil reserves in the world – approximately 261.2 billion barrels (Ministry of Planning, 1997) – representing more that a quarter of the world's known petroleum reserves.

Since 1970 Saudi Arabia, under the supervision of the Ministry of Planning, has developed and implemented six development plans, each covering a period of five years, and a seventh plan is now underway. These plans have been designed to set in place mechanisms for the co-ordination and implementation of the programmes of individual government agencies and the private sector in the light of the increasing scale of development and the potential constraints put upon it by the inadequacy of infrastructural facilities and the shortage of manpower, as well as any temporary financial constraints which might at times dictate caution in setting the pace for growth.

The period between 1938 and 1970 was characterised by some economic growth in the ten or so years following upon the commercial exploitation of oil, but it was limited by the Second World War, which inhibited the full development of Saudi Arabia's oil resources. Nevertheless, by 1948 the country's total revenues had risen to US $85 million, about 60 percent of it derived from oil exploitation, so that for the first time Saudi Arabia had some capital to invest in national development. There was still, however, little

industrialisation or urbanisation, with the great majority of the population relying on a subsistence economy, and many of them still nomadic.

Also in 1948 the first formal budget for the Kingdom was produced. and the next five years saw the setting up of the first local radio station, the completion of modern port facilities at Jeddah, the establishment of the first municipal electricity network (in Makkah), and the first formal higher education institute. In this period the first daily newspaper appeared, the country's infrastructure was improved by the completion of the Dammam-Riyadh railway, and measures to enhance the production of oil took place in the Eastern Region. By the year 1950 oil production had risen from 1 million barrels in 1938 to 200 million barrels in 1950.

The later stages of this period before the First National Plan saw an ongoing expansion in the country's administrative network, and steady economic growth and overall development, but it was also marked by financial constraints due to the limited demand for oil, and the wars and political instability in the Middle East. The period saw steady development of the physical infrastructure of the country, along with its welfare services and manufacturing sector. The demographic and social profile was also changing, with many people beginning to move into cities and with the increase of urbanisation. Although the oil industry, both in terms of production and of estimated reserves, continued to grow, there was a slowing down in Saudi Arabia of its rate of expansion because of a lower rate of increase in demand and the availability of oil from elsewhere. It was in fact the slowing down of income from oil revenues that played a major part in the decision to set up and implement the National Five-Year Development Plans, which began in 1970.

1.4.5   The National Development Plans

The First Development Plan (1970-1975) was a cautious but adaptable programme, aimed primarily at advancing the development of the Kingdom's infrastructure, the improvement of public services, and the establishment of the administrative machinery to implement procedures and decisions. In the longer term the Plan's objectives included the nurturing of the nation's manpower resources through education and training programmes. The period covered by the First Plan saw a great change in oil income for

the country. Not only did the government have an increasing share in the ownership of the oil sector, but there was an increase in oil prices and a change in the way they were to be decided – control moved from the international oil companies to the producing countries – as a result of actions by the Organisation of Petroleum Exporting Countries (OPEC) and the Organisation of Arab Petroleum Exporting Countries (OAPEC). The outcome was a vast increase in the price of oil, fourfold between 1971 and 1974. Not only did the unit price of oil increase dramatically, but Saudi Arabia's actual production of oil rose from 3.8 million barrels a day in 1970 to 7.1 million barrels a day in 1975. (Further increases saw it reach 9.5 million barrels a day in 1979, with some decrease and fluctuation in the years after that.) All of this was a tremendous boost to the economy of Saudi Arabia, making it very quickly one of the richest countries in the world, and setting the stage for potential rapid change.

When the Second National Development Plan (1975-1980) came into force, conditions were quite different from the time of the start of the First Plan. Financial restrictions were now fewer, and development was limited more by manpower and infrastructure considerations than by finance. The period of the Second Plan was characterised by heavy spending in the country's physical infrastructure and by expansion of the government administrative machinery. There was also a continuing increase in the percentage of population living in urban areas, reaching 54 percent by 1980 (36 percent at the start of the First Plan).

The thriving world oil market during the period of the first two National Development Plans contributed to an increase in Saudi government revenues from all sources from SR 5.7 billion (£0.95 billion) in 1970 to SR 211.2 billion (£35.2 billion) in 1980.

The Third Plan covered the period 1980-1985. Its main objectives were to accelerate the construction of the physical infrastructure and to lay the foundations for a more diversified economy, and essentially it carried on the development which had taken place during the period of the Second Plan.

The Fourth Plan covered the period 1985-1990, with a total government expenditure of SR 1,000 billion. Its major objectives were to continue the structural change in the economy in order to diversify the economic base and thus reduce dependence on oil revenue; to encourage the rapid development of the private sector as the main instrument

for achieving this diversification; to complete the infrastructure projects necessary to reach long-term economic and social development goals; and to develop further Saudi Arabia's manpower resources.

The Fifth Plan was in operation during 1990-1995. Its main objectives. as established by the Council of Ministers, were to safeguard Islamic values by duly observing. disseminating, and confirming the *Share'a*; to defend the faith and the nation and to uphold its security and social stability; to form a productive national workforce by encouraging Saudi citizens to take advantage of the infrastructure and institutions provided by the state, ensuring their livelihood, and rewarding them on the basis of their work; to develop the human resources pool, thus guaranteeing a constant manpower supply, upgrading its quality and improving its efficiency to meet the requirements of the national economy; to raise cultural and information standards to keep pace with the country's development; to maintain the reduction of dependence on crude oil as the Kingdom's main source of wealth; to create more jobs; to relate more fully to technological advance; to continue with real structural changes in the economy so as to sustain the movement towards a diversified economic base; to develop mineral resources and encourage their discovery and utilisation; to improve the quality of already established utilities by enhancing their performance level; to complete the infrastructure projects necessary to achieve overall development; further to encourage private sector participation in socio-economic development; to reach balanced growth in all regions of the Kingdom; and to achieve economic and social integration among the Gulf Corporation Council (GCC) countries.

Of particular interest in the context of telecommunications services and the direction they have now taken in Saudi Arabia is the fact that the Fifth Plan showed the importance of the private sector in the development process and placed the emphasis on regional development rather than planning at a national level only, which is how it had been with the previous four plans.

The Sixth Development Plan covered the period 1995-2000. Its main objectives as established by the Council of Ministers were these: to safeguard Islamic values by duly observing, disseminating, and confirming the *Share'a*; to make productive national citizens by providing them with the appropriate means and sources of income and ascertaining their rewards on the basis of their work; to develop human resources and

continually to ensure an increasing supply of manpower, upgrading its efficiency to meet the requirements of the national economy, and replacing non-Saudi manpower with suitably qualified Saudis; to achieve balanced growth throughout all regions of the Kingdom; to continue to encourage private sector participation in economic development; to maintain the reduction of dependence on the production of crude oil as a source of national income; to continue with the restructuring of the country's economy through an ongoing diversification of the economic base, particularly through laying more emphasis on industry and agriculture; to develop mineral resources and to encourage their discovery and utilisation; to concentrate on qualitative development of existing utilities and facilities by improving their performance level; to complete infrastructure projects necessary to achieve overall development; to promote scientific activity and to raise cultural and information standards to keep pace with the Kingdom's development; to achieve economic and social integration among the GCC countries, and to support economic co-operation with Arab, Islamic, and other friendly countries.

It is clear that the Sixth Development Plan therefore maintained the development that took place under the Fifth Plan. It continued to enhance and broaden the objectives of the previous plans through maximising private sector co-operation in the provision of jobs, through continuing the diversification of the economy to decrease its dependence on oil revenue, through providing new physical infrastructure for the expanding population, through improving social services, through attempting to raise per capita income, and through aiming to maintain a balanced budget over the five year period.

Of particular interest for this present study it might be noted that the Sixth Plan gave priority to expanding the fields of technological development. This is the first substantial recognition of the importance of the new information technology in the National Development Plans, which is late compared with western countries. It also placed stress on replacing foreign workers with suitably trained and qualified Saudis, in other words it maintained the process of Saudisation. Part of the reason for the drive towards Saudisation is linked to precautions taken against any fall in oil prices. With such a fall and the associated revenue drop for Saudi Arabia there is the danger of inflation, and with fewer non-Saudi workers in the Kingdom at least the riyal is kept circulating within the country itself.

The need to bring more Saudi nationals into top management positions was mentioned several times during a conference, held in Washington DC, entitled 'Investing and Operating in Saudi Arabia' in 1998. On that occasion various commercial and government figures from both Saudi Arabia and the USA came together to discuss the past and the future of US trade with Saudi Arabia. Mr. Zaidan Jawdat, senior contracts representative at the Bechtel Power Corporation, noted that:

> Bechtel's management contract emphasised that at Jubail, for every management position, there was a parallel directorship position emphasising the ongoing intense transfer of technology. There's an excellent group of Saudi workers there. They exist. You've just got to find the work and develop it.

Another Saudi government official at the conference stated:

> It basically comes down to a process of vetting and giving [Saudi workers] them very intensive training. Mobil's refinery in Saudi Arabia is 75% Saudi. SABIC is 80% Saudi. Saudis don't lack the will to work and the skills to work.

Saudisation plays an important part in the matter of non-functional requirements (NFRs) for the Saudi telecommunications system which will be discussed later in this study. It is only through the presence of Saudis in positions of authority in management and design that many of the culturally and socially related constraints under which the service has to operate can be identified and dealt with in specifications. Saudisation does not itself give rise to such constraints and requirements – these are part of the social fabric of the Kingdom – but only Saudis can recognise them and give them proper consideration in plans and system design.

The first thirty years of the development plans have seen very considerable achievements within the country, including economic growth and stability, diversification of the economic base and reduction of dependence on crude oil, the development of human resources (embracing increased Saudisation), the development and preservation of the physical infrastructure, improvements in the quality of life and living standards for all citizens. Commenting on the economic situation that has now been reached in Saudi Arabia, in no small measure due to the five-year plans, Burkhart (1998) writes:

The Saudi government is under social, political, and economic pressure. More than the other countries in the region. the Saudi government has spent its oil wealth lavishly. sustaining ambitious construction programs, a gracious lifestyle for the elite, and social spending programs to improve the average citizen's standard of living. Although Saudi Arabia has by far the largest GDP of any country in the region, the GDP per capita is modest, due to the large population.

One other very important achievement of the development plans has been the expansion of the private sector role. This encouragement of private sector initiative has been an important feature of the development plans, and relates directly to activities and initiatives in the Saudi telecommunications sector in recent years, particularly as regards joint ventures with companies from outside the Kingdom. The private sector has been urged to engage in common projects with foreign companies and to invest in new output generating capacities using the latest technology. The plans have given, and continue to give, direction to the private sector on the likely course of the economy, and on related government policies and business opportunities. The outcome is now that the private sector is more independent of government finance than it was when the five-year plans were first introduced. The strength and independence of the private sector is an important feature of present-day Saudi economy.

The Seventh Development Plan (covering the years 2001 – 2005) is now underway. It gives further impetus to the use of the new technology, particularly in information and telecommunications, and the use of science as a tool to realise economic benefits in the competitive climate of both domestic and international markets. Compared to western countries this is late, but, as we have noted above when discussing the Sixth Plan, even the mention of the importance of the new information technology was comparatively late in Saudi government documents. There is therefore a lot of catching up to do. Saudi Arabia will have national communication and transportation networks capable of meeting the nation's social and economic needs in the 21st century.

As far as the commercial and industrial sectors in Saudi Arabia are concerned, it is worth noting that the government keeps a tight restraint on the control of companies. This

means that foreign ownership is not permitted in sensitive areas or in well-developed sectors where it is believed sufficient local investment and expertise already exist. Foreign investment is normally limited to joint ventures in which the Saudi partner holds at least 25 percent up to a majority share.

The financial system of Saudi Arabia is open, with no restrictions on financial flows and with the riyal being freely convertible. By law, the currency is fully backed by convertible currencies and gold, and the country's net official assets position covers this requirement by a substantial margin. Inflation has generally been low, and the internal clearing and settlement mechanisms are highly advanced. Supervision is in close keeping with the Basle Committee principles, reflecting Saudi Arabia's status as an official observer. The growth and development of the system also reflects years of consultation and co-operation with the IMF and World Bank to reflect Saudi Arabia's Executive Director status in those institutions.

The Saudi financial sector is very robust. Saudis are increasingly using the services of banks, and since the Gulf War customer deposits have grown much more rapidly than currency in circulation, reflecting rising demands for the security and services that banks are able to provide. As a group, Saudi banks are exceptionally strong. By virtue of the oil booms and successive government five-year plans, Saudi Arabia's Specialised Credit Institutions (SCIs) play a large role. These oversee a big part of the national financial heritage, and help to bankroll the needs of commerce and finance the requirements of individuals. Indeed in terms of loans outstanding, the SCIs are bigger than the banks. While their loan portfolios are very different, their presence is an important factor for financial sector development. With its strong banking sector, stable political system, free market, and lack of restrictions on currency exchange, Saudi Arabia offers great potential for business initiatives, both internally and involving foreign companies. One such initiative is privatisation, such as currently being undertaken with the Saudi telecommunications system. However, Saudi Arabia is not pursuing privatisation as traditionally known, i.e. the sale of government assets. Rather it is addressing opportunities for private developers to finance and invest in transfer infrastructure and get a return from it.

Although there had been moves towards privatisation before, particularly in utilities provision and the mobile telephone sector, the first major step towards privatisation in the

Kingdom came in 1997 when King Fahd Bin Abdul Aziz revealed the privatisation of telecommunication services and the establishment of a private company. Saudi Telecom Company (STC), to run the country's telecommunications facilities.

There are many lessons that can be learnt from privatisation in the West. The most important of these is that privatisation gives the organisation independence and freedom in managing and funding itself away from government regulations. As we are going to see in this study, most of the MoPTT's constraints come from government regulations, and privatisation would be a major step towards overcoming most of these constraints.

1.5 The Background to Telecommunications in Saudi Arabia

It is against the background indicated above that we must locate telecommunications services in the Kingdom of Saudi Arabia. As well as restrictions placed on any service by geographical and topographical factors, the legal, cultural, and social milieu of the country mean that there are further constraints on how a telecommunications system might be used. These constraints are independent of any technical capabilities that a system may have, and indeed may in many cases not even be recognised by those unfamiliar with Saudi laws, customs, and social controls. In effect the constraints form a series of NFRs, and these will be discussed at length later in this study.

Saudi Arabia is currently the largest telecommunications market in the Middle East Region. The country has been the largest market, for example, for US exports of telecommunications equipment among the Arab States. A considerable share of American exports in the 1990s stemmed from Saudi Arabia's massive five-year Telecommunications Expansion Program 6 (TEP-6), which was awarded to AT&T Network Systems (now part of Lucent Technologies) in May 1994. At an estimated $4 billion, TEP-6 was at the time the largest telecommunications contract ever awarded outside the United States. In 1998 US exports of telecommunications equipment to Saudi Arabia were $229 million, up from $164 million in 1997.

The headquarters of the MoPTT, the Saudi capital Riyadh, is the fastest growing city in the Middle East, with a population expected to reach over seven million by the year 2010, and similar growth trends are anticipated throughout the Kingdom. In the context of its

immediate geographical region of the Arabian Gulf, Saudi Arabia's population is greater than all of the other Gulf States combined and half of its people are under the age of 16 years. Its smaller and highly urbanised Gulf neighbours, such as the United Arab Emirates and Bahrain, have enjoyed high teledensities (40+ lines per 100 and 25 lines per 100 inhabitants respectively) over recent years as well as the introduction of a wide range of additional customer services. However, Saudi Arabia, basically due to its size and population distribution, has been struggling to reach 10 lines per 100 inhabitants. The average teledensity in high-income countries is approximately 40 lines per 100 inhabitants.

Increasing industrialisation within Saudi Arabia has meant that the demand from the business sector for both land and mobile lines is very high. Addressing this high level of demand, the Saudi government has embarked on an ambitious programme to develop the telecommunications infrastructure to keep pace with its competitive Gulf neighbours and the dynamic world telecommunications/IT environment. Further, the Fibre Optic Link around the Globe (FLAG) project, to which Saudi Arabia is connected, also boosts demand for high-speed data communications equipment and the market has been further advanced by the availability of the Internet within the last three years beyond the confines of the academic world and a few commercial organisations.

In a special report in the Washington Times of 22 September 2000 the President of Saudi Telecom, Abdulrahman Al-Yami, wrote about the changes in the telecommunications provision in Saudi Arabia which have recently taken place. It is worth quoting what he had to say in full, since it expresses the hopes and expectations of the STC (which grew out of the MoPTT):

> If you conduct business in, or with, Saudi Arabia, you will have noticed many changes over the last two years. The economy is opening up, trade is developing and multinational companies are developing links with Saudi businesses across a range of sectors.

> Yet you might not have recognized some of the greatest changes that have taken place. For there is a quiet revolution going on in our telecommunications sector; a range of developments that is bringing real improvements to the way that businesses and individuals can communicate with, and in, the Kingdom.

Connections are quicker and clearer, the mobile phone network has wider coverage and greater capacity, and tariffs for business and international calls are falling. In short, it is becoming easier to communicate with Saudi Arabia.

It is a process that is being led by Saudi Telecom, created as a new company two years ago out of the Government Ministry. Our vision is to create a new, customer-focused service for Saudi Arabia, investing in infrastructure and service improvements to bring truly world-class telecoms to the Kingdom.

In only two years, we have managed to take great steps towards that goal. We have added more than 800,000 new landlines to the network, increasing digital line capabilities by 150 percent and adding remote areas to the network. Customers are enjoying an average 10 percent drop in telephone costs. We have connected more than half a million new GSM subscribers. Connection times have fallen from months to only a matter of days and new GSM subscribers can realistically expect to be connected within an hour of purchase, rather than the weeks it previously took.

To put some of these figures in perspective, we have connected more new subscribers in the last 12 months than was achieved by the Ministry in the 10 years before Saudi Telecom was set up as a company.

The changes go beyond new lines, however. We are working to build a company that has a true customer focus in its operations and that means restructuring to give the right balance of strategic, business, marketing, customer-interface, and technology elements.

What does that mean for business? It means getting the basics right – with greater capacity, lower tariffs and better customer service whilst investing in new technologies and services, such as Internet delivery, wireless applications and better data services.

We certainly do not underestimate the large and complex job before us, but it is achievable.

The telecoms sector will open up to new competition over the coming months and years. Our job is to be ready for that new competition by offering a world-class, customer-focused service.

Telecommunications is a tool that, perhaps more than any other, brings nations – and therefore businesses – together. For many, it is the lifeblood of commerce in the global economy.

Saudi Arabia needs world-class telecommunications if it is to succeed in developing trade. Saudi Telecom is the company that can make that process happen.

As far as Internet access in the Kingdom is concerned, it is controlled and monitored by the Internet Unit at the King Abdulaziz City of Science and Technology (KACST). One of the primary sources of access for a number of Saudis is through illegal foreign ISPs located in neighbouring countries. Using such ISPs is illegal in Saudi Arabia because of the perceived danger of exposing Saudi citizens to websites with material unacceptable to Saudi cultural values. Saudi ISPs are monitored to deal with this possibility, but those of other countries are not. In the year 2000 there were 31 ISPs with an estimated 99,600 dial-up accounts. There were, however, 1.8 million PCs in the country. By comparison with 2000 Internet access is expected almost to double by 2002 and again by 2004. It is estimated that 33% of Saudi firms have currently gained Internet access.

The case of Internet use in Saudi Arabia is, indeed, one of particular interest as it illustrates both how a demand can be created and how the distinctive Saudi cultural and social environment can place constraints on how the demand is fulfilled (see in particular Chapter 4.)

1.6 Overview of the Telecommunications Sector in Saudi Arabia

This section includes the headings:

- The History of Telecommunications in Saudi Arabia
- The Present Situation in Saudi Arabia
- Telecommunications Infrastructure

- Privatisation and Deregulation

- Internet Activity

- Electronic Commerce

- Hardware Manufacturing

- Software Manufacturing

- IT Usage by Households, Business, Government and Military

- The IT Labour Market

- IT Geographies

- Government Policies

- The Legal Environment

- IT Strengths and Weaknesses

- The Impact on the Non-IT Globally Competing Firm.

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1.6.1 The History of Telecommunications in Saudi Arabia

The history of telecommunications in the Kingdom of Saudi Arabia dates back to 1950 when King Abdul Aziz started to establish the telecommunication sector in Saudi Arabia. Initially, the Post, Telegraph and Telephone Directorate (PTTD) was set up. At that time, its services were limited to three cities, namely Riyadh, Jeddah and Makkah. It had premises of only 7 wireless centres and 3 telephone centres configured only to 150 lines manned by 250 employees.

On 7 September 1953, King Abdul Aziz issued a Royal Decree for the establishment of the Ministry of Transportation. The PTT Directorate was placed under its control.

In 1964, a very important step was taken by the Ministry of Transportation to install and construct a much greater capacity. This system included 13 exchanges points, which were established and distributed to the main cities as follows:

- three in Riyadh with the capacity of 16,000 lines each;
- two in Jeddah with the capacity of 18,000 lines each;
- two in Makkah with the capacity of 16,000 lines each;
- one in Qatief with the capacity of 1,000 lines;
- one in Sayhat with the capacity of 600 lines;

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- one each for Madinah, Dammam and Taif with the capacity of 6,000 lines each:
- one covering Dahran, Khobar, Hafoof and Mubarraz with the capacity of 4,000 lines.

This project was completed in 1969. See Appendix C for a map of Saudi Arabia.

In 1975 another Royal Decree was issued to establish the Ministry of Post, Telephone and Telegraph (MoPTT) independent of the Ministry of Transportation.

The MoPTT headquarters are located in Riyadh, Saudi Arabia; and produces annual revenues of SR 6 billion (£ 1 billion). The present employment level of the entire organisation is approximately 20,000 employees, as shown in the organisation chart in Figure 1. The Deputy Ministries report to the Ministries, and each department reports to the Deputy Ministry of which they are part. Overall, the organisational structure represents a logical framework for achieving the desired objectives of the Ministry.

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                        ┌─────────────────┐
                        │ Minster of PTT  │
                        └────────┬────────┘
                                 │
                                 │      ┌──────────────────┐
                                 ├─────▶│ Minister's Office│
                                 │      │(General Manager) │
                                 │      └──────────────────┘
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   ┌──────────┬──────────┬───────┴──────┬──────────┬──────────┐
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│ Deputy ││ Deputy ││  Deputy  ││  Deputy  ││ General  │
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│  of    ││  of    ││   of     ││   of     ││   Post   │
│Telephone││Finance ││Operations││Telegraph ││          │
│ Affairs ││and Admin││  and    ││ Affairs  ││          │
│        ││ Affairs ││Maintenance││         ││          │
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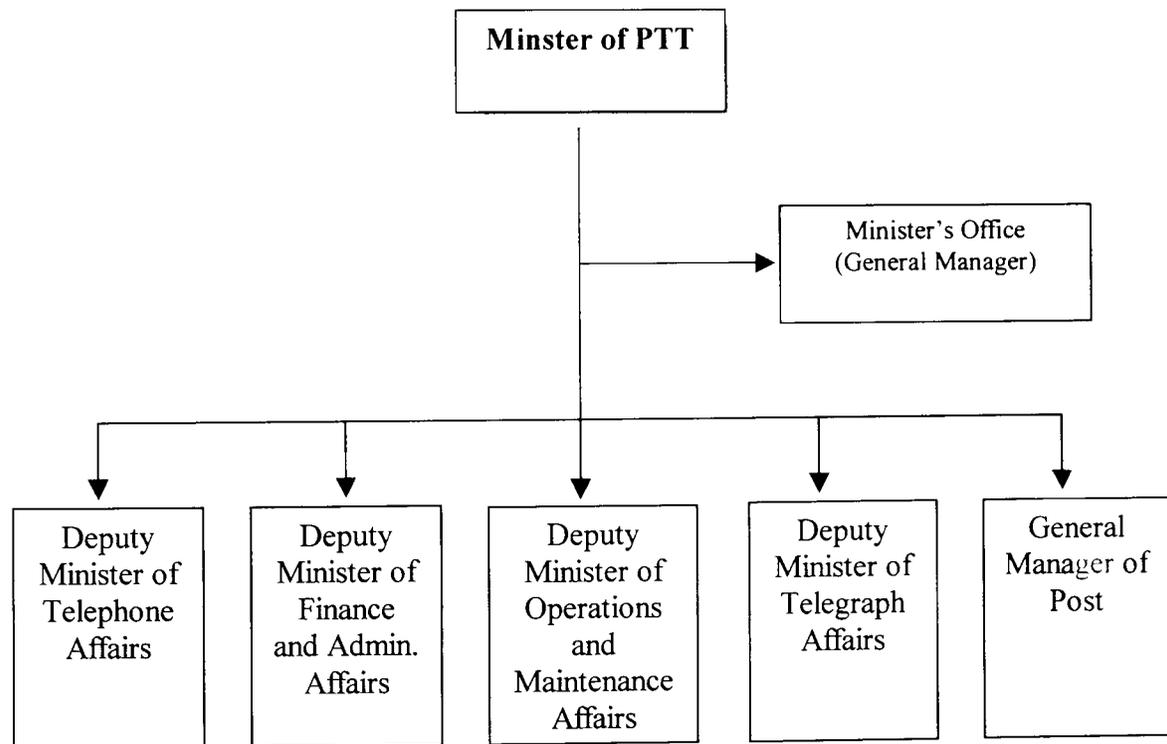
Figure 1. The MoPTT organisation structure

The second Five-Year Plan of the Kingdom of Saudi Arabia (1975) envisaged the establishment of a telecommunications network with the capacity of 1 million lines. The government concluded several contracts with various international telecommunication companies as a result of which first expansion project was implemented with a capacity

of 500 lines. Another contract was awarded for installing a national network of one million lines, covering many cities, districts and regions. As a result of these efforts. the capacity of local networks increased from 177,000 lines in 1978 to 1 million lines in 1982, which served 283 cities instead of the 15 cities of 1978. This capacity was further raised to 1.5 million lines covering 800-900 city districts and regions. Likewise. the capacity of working lines increased from 126,000 in 1978 to 710,000 lines in 1982.

In 1995, a large contract was signed between the MoPTT and the AT&T Co. for the expansion of 5-7 million lines and the development of the MoPTT network. which was to be carried out in stages, comprising high technology installation for digital networks. NAS, signal systems and smart networks.

1.6.2 The Present Situation in Saudi Arabia

Since 1980, telecommunications services in Saudi Arabia have made a significant contribution to economic and social development, through the provision of a wide range of communications services: telephones, mobile telephones, paging systems, leased circuits, telex, data communications, telegraph, letter and parcel services. Such services provide essential communication links, both within the large surface area covered by Saudi Arabia and with the outside world. In recent years, commercial establishments and the manufacturing and financial sectors have come to rely more and more on telecommunications for the collection, storage, processing and distribution of information in their efforts to raise productivity, to control costs, to manage decentralised units, to reach customers, and to promote new products.

During the Fifth and Sixth Plan periods (1990 – 2000), substantial progress was made in the overall performance and productivity of the telecommunications service, through both rising revenues and greater control of operating and maintenance expenses. For example, revenues from the telephone service, which accounted for 96 % of total revenues, rose from SR 4 billion (£667 million at the end of 1989 to SR 6 billion (£1 billion) at the end of 1994. At the same time notable advances were made in the expansion and quality of services and in the management of technical and human resources.

1.6.2.1 Economic Efficiency

The government of Saudi Arabia is well aware of the socio-economic importance of the telecommunication sector. This awareness has led them to concentrate on investing in this sector to meet the need for basic telecommunications, as well as advanced information communications.

The Saudi Arabian telecommunications system is faced with an environment characterised by a greater demand for traditional telecommunications facilities and for new services. Consequently, investments have had to be prioritised and these priorities needed to be reviewed by other governmental bodies. This created the dilemma of the government needing to make a choice between giving priority to investments with immediate benefit in basic telecommunications, and investments in new technologies with long-term benefits.

The development of telecommunication of all kinds has progressed in Saudi Arabia in exponential manner. However, when looking at the growth of teledensity, Saudi Arabia during 1990 to 1998 increased teledensity by 6.9% a year compared to an 18% increase per year in the rest of Asia. Saudi Arabia's level of economic development can support a higher level of telecommunication access.

The Saudi Telecommunications Company (STC), a private company under the MoPTT, (See Sections 1.2 and 1.4.5 for information about the establishment of this company.) is evolving within a global telecommunication environment characterised by:

- Greater liberalisation and competition. More and more countries in the world are liberalising their telecommunication networks and introducing open competition networks and services.

- Globalisation. The development of cellular networks within Saudi Arabia and in bordering areas, new operating practices such as call-back, the success of the Internet, and regional and international satellite systems, make national borders less and less relevant to telecommunications.

- The convergence between the telecommunications and information industries. Creating software is an important component in any investment and the telecommunications industry is developing and participating in the development of this software.

- <u>The convergence of telecommunication services</u>. The difference between telecommunication services is progressively disappearing and it is becoming difficult to distinguish between operators and providers of services, between telecommunication networks and video networks or other types of networks, between the various satellite transmissions (telephony or direct-to-home TV for example), and new multi-purpose terminals that ensure or will ensure transmission and reception of data, voice and images.

- <u>The pressure of the market</u>. Operators or service providers, regardless of their size, are being forced to enter into new international strategic alliances or partnerships in order to become more powerful.

The goal of the STC is to provide a world-class telecommunications system to the customer. It is not only the network that does not have the capability and the capacity to provide this service; it is also the organisation that is not able with the existing resources to meet the needs of the customer either now nor in the future, if no changes take place. The way forward for the STC, therefore, lies not just in bringing the network up to capacity and applying a technological 'fix'; it also has a political dimension in that it depends on the resources which the government is prepared to put into it, and these need to be substantially improved for the company to reach its goal.

1.6.2.2 Available Opportunities for the Private Sector

Enormous capital investment is needed to expand and upgrade the telephone exchanges, the long distance network, mobile telephones and support facilities, though great strides forward have been made during the period of the Sixth Development Plan. The total cost of projects in the Sixth Development Plan of Saudi Arabia is expected, when final figures become available, to exceed SR 16.7 billion (£2.8 billion).

However, there will still be significant opportunities for private sector investment in telecommunications, through joint ventures, supplier credits, or revenue sharing programmes, particularly as the profit levels in telecommunications are now large enough to attract private investors. Profitability can be further increased through productivity gains, cost reductions per line and improved revenue collection.

1.6.2.3 Development Strategy

The development strategy for the telecommunications and postal sectors have been implemented through the following objectives, policies and programmes.

1.6.2.3.1 Objectives

In recognition of the important role of telecommunications and postal services in the Kingdom's economic and social development, the following objectives were pursued in the Sixth Development Plan of Saudi Arabia:

- to satisfy the increasing demand for telecommunications and postal services in all regions;
- to provide high quality telecommunications and postal services at favourable prices;
- to modernise and expand the telecommunications networks and the postal infrastructure;
- to consolidate the financial viability and productivity of government agencies in these sectors and to achieve their financial autonomy;
- to develop a highly skilled and qualified Saudi work force;
- to provide opportunities for the private sector to finance and operate the telecommunications services.

1.6.2.3.2 Policies

The policies indicated below guided the development of the telecommunications sectors in the sixth plan period.

The telecommunications network, particularly the long distance network, was expanded and modernised in all regions, through the widespread introduction of digital services and conversion from analogue services.

The quality of telecommunications services was improved to meet customer requirements through a reduction of the new telephone waiting lists, efficient maintenance and better fault repair management.

New telecommunications services were introduced, such as an integrated services digital network (ISDN), small satellite services (VAST), broadband video conferencing.

electronic mail and other data services on leased lines or through the public telephone network.

New, expanded or upgraded switches were installed for the local, national and international networks, and included the latest signalling and software technology. Investment funds were raised from private financial institutions, along with the use of supplier credits and revenue sharing agreements for build-operate-transfer operations. Opportunities for increasing joint ventures or revenue sharing arrangements were examined for activities such as the mobile telephone network, paging systems, pay telephones and other services; while competition was encouraged in services such as video conferencing and data communications. Local, national and international telephone charges were reviewed and modified to reflect cost structures. The development of Saudi human resources were therefore given a high priority in this sixth plan.

1.6.2.3.3 Programmes

The main programmes in the telecommunications sector during the period of the sixth plan were as follows:

- Telephone Expansion Programme. This programme focussed on the supply, installation and commissioning of new digital switching and junction equipment, and the construction and installation of outside plant facilities. The expansion and upgrading covered the local, trunk, tandem and international exchanges. Terrestrial mobile subscriber facilities and radio paging services were included in this programme.

- Long Distance Network (LDN) Programme. The expansion and modernisation of the LDN was seen as the core element in the future development of the telecommunications network. These planned terrestrial international links have now been installed and have connected Saudi Arabia to Kuwait, Qatar, UAE, Jordan, Yemen and Sudan by digital microwave or optical fibre.

- Data Communications Programme. This programme aimed to provide new data communications services through the introduction of new technology and facilities such as ISDN access, a public electronic mail service, a dedicated digital data network, and the expansion of the analogue leased data service.

- Support Services Programme. The main activities which took place under this programme fall into three main categories – data processing, frequency management

and buildings – and included the modernisation and storage capacity expansion of central computers, the replacement of hardware, the development and modification of software, the expansion of frequency management, the provision of technical buildings, warehouse buildings, information buildings and subscriber officers. This programme also provided mobile telephone exchanges, upgraded satellite facilities. replaced analogue microwave systems, and provided mobile, paging and TV services to meet some special requirements.

- Operation and Management (O&M) Programme. The activities under this programme brought about the required performance of the current and planned network expansions. They included the contracting of O&M activities for the LDN (microwave, coaxial, satellites), the telex and packet network, the O&M of frequency management, consulting services, maintenance of the telegraph network. coastal stations, building and computer services. Other major programme items were the maintenance of exchanges, the operation of the telephone network and the subscriber rural system (SRS), and the provision of spare parts.

- Manpower Development Programme. This programme aimed to develop the skills and performance of the MoPTT employees through the provision of training that was targeted according to employees' experience and work requirements. The training objectives were achieved with the support of technical colleges, training centres, the computerisation of training classes, and on-the-job-training.

1.6.3   Telecommunications Infrastructure

With the developments described above, Saudi Arabia has undergone a complete transformation of its existing telecommunication infrastructure. The project began in late 1994 when a $4.2 billion (£2.63 billion) contract was awarded to AT&T; this project is to be completed by the end of 2001. In 1998, the most recent time for which there exist reliable statistics, the country had around 2 million phone lines in place, which translates into 10.64 phone lines per 100 inhabitants. These statistics, provided by the International Telecommunications Union (ITU), place the country among the lowest in the region at that time. Table 1, which is based on these statistics, presents a comparison between the Kingdom and its neighbours, in addition to the US and the UK.

Country	Population (1000s)	Total telephone lines (1000s)	Per 100 inhabitants	Growth over previous year (%)
Bahrain	599	144.40	24.11	2.50
Egypt	60,603	3,024.90	4.99	11.4
Iran	61,128	5,825	9.53	14.40
Israel	5,696	2,539.10	44.58	8.40
Kuwait	1,687	391.80	23.23	2.50
Lebanon	3,084	460.60	14.93	39.60
Qatar	558	133.50	23.93	8.80
Saudi Arabia	18,836	2,003.60	10.64	16.50
UAE	2,260	738.10	32.66	9.80
UK	58,144	29,410	50.25	3.70
USA	266,557	170,568.20	63.99	3.60

Table 1. Telephone lines in Saudi Arabia and its neighbours

In addition to the wire-based phone lines Saudi Arabia has a wireless network (analogue and digital) with a current capacity of about 200,000 lines.

1.6.3.1 The Existing Network

The existing backbone of the Saudi long-distance network was formed by an extensive, mostly analogue, microwave radio. Some of the initial 4 and 6 GHz microwave systems. The existing network also includes approximately 4,000 km of analogue coaxial cables between Riyadh and Dammam and between Riyadh and Jeddah, approximately 1.200 km of digital coaxial cable, and approximately 2,000 km of optical fibre systems including a multimode fibre system between Makkah and Taif (PDH optical fibre systems).

1.6.3.2 The Telephone Network

The Saudi telecommunication sector continues to grow at a remarkable rate, with the expansion of both facilities and services. The country's telephone system is already one of the world's most modern and efficient, and new microwave links with Arab countries have been opened to strengthen regional communication.

1.6.3.3 The Microwave Network

A domestic microwave service between smaller towns supplements the 9,300-mile 550-station microwave system.

1.6.3.4 Submarine Cables

Submarine cables complement the Saudi wire and satellite network to make the country an international hub for communications. The currently existing coaxial cables are part of the SEA-ME-WE (Southeast Asia/Middle East/West Europe) project, and this cable connects the Kingdom to Egypt. Two other cables link the country with Bahrain and Djibouti. These cables are connected to earth stations distributed around the country.

In April of 1998 the Kingdom reached a formal agreement with FLAG (Fibre-optic Link Around the Globe) Telecom; the agreement adds the Kingdom to a list of 11 other countries already online. This cable links the UK, Spain, Italy, Egypt, the United Arab Emirates, India, Malaysia, Thailand, China (at Hong Kong and Shanghai), South Korea and Japan. Jeddah was selected as the landing point of the cable. FLAG uses Synchronous Digital Hierarchy (SDH) technology, which means that the country enjoys the benefits of high-speed high-quality digital communications with Europe and Asia.

1.6.3.5 Satellite and Coaxial

The Kingdom's seven standard earth stations link up with the Intelsat, ARABSAT and INMARSAT Satellite Systems, allowing subscribers to dial 185 countries directly. These stations are also used for television and radio transmissions. Currently Saudi Arabia has more than 6,000 satellite circuits. The country also has 3,100 miles of coaxial cables. Telex has also seen impressive growth, with the number of lines increasing to 9,800, linking over 152 cities and villages to countries around the world.

ARABSAT is a consortium of 21 Arab countries; Saudi Arabia is the largest stakeholder with 36.66% of paid capital. To meet the increasing demand within its coverage area ARABSAT presently is in the process of adding new services to its existing services. such as:

- VSAT Networks
- thin route SCPC DAMA
- digital TV broadcasting.

1.6.3.6 Cellular and Wireless Systems

Saudi Arabia, like most other countries, has had two cellular systems in use; the first was an analogue cellular system which was introduced in the early 1980s with a limited coverage area, although it greatly improved over the years. This older system had a final capacity of 30,000 lines. The analogue system has now been dismantled, and all its subscribers were transferred to the second and more recent system, the digital system. This newer digital system is a GSM 900 network, which provides better quality and flexibility. This network has been in operation since January 1996 and by 2000 was serving over 500,000 subscribers in four major cities in the Kingdom, namely Riyadh, Jeddah, Dammam and Makkah. The network has been expanded to cover more than 30 cities.

1.6.3.7 WANs and LANs in the Kingdom

A few years ago only a very small number of networks existed in the country, most of them belonging to large organisations (educational, government and commercial). Most of these networks are LANs (local area networks) with the exception of some used by government (military, monetary agency) branches and some commercial institutions, which utilise WANs (wide area networks). Only recently did smaller organisations started to create networks, and this area in Saudi Arabia is still at its infancy stage. Although the number of private networks has dramatically increased in the last few years, it is still far less than it should be.

1.6.3.8 The Year 2002

This is the set date for completion of the ongoing project, which will expand the Kingdom's telephone network by 1 million lines for a total of 3 million subscriber lines

and 500,000 GSM subscribers. The existing analogue transport network will be transformed into a modern digital infrastructure with some 10,000 km of fibre optic cables in SDH rings configuration and new operations support systems will manage it.

The long-distance network uses a backbone of five 2.5 Gbps fibre optic rings augmented by high capacity digital microwave radio hops. The long-distance fibre optic network (FON) has been planned to cover the geographical area of Saudi Arabia in its entirety.

1.6.4 Privatisation and Deregulation

Until the 1990s little or no sufficient moves regarding the privatisation or deregulation of telecommunications took place in Saudi Arabia. There were only minor steps taken in this regard, most of them in the wireless services area, but they had a significant impact on competition in the Saudi telecommunications market. This happened in early 1992 when the paging service was introduced, and when private firms where officially allowed to sell and programme the equipment. But still most of the processing was done at the MoPTT offices; these private firms had no control over services or pricing. In late 1995 and early 1996, the GSM 900 digital cellular network became operational in the Kingdom. A similar approach was used, but with a little more flexibility in that subscribers now can apply for the service at a vendor instead of having to apply at the MoPTT offices. Other deregulations allowed subscribers to transfer the service to whichever provider they wanted. Historically, the original subscriber could either terminate the service or sell it. In the first case the service went back to the MoPTT, afterwards it was reissued it to someone else. Under the second option, which was widely used mainly due to the high demand and over the inadequate 'regular' supply, a subscriber would enter into a verbal agreement with another party for the transfer, but this was unofficial and the original subscriber's name still appeared on the bill.

On 15 December 1997, reports that the MoPTT was to be privatised were confirmed when King Fahd Bin Abdul Aziz, Chairman of the Council of Ministers, declared the privatisation of telecommunication services and the establishment of the Saudi Telecom Company to run the country's telephone and telex facilities during the following six months. The move to set up the STC may be considered as the first major step in the Kingdom's privatisation drive.

The ministerial committee for privatisation worked out the basic system of the company and fixed its capital. It also finalised the new telecommunications systems to be prepared by the MoPTT. As a result of privatising the MoPTT, all technical and administrative facilities including fixed telephones, data transfer system, pagers, mobile, phone public phones and the general telephone network were shifted to the newly established STC. In addition, all state rights and properties as well as local and international investments related to telecommunications were transferred to the STC. In addition, all financial and contractual commitments on the government were shifted to the company.

The new company provides all telecommunications services in the kingdom, availing to Saudi nationals more job and training and works better for technology transfer. Some of the employees of the MoPTT have been shifted to the company. The Saudi government charges the company for the following:

- providing the service commercially;
- providing licenses to carry out telecommunication services in the kingdom;
- using frequency spectrums.

The privatisation panel has been assigned to make proposals on the charges to be received by the state from the company. The MoPTT supervises the STC's telecommunications services and the current systems. The Saudi government through its public investment fund is a major shareholder, and the Saudi Ministry of Finance is a board member in the STC, representing the Saudi government.

1.6.5   Internet Activity

Currently, the Internet is available in Saudi Arabia through the King Abdul Aziz City for Science and Technology (KACST) with access limited to a small number of individuals, most of whom are researchers. Just before the introduction of this Internet, the MoPTT hosted a service called Al-Waseet, a packet-switched national data network (X.25). Many subscribers used to use this Al-Waseet network in order to connect to their Internet service providers (ISPs) overseas, which they already had an account with; if not they had to request a joint service from Al-Waseet. These joint services provided by Al-Waseet were too costly and the connection speed was very slow.

In mid-1997 Saudi Arabia announced that the Internet would be available locally. This announcement came from the KACST after months of anticipation by Saudi citizens. The City of Science and Technology set up a special unit which would supervise the whole process of linking Saudi Arabia with the rest of the world through the Internet services. Access to the Internet in Saudi Arabia, where foreign publications are strictly controlled and censored, has been delayed by worries about material considered offensive. In order to filter out material considered undesirable the government has created a funnel through which all international websites have to be channelled. The KACST has installed a system that will prevent users from viewing prohibited websites. The ultimate arbiter on what is permissible will be the Interior Ministry. The system is supposed to be updated daily: to take one example, as new pornographic sites spring up in cyberspace, their addresses will be logged in Riyadh and duly blocked. Or so the theory goes. The service was expected to begin in December of 1998, but telecommunication analysts suggested that there could be further delays because of the creaky Saudi telephone system might not be able to cope with the new demands by the users of the Internet. However, the Internet started to operate at the expected time, but with a very slow and poor performance. One Saudi official said, 'The Saudi Telecommunications Co., a newly established private company, was setting up servers across the country to handle the data traffic.'

It is interesting to note that Internet use in Saudi Arabia has happened in quite a different way from the West, where things are done the other way round. The West usually introduces the new technology to the market, lets the people try it and experience it, and then some feedback will be taken in order to see the people's view regarding it. Then some control might be introduced if needed.

In September 1998, a meeting with representatives from 72 telecommunications companies, including the STC itself, was held at the MoPTT to decide among them who is going to be the Internet service provider for Saudi Arabia. The result of this meeting was that the STC qualified to be the first Internet service provider for the Kingdom of Saudi Arabia. The KACST and the STC have fixed the subscription rate for the Internet services at 7.5 halalas (£0.0125) per minute.

The KACST stated at that time that the connection speed would be 512 KB, that the installation fee for each unit would be SR 24,000 (£4,000), and that the monthly

subscription fee for each unit would be SR 112,000 (£18,666). The KACST also made it clear that these fees did not include the cost of leasing telephone lines or any other services from the various departments of the STC. These other services would be dealt with separately and the Internet service applicant company should bear responsibility for them. The KASCT has also stated the monthly fees of other connection speeds, in that it would charge SR 224000 (£37,333) for the 1024 bit connection, SR 336000 (£56,000) for the 1536 bit connection and SR 448000 (£74,666) for the 2048 bit connection.

Some of the firms that provide Internet connection and site development services include:

- Al-Waseet.
- GE IS.
- ICS Saudi Arabia.
- Marafi Media Services.
- MCI Mail Saudi Arabia.
- NoonSeen Productions.
- Riyadh Web.
- Sahara Online.
- Saudi Communications Network.
- Saudi Home.
- Saudi Online.
- Saudi Network Information Centre.

1.6.6   Electronic Commerce

The Saudi business community is becoming increasingly aware of the value of electronic commerce (e-commerce). There are around 200 companies that have implemented e-commerce technology in Saudi Arabia. Most of these companies are commercial enterprises. The Saudi Arabian Monetary Agency (SAMA) is the only government agency that has implemented e-commerce. Other government agencies are in the early planning stages of achieving that.

SAMA has successfully carried out two financial projects relating to e-commerce:

- The Saudi Payment Network (SPAN), created in April 1993, which allows different banks to use online electronic funds transfer (EFT) capabilities for their automatic teller machines (ATMs) and point of sale (POS) terminals.
- Inter-bank settlements are done through an EFT switching system known as Saudi Arabia Riyal Inter-bank express (SARIE). This was launched in August 1997 with the help of Logic, a UK-based company. Previously all inter-bank transactions were settled by paper.

The e-commerce market in the Kingdom can be divided into two categories:
- Saudi trading partners (distributors and agents) of major international suppliers, and transportation companies.
- Major national companies that procure from a large number of local and international suppliers.

Among the commercial sector companies are:
- Saudi-Aramco, which is the most advanced in its e-commerce programme. The programme is connecting a large number of local suppliers with Aramco's computers for electronic exchange of purchase orders and acknowledgment.
- Saudi Arabian Basic Industries (SABIC), one of the world's largest petrochemical companies.
- Saudi Consolidated Electricity Company (SCECO).
- International Airports Project Administration (IAP).
- Saudi Arabian Airlines.

The presence of e-commerce vendors is helping the companies to accelerate their efforts in adopting this crucial technology and redesigning operational procedures to maximise productivity. Saudi Arabia is a major market in the region and has a well-advanced commercial sector. Given that the Saudi commercial community is already implementing e-commerce in their commercial environment, soon they will look to government institutions that participate in trade facilitation to have a supporting e-commerce infrastructure to be able to process trade transactions electronically.

The Ministry of Commerce have set-up a special branch to develop e-commerce in Saudi Arabia. The Saudi American Bank (SAMBA) and the National Commercial Bank (NCB) were the leading banks to develop e-commerce requirements.

1.6.7   Hardware Manufacturing

No significant hardware production operations exist in Saudi Arabia. The lack of human resources and technology, the strict regulations and the oil based economy all contribute to this shortcoming. In the area of computers, most of the existing operations are in the form of assembly lines. In the late 1990s Saudi Microsoft has appointed five Saudi Arabian PC system builders as Microsoft direct original equipment manufacturers (OEMs). These appointments are the first of such appointments in the region; most importantly, the move recognises the high level of quality of the locally assembled PCs. These firms concerned are:

- Al-Jasim Electronics in Dammam.
- Al-Khaleej Computers Corporation in Jeddah.
- Digi Systems in Riyadh.
- International Computer Company Limited in Jeddah.
- Al-Waseet Electronics in Khobar.

These five firms have the potential to be significant players in the local market in the short run and possibly in the region on the long run. In addition to these firms, several smaller firms produce printed circuit boards, but the scale of these operations is insignificant. Nevertheless, this is just the beginning for more advanced forms of hardware manufacturing in the future.

The Saudi Cable Company (SCC) carries out the most significant hardware manufacturing operations that exist today. The SCC is a local firm based in Jeddah; the firm has established itself in a strong position of market leadership with a reputation for technical excellence and uncompromising product quality. The SCC cables are ISO 9002 certified; their product range also includes:

- single core wires and multicore cables;
- control, flame retarded and low-smoke halogen-free cables, and overhead conductors;
- metallic jelly-filled and air core cables from a single pair up to 3,000 pairs;
- light pack and loose tube optical fibre cables;
- joint closures;
- termination hardware and optical assemblies;

- 709 and 710 connectors under licence from Lucent Technologies.

The SCC is regarded as one of the major hardware manufacturers in the region and might possibly be one of the major global hardware manufacturers in the future. Saudi Arabia is not considered as a leader in the area of hardware manufacturing in the region, but it has the potential to become so.

1.6.8 Software Manufacturing

The Saudi software manufacturing operations are far ahead when compared to hardware manufacturing operations. In the 1980s and 1990s, and as the use of information technology rapidly increased through out the Kingdom, the software development industry followed. The first goal of the software industry in the country was satisfying the local demand; once this was achieved, the focus shifted towards regional demands. Many of the nationals of the countries of the region lack English language skills, and because most applications are developed in English, there was a great demand for an Arabic version. Based on this need, several firms saw an opportunity to gain market shares by providing a solution to this problem. It also became clear to many that if they were to overcome such hurdles the gains would be massive. This step was probably the first in this area, but in many respects the most important one.

Today an increasing number of Saudi firms provide a variety of services to the local and regional markets. The first product introduced to the local market was a simple word processing application that supported the Arabic language. As the demand grew, so did competition and innovation, and all sorts of applications were being developed in order to meet this demand. The major advancement came with the introduction of the Arabic version of Windows; this product set the stage for a standard platform on which developers could build. Soon after, firms that provided partial or total solutions started to enter the market.

The market in Saudi Arabia is just starting to take shape, where some firms concentrate on software development and others on network and Internet solutions. Most of the large players in the market are joint ventures with global firms, such as IBM, Comet Group and AT&T. These large firms are the ones that usually provide total solution services.

Meanwhile smaller firms have gained ground in the area of software development. One of the main firms that have progressed in the area of software development is Dow Log Technology Co.; they produce PC-based educational programs founded on the national curriculum. Some of the main firms in Saudi Arabia include:

- Dow Log Technology Co.
- Saudi Business Machines Ltd.
- Adawliah Universal Electronics APL.
- Al-Khaire Computer Systems.
- Arabia Electric Limited.
- Arabian Control Systems.
- Jeraisy Tech.
- International Systems Engineering.
- Mansour-General Dynamics Limited.
- Suleiman IS.

1.6.9 IT Usage by Households, Business, Government and the Military

Information technology has been in use in Saudi Arabia for quite some time, but has been mainly in the government, academic or commercial areas. Until the mid 1990s the effective IT usage in the government sector was limited to a few branches, for example the Ministry of Defence and branches of the armed forces, Ministry of Commerce, Saudi Arabian Monetary Agency and the MoPTT. Since then, other branches of the government have been increasingly adopting IT. In the commercial arena, financial institutions were the first to adopt IT and use it, which has proved very beneficial. Other organisations followed in this path, but high cost was involved and the lack of skills was limited. Recently, with the rapid advances in technology, reduced costs and an increasing level of skills have allowed information technology to spread, with the largest share of growth in IT is in the commercial sector. The usage of it by households was the area that did not witness any significant growth up until around 1995; since then the use of IT has been increasing exponentially. Boasting the largest computer market in the in the Gulf region, Saudi Arabia is currently (2001) enjoying a computer boom. With an annual turnover of approximately £750 million, Saudi Arabia accounts for 40% of computer sales in the Gulf

region. Recent price wars between the world's largest PC producers are expected to fuel the Kingdom's ever growing computer market.

Saudi Arabia offers a growing home market and a burgeoning small business market to computer manufacturers. Approximately 15% to 20% of PCs end up in the home market, while the rest of production is allotted to corporate accounts. Throughout the country, local businesses are upgrading their computer systems. Both Saudi Aramco and the King Khaled Military City's Administration for Operation and Maintenance have upgraded their computer systems. King Fahd University of Petroleum and Minerals and Imam Mohammed Ibn Saud Islamic University as entities are also working on significant computer projects. The rising level of computer literacy and the Internet in Saudi Arabia form a major catalyst for this boom. Nowadays more and more companies are using the latest technology in Saudi Arabia. Until the mid 1990s e-mail and networking were unheard of, but since then they have become common features of small- to medium - sized businesses in Saudi Arabia.

1.6.10   The IT Labour Market

When examining the Saudi IT labour market, no significant shortages can be pointed out. Nevertheless, with an IT boom in the country, one would predict that such a shortage would take place within a few years. The Saudi IT labour market is supplied through two major sources: locally and globally. Locally, graduates with degrees in information technology-related subjects form the bulk of the local supply. Three major universities offer programmes in this field. The first of these is King Saud University (KSU) in Riyadh. It offers degrees in Computer Engineering, Computer Science, IS and Electrical Engineering. Indeed KSU have the first and the only Faculty of Computer Science in the Kingdom. The second is King Abdulaziz University (KAU) in Jeddah, which offers similar programmes with specialisation in Computer Science, Structural Programming, Program Languages, Database Systems, System Analysis, Operating Systems, Electronic and Communication Engineering, and Computer Engineering. The third is King Fahd University of Petroleum and Minerals (KFUPM), which is located in Khobar. The KFUPM offers similar programmes to those offered in KSU and KAU, with additional programmes such as Software and Hardware Engineering. In addition to these universities there are now many other computer training centres at the Kingdom, such as Microsoft,

New Horizon Al-Alamia etc. Private institutions and organisations provide the remainder of the local supply; these institutions provide courses that aid individuals to be more computer literate. Such programmes provide the basic framework for further advancements in this field for these individuals.

Despite these many training opportunities, there is no national strategy for developing IT professionals and technical people. The only thing resembling a strategy is that, as we have seen, the government is offering IT degrees in its universities. There is, however, no plan for employing graduates in the right place.

The second source of labour is the global market, which has been historically the major source of labour for the country. On the other hand, this portion of the supply chain has been shrinking, mainly due to stricter immigration laws. The Saudi government has also been implementing a Saudisation program, which has been largely effective in increasing the level of Saudis in the work force. Nevertheless, this non-Saudi portion of the labour market will still be there until well into the 21st century, because of economic and technology transfer issues.

1.6.11   IT Geographies

When looking at Saudi Arabia, we notice that information technology is concentrated on three major areas of the country. These three areas happen to be also the main cities: these cities are Riyadh, the capital, Jeddah on the west coast, and Dammam on the east coast.

Riyadh is the largest and most important IT incubator in the country. This is mainly because it is the capital and most of the government agencies are located there. Riyadh is also regarded as the business centre of the country; therefore many of the businesses organisations are located there. Another significant feature of this city is the Economic Balance Programme; this programme is a host for several important joint ventures. most of them with large global firms, some of which are in the IT field. Dammam comes second; at one time it was considered the major IT centre in the country, mainly because of the presence of KFUPM and Aramco. Both of these organisations are considered as pioneers in the use of IT in Saudi Arabia. Jeddah comes third; it has the lowest IT concentration among the three. As was mentioned above the Kingdom's FLAG access point is through Jeddah, and in addition many of the earth stations are located there. With

these two major access points Jeddah can be identified as the communication hub of the country, which in turn has led to some concentration of IT organisations in the area.

1.6.12   Government Policies

Most of the located programmes and initiatives of the governments are hosted by the educational institutions in the country. In addition, several programmes also exist in some of the government-subsidised businesses and in government agencies. These programmes generally are in the form of financial aid or facilities to researchers. As part of the Sixth National Development Plan, Saudi Arabia now has an information technology plan.

1.6.13   The Legal Environment

As we have seen in Section 1.4.3 the Saudi legal system, including civil law, is based on the *Share'a*, Islamic law, which is derived from the Quran, *Sunna* (the sayings of the Prophet Muhammad) and *Ejtihad* (modern interpretation of Islamic law). The commercial legal system differs somewhat from the civil system, but shares some basics. This system is more influenced by the West in many ways; this due to the amount of international business that the country was involved in after the discovery of oil (1934). In the absence of legal scholars in the earlier days and the need for some form of legal framework, adopting and modifying existing systems was the best solution. Over the course of the following years this system was modified to suit both local and global purposes.

Until the late 1990s copyright and intellectual property laws in Saudi Arabia were only enforced on printed materials. Since then, and with the increase of global trade in Saudi Arabia, many vendors have called for better enforcement of these laws. The first step which was taken in this matter mainly concerned the audio and video materials. Enforcement of these laws was successful to a great extent. Unfortunately, until now software copyrights are still not enforced to the extent to which many vendors would like to see. There are no solid figures on the software piracy rate in the country, but estimates place it above 53%. Local software developers affected by this practice initiated the movement towards enforcement of software copyrights. Other forces which have recently called for stricter enforcement are global firms with joint ventures in the Kingdom: one

such vendor is Saudi Microsoft. Effective enforcement of such laws will probably take some years, but at least a level of awareness has been achieved.

The Saudi legal system does not restrict trans-border data flows, except if the data is considered 'inappropriate' or 'sensitive'. Privacy is a very big issue in Saudi Arabia, but because citizens are not fully aware of how such information may be used, it is not being observed. Nevertheless, once such information is put into use by businesses, the issue will be discussed and the citizens may make appropriate demands in relation to it.

The Saudi market system is categorised as a laissez-faire market. There is an obvious lack of standards, and the product categorisation processes seems to be unorganised, especially when it comes to technology. For example, voice-processing products are somehow considered as a part of telephone systems and accessories, and therefore may or may not be subjected to relevant laws. Until draft standards for communications products were published in the year 2000, there were no technical standards in Saudi Arabia except that the products need to be matched with the local electric voltage, which is 127 volts, 60 hertz.

As long ago as October 1995, Saudi Arabia Storage Operation Systems (SASOS), in co-operation with the Ministry of Commerce, issued new guidelines to control the quality of certain communication products which are imported into Saudi Arabia. The new programme, the International Conformity Certification Programme (ICCP), currently applies to 76 regulated products. The new ICCP programme requires that certification be issued by one of SASOS's 13 appointed laboratories in the United States for compliance with either SASOS or other internationally recognised standards.

1.6.14   IT Strengths and Weaknesses

When looking at the Saudi IT situation, no major competitive advantages can be identified from information technology. The country has fallen behind in terms of IT when compared to its neighbours in the region, and only now, at the beginning of the 21st century, is it starting to catch up. The only advantage that the country might have is that it has the potential of becoming the region's communication gateway, in a few years if well planned for. The FLAG access point; the earth stations, and several private joint ventures are capable of putting the country in such a position.

On the other hand, one strength that can be identified in the country's IT is the current infrastructure, being the most modern infrastructure in the region through tackling many of the weak areas that the other countries of the region had in IT.

Another strong area of IT in the country is the software and hardware industry; currently Saudi Arabia develops and produces a high percentage of software used in the country and in the region. If this industry is allowed to flourish, soon it might become a second source of income for the country. Regarding the hardware industry, Saudi firms have achieved a level of reliability that allows them to be identified as OEMs. This is a first in the region, but can only be sustained by future government incentives. Further development improvement must be encouraged in Saudi Arabia for such industries, if the goal of the Saudi government is to be an IT power in the region.

The main reasons why Saudi Arabia is behind in the area of IT can be contributed to several factors, these include:

- computer illiteracy;
- lack of government incentives to attract businesses (free-trade zones/subsidies);
- poor enforcement of intellectual property and copyright laws;
- lack of resources.

These are just some of the reasons why Saudi Arabia is far behind many countries in the field of IT, and unless some of these issues are dealt with, the progress of IT will be hindered.

1.6.15   The Impact on the Non-IT Globally Competing Firm

For a non-IT globally competing firm, the Saudi market offers some attractions. In setting up small-scale operations, the current IT infrastructure and prudent planning can give the firm a competitive advantage. Such an advantage will enable these operations to expand, but in the long run and as demands increase costs can run higher than expected. Local manufacturing is also attainable and based on the current IT. Upgrading the current IT infrastructure means greater flexibility, capacity and lower cost in the future. In addition, skilled labour and experts are also available in abundance. On the other hand, several issues have to be taken into consideration, and the first of these is availability. In Saudi

Arabia, availability is a big issue; demand is always ahead of supply in the area of IT, which in some cases can be disastrous for a business. The second issue is cost: the costs involved are able to give a firm an advantage through IT locally. Once the firm tries to compete on the regional or global level, these advantages start to diminish. Thirdly is the issue of quality; depending on the needed location and services, the level of quality will differ. The quality level is not as high as it should be, but based on the nature of business, a solution can be reached.

1.7 Summary

This chapter has presented, in considerable detail, the cultural, political and economic context of telecommunications in Saudi Arabia. The factors which have been identified as of primary concern are the cultural, legal, political, and economic environment in the Kingdom, the implications of recent developments (both technical and commercial), and the technical and business challenges facing the telecommunications industry in the country. The importance of Saudisation and of a proper understanding of the concept is introduced.

Chapter Two

THE RESEARCH APPROACH AND METHODOLOGY

2.1 The Research Methodology

This section will discuss the research techniques and procedures used by the researcher. It will focus on the research methodology and the data gathering technique adopted. with reference to the sample selected, and the analysis of the data.

Research methodology or strategy is best characterised as the matching of a basic research objective with a specific research method. In an enterprise like this study, the research objective will be primarily the gathering of information or data, and it is recognised that, in terms of data collection, most research undertakings fall into one of two categories – qualitative or quantitative (or are a combination of these).

The distinction between the two may be described in varying terms. There may be detected lying implicitly behind the quantitative method an objective or 'realist' philosophy, a viewpoint which sees the area to be studied as characterised by phenomena which are positive, factual, and external to the individual. The qualitative method is more in line with an alternative view of reality which stresses the importance of the subjective experience of individuals. The researcher had to choose which of these approaches to adopt in seeking to examine and analyse the MoPTT telecommunications system, recognising and taking into account any constraints that might apply to the study. A brief account of each methodology is given below.

2.1.1   Quantitative Method

Quantitative research usually involves large numbers and concentrates on variables. A quantitative approach is commonly used when the researcher wishes to deal with a small number of variables in an attempt to explain some aspect or aspects of the phenomenon under investigation. Its methods are also best suited to situations where variables are most

easily identified and controlled. For instance a researcher may wish to establish whether there is a correlation between height and place of birth. Once it has been decided what the various height thresholds to be used are, it is easy to measure them. Similarly once it is established whether place of birth is to be as wide in range as a country or state, or as narrow as a specific city or registration district, then it is easy to identify from the data available. Obviously, such a method cannot establish much if it simply uses a few cases. The images that quantitative researchers construct are normally based on general patterns of variation across very many cases. In quantitative research, the conceptual approaches to problem solving are explicit and fixed, using an agreed tool for measuring. Statistical tests are often employed to indicate whether a particular relationship is significant.

It might initially appear that a quantitative method would not be suitable in this research as there is only one MoPTT and only one telecommunications system in Saudi Arabia, so that it is not possible to use the MoPTT telecommunications system and a number of other systems as cases from which general inferences may be drawn. However, within the MoPTT there are many units and departments and many areas of structural similarity between them. Provided care is exercised, it is at least initially plausible that observations gained from a study of a number of units might display patterns of variation that may be reasonably applied to other units.

Further, the concern of this study is not only, or even primarily, to derive results from a number of case studies that might be applied to other MoPTT units, but to describe the structure and operations of the MoPTT in its entirety. To that extent, the matter of using results from selected cases to apply to all cases is not appropriate, and to that extent too the question of whether the quantitative method is the right one does not arise. However, an approach that is at least partially quantitative in nature is appropriate, for the study deals with data which are largely quantifiable (though not only with such data). Patton (1990) writes:

> Quantitative methods . . . require the use of standardized measures
> so that the varying perspectives and experiences of people can be
> fit into a limited number of predetermined response categories to
> which numbers are assigned. (p. 13-14)

This somewhat dismissive description – Patton is not sympathetic to quantitative method – nevertheless does seem to sum up the quantitative method well.

2.1.2   Qualitative Method

Qualitative research is a basic strategy of social research that usually involves in-depth examination of a relatively small number of cases. Cases are examined intensively with techniques designed to facilitate the clarification of theoretical concepts and empirical categories. (Ragin, 1994, p. 190).

When seeking to gather information about attitudes, perceptions, and responses, the qualitative method is generally more suitable. Here the main interest is with a comprehension of the way in which people interpret, modify, and shape their surroundings. Qualitative research is concerned with how the world is interpreted, understood, experienced or produced.

Qualitative method may be said to seek insight rather than statistical analysis. The inherent danger of using qualitative techniques is that there might be a loss of rigour, with vague and subjective impressions masquerading as information collected through careful and well-designed research, the more so, perhaps, because the measuring tool of qualitative method is the researcher himself.

However, provided the researcher is aware than he is himself a variable in qualitative research, and that his own reactions might influence the attitude and reactions of respondents, then the qualitative approach can prove valuable. The qualitative method offers the opportunity to be adaptable, to react flexibly to the information provided by respondents, to pursue new lines of enquiry, to abandon those which, in any one instance, appear to be leading nowhere, to probe for further information, and to go into greater depth in any one case or on any one point.

In studying the attitudes and opinions of personnel at the MoPTT the qualitative method may seem initially to offer the best way to achieve useful and informative results, since this involves an evaluation of subjective perceptions, reactions, and judgments. In the present study the researcher has been able to spend time observing the MoPTT telecommunications arm in operation. He was able to devote considerable periods to

observing work sessions and to interviews and conversations with large numbers of managers and employees.

Greertz (1993) claims that, in order to understand the cultural system of an organisation, one has to be inside the system and involved in it. The researcher in this case found it a great advantage in achieving this aim during his fieldtrip, as his own native language is that used in the Saudi MoPTT.

It seemed clear, then, to the researcher that this research demanded neither a quantitative nor a qualitative approach to the exclusion of the other. Rather than decide in advance to opt exclusively for a qualitative or for a quantitative method, the researcher carried out his observations, gathered his information from various sources, and conducted his interviews and conversations according to the most viable approach. His research methodology may be said to have been in effect a combination, as appropriate, of the quantitative and the qualitative. The information he was seeking to elicit was both quantitative and qualitative in nature.

2.2 Data Collection: The Chosen Research Design

There are two broad categories of research design: case studies and surveys. These are not mutually exclusive categories, and case studies often involve, at least partially, the use of surveys.

2.2.1 Case Studies

In some ways the examination of the MoPTT may be seen as a case study of Saudisation. However, as we have noted above, it is an unusual case study if the MoPTT is viewed as a whole. Although case studies are usually individual instances selected, because of their particular suitability, from a larger number of possibilities and intended to test or to illustrate in a detailed way a hypothesis covering a larger group of similar examples, here we are using the MoPTT more as pathfinder, showing the sorts of issue that will arise in applying Saudisation to an IS in other public sectors.

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On the other hand, we have already noted that the MoPTT consists of a number of units with similar structures and operational parallels. This being so, it has been possible with care to discern recurring patters in the units observed which might legitimately be applied to all units within the Ministry. In that sense, each unit observed might be regarded as in itself tantamount to a case study.

2.2.2   Surveys

This study also made use of the survey type of research design. This is perhaps the commonest type of research design. A survey attempts to effect the collection of data or information from a population sample at a specific time, typically by questionnaire or interview (in the broadest sense). It is not a method where the researcher usually attempts to control or manipulate variables. The survey method is flexible, and surveys may be relatively simple or relatively complex, capable of presenting relational analysis.

A survey may require considerable planning, so that its scope may be affected by such factors as the finance and time available to the researcher. Whether the survey is large-scale and undertaken by some government bureau or small-scale and carried out by the lone researcher, the collection of information typically involves one or more of the following data-gathering techniques: structured or semi-structured interviews, self-completion or postal questionnaires, standardised tests of attainment or performance, and attitude scales.

The survey suggested itself as an appropriate research design for part of this study, being well suited to the needs, resources, and existing state of knowledge of the researcher. The survey encompasses two common data collection methods used by researchers in the social sciences: the questionnaire and the interview.

The questionnaire usually contains questions aimed at getting specific information on a number of topics. Questions may be of either the closed form, in which the question permits only certain responses (such as a multiple-choice question), or the open form, in which the subject makes any response he wishes in his own words. Which form will be used is determined by the objective of the particular question. Generally, though, quantification and analysis of the results may be carried out more efficiently if questions are exclusively of the closed type.

The use of questionnaires, however, carries with it some established difficulties. Chief amongst these is that it tends to produce a low response rate. It also can prove to have an inhibiting effect on respondents in some circumstances, as they may be reluctant to commit to paper opinions and attitudes which they would feel happier discussing verbally, even although they know that notes or recordings of interviews and conversations are being made and that their views will eventually find expression on paper.

The researcher carried out interviews with selected MoPTT personnel (on the question of sampling see below). Scholars vary in the terminology they apply, but there is wide agreement that research interviews may be divided into three main categories, and these categories are substantively the same, whatever names they are given. Borg (1981) names these three types as follows: the highly structured interview, the unstructured interview, and the semi-structured interview, and they will be briefly dealt with below. Patton (1990) calls these three types respectively the standardised open-ended interview, the informal conversational interview, and the general interview guide approach.

An interview is structured where typically each person is asked essentially the same questions in the same order. The questions are generally written out in advance in exactly the way they are to be put during the interview, and in effect they form of type of questionnaire. Probing may be permitted, but going off at a tangent or asking supplementary questions suggested by the subjects' responses does not take place. A highly structured interview will reduce interviewer effect, but it may suffer from its inflexibility and lack of spontaneity.

In an unstructured interview the researcher does not follow a detailed interview guide but rather knows the sort of information that he wishes to elicit and aims to obtain it in a general conversational way, making comments or asking questions in a spontaneous way from time to time to lead the interview in the direction he desires. Various types of interview or exchange may be classified as unstructured, from the casual encounter with someone who happens to be able to throw some light on an aspect of the researcher's area of concern to meeting with individuals or groups whose culture and outlook are so different from that of the investigator that he has no choice, at least initially, but to employ an unstructured approach (Kane, 1991).

Of the semi-structured interview Borg (1981) writes:

> Most interviews in educational research are semistructured. The interviewer follows a guide that covers all essential information needed by the researcher. However, he also has the option to follow up any answers in an effort to get more information or clarify the respondent's replies. (p. 88)

In interviews of the semi-structured type one of the underlying assumptions is that, while the ground to be covered may be firmly set in the interviewer's mind, it may be covered with any one particular respondent or group of respondents in a different order from that which is used with others, or if the respondent is allowed to go off at a tangent in supplying useful information before being guided back to the next question. In some instances of this type of interview it may be useful to outline the issues to be examined with the subject before the interview proper begins (Patton, 1990).

One disadvantage of this type of interview over a more structured approach is that, while responses obtained may cover a great deal of material and allow for group variation, they may not be so readily quantified or categorised, and they may not therefore be so susceptible to codified analysis, if that is the analysis method of choice.

Aware that some MoPTT personnel, whether senior or junior, might feel inhibited in the expression of their views if they were being made to fit into predetermined question-and-answer structure the researcher opted for an approach that was in general unstructured during his fieldtrip. Therefore, he decided to arrange interviews only with some top MoPTT managers and certain other individuals, and conversations and consultations with others, in order to gather information from them for his research purposes.

2.3 Sampling

In general terms, sampling is the selection of a number to be investigated from a total population in the belief that those selected are representative of the total and that what is discovered about the selected number will allow inferences to be made about the total (Cohen and Manion, 1994; Ragin, 1994). Sampling techniques are classified in different

ways (and sometimes given different names), but two main techniques can be identified. They are outlined below.

2.3.1 Probability Samples

This may be defined thus: a probability sample is 'a sample with each element or group of elements having an equal probability of being included' (Adams and Schvaneveldt, 1991, p. 179).

Probability sampling is subdivided into various types. Probability sampling includes simple random sampling, in which there are selected at random (such as by drawing from a hat) from the population the required number of subjects. Systematic sampling is a form of random sampling, but in this case, sometimes after the first sample has been selected randomly, then every nth unit, say every twentieth, is taken from the population as required. Stratified sampling is similar to systematic sampling, where the population is divided into parts or strata on the basis of certain characteristics, and as such requires that the researcher is already familiar with some characteristics of the population as a whole. Cluster sampling is often used when geographic, economic, or other considerations make it impossible to select on a simple random basis. First some elements, say locations, are selected randomly, and from within those clusters further selection is then made. If that further sampling is itself based on a second stage of random selection it is referred to as stage sampling.

2.3.2 Non-Probability Samples

This is sampling where it is not possible to state the probability of a given subject being included in the sample. In other words, the subjects are not selected randomly from within the relevant population.

Non-probability sampling comes in various types. Convenience sampling is perhaps the commonest type of sampling (Adams and Schvaneveldt, 1991), and it is simply gathering data from anyone who is convenient: friends, neighbours, classmates, or whatever. Quota sampling is the approach whereby the researcher is seeking to study a fixed number of subjects with certain characteristics, in the proportions in which they occur in the total

relevant population. Dimensional sampling is a particular type of quota sampling in which the investigator distinguishes various factors of concern in the population and attempts to obtain at least one respondent showing every combination of these factors. In purposive (sometimes called 'purposeful') sampling, the subjects to be sampled are selected on the basis of certain criteria which have been established, in the belief that they will be particularly suitable or informative.

In this study the researcher has opted for purposive sampling. From his own previous knowledge of the area, and from existing connections, individuals were identified and selected for interview and consultation who were likely to be of most value in providing the information he sought. Also, through personal contact with the Chairman of the MoPTT, the researcher was guided to individuals considered to be the most informative.

2.4 The Conduct of the Fieldtrip

In order to familiarise himself with both the old system and the changes that were underway, the researcher laid the preparations for his enquiry by studying, as we have noted in Section 1.2, the literature on areas relevant to his research, and by arranging to undertake a field trip to Saudi Arabia in order to consult with MoPTT personnel, both senior and junior, and other individuals.

In order to prepare as fully as possible for his fieldtrip research the researcher's supervisor, Professor John Dobson, arranged a meeting for him in August 1997 with Mr Adam Scott, a senior executive at British Telecom (BT) and a Professional Fellow in St Andrews Management Institute. Mr Scott's extensive experience of the privatisation of telecommunications in the UK and his personal knowledge of the telecommunications system in Saudi Arabia, gained while working in the country, proved extremely beneficial. He was able to provide information about, for example, the financial concerns which BT faced in the course of privatisation, and about the differences which resulted in BT's structure and design following privatisation. He was able to compare the experience of BT with that of the MoPTT during the privatisation process. In particular Mr Scott was able to indicate that some of the main areas of difference between BT and the MoPTT lay in the different cultural environments in which the respective privatisation processes took place. The information which Mr Scott was able to provide about the experience of

privatising the UK telecommunications sector and the advice that he was able to give about what to anticipate in Saudi Arabia was of great value to the researcher in the conduct of his investigation.

2.4.1 The Fieldtrip

The purpose of the fieldtrip to Saudi Arabia was to enable the researcher to collect all the data and information needed in order to complete his research. A close investigation to the current situation in the MoPTT was needed to gather the required data and information.

The fieldtrip started on 13 December 1998, at the main office of the STC in Riyadh, and ended on 15 March 1999. Professor John Dobson, the researcher's supervisor, decided to travel to Saudi Arabia in order to see for himself, as a senior person in this field, the exact situation in the MoPTT. Professor Dobson was present for five days at the beginning of the fieldtrip to guide, direct, and advise the researcher on collecting the data and information needed for the thesis.

The specific fact-finding techniques used on this fieldtrip offer an opportunity to go behind the scenes in an organisation – to learn the inside story – to discover how things actually work in a new area of information. Fact-finding techniques employed included interviews, consultations, observation, discussion with MoPTT staff, consultation of MoPTT documents, and inspection of documents produced by the MoPTT's consultants. All these techniques were employed to help ensure an accurate and comprehensive investigation for this thesis.

In the course of his fieldwork the researcher duly interviewed and consulted, as arranged, with executives and top managers of the MoPTT, and noted their responses.

In addition to interviews and consultations with executives and managers, the researcher's methods have included discussions and work sessions with MoPTT staff at levels other than that of manager. Observations, including work shadowing, conducted during the work sessions, as well as the discussions and informal conversations with all levels of MoPTT personnel, offered insight into the day-today operations of the Saudi telecommunications system of a kind that might not have been possible to gain from

senior staff alone. Observation helps in obtaining first hand information about how activities are carried out. This method was used to observe how documents were handled. how processes are carried out, and whether specified steps were actually followed.

The researcher's interviews, consultations and discussions were used to collect information and to discover areas of misunderstanding, unrealistic expectations. and even indications of resistance to the proposed system. The respondents were managers and employees who provided data for the new system and were affected by it. These respondents were chosen, with the help of initial personal contacts, for their knowledge of the system under study. As indicated in Section 2.2.2 above interviews were largely of the unstructured consultation type. The researcher was thus able to follow up informative lines of response without having to adhere to a rigid series of questions in a predetermined order, and to concentrate on the specific areas about which he wished to elicit information from each particular respondent.

The individuals amongst the management of the MoPTT with whom the researcher interviewed and consulted were identified for their knowledge and usefulness initially through personal contact with a senior executive of the MoPTT. Consultations with those persons were set up by the executive and these were confirmed by telephone by the researcher.

The interviews and consultations with managers took place for the most part in the offices of the individuals concerned. Aware of the disadvantages of tape recordings, which may inhibit free expression from some respondents, the researcher made no recordings of these particular interviews but took notes instead. As mentioned above. Professor John Dobson, the researcher's supervisor, was present during all the consultations with senior MoPTT staff.

In total 36 interviews and discussions using a mixture of interview approaches were conducted with Ministry and operational executives. This number included three Deputy Ministers, two Assistant Deputy Ministers, 27 General Managers and four Directors. A diagram indicating the identity and position of the main respondents is provided (see Table 2). After each discussion, the researcher and the respondents met to consolidate their notes into a single view of the consultation. No specific pattern of interview was used for each discussion. This was because the researcher's main concern was to

approach individuals with key knowledge, and there could be no certainty in advance how any one individual would respond to his questions. It was therefore of greater importance to seek fluidity of response and quality of information by whatever method seemed to be best at the actual time of the discussion. This would have been inhibited by deciding in advance that all interviews, for example, would be structured or would have closed questions. The type of approach which the researcher used may in fact be described as self-structured interviewing.

Table 2 indicates the ease with which the researcher was able to gather information in the various telecommunications areas about which he held discussions.

Fieldtrip Respondents	Outcomes
Minister of PTT, Dr. Ali Al-Johani	General information about the issue of privatising the telecommunications sector from the Saudi government point of view.
President of the STC, Engineer Abdulrahman Al-Yami	Advised me where to visit and whom to meet in the MoPTT, in order to answer the questions I asked him.
Vice President for Information Technology of the STC, Engineer Fahad Al-Fawaz	Useful meeting; the following issues were discussed: ● The system design of the STC ● The competitors of the STC ● The infrastructure network of the STC ● STC services and products ● The future of the STC.
Vice President for Administrative Affairs of the STC, Mr. Awaad Al-Assaf	This meeting was not useful.
Head of Strategic Department of the MoPTT, Engineer Abdulrazzag Abubakr	Not enough time, but the following issues were discussed: ● MoPTT polices goals, and strategies ● Services systems architecture of the MoPTT ● Future plans and developments.
General Manager of Computer Department of the MoPTT, Mr. Abdulrahman AlKassim	Explained the various usages of computers in the MoPTT.
Director of Information Technology Department of the MoPTT, Engineer Ali Al-Ghamdi	Very useful, repeated and important meetings. The following issues were discussed (from the MoPTT IS point of view): ● The story and changes of the MoPTT ● MoPTT objectives and business areas ● IS architecture and design in the MoPTT ● MoPTT managers and employees ● MoPTT customer services ● MoPTT processes of privatisation ● MoPTT scoping, resourcing and delivering agents.
IS Deployment Manager of Lucent Technologies in Saudi Arabia, Mr. Douglas Struthers	Explained the role that Lucent Technologies play for the MoPTT, and the STC program analysis.
Professor of Economics and a member of the STC board, Professor Khalid Al-Nahas	Very professional person, specially in the political view of privatising the Saudi telecommunications sector. I used to meet him frequently to take his opinion and advice for my thesis.
Assistant Professor of Management Information Systems in King Abdulaziz University, Dr. Khalid Al-Jomaih	My advisor, who I use to meet every week, to discuss the information I collected for my thesis. He used to correct me and put me on target. He was employed to be my supervisor by the sponsor of my scholarship (KAA University).
General Manager for Budget and Programs of the MoPTT, Mr. Abdullah Bajaba	In a brief meeting explained about the budget plan and programmes of the MoPTT.
General Manager for the International Account of the MoPTT, Mr. Khalid Balkhyour	Interesting, but not relevant.

Table 2. The principal fieldtrip respondents

Suitable persons to contact amongst more junior MoPTT staff were identified by Mr Al-Ghamdi, Director of Information Systems in the MoPTT, and they were approached by the researcher along with Mr Al-Ghamdi. Some of the discussions with those individuals were tape recorded, but for the most part the researcher made notes.

Contact with Lucent Technologies (Previously AT&T) management was also made through the assistance of Mr Al-Ghamdi. Consultations with Lucent personnel were for the most part tape recorded, though the researcher also made some notes.

Professor Dobson was not present during the conversations with MoPTT junior staff or Lucent staff.

With the exception of Lucent staff, the interviews, consultations and discussions took place in Arabic, and the researcher's notes and transcriptions of tape recordings were later translated into English by himself.

The researcher was directed to MoPTT documents and written records by several of the MoPTT managers with whom he spoke, and Lucent also provided some informative documents.

Information relevant to the research was gleaned from these documents produced by the MoPTT and by Lucent and other consultants. Each of these documents has been reviewed to identify executive strategies and significant business perspectives. MoPTT (STC) documents were studied to help in understanding the system, the organisation, and its operations. Records and documents consulted included written policy material, manuals, regulations, and standard operating procedures produced by the organisation as a guide for managers and employees.

The experts from Lucent Technologies had broad experience in telephone company operations and were able to offer insights into trends and strategies in the world of telecommunications. They provided information about procedures, methods, information needs, and customer service operations. They were able to build models of processes that make up a modern phone company and the researcher was able to apply their knowledge of current trends to the development of this thesis.

2.5 Data Analysis

The documents utilised and the information supplied by experts in the field were used as sources for the understanding and analysis of significant relationships and processes, and for various suggestions and proposals eventually made by the researcher.

The information and opinions which the researcher was able to glean from these respondents have informed the descriptions of the structure, processes, and systems in operation at the MoPTT which the researcher has provided. They have also enabled him to offer constructive suggestions and proposals as to the direction that the STC needs to take.

Using a variety of tools, including CASE and SWOT techniques, the researcher analysed and, where appropriate, quantified the data he unearthed in the course of his fieldwork and other research. In particular use has been made in this study of structured analysis as identified and described in the CASE tools literature. Structured techniques in general emphasise diagrammatic and schematic designs. Just as a photograph or blueprint of a building is infinitely more expressive than a written description, a structured diagram is a more easily understood mechanism for partitioning complex problems. The various analyses have been presented in the form of tables, diagrams, and flow-charts in Chapter 5, 6, and 7.

The researcher followed a top-down design (hierarchal approach) in his graphical representation of the structures and operations of the MoPTT.

The combination of interviews, consultations and discussions with MoPTT staff, observation, document study, and discussions with experts produced a wealth of details on processing cycles, operating statistics, and volume of transactions.

Following his fieldwork, his investigation of documents, and his interviews and consultations with experts, the information was collated by the researcher and was used to create the MoPTT Strategy Models, which are representations of business factors such as the MoPTT goals, objectives, critical success factors, and so on. Details of these processes are given in Chapter 8.

As a result of the information gathered from his various sources and of the observations made by the researcher, he has been able to provide a methodical and systematic account of the entire organisation and operational structure of the MoPTT's telecommunications system. This account has been comprehensive, and covers the MoPTT system from a number of points of view, laid out as appropriate in Chapter 9.

Chapter Three

REQUIREMENTS

3.1 The Meaning of Requirement

It is clear from the literature on the subject that the concept of requirement, although apparently a simple notion, seems to be problematic. The term 'requirement' is not used throughout the software industry in a consistent way. In some cases, a requirement is seen as a high-level, abstract statement of a service that the system should provide or a constraint on the system. At the other extreme, it is a detailed, mathematically formal definition of a system function.

How elusive a satisfactory understanding of the concept can be is illustrated when an attempt is made, as it generally is, to draw a distinction between functional requirements and NFRs.

Robertson and Robertson (1999) provide a definition of a requirement thus: 'A requirement is something that the product must do or a quality that the product must have.' (p. 5). They also define functional requirements in this way:

> The functional requirements specify what the product must do.
>
> They relate to the actions that the product must carry out in order
>
> to satisfy the fundamental reasons for it existence. (p. 104)

And they define NFRs as follows: 'Non-functional requirements are the properties, or qualities, that the product must have.' (p. 5)

Kotonya and Sommerville (1998) define a requirement as 'a statement of a system service or constraint' (p. 6). They state that requirements are descriptions of how a system should behave, of application domain information, of constraints on the system's operation, or specifications of a system property or attribute.

Kotonya and Sommerville (1998) do not in fact provide a definition of a functional requirement, though they do offer a definition of an NFR. It is, however. so tautological as to be uninformative: 'Non-functional requirements are requirements which are not specifically concerned with the functionality of a system.' (p. 187) Their contribution is more helpful when they give describe NFRs and give examples of the kind of area they cover:

> [Non-functional requirements] place restrictions on the product being developed and the development process. and they specify external constraints that the product must meet. Non-functional requirements include safety, security, usability, reliability and performance requirements. (p. 187)

Elsewhere Sommerville (1992) offers a definition of an NFR:

> A non-functional requirement is a restriction or constraint placed on a system service. It may arise because of user needs. because of budget constraints, because of organisational policies. because of the need for interoperability with other software or hardware systems or because of external factors such as safety regulations. privacy legislation, and so on. (p. 92)

This is an odd attempt at a definition. Sommerville first gives a common, even banal, statement of what a requirement of any type, not just an NFR, must be. Then he states a number of contingent, but hardly defining, facts about how restrictions may arise. As an attempt at a definition it must be said, at the very least, to lack rigour. An objector might say, after all, that budget constraints give rise to functional restrictions too (for example cost-cutting at the design or installations stage may mean technical malfunction).

3.2 The Place of Requirements

Although the literature on requirements has dealt largely with IT systems themselves. the insights it accords can be applied to any system which relies on IT to make it work. When we consider requirements, then we shall have in mind the telecommunications system being developed by the MoPTT in Saudi Arabia. as this has at its core a computer-based

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system. It has to serve end-users, stakeholders, and clients, and it has to provide a service which is not only technically capable of the demands made upon it but also viable within the environment in which telephone communication in the country takes place. In other words, it has to deliver both functional requirements and non-functional requirements.

Requirements engineering lies at the very heart of any system. Problems relating to requirements can result in the late delivery of systems and requests for changes after the system goes into operation. In recent decades many users have found themselves with systems which do not really deliver the service which the users want. This need for revision and replacement is at considerable cost to all parties involved. It is therefore vital at an early stage in system design to establish what the requirements are and to write specifications for them, or at least to elicit as far as possible the areas in which requirements will apply (perhaps more realistic for some types of NFRs). Requirements engineering is the activity of discovering, analysing, and documenting these requirements.

This much may be commonly agreed, but in practice difficulties arise. One such difficulty is the question of the level of detail that may be required in the production of specifications. As far as functional requirements are concerned this may not be too problematic. The reason for this is that, no matter what disagreement there may be amongst writers about where the precise line occurs between functional requirements and non-functional requirements, at least technical matters must surely be considered to be functional. There is no reason why specifications for technical requirements should not be very detailed. They will be needed by technical experts and skilled personnel of various types who will be concerned with correcting faults and understanding how a system works in a way that an end-user or customer does not necessarily need to know. As far as functional requirements are concerned, then, specifications may take the form of a detailed technical manual.

NFRs may be a different matter. A customer may find a product or a service unusable, perhaps because it is too slow or because it does not have the security qualities he seeks. Since the customer, certainly in the case of a telecommunications system, is unlikely to be a technical expert he is likely to frame any complaint or comment he might have in natural language. As far as NFRs are concerned specification detail may be better dictated by such natural language. Again, borderline functional/non-functional requirements may

need a considerable degree of detail in specification, but what kind of detail would be appropriate in the case of, say, cultural requirements (which are certainly non-functional)?

Sommerville (2001) sets out what he considers appropriate amounts of specification documentation detail in different cases:

> Some of the problems that arise during the requirements engineering process are a result of failing to make a clear separation between these different levels of description. I make this separation by using the term *user requirements* to mean the high-level abstract requirements and *system requirements* to mean the detailed description of what the system should do. As well as these two levels of detail, a more detailed description (a software design specification) may be produced to bridge the requirements engineering and design activities. User requirements. system requirements and software design specification may be defined as follows:
>
> 1. *User requirements* are statements, in a natural language plus diagrams, of what services the system is expected to provide and the constraints under which it must operate.
>
> 2. *System requirements* set out the system services and constraints in detail. The system requirements document, which is sometimes called a functional specification, should be precise. It may serve as a contract between the system buyer and software developer.
>
> 3. *A software design specification* is an abstract description of the software design which is a basis for more detailed design and implementation. This specification adds further detail to the system requirements specification.
>
> Different levels of system specification are useful because they communicate information about the system to different types of reader. A user requirement may be expanded into several system requirements. (p. 98)

Kotonya and Sommerville (1998) provide an example of how the degree of detail that specification documentation demands may vary, and also illustrate how difficult it may be in practice to distinguish between functional requirements and non-functional requirements. They write:

> Whether or not a requirement is expressed as a functional or a non-functional requirement may depend on the level of detail to be included in the requirements document or the degree of trust which exists between a customer and a system developer. To illustrate this, consider a requirement for system security: the system shall ensure that data is protected from unauthorised access.
>
> Conventionally, this would be considered as a non-functional requirement because it does not specify system functionality which must be provided. However, it could have been specified in slightly more detail as follows: the system shall include a user authorisation procedure in which users must identify themselves using a login name and a password. Only users who are authorised in this way may access the system data.
>
> In this form, the requirement looks rather more like a functional requirement as it specifies a function (user login) which must be incorporated in the system. In fact, this illustrates a very common situation where an abstract non-functional requirement is decomposed into more detailed functional sub-system requirements. (p. 188)

This passage illustrates not only that the level of detail in requirement specification may vary as appropriate, but also fuels the suspicion that the only substantive distinction between types of requirement that can stand close examination is that between technical and non-technical requirements.

Whatever the relationship between functional requirements and non-functional requirements and wherever the line between them should be drawn, however, writers do agree that the distinction between the two types is a useful working distinction. It is our

task to apply the concepts to the Saudi telecommunications system of the MoPTT and to arrive at an understanding of how requirements may be identified and specified in relation to this system.

System requirements are generally set out in a formal document for the use of customers and other end-users, for managers, for engineers, for technicians, for maintenance staff, and so on. Documentation typically describes the services and functions that the system should offer, the constraints under which it has to operate, its overall properties, definitions of other systems with which the system in question has to integrate, information about the application domain of the system, and constraints on the process used to develop the system (Kotonya and Sommerville, 1998).

Requirement documentation, however, does not come in a standardised form: indeed there is not even a commonly used title for the specification document. For preference requirement specification should be written in natural language (though a certain amount of technical language cannot be avoided). This would especially be so in the case of many NFRs, when the persons consulting the documentation are less likely to have technical know-how or be familiar with technical jargon.

3.3 Functional Requirements

As far as functional requirements are concerned matters are relatively straightforward. We have already seen that considerable detail may be appropriate in specification documentation for functional requirements. Specification of functional requirements may assume that most readers of these specifications will have technical experience or training which will enable them to understand technical language, where used, and act upon previous knowledge in, for example, maintenance or design activity.

Since considerable detail and a certain amount of technical language may be regarded as appropriate for functional requirements, we shall not attempt at present any list of such requirements, or even a list of the main areas they cover. A full list of functional requirements would in effect be a full technical manual and, depending on the complexities of the system, might run to several hundred pages. For more details about the functionality of the MoPTT telecommunications system, see Chapter 5.

3.4 Non-Functional Requirements

As far as the Saudi telecommunications system is concerned NFRs, though maybe fewer in number (however they are listed) than functional requirements, are of greater interest to us. The acknowledged difficulty of stating the exact boundary between functional and non-functional requirements and the fact that a requirement which may originally be stated as an NFR may be reformulated as a functional requirement should not deter us from an examination of NFRs.

NFRs, as we have seen, have been thought of as the properties or qualities that a system needs to have (Robertson and Robertson, 1999). They have also been characterised as placing constraints or restrictions on a system. This, however, can mean that they take on very considerable significance. Kotonya and Sommerville (1998) write of NFRs:

> Because they are restrictions or constraints on system services, non-functional requirements are often of critical importance, and functional requirements may need to be sacrificed to meet these non-functional constraints. (p. 187)

And Sommerville (2001) writes:

> Many non-functional requirements relate to the system as a whole rather than to individual system features. This means that they are often more critical than individual functional requirements. While failure to meet an individual functional requirement may degrade the system, failure to meet a non-functional system requirement may make the whole system unusable. (p. 101)

In a country like Saudi Arabia, where many of the features, especially cultural features, of the environment in which the MoPTT's telecommunications system has to operate are different from those in which the technical aspects of the underlying computer-based system were first developed, NFRs need to be given special attention, and it is therefore important to identify the areas in which they operate.

As with functional requirements, no exhaustive list of NFRs will be attempted, but the spheres within which they may be found to apply are worth eliciting.

The literature offers several lists of areas in which NFRs apply. These lists do not always agree, a further demonstration of the fact that the line between functional requirements and non-functional requirements is hard to draw. One list of NFRs is that provided by Kotonya and Sommerville (1998), following the IEEE-Std 830 – 1993:

1. Performance requirements
2. Interface requirements
3. Operational requirements
4. Resource requirements
5. Verification requirements
6. Acceptance requirements
7. Documentation requirements
8. Security requirements
9. Portability requirements
10. Quality requirements
11. Reliability requirements
12. Maintainability requirements
13. Safety requirements (p. 189).

Although this may represent a common understanding of NFRs within the software systems industry, it is difficult not to be suspicious of this list, particularly since it is more of a classification than a catalogue of examples. It seems initially implausible to classify, for instance, reliability requirements or maintainability requirements as NFRs, since they would appear on the face of it to be functional aspects. Indeed an examination of this list would suggest that since questions or concerns about performance requirements or interface requirements, to take two examples, would be addressed to system engineers or designers, they would be more likely candidates for a list of functional requirements. Concerns about acceptance requirements or quality requirements, on the other hand, would be referred to an evaluator or assessor, such as a customer relations employee, and therefore would seem to be NFRs.

For the purposes of the Saudi telecommunications system a more promising approach is perhaps that of Robertson and Robertson (1999), who list NFRs areas thus:

- Look and Feel Requirements — the spirit of the product's appearance.

- Usability Requirements — the product's ease of use, and any special usability considerations.

- Performance Requirements — how fast, how safe, how many, how accurate the functionality must be.

- Operational Requirements — the operating environment of the product, and what considerations must be made for this environment.

- Maintainability and Portability Requirements — expected changes, and the time allowed to make them.

- Security Requirements — the security and confidentiality of the product.

- Cultural and Political Requirements — special requirements that come about because of the people involved in the product's development and operation.

- Legal Requirements — what laws and standards apply to the product (p. 115).

One striking feature about this is how little it resembles the list cited by Kotonya and Sommerville. It is this list that we will use, at least at a preliminary stage, as a working list to identify and analyse NFRs. The reasons for this are that it simply has greater viability, on two basic grounds. One is that it is more straightforwardly plausible. It identifies concerns and constraints that are not technical and, in comparison with the list of Kotonya and Sommerville, appears to have no areas which strike the reader as reducible to functional requirements. The other ground is that Robertson and Robertson expand on what they intend to cover by the categories they identify, thus providing fuller descriptions of what they mean by NFRs. When these added descriptions are studied it is clear, again, that the requirements involved are of a non-technical nature and thus, wherever the precise line between the two types of requirement is drawn, are prime candidates for consideration as NFRs.

Individual requirements listed under the headings of Robertson and Robertson would depend, of course, on the system or product concerned. One heading which might be of special interest in the context of the MoPTT's telecommunications system would be that of cultural and political requirements, because of its particular significance for the successful operation of the system. We shall therefore return to this category more fully later in this chapter. We might also note at this stage that the categories of Robertson and Robertson, though more useful than those of Kotonya and Sommerville, are not in every

respect suitable, without moderation, for a description of the Saudi telecommunications environment (see Section 3.4.1.8).

3.4.1   Examples of Non-Functional Requirements

Using the categories of NFRs identified by Robertson and Robertson (1999). listed above, we can produce examples of such requirements from the Saudi telecommunications system as controlled by the MoPTT.

The NFRs of a product or service can be discovered in a number of ways. In the case of some products or services the areas where NFRs will apply may be so obvious that they will be clear to those who have to write specifications, but in other cases it may be helpful to adopt a specific technique in order to uncover NFRs. Robertson and Robertson (1999) suggest that one way to do this is to look at the functional requirements, and they propose that any personnel involved in establishing NFRs should keep a checklist of NFRs – using their categories – when consulting with users.

This is, at least in part, a recognition that NFRs are often expressed in natural language and will commonly be identified through interaction with stakeholders, users, and customers. In the case of the Saudi telecommunications system, which is intended to provide a service, this is particularly applicable. Robertson and Robertson (1999) write:

> The client for the product may also have expectations that are relevant here. In many cases, the reason for building a new product is to provide a service to users, or the customers of the business, and that service is dependent on one or more of the non-functional requirements. For example, providing portable, or highly usable, or secure functionality may be crucial to the development effort. . . . Thus your client becomes the prime source of the critical non-functional requirements. (p. 133)

As far as users such as the staff of the MoPTT are concerned any prototypes which might be produced of the systems or procedures may help to identify NFRs. Prototypes offer the users opportunities to try out the functions of a product, service, or system and to provide

feedback about its functionality. This can help to clarify NFRs in categories such as usability, look and feel, security, etc.

It may also be helpful to establish a process by which various sources may be examined in the expectation that they may bring to light a particular type of NFR, provided it is realised that the sources concerned are by no means rigid or mutually exclusive classes. Thus in the case of the Saudi telecommunications system we might look at the users for NFRs in the categories of look and feel, usability, security, and cultural/political concerns. The client or customer – so long as we recognise that these may not always be differentiated from the users – may reveal NFRs in the cultural/ political category. The operating environment of the system may be expected to bring to light NFRs in the operational, performance, and maintenance categories. Operational and performance requirements may also be disclosed by looking at any other systems with which the telecommunications system has to interact, as may be legal NFRs.

It should also be noted that, in terms of areas of the MoPTT where the practical fulfilment (or indeed non-fulfilment) of non-functional requirements is an issue, there is some shading between, or indeed combination of categories, to be expected. For example, a failure to have comprehensive standards in place in relation to IS may from an objective standpoint be a quality control issue, but in terms of NFR categories a system engineer might see it as a maintenance matter, while the MoPTT as a whole will see it as a usability problem.

3.4.1.1   Cultural and Political Non-Functional Requirements

From the point of view of this study, this is the most important category, and also in general the one that current development methodologies least understand how to deal with.

Cultural and political requirements in a context such as that of the Saudi telecommunications system will include, as an example, the need to have employees with the skills needed to run a modern telecommunications service.

They will also cover such areas as will be specific to the Saudi social and cultural environment. This category of NFR is particularly interesting in that it illustrates the fluctuating nature of some requirements. Thus we describe in some detail later in this

chapter the example of the NFRs related to the use of the Internet in Saudi Arabia. This example illustrates how an NFR can change until it becomes in reality a quite different requirement, in some ways so different from what it was before that it is in effect inconsistent with its original form.

Examples of political requirements will include the need to have an appropriate customer service, which is not something has traditionally enjoyed a high profile in the MoPTT. This lack of concern, which has been exacerbated by a shortage of funding, has meant, for example, that a large percentage of potential customers wait a long time before they are able to obtain telephone services. If the telecommunications market becomes more competitive in the future, Saudi Telecom would be in a poor competitive position due to its lack of customer focus and the dissatisfaction of the Kingdom's people with the level of service which they know has been provided in the past.

3.4.1.2 Look and Feel Requirements

Look and feel depends on having a thing that is looked at and felt. The experience of picking up a telephone handset and finding that there is actually a line waiting there to be used – the actual physical sensation of handling the telephone and hearing the dialling signal – is an example of a look and feel requirement.

3.4.1.3 Usability Requirements

Usability requirements are another form of NFR. Deficiencies in the infrastructure of the MoPTT illustrate the importance of this type of requirement. The MoPTT suffers from having no internal communications infrastructure, no internal e-mail systems, no newsgroups or bulletin boards, and no way to share information electronically (other than by the manual distribution of disks). Ideally, then, it would be advantageous to introduce some kind of electronic communication means, at least within departments or between users who carry out similar functions throughout the country. The need to do this would be an example of an NFR within the usability category.

Usability in a general way has indeed been identified as a matter of the greatest concern to stakeholders (in the widest sense) of the Saudi telecommunications system. Users and IT staff were questioned by the researcher about whether applications were 'usable as is', 'usable with modifications', or 'needs replacement'. Further details about this can be

found in Section 7.3.3 and Appendix D, but it is clear that a certain degree of dissatisfaction about usability and a need to focus on requirements in this category have been identified.

3.4.1.4 Security Requirements

Security is another category within which NFRs may be identified. Within the MoPTT the two most critical security features for applications and data are access control (ensuring that only authorised users can access applications and data, and generate business transactions) and auditing (ensuring that a track can be kept of which applications and data have been accessed and by whom, and of who provided which data).

As far as access control is concerned, the MoPTT has comprehensive control for the great majority of applications and data managed by the Riyadh Data Centre. The security mechanisms used allow for inspection to find out which users accessed a given application (although not specifically which data was altered).

The Riyadh Data centre uses for the most part RACF (Resource Access Control Facility) and internal application security to protect applications and other resources in the mainframe environment. NDM (Network Data Mover) security is used each time a PC system accesses mainframe data. In some cases, a combination of two or more mechanisms may be used.

There are varied levels of security. Some applications may have just one level of users, while others will have several groups, for example users with restricted access to read data only, users who can modify existing data, users who can delete data, and so on. Approximately half of the MoPTT's applications have only one security level, with the rest having two or more levels. Appendix D gives a detailed account of the security mechanisms that apply to the applications. Our concern here is to exemplify NFRs within the security category as they may be identified in the context of the Saudi telecommunications system. It might be noted that, as has been stated of NFRs, they are associated with functional or technical requirements, such as the requirement to provide passwords or other safe logon procedures.

3.4.1.5 Performance Requirements

NFRs categories also include performance requirements. Specifications for performance requirements are written when there is a need, for example. for a system to perform some tasks in a given amount of time. In the current MoPTT system information from data collections is only available in large batch reports. It can be very time-consuming to look manually through those reports to find the specific information sought. This lack of automated systems mean that jobs are not being performed in good time. Clearly. an NFR is not being met.

It appears not to be clear to the MoPTT management how important this is for the work of the organisation overall. The fact that they use manual systems in any one unit may strike the staff in that unit as inconvenient for them. But there ought also to be an appreciation that an inability to meet a performance requirement in this way also impacts on the operation of their colleagues in other departments, and thus on the whole MoPTT (see Section 6.2.2).

3.4.1.6 Operational Requirements

A further category of NFR which has been identified is that of operational requirements. These typically describe the environment in which a product or system is to be utilised. In the case of the Saudi telecommunications system we can give as an example the environment of the current data collections. This environment consists of systems specifications developed largely by clerical methods. These methods follow a structured approach and at the time they were introduced into the MoPTT were considered to be very advanced. However, in recent years new techniques like information engineering have become fairly standard in the industry. so that the older methods are clearly now somewhat dated. The operational environment of the MoPTT system is now seen as vary labour intensive, with the development of new programs or the modifications of existing programs needing significant staff resources to implement what may appear to be a small change in business practice or retrieval of data. The present environment also needs highly skilled staff to integrate data collections properly. All MoPTT Divisions depend on the Computer Systems Division to make systems changes, and the competition for scarce development resources means some important requirements are not satisfied. Because the

staff skill requirements are so demanding, it is difficult to recruit staff of the right quality, and training time and costs are high.

All of this means that data between functional areas at the MoPTT is currently not well integrated by the most recent standards. There is thus an NFR within the operational category to utilise the newest techniques of information engineering so that the operating environment demands are met.

3.4.1.7 Maintenance and Portability Requirements

Maintenance and portability form another category of NFR identified by Robertson and Robertson. In the context of the MoPTT system long development and maintenance cycles occur, and although there has been instituted a development methodology designed to reduce errors, this is done at the expense of speed of development. Through the researcher's interview and consultation with managers of the MoPTT and important users, suggestions to accelerate the development and implementation time of the computer system requests (CSRs) have been identified. The long development effort and the number of outstanding CSRs is also complicated by the insufficient number of experienced distribution point staff in both development and maintenance environments.

There is therefore an NFR that the staff and the structures should be in place within the Saudi telecommunications system to anticipate changes and to carry them through in good time. The current development environment at the MoPTT fails, in many cases, to offer the users a shared data environment and information access tools. If this requirement were fulfilled it would reduce the time required for development and maintenance activity. In addition, the databases could be re-used by many applications and this would obviate the need to redevelop them for different applications.

The fact that such a requirement also shades into the category of operational requirements is an indication that Robertson and Robertson's categories need not be exclusive. NFRs may be identified that cross the boundaries of the nominated categories; they are nevertheless real requirements which affect the quality of the service offered by the MoPTT telecommunications system.

3.4.1.8   Legal Requirements

Standards, in the sense of regulations relating to quality, maintenance, planning, safety, and so on are clearly NFRs. Such requirements within the MoPTT would relate to, for example, standards in respect of quality control. For example, if quality management systems within the MoPTT were more fully developed than they are, the organisation might find itself committed to the international quality standard ISO 9000. Under such circumstances, it would be a legal requirement to carry out audits at specific times, to ensure that user manuals were up to date, to make certain that proper was training was given, and so on. This would all be to the advantage of the Ministry as a telecommunications service supplier, but it would impose upon it certain constraints and restrictions which are not at present met.

Legal requirements, however, form a strange category in a Saudi environment. We have already noted in Section 1.4.3 that Saudi law is based on Islamic law, and that there is no fundamental distinction between the law of the land and religious law. A distinction between legal NFRs and cultural/political NFRs is therefore to an extent artificial in a Saudi context. Indeed the very categories identified by Robertson and Robertson (1999), in separating cultural/political NFRs from legal NFRs, might themselves be regarded as an example of the imposition of western conceptual categories on a situation where they are not fully applicable. An analyst approaching the question from an entirely Saudi standpoint might feel it useful to modify these classifications. Such a modification would be an example of the new understanding of Saudisation developed by the researcher (see especially Section 4.3).

3.5   Summary

This chapter investigates in detail the question of requirements in relation to the telecommunications industry in Saudi Arabia.

The term 'requirement' as used in the software industry is examined, and an understanding is reached of how a useful working distinction might be made between the two main types of requirement identified: functional requirements and non-functional requirements. Functional requirements are related to the capability of a product, service,

or system to do what it is supposed to do in terms of technical capacity and function. NFRs are related to the qualities of a product, service, or system.

The place of requirements in a system is discussed, as is the role and nature of specifications written to set them out. It is clear that functional requirements will need to be written in detail and most probably in manual form. Specifications for NFRs are, like NFRs themselves, not so easy to characterise.

Particular interest in focussed on NFRs and the way in which they might be categorised. After discussion of alternatives, the categories of Robertson and Robertson have been adopted as a working classification of NFRs. The chapter provides examples of NFRs in the various categories adopted, and means by which NFRs may be identified are discussed.

The most significant type of NFR in the Saudi situation has been identified as the class of cultural and political requirements, specific to the Saudi environment. This is the area which is most at variance with the western world, and which the identification approaches of western thought may find hardest to categorise. Because of the nature of Islamic law and culture, it is also difficult to distinguish clearly between cultural/political requirements and legal requirements in a Saudi context.

Chapter Four

The Particular Importance of Cultural and Political Requirements – the Case of Internet Use

4.1 Identifying Cultural and Political Requirements

We have already seen that any list or catalogue of NFRs will have components that commonly arise from various sources. In broad terms, three such sources might be identified. These are: stakeholders (in the case of the Saudi telecommunications system these might, for example, be the members of the Board of the MoPTT: in the very widest sense they would also include users and customers); from simple relationship models produced by designers etc.; and from change. Change may mean change in people, in operating environment, or in cultural and political factors, or a combination of these. Requirements associated with cultural and political factors are worth close analysis, since they are often elusive and hard to identify. In some contexts, however, they can be very powerful in determining how products, services, and systems fare. It is our contention that this is especially so within Saudi cultural and political parameters, and indeed that this is an area in which future research on NFRs may prove fruitful.

Robertson and Robertson (1999) have this to say about requirements in this category:

> Discovering cultural requirements is difficult because they are often unexpected and at first glance sometimes appear to be irrational because they are outside your own culture. If your reaction is 'Why on earth do they do it like that?' then it is an indicator that you have discovered a cultural requirement. Another technique you can use is to consider each requirement and ask yourself 'Is there anything about this requirement that is here purely because of my own culture?' We find that the best way to find cultural requirements is to have the help of someone from that culture. (p. 130)

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Though this passage is somewhat confused (for it to make sense the reader has to come across two different requirements, one of which initially puzzles him and the other of which does not; yet it is written as though it refers to one and the same requirement). but the last sentence may be worth noting in a Saudi context. In a telecommunications context if, for instance, the choice of where to site cabling and other technical features means that a landline telephone handset can only be located in a Saudi home in an area where the traditional culturally determined privacy requirements of the household are compromised. then this would be a case of failure to meet an NFR. It would have nothing to do with the technical capacity or functionality of the system, but rather with failure to appreciate the non-technical (non-functional) limits under which a system must operate. The fact that technical personnel might be involved in solving the problem posed by the failure to meet a requirement (resiting the cabling, socket, etc.) does not mean that the problem is itself primarily a functional one. The system is not malfunctioning in technical terms: it is failing in socio-cultural terms. Further, it is a requirement that can only be 'discovered' or elicited by someone familiar with Saudi culture.

A further example of an NFR which might seem irrational, or at least puzzling. to someone unfamiliar with Saudi culture would be the need to set up a customer service system which takes into consideration the fact that there are in Saudi Arabia cultural constraints on female customers personally taking up contested bills with a telecommunications provider.

4.2 The Internet

One constraint under which the Saudi telecommunications system must at present operate is closely related to change. It is a particularly interesting example of a requirement from the cultural/political category, in that it illustrates how complex identifying and describing NFRs can be, and yet how crucial they can be for the successful operation of a system. We shall therefore analyse it, with an account of the background to it, in some detail. It is the fact that Internet access is restricted in Saudi Arabia. To explain how the use of the Internet in the country has given rise to an NFR it is helpful to give an outline of the position of the Internet in the Kingdom.

Limited Internet access in Saudi Arabia not a functional requirement, since the telecommunications system is not required to be deficient in a technical way or any other way so that it <u>cannot</u> meet Internet demand. But it is a limitation upon users of the system. Fewer than one in 1,000 Saudis has access to the Internet, and then generally for official purposes only, and the private sector must connect to the Internet outside the Kingdom via a long distance telephone call. The parameters of Internet use within the country are still being debated.

Although the situation has seen considerable change in just three years, as recently as 1999 Burkhart was able to write:

> Saudi Arabia has been something of an enigma when it comes to Internet diffusion. The Kingdom has had an Internet connection for several years, although public access has not been allowed. The Kingdom also sponsors many Web pages, both commercial and government, but these Web sites have all been established outside of the country, mostly in Bahrain or the United Kingdom. While the GulfNet regional network has been operational for more than ten years, and LANs are in wide use, there is little in the way of inter-network connectivity, and little awareness of the potential uses of wide-area networking.

As recently as the time when Burkhart wrote the Internet in Saudi Arabia was basically confined to one city, the capital Riyadh. This meant that the exchange of information between Riyadh and other centres was subject to significant delay, and in fact it may be seen as an intentional control on the passage of information and on other material available on the Internet on the part of the authorities, who were concerned about the effect of open Internet access on, amongst other things, Saudi cultural traditions. Until the late nineteen-nineties the Internet in Saudi Arabia could best be characterised as experimental, although some commercial organisations had developed considerable expertise in designing and implementing IP-based networks and Web pages.

The principal user of the Saudi Arabian Internet was for a long time a section of the academic community. Some government agencies were involved with decision-making regarding the Internet, but there is no evidence that government employees actually used the service. The largest companies used the Internet through off-shore connections, but

most Saudi companies did not use this technology until the last two or three years. Along with the academic community, the health sector was an early proponent and adopter of the Internet and facilitated the first international Internet connection.

For a variety of reasons, including social and internal security factors. the Saudi authorities were concerned in case they should lose control over internal and external communications and sources of information for the people of the country. Specific concerns included the availability of pornographic material, instructions on how to commit suicide, anti-government propaganda, and weapons construction information on the Internet, and the potential for proselytisation of Saudi Muslims by foreign religions via the Net and e-mail. These concerns were articulated by a commission set up in 1994 to consider the benefits and potential problems of public Internet access. The commission comprised 18 officials from ten government departments, including the Ministries of Defence and Foreign Affairs, KACST (King Abdulaziz City for Science and Technology), and King Saud University (KSU), and was chaired by Dr. Saleh Abdulrahman al-Athel, the President of KACST. Each organisation represented formed its own internal committee to examine Internet-related issues. Additionally, the commission established issue-specific working groups and awarded contracts for studies.

In early 1997, this commission made its final recommendation to the Council of Ministers, namely that public access to the Internet should be allowed via a firewall to be maintained by KACST to reduce the potential for Saudis to access inappropriate information. This use of a technical device, a firewall, to control Internet access is a concrete example of an NFR of the Saudi telecommunications system being 'decomposed', as Kotonya and Sommerville (1998) put it, into a functional requirement. Though there was a recognition of the potential benefits of Internet access, there was also a perception that the potential benefits were not worth allowing harm to come to either the government or the populace. There was, though, a belief that the risks could be mitigated through technical means. Despite advances in the situation vis-à-vis Internet use since 1997, the effective implementation of a firewall and other control systems remains in place in Saudi Arabia.

The concerns reflected in the limited access to the Net in Saudi Arabia and the establishment and report of the commission investigating internet use delayed the approval of Internet use in Saudi Arabia, probably by at least two years, and is similar to

the concern that first held up the introduction of mobile telephones in the Kingdom (Burkhart, 1999).

In addition to cultural and security concerns, the diffusion of the Internet was held back to some extent by the typical Saudi way of doing business, a cultural factor that affects the operations of both the public and private sectors. Centralisation around a single leader is a feature of traditional Saudi leadership practices that has carried over into modern corporations and the government. A key feature of this is the concentration of strategic information at the top of an organisation.

Although, as has been remarked, the position has now changed and continues to change in relation to Internet use in Saudi Arabia (see below), we may see in the factors which have inhibited Internet use an example of a culturally, politically, and socially grounded NFR. The dictates of government policy and cultural norms meant that a constraint was placed upon the use of the national telecommunications system.

This NFR was also worked out, in practice, in terms of technical or functional requirements, since it was through technical limitations that the NFR was, to some extent, implemented. The connective infrastructure which was in place at the time was not able to establish or to sustain Internet use throughout the entire country. There existed no ISP (Internet Service Provider) backbone, the single international link was slow, the Kingdom had no Internet exchanges, there was no dial-up or leased-line access, and indeed no access other than via LANs connected to networks at KACST or KFSHRC (King Faisal Specialist Hospital and Research Centre).

Further, networking used to be hindered by the inadequate telephone system within Saudi Arabia. Most of the country's telephone lines were analogue in the mid-1990s, and dial-up connections were normally limited to 9.6 Kbps, insufficient for more intensive Internet activities than electronic mail, Usenet newsgroups (which, however, were not available in Saudi Arabia), and small file transfers. There has now been a change in telephone line speed to 56 kbps, sufficient to accommodate Internet and e-mail requirements. Most Universities now are using Fibre Optics. After the mid-1990s there took place up-grading and expansion of the public switched telephone network as part of the Telecommunications Expansion Project No. 6, and this effected a rapid improvement in the situation for long-distance communications and within certain urban areas. The public

switched telephone network (PSTN) is being expanded by 1.5 million lines and transmission and switching are in the process of being digitised. These improvements are scheduled for completion in the year 2001, and they will make the PSTN more network friendly (Burkhart, 1999). However, as we have stated, technology by itself has not been for some time principal constraint on the establishment of nationwide Internet access in Saudi Arabia. The main constraint has been NFR grounded in the Saudi political and cultural environment.

However, in the last few years a change has been underway, not just in the technical capabilities of the Saudi telecommunications system. One factor is that Saudi society is undergoing a generational change, with second-generation Saudis, now entering their 40s, assuming more responsibility. This generation tends to be more technically educated than its elders, more cosmopolitan, more open to new ideas, and more aware of the existence of alternative forms and ideas internationally. Saudis studying abroad, and going back to influential positions in the Kingdom, have become accustomed to using the Internet in the course of their studies, and will be reluctant to give up its advantages on returning home. A younger and more technically literate generation, therefore, is coming to the helm in public and private organisations. These new leaders are better able to integrate advanced technology into their operations, and are more open to modifying their operations to take advantage of technological advances. Further, Saudi organisations, both public and private, have grown considerably in the past ten years, and the increasing complexity and scope of operations is not conducive to individual control, forcing central family figures to delegate. New social tensions are arising as the younger generation seeks greater autonomy and authority.

This change taking place means that there are new stakeholders (in the broadest sense) who have some input to what is required of the telecommunications system they use. This may take some time, and would only be well underway when such individuals are in fact in positions of authority in the government and government departments (such as the MoPTT). This change would also mean change in NFRs. Even though there may still be 'firewall' controls within the Saudi telecommunications system as far as use of the Net is concerned, there is (and there seems to be no reason to doubt that there will continue to be) a move towards the use of day-to-day telephone connections for using the Web and e-

mail. This move affects (or will affect) not just academic, government, and business users, but also ordinary domestic telephone lines.

We thus have an example of an NFR, but in the case of Saudi Arabia it is a new NFR. The requirement will be that the telecommunications system <u>will</u> now permit Internet access. This, as we have seen, is not any longer a matter of the technical capability of the system; it is rather a matter of the political, social, and cultural environment within which the system will operate. It is not something that is within the control of the developers, designers, or engineers of the system in a narrow sense, but rather something that is driven by the needs of users and controlled by the authorities of the country. It is in trade-offs and interactions between these two groups that the extent to which the demand grows and the extent to which it becomes perceived as a requirement will be determined. As with some other NFRs, this NFR will relate to functional requirements. For this particular NFR to be fulfilled, the adaptation or implementation of technical functions may be needed, though, as we have seen, Internet access questions in Saudi Arabia are no longer primarily questions of technical system capacity.

This account of the state of Internet access in Saudi Arabia can provide some important insights into NFRs. One is that, no matter how much consideration has gone into requirement specifications and no matter how fully they may have been written, they cannot be regarded as final as far as some types of NFR are concerned. NFRs may fade (such as the requirement to restrict access to the Internet in Saudi Arabia) and new NFRs may emerge (such as the requirement to ease access to the Internet). This may be particularly true of NFRs in the cultural and political category, where change may take place.

We may say, then, that it is typical of NFRs that they are related to change. Change may be of many types and may cover many areas though, as have already seen, it is convenient to categorise change as being of three basic types (or a combination of two or all three types): change in people; change in political or cultural factors; and change in operating environment. The change relating to Internet access requirement that we have discussed may be seen basically as a change involving primarily social and cultural factors, though it has political dimensions and it may be translated into functional requirement as far as the operating environment is concerned.

4.3 Saudisation

The illustration from the case of Net use of variability and change that seems characteristic of NFRs draws attention to a factor at work in Saudi Arabia in many areas. including that of the requirements of the kingdom's telecommunications system. It is Saudisation. The idea of Saudisation is one that normally features in a context of the increasing technical know-how of native Saudis over a range of areas from accounting to engineering.

Saudisation, however, is a more complex matter than that. It can no longer be seen as an almost passive attitude where native Saudis, whether through training received outside the Kingdom or through training received by working with foreign experts in Saudi Arabia. have gradually taken over the roles of non-Saudis in a wide variety of enterprises. It cannot any more simply mean, if it ever did, learning the western way of doing things and then copying them within the Kingdom. For. as we have seen, if a telecommunications system had been designed and implemented entirely along western lines by non-Saudi designers and engineers then a number of crucial (non-functional) requirements might have been overlooked. These might have ranged from a simple failure to realise that Saudi cultural traditions relating to privacy dictate an NFR about where telephone points can be located in homes, to a failure to appreciate the complex and shifting nature of cultural requirements and political control dictate requirements about Internet access.

Saudisation, in relation to other enterprises as well as to the country's telecommunications system, is no longer western techniques and technology being applied in the country by Saudis instead of westerners, but Saudis doing things the Saudi way, making appropriate use of techniques and technologies that are now world-wide. It means a full expression of Saudi cultural autonomy. No technology and therefore no system, product. or service can hope to succeed without full account being taken of the social, cultural, religious, and political norms of the Kingdom.

To cash this out in practical terms, it means that no commercial or industrial enterprise which has its origins outside Saudi Arabia or which uses approaches and technologies developed outside Saudi Arabia can seek to make headway in the country without acceptance that Saudis themselves have to provide crucial cultural input into the development and operation of the enterprise. Further, this acceptance has to be a clear and

'up-front' <u>specification</u> of the critical role to be played by conformance to the cultural norms of Saudi society. Specification is the key.

4.4   Summary

This chapter concentrates on NFRs arising out of cultural/social concerns.

In the context of the Saudi telecommunications system such NFRs are of particular interest, and are often related to change. The case of Internet access in Saudi Arabia is discussed at length, since it provides an especially good example of an NFR which is undergoing transformation, while still acting as a constraint on telecommunications usage.

The Internet case is related to a new understanding of Saudisation, and to a scenario where Saudi engineers and software developers are no longer reproducing the skills they have learned from western experts, but where they are providing Saudi solutions to Saudi questions.

Chapter Five

CURRENT FUNCTIONS IN THE MoPTT

The Primary objective of this chapter is to define, analyse, and assess the current functions (business areas) and processes of the MoPTT. (They may be considered as functions when we look at the functionality or the operational systems of the MoPTT. On the other hand, they are business areas when we look at the system as a service.) In this discussion the researcher will offer a detailed examination, drawing out the non-functional aspects of the functions, particularly these that are culturally determined and related to Saudisation.

5.1 Current Business Processes in the MoPTT

The most important business processes in the MoPTT have been identified as functions, processes, and sub-processes. Figure 2 depicts the functional breakdown of the current MoPTT. The functions can be broken down further into to processes. The figure illustrates the levels of breakdown thus carried out.

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                    ┌──────────────┐
                    │  FUNCTION    │
                    └──────────────┘
            ┌──────────────────┴──────────────────┐
      ┌───────────┐                          ┌───────────┐
      │  PROCESS  │                          │  PROCESS  │
      └───────────┘                          └───────────┘
      ┌─────┴─────┐                          ┌─────┴─────┐
┌───────────┐ ┌───────────┐          ┌───────────┐ ┌───────────┐
│SUB-PROCESS│ │SUB-PROCESS│          │SUB-PROCESS│ │SUB-PROCESS│
└───────────┘ └───────────┘          └───────────┘ └───────────┘
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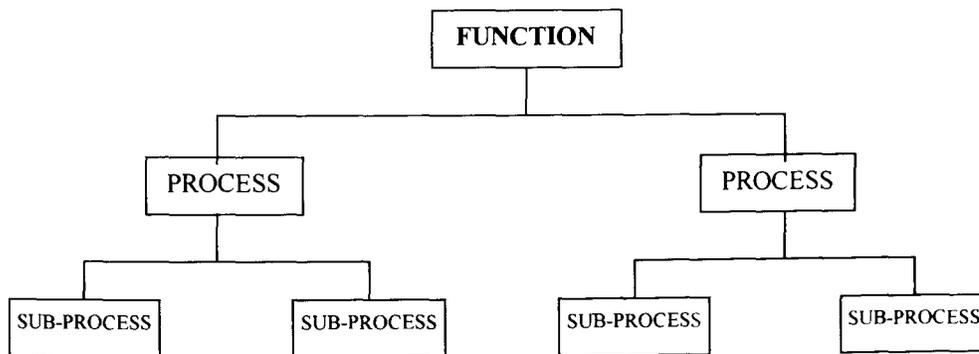
Figure 2. The functional breakdown of the MoPTT

The MoPTT functions include Strategic Planning, Marketing, Customer Services, Materials Management, Network Development, Network Management, Buildings & Land Management, Vehicles Management, Human Resources Management, Financial Management, and Training. Figure 3 shows the overall picture of the MoPTT business functions and processes.

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                              ┌─────────────┐
                              │   MoPTT     │
                              │  Functions  │
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Strategic Planning	Marketing	Customer Services	Materials Management	Network Development	Network Management	Buildings & Land Management	Vehicles Management	Human Resources Management	Training Management	Financial Management
Develop Strategic Planning	Research Market	Provision Service	Acquire Equipment & Facilities	Plan Network	Maintain Network	Design Buildings	Acquire and Assign Vehicles	Plan Manpower	Develop Training Programs	Develop Financial Control Policies
Define Yearly Budget	Develop Publicity & Advertising	Bill Customer	Monitor Inventory (Stock)	Implement Network	Repair Network	Acquire and Dispose of Buildings and Land	Maintain Vehicles	Recruit Personnel	Deliver Training Programs	Perform Financial Accounting
Distribute Budgets to Departments		Support Customer Service	Maintain Vendor List	Support Network Development	Support Network Management	Maintaining Buildings and Land		Develop Manpower	Monitor Training Programs	Monitor Financial Performance
Monitor Proposed Versus Actual Budgets			Payment to Vendor			Provide Security		Manage Compensation		

Figure 3. Current MoPTT Business Functions and Processes

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This chapter provides in-depth analysis of these business functions within the MoPTT, described above from the Current Business Process Assessment point of view.

It is important to note that some of these major functions in the MoPTT display a number of features which influence in a major way how they operate and have an influence on their effectiveness and efficiency, but which are not themselves integral or specified characteristics of the functions themselves. These features may be referred to as non-functional aspects. Some of these factors result from government regulations and requirements, and others relate to general attitudes within the MoPTT.

In relation to the accounts of the functions and their operation provided in this chapter we shall consider the extent to which the individual functions are influenced by non-functional aspects. In doing this we will focus on features of the operating environment of these functions which are not essential or integral parts of the function designs, but which affect the efficiency and effectiveness of the functions.

The discussion of non-functional aspects sets some of the groundwork for NFRs, which have been discussed in detail in Chapter 3. NFRs are related to the qualities of a product, service, or system, and are in effect constraints under which a system must operate, while not themselves part of the technical capacity of a system or laid down in the specifications which relate to that technical capacity.

5.2 Strategic Planning

Strategic Planning aims to develop strategic and operational goals and objectives and to establish an annual operating budget to support those goals and objectives. At present there is no single strategic planning operation within the MoPTT, although the start of a strategic planning process has been attempted within the Operation and Maintenance (O&M) Division and also within the office of the Deputy Minister for Finance and Administration (DM for F&A).

Every five years the office of the DM for F&A develops a five-year strategic plan, which provides direction for the MoPTT. For each planning exercise data is collected from all Deputy Ministries, Regions and Districts. The plan sets goals and objectives based both

on this input and on accepted national goals and objectives. The plan also lays out the projects and the investment needed to achieve the Ministry's five-year goals and objectives, and provides for the evaluation of progress. Attempts are made to allocate yearly budgets based on this five-year plan.

There are four processes in the Strategic Planning function carried out by the MoPTT:

- Develop Strategic Plan.
- Define Yearly Budgets.
- Distribute Budgets to Departments.
- Monitor Proposed Versus Actual Budgets.

5.2.1 Non-Functional Aspects

One feature of this function is that the MoPTT is handicapped through not taking Strategic Planning sufficiently seriously at a senior level. Lip service is paid to the idea of Strategic Planning but the way in which it is carried out demonstrates that no genuine and determined effort has gone into putting it into practice.

As an indicator of this we can, for example, point to the fact that there are two main sources of strategic plans in the MoPTT: the Division of the Deputy Minister (DM) for Finance and Administration (F&A) and the Division for Operation and Maintenance (O&M). However, there is no co-ordination between the plans of these two Divisions, so that it is hardly surprising that there is on occasion conflict between the plans produced.

In the case of conflict what in fact happens is that the MoPTT management wavers between the F&A Division and the O&M Division, with the result that neither can feel that they have the confidence of the management in what they put forward.

This lack of serious dedication to Strategic Planning, manifested in the fact that two sources for Strategic Planning exist, is a non-functional aspect of the function of Strategic Planning in that it is not by definition or by specification an aspect of Strategic Planning, but nevertheless a factor which plays a major part in the extent to which the Function of Strategic Planning is effective and efficient.

That Strategic Planning is given insufficient commitment is also demonstrated by the fact that there is no systematic application of the computerised gathering and dissemination of data in relation to the Strategic Planning function. And the fact that the MoPTT has only limited control over its financial resources is a further aspect of Strategic Planning which militates against maximum effectiveness and efficiency. The budget assigned centrally each year does not meet the requirements of either five-year Strategic Plan formulated within the MoPTT, a further demonstration that Strategic Planning does not have sufficient practical backing at a high level within the MoPTT.

To have a chance of achieving aims, long-term planning must receive the commitment of the top management of an organisation, for these are the people who lay down the strategic goals and objectives to which the subordinate levels can look as the basis for their input.

If the non-functional aspects of the Strategic Planning function were different, in particular if there was one centralised unit with the responsibility for devising and developing strategic plans, if the management was fully committed to Strategic Planning, and if the budget matched strategic requirements, then greater effectiveness and efficiency could be expected. The constraints under which Strategic Planning must operate – which are not an integral part of it and have nothing to do with essential specification – mean that it is handicapped by non-functional aspects.

The key factor in the difficulties besetting Strategic Planning is that the two main sources of strategic plans in the MoPTT cannot be reconciled into one source as long as the current procedural and administrative routine exists. As things stand, policies go direct from the F&A Division to service delivery as well as through the O&M Division. In effect, in this scenario, F&A are the government and O&M are the MoPTT, so that strategic directives may on the one hand be filtered through MoPTT experience and expertise (O&M policies), but on the other hand they may not (F&A policies). The Saudi government, in the latter case, is intervening in a system which might perhaps better be left to devise and implement its own strategic policies, perhaps because the government feels that, as paymaster, it ought to have direct say in long-term planning. It is small wonder that, under those circumstances, the STC feels confused and frustrated, and that there is a lack of top management commitment to Strategic Planning.

One way of dealing with this would be to apply in the MoPTT a model similar to that of the UK's National Health Service (NHS). Here government finance is directed in the first instance at resourcing, and it is from there that policies (strategic plans) emanate. Would it be possible for there to be established in Saudi Arabia a body such as OFTEL (the UK telecommunications industry regulator), which could carry out a similar role to that of its UK counterpart? This would eliminate the sourcing of Strategic Planning at two different locations, and thus would do away with contradictions between policies. and with the feeling on the part of the MoPTT's management that they are serving two masters as far as long-term planning was concerned. Not only would Strategic Planning be more efficient and streamlined, but the commitment of top management to it might be expected to increase.

For further information about Strategic Planning function see Appendix A.

5.3 Marketing

The Marketing function of the MoPTT consists of the following processes:

- Market Research.
- Develop Publicity and Advertising.

The Research Market process makes use of customer surveys, computer models and customer requests, and the data gathered through those techniques is used in predicting demand for new services. Field trials of new ideas may be conducted at District or Regional levels, with complete business plans for new products and services having been created. Facts and figures collected in the course of Market Research are shared with any interested parties within the MoPTT.

In the Develop Publicity and Advertising process campaigns are run to inform the public of services on offer. If these campaigns have a location for exhibition purposes. then the MoPTT tries to uses a venue that is free of charge to the Ministry. Advertising of the MoPTT products and services is targeted at two types of consumers: those who use the public switched telephone network and those who use other services. The public is informed of services on offer via media campaigns. though of course when network

expansion begins in a given geographical area, publicity is also informally transmitted by a word-of-mouth.

5.3.1   Non-Functional Aspects

In the MoPTT Marketing suffers through not being held in high regard as an important function, a factor which clearly affects its effectiveness and efficiency. This means that, although Marketing may in fact operate well as far as the accurate development of estimates and forecasts are concerned (in terms, as it were, of it specifications), it cannot deliver its potential because of a non-functional constraint.

Because of the low esteem in which Marketing is held its promotional and publicity efforts receive no funding, and money has to be found from budgets intended for other purposes to finance such advertising as does take place. Since there has been no competition in the Saudi telecommunications market, the MoPTT have traditionally viewed the Marketing business area as a waste of money.

A major factor in this situation is cultural. Traditionally the Saudi way of doing business, in whatever sphere, has depended on personal contact and influence. If this changes, it will be slowly. Marketing, therefore, in the modern western sense will not be accepted for some time.

One operational factor which Marketing has face is the fact that the MoPTT telephone network has little spare capacity. In this state of affairs, it is to the advantage of the MoPTT that Marketing has a low profile, for if successful promotional campaigns attracted new customers, the current low capacity would mean that the demand could not be satisfied. We may call this a non-functional aspect of the Marketing function's operational environment, since it has nothing to do with the aim or objectives of Marketing as such, or with its capacity to deliver them as far its integral systems are concerned.

Marketing is also handicapped by the fact that it does not automatically receive information relevant to publicity or promotional activities. Thus, it does not have. so to speak, the fuel to run, even though its engine may be working capably if properly supplied. Again, this lack of liaison from other units in the MoPTT is an aspect of the

situation which is not built into the Marketing function as such. The effect. however. is that it cannot operate to its design.

One way in which Marketing might be boosted would be through value added by Customer Services (discussed as far as its own non-functional aspects are concerned below). Direct information on telephone bills, such as is used by BT. might be tried. Services such as caller ID, ring back, and so on could be marketed in this way.

For further information about the Marketing function see Appendix A.

5.4 Customer Services

The customer interacts with the MoPTT though the Customer Service function. The processes in this function are:

- Provide Service.
- Bill Customer.
- Support Customer Service.

In the Provide Service process for basic telephone services the customer enters a Subscription Office and submits an application. A field survey is may be necessary if the service location is new, the survey maps are unreliable, or the customer cannot provide the appropriate information. If there is clearance when the customer's credit and final account status is checked the application is accepted. The application is allocated a telephone number, if required, and the appropriate data is entered in the Saudi Arabia Storage Operation Systems (SASOS) system to create a service order. The order is then assigned cable pairs, scheduled, dispatched and installed. If a service order cannot be carried out because of a full exchange or network problem, a held order is generated in the Customer Service Held Orders (CSHOR) system, and the original service cannot be completed until the held order is cleared. This, however, is something that may take months or even years, so the original service order is cancelled to avoid cluttering the system. When an order is completed in SASOS, responsibility then passes to the billing system.

If he wishes any further service or item from the MoPTT the customer usually contacts a marketing representative in a Subscription Office. If the customer represents a major account of the MoPTT, such as a large business customer or another Ministry, he may contact anyone, at any level, within the MoPTT. The customer's request is sent to the Division that is responsible for the product or service concerned, a design card is prepared and equipment is allocated. If necessary, trunk or junction capacity and distribution network capacity is assigned. After installation is concluded and the customer's request is fulfilled, a completion list is sent to the appropriate District office where a service order is created and closed in SASOS. Responsibility then passes to the Bill Customer process.

In the Bill Customer process customers are normally billed once every quarter, though Al-Waseet and Telex customers are billed monthly. For mainstream billing nine bill cycles are run per quarter (one every ten days). The procedure is that automatically scheduled batch jobs produce customer invoices (at times invoices must be cut manually) and these are then sent to customers, who settle their bills at their banks. Records of payments received at banks are sent manually to the MoPTT, where customer accounts are updated. After the 15 days that it takes to produce and send out bills, customers have 45 days to pay invoices. If they don not do so disconnection procedures begin. If the customer has not paid after 90 days, service is disconnected permanently and final account payments are collected.

The Support Customer Service process includes maintaining tariffs, providing operator-assisted services, managing held service orders and dealing with faults reported by customers.

The Tariffs Branch of the Commercial Services Department is responsible for maintaining all MoPTT tariffs. Tariff requests are initially centrally submitted to the Ministry for approval. The MoPTT co-operates with outside bodies, such as the Gulf Co-operation Council (GCC) Telecommunications Committee, on tariff-related issues.

5.4.1   Non-Functional Aspects

The Customer Services function has to operate under considerable constraint. and certainly, because of the interaction of this function with the public. it receives much criticism from outside.

One factor influencing the efficient and effective operation of Customer Services is the shortage of exchanges in the MoPTT system, which means that there is a lack of lines available to deal with customer requirements. Customers can often simply not get through to Customer Services, and this is a clear constraint on operational processes. This shortage comes about, not because there is inadequate technical capacity. but because of the slow processes of exchanging information from different departments regarding a customer requiring a line. In this sense shortage of lines is not a technical matter. but rather an NFR.

Inefficiency is also caused by the fact that there is no integration associated with the Customer Services function. Because services to customers cover so many operations. from fault reporting and correction to billing, then they are dealt with by personnel from different units within the MoPTT, and this means that faults are not put right as soon as they might be or new lines supplied as quickly as would be ideal.

As with some other functions within the Ministry, efficiency and effectiveness are compromised because so much of the information collection and dissemination is done manually, with a duplication of paperwork. Since more efficient ways of dealing with reporting and the instigation of action, such a computerised centrally available records. could be employed, the Customer Services function has to operate in an environment which is not an essential aspect of its nature. Billing, for example, is a tedious and slow process, which could be speeded up considerably by the use of integrated IT techniques.

For further information about the Customer Service function see Appendix A.

5.5 Materials Management

The Materials Management function involves the following main processes:
- Acquire Equipment and Facilities.
- Monitor Inventory (stock).
- Maintain Vendor List.
- Payment to Vendor.

The Acquire Equipment and Facilities process includes issuing purchase orders using the preferred list of vendors' products following internal requests.

Information is gathered using purchase orders to forecast demand for materials and create thresholds for commonly-ordered stocks.

Minor materials needs are dealt at District level, while major material needs go through a formal 'District to Region to Headquarters' procedure. In all cases this is a manual procedure where no inter-related inventory control or co-ordination plays any part.

Generally equipment is acquired and held in stock while cable is acquired on an 'as needed' basis. Equipment thus remains stored for future use over a project's life and spare parts are usually not ordered due to insufficient funds.

For daily needs, the reservation and use of available material stored in local warehouses is co-ordinated, with contact between the District and Region warehouses. If the material is not available in either location, a request is forwarded to the Headquarters of the O&M Division of the MoPTT. Attempts are sometimes made to obtain material on the basis of current available funds. In some cases materials are not always obtained, depending on the priority rating of a job.

5.5.1   Non-Functional Aspects

Materials Management, like other MoPTT functions, suffers from the constraint that funding is not handled well. Finance is limited, and many essential materials are not available at all within the MoPTT for this reason. Further, many obsolete materials are held because stock information is not accurate enough to ensure that the right materials are ordered. In a sense it is an issue of management. But the point is that the 'bad' management cannot be sorted out as it would be in the West. There are cultural aspects – NFRs – which inhibit the development of management along western lines. Only a Saudi solution – not an easy matter of course – can put things right.

Further, responsibilities for the Materials Management function do not appear to be clearly defined within the Ministry, an aspect of the situation which militates against efficiency and effectiveness. Indeed, three groups have claimed some responsibility for

the Materials Management function and the areas for which each unit is accountable is far from settled. Inventory record keeping, for example, is carried out by the Buildings and Security Department, by the Stock Control Division of Strategic Resources, and by the Construction Department. There is insufficient integration between the operations of these units, with each group following an individual programme on stock management priorities and with no single set of guidelines at Ministry level followed by all three groups. This means that information about stock levels and the location of materials is not held in common.

The situation in Materials Management might be helped by the Chief Executive simply pointing to one of the three units discussed above, perhaps the Stock Control Division, and saying, 'This is yours.' Or perhaps what is needed for Materials Management is for new responsibilities to be delineated and for a completely new unit dealing with them to be designed, along with the new IS model. At any rate, there seems to be a clear need for a single department dealing Materials Management.

Quite apart from the fact that three units are involved, and that there is no Ministry level single Materials Management unit, there is the problem of manual record keeping, which is general within the MoPTT. This renders it hard to maintain accurate records of stock. There is no current way to provide an accurate assessment of stock levels in the MoPTT warehouses. There is, furthermore, no electronic sharing of stock records between the Ministry and its contractors.

For further information about the Materials Management function see Appendix A.

5.6 Network Development

The Network Development function consists of the following three processes:
- Plan Network.
- Implement Network.
- Support Network Development.

The Plan Network process involves many units throughout the MoPTT, with responsibilities divided amongst these groups according to the network involved:

Customer Access Network (CAN), Exchange Network, Long-distance Network and International Circuits. Information on current and forecast service demand, network utilisation, strategic direction and other indicators is shared with other planning groups, a characteristic which, as we have noted, is not always featured in relations between MoPTT units. Key long-range plans are developed on an annual basis.

There is nothing to indicate, however, a systematic process for defining and approving expansion projects, something we have already commented upon. The drive for expansion projects may even come from beyond the MoPTT. Three general types of expansion projects have been noted:

- Major network expansion projects.
- Large CAN expansion projects, with span districts and regions.
- Small CAN expansion projects, contained within a single district.

In the Implement Network process, if the expansion project is to be given to an outside contractor, engineering units at either the District, Regional or Headquarters level will produce technical specifications to be used when the proposal is put to tender. The Universal Plant Unit List is used when writing these specifications. Tender responses are assessed by a committee made up of MoPTT personnel from various Departments, Divisions and Branches, the make up of the committee being determined by the size of the project. The selected contractor will provide installation and construction personnel, as well as detailed design drawings.

If an outside contractor is not to be used to carry out an expansion project, the engineering unit that submitted the original plan provides the detailed design drawings, and District installation and construction personnel do the work. In some cases a project involves work in more than one District or even Region, and then the engineering unit that has control over all lower levels co-ordinates the efforts of the groups involved (usually this engineering group is the same group as developed the original plan). If the project involves the CAN network materials are sourced from existing district stock or acquired from other Districts and Regions through co-ordination with the appropriate engineering unit.

One problem that exists is that engineering drawings are not kept up to date. and often they are updated only after a large project is fully terminated. Riyadh and Jeddah are two places where, because of a large build-up of work, drawings are many months out of date.

In the Support Network Development process. several sub-processes are carried out. Network inventory and assignment information is implemented. SASOS Departments and Assignment Control Centres (ACCs) are notified of available facilities. and SASOS and ACC staff are then responsible for assigning facilities to customers. All units produce reports, especially for statistics relating to demand forecasting and utilisation. Most of these reports are developed in PCs using data that is either downloaded from another system or keyed in by hand. Finally, many departments are responsible for setting standards, policies and procedures to be used when executing tasks relating to network development. For example, policies and procedures to follow when accepting projects are laid down.

5.6.1   Non-Functional Aspects

Several non-functional aspects affect the MoPTT's Network Development function, some of which can also be identified in relation to other Ministry functions.

These factors include the fact that there are too many units (at least six) with input into network development plans. Furthermore, no one of these units is seen as the primary or main unit for network development, so that there is a lack of overall co-ordination and integration, and, as with other functions, there is no long-term strategic planning.

The processes behind the budgeting for Network Development are also deficient: budgets for expansion plans are not approved with consistency nor with respect to balanced network development. This is, again, an aspect which affects other functions. Depending on the nature of an expansion project, budgetary approval from the O&M Division of the MoPTT Strategic Planning Department, the Strategic Resources Department, the F&A Division of the MoPTT, or even the Ministry of Finance and National Economy (MoFNE) may be needed for implementation to get under way.

Further, in some projects exchanges have been developed without a corresponding development of other resources required to make them work. and in some cases outside

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resources have been put in place, but there has not been the corresponding required exchange development. Inevitably, in those circumstances, few actual operating network developments have actually taken place.

Apart from budgetary control aspects, what tends to happen for actual operating expansion to take place is that the process is ruled by the number of held orders in the MoPTT. If any one area has a large number of held orders, it is more likely that network expansion plans will be implemented in that area. Priority thus goes to projects which will service the largest number of clients at the least cost, another example of the fact that network development is constrained by factors which are not integral to the function.

Another aspect which reinforces the piecemeal non-integrated approach of this function is the fact that, as in so many units of the MoPTT, the maintenance of relevant information is primarily a manual process which leads to duplication of efforts in maintaining data and to discrepancies between versions of the data.

The efficiency and effectiveness of Network Development is thus handicapped by a number of non-functional aspects. The problems could be addressed by a smaller number of units or by the institution of a single co-ordinating unit which was proactive rather than reactive in its thinking, by the adoption of computerised generally accessible data, by the integration of planning throughout the MoPTT, and by changes to the budget approval processes.

It seems apparent that, as with Materials Management, a single unit for Network Development should be created by the Chief Executive to deal with its current piecemeal and non-integrated configuration. Again, this might be accomplished in unison with the new design for IS.

For further information about the Network Development function see Appendix A.

5.7 Network Management

Network Management is the function concerned with maintaining and repairing the telecommunications network to ensure delivery of the best possible service to users.

It should be noted that outside contractors operate and maintain many of the major facilities of the MoPTT; they are employed in the following areas:

- national and international long-distance transmission networks;
- undersea cable and satellite stations;
- the Public Switched Telephone Network (PSTN) exchanges and related cable carrier systems;
- telegraph, PSDN and DDN.

The MoPTT owns and operates exchanges and a number of satellite stations. Network utilisation statistics and outage reports are transmitted manually between contractors and the appropriate MoPTT units manually.

The following three processes have been identified in the Network Management function:

- Maintain Network.
- Repair Network.
- Support Network Management.

The Maintain Network process involves monitoring, controlling and repairing exchanges and other network elements in order to avoid service interruptions or network faults. Most exchanges are capable of being monitored remotely, though there are some older exchanges where this is not possible; they are being replaced wherever possible. Alarms and statistics from the switching exchanges throughout the Kingdom are hierarchically viewed at Regional and national centres for maintenance and traffic control respectively. Alarms for the transmission networks are direct to the individual contractor control centres, fault and performance management is shared manually between the MoPTT staff, and network load is balanced based on traffic patterns.

Any maintenance activities which may cause load imbalance or problems for the provision of service, are reported as unusual conditions to the National Network Control Centre (NNCC). The responsible Regional Maintenance Centre (RMC) contractor then interfaces with the NNCC, and this ensures that the work is co-ordinated so as to avert service outage or impairment. In cases where it is apparent that outage cannot be avoided, NNCC first advise the responsible customer control centres and then take charge of re-routing activities to lessen the impact. In emergencies Broadband Restorations or Network Controls are called in and top management advised accordingly.

Network utilisation and performance data is gathered from several sources. Component and performance data is sent monthly from the RMCs to the Exchange Operations Branch of the Network Operations Department at the O&M Division of the MoPTT Headquarters. The data is analysed to identify common problems, assess in-field spares levels and defect rates across the Kingdom, and to initiate actions for further warehouse re-stocking or procurement. National and International Tele-traffic Management Branches within the same department also gather data, which is examined to help balance the load on the entire network.

The Repair Network process deals with Network Management once a fault has occurred. Faults may come to the notice of staff in a number of ways: they may be detected by control systems, reported by contractors or Network Operations staff, or reported by customers.

The Support Network Management process includes administrative tasks relating to contractors, equipment and switch management. These tasks may be such as payments made to contractors, which are carried out and co-ordinated, the repair of printed circuit boards used in exchanges and other equipment, and the administration of the national numbering plan.

5.7.1 Non-Functional Aspects

As with other MoPTT functions, there is no single division for the management of networks; indeed functional responsibilities are dispersed and unco-ordinated, and many units are involved in overseeing and controlling sections of the telecommunications network. This non-functional aspect of the operating environment of Network Management clearly hinders efficiency and effectiveness, and there is a need to streamline the system through centralisation. The Network Management function is not unique in this.

The function also suffers through the fact that the infrastructure of the network is aging. Most national networks, for example, are analogue rather than digital, and are therefore approaching the end of their useful working time. This aspect means not only that some networks are difficult to manage, but the temptation is to let obsolescent networks run

down rather than maintain them, so that the time when they are replaced by more modern systems is reached more quickly. The MoPTT's bit-by-bit attitude to Network Development and the ongoing use of out-dated equipment has also led to in many different types of apparatus being used throughout the network, something which clearly makes more difficult the activities of identifying and repairing faults.

Lack of automation and computerisation are also aspects of the function's operating environment. Various support procedures such as administration and equipment testing, are not automated. For example, scheduling and carrying out maintenance and repair procedures are at present managed manually in the RMCs and the District Dispatch Centres (DDCs), testing of equipment and tracking of test results is done manually, and the Network Operations Department keeps records of transmission equipment and facilities assignments manually. The operations of the Network Management function are considerably hampered by the slowness and labour-intensity of such an operating environment.

As with other Ministry functions, record keeping and communication with other units is manual rather than computerised, and there is much duplication of records of work done by contractors.

All of these aspects to the operating environment of the Network Management function mean that it fails to meet industry standards for the identification and clearing of faults.

The problems of Network Management are so complex that no 'quick fix' type of resolution can be envisaged for them. They are a legacy of the way the systems have developed over the years, and some of the problems at least may have to be lived with for five or ten years.

The best approach may be to have one single individual to have overall control of the gradual modernisation and restructuring of Network Management over this five or ten years. In practice, over such a period, this will have to be the King, acting as appropriate through the Council of Ministers and other bodies. Every six months or so the King would call a meeting of those given responsibility for parts of the Network Management function and ask. 'How far have we got?'

For further information about the Network Management function see Appendix A.

5.8 Buildings and Land Management

The Building and Security Department carries out most of the tasks in this function after co-ordinating Region, District and project requirements.

Buildings and Land Management consists of the following processes:

- Design Buildings.
- Acquire and Dispose of Buildings and Land.
- Maintain Buildings and Land.
- Provide Security.

The Design Buildings process consists of the planning, technical design, costing and scheduling of all MoPTT building projects throughout the Kingdom. Regions are authorised to use local contractors to design and construct the buildings and in the case of some Regions they have their own construction groups which are authorised to carry out their own construction of small projects. Larger projects need approval from Headquarters, who ensure that standards are followed. Space planning is also part of the Design Buildings process.

The process also incorporates establishing policies, practices and standards for planning, design and construction sub-processes over the whole country. Consulting services are provided for design and construction sub-processes and for Building Engineering services throughout the Kingdom. Standard models for buildings and structures are maintained for use on all construction projects.

The main purpose of the Acquire and Dispose of Buildings and Land process is to support the expansion of the existing networks. The number of exchange or switch areas is growing with the continuing construction of buildings, both residential and commercial, in the major concentrations of population.

For the existing network a forecast of new exchange/switch areas or expansion of existing buildings is provided, and these requirements are reviewed at the department level in order to generate a plan of building and land acquisition. For the GSM network, the forecast is received from the contractor based on the project plan.

Ultimately, the land or project budget determines the plan of acquisition during the financial year. When this has been done new building design details are finalised and the specifications are submitted for tender. Bids received are evaluated and approved at the department level. Hiring of land and existing buildings is also an option to be given consideration.

The Maintain Buildings and Land process involves administrating and monitoring the various contracts, for example, the Electrical and Mechanical contract and the Operations and Maintenance contract for all the Regions and Headquarters. Spare parts and preventive maintenance of equipment records are kept. The development and scrutiny of safety procedures, accident prevention schemes and safety promotion throughout the Ministry are also involved. Practices and procedures are constantly monitored and are revised if the need arises.

The Provide Security process incorporates laying out the direction of security policy and conducting security operations using methods and practices are developed which are consistent with the MoPTT policy. In accordance with this policy, co-operation is maintained with the various government departments and civic authorities, for example the National Guard. Passes to visit sites and to transfer equipment are issued in order to record the movement of people and materials.

Standards and guidelines are developed for the design and construction of physical security and surveillance items. When security investigations are undertaken reports are presented to top management.

5.8.1   Non-Functional Aspects

Buildings and Land Management is another MoPTT function which has to operate under the constraints imposed by the lack of centralisation. Currently, information regarding the availability and use of accommodation is recorded manually by several groups, including the Buildings and Security Department of the O&M Division, the Engineering Department of the O&M Division, and the MoPTT Telegraph Affairs Building Department. Because there are no automated central records, more than one unit can believe that space is available and makes plans to utilise it, only to discover that the

accommodation is in fact in use by another unit. An automated buildings database which can be accessed and updated by units needing information about buildings and accommodation is therefore required, as this would permit more effective planning of building space and better organised use of buildings.

This lack of an automated and centralised information record is a non-functional aspect of the operating environment of the Buildings and Land Management function which we have already identified in connection with other MoPTT functions.

For further information about the Buildings and Land Management function see Appendix A.

5.9 Vehicles Management

Vehicles Management is a function that has an important effect on the performance and efficiency of daily installation, maintenance, engineering and construction work.

Vehicles Management involves the following main processes:
- Acquire and Assign Vehicles.
- Maintain Vehicles.

The Acquire and Assign Vehicles process begins when a vehicle or vehicles are ordered. On receiving the internal order, the unit personnel consult the budget to check for available funds. If funds are available, the vendor list is consulted and a purchase order is issued. When the vehicles are received, they are inspected, payment is made to the vendor and the inventory data is updated. The vehicle is then transferred to the appropriate unit.

In the Maintaining Vehicles process, each District work centre looks after its own vehicles, seeing to the repair of body damage and mechanical breakdowns. However, the Strategic Resources Department has the final approval of funds needed for proper and regular vehicle maintenance. Any decisions to dispose of and replace vehicles are also Strategic Resources Department responsibilities. The status of each vehicle is tracked.

5.9.1 Non-Functional Aspects

The Vehicle Management function of the MoPTT has to operate under several constraints, but these seem on the whole to be integral to the function rather than non-functional aspects of its operating environment.

One factor, however, which may be identified is that most of the Ministry's vehicles are old and therefore suffer from reliability problems. This is related to the lack of trained personnel to maintain the vehicles, and also to the fact that inadequate funding has been allocated to the purchase of new vehicles. Insufficient thought also seems to have gone into planning in relation to the updating of vehicles. as network modernisation will require vehicles fitted with more modern equipment to deal with repair and maintenance tasks.

Such funding as has been allocated to this function tends to be spent on vehicles for the MoPTT management, which shows a lack of appropriate priorities in respect of fleet requirements.

For further information about the Vehicles Management function see Appendix A.

5.10 Human Resources Management

The Human Resources Management function develops and monitors policies for manpower in the MoPTT. As would be expected, Human Resources policies affect staff at all levels of the MoPTT.

Human Resources Management consists of the following processes:

- Plan Manpower.
- Recruit Personnel.
- Develop Manpower.
- Manage Compensation.

The Plan Manpower process includes predicting manpower demand and supply. The predictions, both are short-term and long-term. assist in matching the MoPTT's requirements for current and future staffing levels. On the basis of the predictions

recruitment and deployment strategies are developed to enable the supply of staff to meet needs. Manpower budgeting is undertaken to determine the cost of staff to the MoPTT, and manpower levels and skills are monitored across the MoPTT. Regular research of labour market conditions is conducted within the Kingdom to gauge the competitiveness of the Ministry's remuneration and employment policies. Salary budgets are determined and given for approval to the Ministry of Finance.

The Recruit Personnel process involves developing recruitment policies and programmes both within and outside Saudi Arabia. Organisation structure is developed and reviewed, job classification and compensation levels are determined for different levels in the MoPTT, and job descriptions and qualifications for different staff posts are also developed.

The Develop Manpower process concerns policies related to all aspects of manpower. Programmes to support and motivate management and staff are developed. Polices related to remuneration include annual increments, 'experience related' salary increments and 'outstanding ability' programmes. Develop Manpower also incorporates creating and developing policies on training and personal development needs for all types of personnel. These policies are in line with the MoPTT's manpower strategies as identified by the manpower planning process. The training needs are then passed onto the Training function.

Policies on Saudisation are developed and monitored by the Develop Manpower process, Saudisation objectives being put in place after consultation at Regional and Departmental level. Advice is offered to various parts of the Ministry regarding the achievement of Saudisation objectives within the organisation. Finally, policies related to payroll are developed and set.

The Manage Compensation process deals with paying employees, an automated process within the MoPTT.

5.10.1   Non-Functional Aspects

There are some non-functional aspects which affect the environment in which the Human Resources function has to operate. One of these is government regulations, which hamper

the MoPTT's capacity to carry out human resources tasks efficiently and effectively. The Ministry's staff are government employees, and taking on personnel and letting them go are precisely controlled procedures, which need to receive approval at several levels in the Ministry.

Government regulations also make it difficult to hold on to skilled employees because of policies in respect of wage and pay increases, and the MoPTT is further restricted by external rules on granting promotions and on service bonuses.

Policy decisions within the MoPTT itself have also affected pay and incentive initiatives. Human Resources management have been very restricted by the Ministry's own top management in what they can do to reward employees for outstanding service, because most salary increases are linked with years of service or with educational qualifications.

The function also operates under the constraint that there are two units, one in the F&A Division of the MoPTT and one in the O&M Division, to manage human resources, and this means much duplication of effort. Neither department uses an automated personnel management system, so that the Human Resources function, like other MoPTT functions, is hampered by out-of-date systems and processes, which make it impossible to keep staff information up-to-date. Indeed payroll information is thought to be the only reliable data held on automated systems. Clearly an integrated and automated system is a priority if two units are to continue to deal with human resource matters.

The Human Resource function also has to operate within the constrictions laid down by Saudisation. The idea of Saudisation is usually applied in relation to the increasing technical capacity and knowledge of native Saudis over many fields from accounting to engineering, and it refers to the taking over by Saudi nationals of roles once performed by non-Saudis, particularly by westerners. However, we have argued above (Section 4.3) that a new understanding of Saudisation is required if the MoPTT is to move forward. In terms of this new understanding of the concept, the critical cultural contribution to the development and running of any venture, including the telecommunications service of the MoPTT, has to have its basis amongst the Saudis themselves.

However, as things stand at present, the old (and at the time of writing still prevailing) concept of Saudisation as the indigenisation of the workforce also currently places NFRs

on human resources. The global market has been in the past a major source of labour for the Kingdom, but this is now dwindling largely because of stricter immigration law, and the Sixth National Development Plan openly advocated replacing non-Saudi personnel with Saudis. The reasons for doing this may have been sound, including as they did the desire to guard against possible inflation following any drop in oil prices by ensuring that the riyal was kept within the country, and we would argue that the eventual outcome will be beneficial in other ways associated with the new understanding of Saudisation. But there is no doubt that in the short term a policy of excluding the expertise and experience of suitable non-Saudis is in effect a non-functional constraint upon the Human Resources function.

For further information about the Human Resources Management function see Appendix A.

5.11 Training Management

The Training Management function of the MoPTT consists of the following processes:
- Develop Training Programmes.
- Deliver Training Programmes.
- Monitor Training Programmes.

In the Develop Training Programmes process training requirement information is gathered from groups throughout the MoPTT. An annual budget request to the F&A Division is submitted based on the requirements identified. Other groups (training recipients) submit budget requests to send staff to training. The Training Department's budget determines what training courses will be offered in a year, while who will attend the courses is determined by other groups' budgets. In the past, budgets have been allocated to the Training Department to deliver courses.

Once it has been determined what training courses will be offered during the year, those courses must be reviewed and, if necessary, designed. If a course is new, it is decided what material should be presented and the presentation method. If a course has been offered in the past, its materials and presentation styles are assessed and updated as necessary.

The Deliver Training Programme process consists of scheduling and conducting the training. A catalogue is distributed which contains course schedules. Various factors determine who will attend training, one of these being the individual's position which establishes the type of training to which an individual is entitled. Course attendees must meet the course's trainee profile. Two training colleges exist, one in Jeddah and one in Riyadh, though a number of other venues exist where training is conducted. Amongst these are some district Training Centres which help in delivering technical training in a cost-effective manner. Training may be provided in a formal classroom setting or in a seminar and courses which allow remote or computer-based training are under development. Contractors may use the MoPTT facilities for training. In these cases the contractors hiring outside instructors and, although Training Department staff may be involved with administrative tasks that are related to the training, they will not do the training itself.

In the Monitor Training Programme process, course attendance and training effectiveness are observed manually. In Riyadh, attempts are made to monitor training programmes via personal computer. Data in this system, though, is not current. An obsolete and unused Student Record System exists on a mainframe computer in the Riyadh Data Centre.

5.11.1 Non-Functional Aspects

The training function seems to be influenced by fewer non-functional aspects than some other MoPTT functions. That is not to say that its operating environment is free from constraints, but most of these constraints seem to be integral to the Training function itself, and cannot properly be categorised as non-functional factors. The two main constraints affecting the training function are lack of funding and the fact that only Saudis are trained. These factors operate internally within the function itself without affecting other functions in the MoPTT. Indeed training is a more independent function to the extent that it may act as a constraint upon other functions of the MoPTT. but is less constrained by these other functions.

However, two aspects of the function's operating environment may be identified which are not an essential and integral part of how training is set up and run. One is that. like other MoPTT functions, Training suffers through a lack of adequate budgeting. Within

the Ministry the allocation of funds for in-house staff training has a low priority. The other factor is that only Saudi nationals are allowed to attend training courses, although most technical positions in the MoPTT are held by non-Saudis. This poses a major problem for the MoPTT management, since it is the training of technical staff that would provide the most benefit to the Ministry.

For further information about the Training Management function see Appendix A.

5.12 Financial Management

The Financial Management function is primarily responsible for the development of financial (including accounting) policies and procedures, the tracking of revenue and expenses, the managing of assets, the monitoring of the MoPTT's overall financial position, and for satisfying payment obligations related to payroll and contractor/supplier agreements.

Financial Management consists of the following processes:
- Develop Financial Control Policies.
- Perform Financial Accounting.
- Monitor Financial Performance.

The Develop Financial Control Policies process includes committing funds, developing accounting policies and procedures, and developing performance measurements.

When committing funds, project proposals are reviewed to make certain they comply with budgetary guidelines and are included in the budget. Appropriate approvals are obtained to reserve the allocated funds before using them and updating the budget.

Accounting control policies, procedures and systems are established in accordance with generally accepted accounting practices, government legislation and the Ministry principles. Government policies and regulations, reviews of audit reports and accounting standards are consulted and accounting policies and procedures for the O&M Division of the MoPTT are decided upon. Necessary financial performance indicators are established in order to ensure that the O&M Division meets its stated objectives.

The Perform Financial Accounting process involves the tracking of all the MoPTT's revenues, expenses and assets. It also involves administrating the payroll and fulfilling payment obligations to contractors and suppliers.

In the course of this process billed revenue is recorded and reported, and payments and adjustments are received from various sources, for example from other ministries. Accounts receivable, for instance customer payment and adjustment control, as well as pay phone and kiosk coin collection control, are maintained and network traffic with other countries is settled.

Outgoing payments, which are related to business operations, are recorded for tracking expenses. Accounts payable, for example disbursement to suppliers for goods and services or miscellaneous employee expenses, are administered.

The asset ledger for all assets (fixed and non-fixed) is maintained. The rates at which assets depreciate are determined and, if appropriate, assets are disposed of.

Employees are salaries and wages, and other payroll-related benefits along with miscellaneous disbursements are processed and paid. Administration of deductions and updates to the payroll system is carried out.

All payment obligations related to contractor and supplier agreements are fulfilled in the Perform Financial Accounting process. For contractor invoices, payment authorisations have to be received from various Departments, and from Regional and District groups, along with supporting documentation related to the contract. Any financial penalties which result from, for example, delays in paying a contractor are computed and processed. Payment of invoices that are less than SR 20,000 (£ 3,333) can be handled without further reference by the MoPTT; those of greater amounts are forwarded to the Ministry of Finance for approval.

Perform Financial Accounting includes maintaining the General Ledger. Revenue, expenses, cost allocation and asset transactions, which are produced by the other accounting functions, are posted to the General Ledger. Entries are prepared, distributions are made to the appropriate accounts, accruals are determined and the Ledger is posted.

In the Monitor Financial Performance process both internal and external reporting requirements are dealt with. Reports are prepared which monitor the MoPTT's revenue and profitability. Rates are changed and revenue is analysed by the F&A Division of the MoPTT. The most important reports are:

- financial Results – quarterly;
- investments – quarterly;
- spending and Expenditures – monthly;
- collective Revenue – monthly.

Operation revenue reports are also drawn up (current period as compared with the same period last year). Expense reports which detail charges, and which cost rate factor data and other details in order to satisfy organisational and operating needs are prepared. Arrangements are made to prepare forward employee data as required to other branches of the MoPTT.

The financial activities of all Deputy Ministries are monitored through the preparation and auditing of reports relating to financial performance. These reports are updated to reflect changes in available funds, which are determined by the Ministry of Finance on the basis of changing priorities in the Kingdom.

5.12.1 Non-Functional Aspects

The current Financial Management function is the most effective function within the MoPTT. However, because of cumbersome procedures, paper-based records, and the fact that two primary groups are responsible for financial management in the MoPTT (the F&A Division, and the Strategic Resources Department within the O&M Division) each of them using a different accounting method, it cannot be called efficient.

As in the case of the Human Resources Management function the MoPTT Financial Management function is restricted by Government rules and regulations. These regulations stipulate that a cash-based accounting method should be used for financial management. This is a case of a non-functional aspect of the environment affecting the procedures of the Financial Management function, as is the fact that government measures require that financial records should be held on paper. This compulsory use of

paper is one of the leading causes of inefficiencies in the Financial Management function because it is time-consuming and labour-intensive. Furthermore, paper documents require a huge amount of storage space and, by government regulation, some of these records must be retained for over 20 years.

In principle, there is no major difficulty with putting right the shortcomings of the Financial Management function. They can be solved by the adoption of modern IS applications, such as the use of Microsoft Excel workbooks.

For further information about the Financial Management function see Appendix A.

For more details about each functional decomposition of each function see Appendix B.

5.13 Summary

This chapter provides a business process and organisation analysis and assessment of the telecommunications activities of the MoPTT, and explores some of the directions the organisation might follow if it is to provide a world-class telecommunications service.

The researcher has collected information and opinion from a variety of sources and using a range of approaches. His methods have included interviews, consultations and work sessions with MoPTT staff at all levels, consulting MoPTT papers, examining consultants' documents and reports, and talking with individuals who have expert knowledge in the telecommunications field.

On the basis of the information gathered it has been possible to identify and observe the business processes and to examine them to establish their efficiency and effectiveness. The analysis and assessment of the various business areas of the MoPTT has involved a breakdown of the activities and procedures followed in each unit.

In addition the researcher has provided comment on the common theme of the non-functional aspects associated with each business area. Non-functional aspects are factors, affecting the performance of the various business areas, which are not related to the technical capacity or workability of those areas. Rather they relate to attitudes, perceptions, and understandings. Nevertheless, they are of critical importance for the

effective and efficient operation of the business areas, and if neglected in effect form constraints upon their successful implementation.

An examination and assessment has also been made of general mind-sets and approaches within the MoPTT. In particular the part that might be played by a strategic plan has been fully discussed. The lack of a current strategic plan, or support for it, has been stressed. Without a strategic plan the MoPTT is in a weaker position as far as budget requests to the Ministry of Finance are concerned, and the organisation cannot be driven forward in an increasingly competitive environment.

Another general factor to emerge is the lack of integration as far as common Ministry-wide requirements and procedures between the various business units are concerned. Thus, there is much duplication of data between units, which impedes efficiency in a number of ways. This labour-intensive and tedious duplication is one result of the failure to introduce new technology into the recording, storage, and retrieval of information. Much of this is currently done manually, so that it cannot be remotely entered or retrieved.

The failure to move with new technology, characteristic of many MoPTT functions, processes, and sub-processes, is related to the shortage of properly targeted funding, itself related to the absence of Ministry-wide strategic plan initiatives.

Mention might be made in particular of the lack of suitable training for MoPTT staff, since it covers all functions throughout the Ministry. Though often educated to a high general level, MoPTT personnel tend to compare poorly in technical skills with their counterparts outside the organisation. There is no suitable in-house training to address this lack.

Following the assessment by the researcher of the various business areas within the MoPTT and his discussion of the common areas of concern, certain potential developments are considered for the redesigning of the business procedures. These include the adoption of a strategic plan, the establishment of more streamlined customer care (with a common point of contact for a variety of customer needs), the greater automation of the billing process, a fuller implementation of network planning, and the mechanisation of operations involving network technical personnel.

Chapter Six

MoPTT SKILLS AND MANAGEMENT PRACTICES

6.1 Introduction

In order to understand more about the non-functional aspects of the MoPTT it is important not only to describe and analyse the functions of the Ministry, but to do the same in relation to its employees' skills and management practices. This is necessary for the MoPTT to perform its activities effectively. This chapter therefore examines and analyses thoroughly the various basic skills necessary for the MoPTT's employees. In addition, the chapter discusses the management practices that are carried out by the MoPTT.

6.2 MoPTT Skills Assessment

It has been asserted that the MoPTT is over-staffed for the size of network supported. However, the greater problem facing the Ministry is the composition of the workforce in terms of type of staff and their numerical distribution. The MoPTT is understaffed in technical positions and over-staffed in administrative positions. Several similar comments have been recorded from different managers to the effect that their Departments are seriously deficient in technical staff and knowledge, and indeed available statistics related to employee skill sets support these claims. Attempting to operate under these constraints is a clear case of a failure to appreciate and meet an NFR (as discussed in Chapter 3). Specifically, it is failure to meet an operational requirement (see Section 3.4.1.6), in that the distribution of staff skills and the requirements that the MoPTT has to meet do not match.

As a result of analysing the different functions of the MoPTT in Chapter 5, several basic skills necessary for the MoPTT's employees have been identified. These skills include:

- computer literacy;

- business knowledge:
- ability to speak and write English;
- advanced education;
- human resource skills.

For each of the skill sets, representatives of various Departments have been asked by the researcher to identify what types of people within their Departments possessed the skills, and how often these skills were used. The questions were designed to provide rough numerical estimates of the staff in various Departments with some command of the skill in question. Questions such as 'How many people in your department use a computer daily?' or 'How many people in your department can speak and write English?' were asked during the course of the data-gathering phase of this stage. For more information regarding these questions see Appendix G.

In addition, an attempt has been made by the researcher to obtain employee training data from the Riyadh Training Centre and from the Strategic Resources Department. Unfortunately, the data obtained could not be relied upon to be accurate. The Training Department's database has not been updated recently and the Human Resources Division within Strategic Resources has not maintained up-to-date training information in the MoPTT's main employee database. In addition, employee profile data maintained on the mainframe has been reviewed by the researcher, although he was informed Training Department that neither the data nor the programs used to report the data was up-to-date. Only broad assessments have been made of the data obtained from these Departments. However, this means that there is a failure to meet an operational requirement.

6.2.1   Computer Literacy

Indeed a further example of this shortcoming can be found in the area of computer literacy, where there is a failure to match staff's existing capabilities with the skills required. Fewer than 50% of the MoPTT staff use a computer (either PC or mainframe terminal) in their daily tasks. Last year, approximately 500 employees (less than 3% of the MoPTT work force) took some form of computer or systems training from the MoPTT's Training Centre. Few Departments indicated to the researcher that all members of their Department use a computer daily. There are 2,000-3,000 PCs within the MoPTT.

The Ministry is planning to introduce new computer systems throughout the organisation and automate many tasks currently done manually. To take full advantage of this automation, the MoPTT should plan to educate most of their employees on basic computer usage. A continuation with the situation as it is at present represents a failure to meet operational requirements, which is a category of NFR as identified in Chapter 3. The capabilities of current staff, perhaps due to training inadequacies, do not fit with the actual needs of the Ministry.

6.2.2   Business Knowledge

The MoPTT staff, especially at the clerical and technician level, do not appear to have a clear understanding of how the work they perform affects the overall work of the organisation. This is the picture that emerges from discussions with District. Regional, Headquarters, and Ministry staff at all levels, and from training records. This is particularly significant because automation of manual procedures and new computer systems will lead to greater integration of Departmental functions. As a result, most staff of the MoPTT will not be able to perform their individual tasks without directly affecting some other individual's work. As new systems and processes are implemented, the MoPTT should plan to equip most of their employees with an understanding of all Departments within the organisation, and how one individual's actions may affect what happens in other Departments.

If the staff attempt to operate without this understanding, they will fall short in their performance requirements, which we have identified in Section 3.4.1.5 as one of the NFRs which impact upon the efficiency of the organisation. Indeed, in this case there can be seen how an inadequacy in one type of NFR (operational) can result in an inadequacy in another (in this case performance).

6.2.3   English Language Skills

One of the goals of the MoPTT is to become a world-class provider of telecommunications services. Achieving this goal implies that the MoPTT will have increased interaction with people from around the world. Since English has become the language used in global business communications the MoPTT would be prudent to ensure

that its workforce can speak and write English proficiently. Today, most management staff of the MoPTT are bi-lingual in spoken, but not written, Arabic and English. Some units in particular in the Ministry need improvement in this skill, amongst them the International Accounts Department in the F&A Division and various operator-assisted services departments. Last year, over 900 employees received English language training at the Training Centre. The MoPTT should continue to provide English language education and ensure that English-speaking staff are available in all customer service or international accounts departments.

Indeed, although cultural requirements are normally exemplified by a failure to appreciate and take into account matters which are specific to the Saudi environment, this failure to ensure that appropriate staff are fully competent in English can also be seen as a shortcoming in this respect. For the MoPTT to succeed in providing a world-class telecommunications service in a competitive environment their staff must be able to offer the same quality of service as potential rivals. If English is required for this, and insufficient staff are competent in English, this is a constraint upon the MoPTT's commercial capabilities. The constraint is culturally based, in that insufficient high school pupils are learning English to the required standard, or are prepared to maintain and improve their English after leaving high school.

6.2.4   Education

One shortcoming in this area is that there is a lack of higher education and appropriate qualifications amongst those holding positions of responsibility in the MoPTT, except in technical areas. This is a result of government policy, which does not encourage individuals to take qualifications or to have a university education. There is a tendency to appoint an individual to a managerial position in relation to finance, human resources, and so on, solely on the basis of how long he has been with the company without taking into account the education they have had. Except for managers for technical positions i.e. network management or network development, in this case only employees with a BSc in Engineering would be employed. It is a government rule to employ Saudis only as managers, so non-Saudis cannot be managers even if they are better educated.

This is a culturally/politically determined constraint on efficiency within the Ministry. and is a good example of the failure to meet an NFR, as it means that MoPTT employees in senior positions will simply not have the skills needed to run the service (see in Section 3.4.1.1 and 4.1).

On the other hand, although senior engineers may be technically qualified. there is a serious lack of technical education amongst MoPTT staff in lower positions. In-house training available to employees does not provide up-to-date technological training. Occasionally, vendors provide one-day seminars on their new technology, but these events are insufficient to improve, or even maintain, the MoPTT technical knowledge. This lack of technically skilled staff will become a greater handicap with the implementation of the future MoPTT technology.

6.2.5   Human Resource and Project Management Skills

The single area where the MoPTT employees have received the most training is management practices. However, this is attributable to the organisational policy of sending only Saudi-nationals to training and having over 90% of management positions filled by Saudis. Over 1,000 people have taken some sort of management course in the past year. The Time Management course offered by the Training Centre is the single most popular course offered. Continuing to send employees to this type of course should be beneficial to the entire MoPTT, particularly in view of the lack of previous qualifications indicated in Section 6.2.4 above. In addition, courses of this type being developed within the organisation both contribute to the Saudisation of the MoPTT. in the sense developed by the researcher whereby Saudi solutions to Saudi issues are found, and provide examples of it (see Section 4.3 and Section 10.3).

Figure 4 shows that, in the past, the MoPTT has concentrated on management and technical training. The MoPTT should consider distributing training funds more evenly across other types of course, especially customer service and interpersonal communication courses.
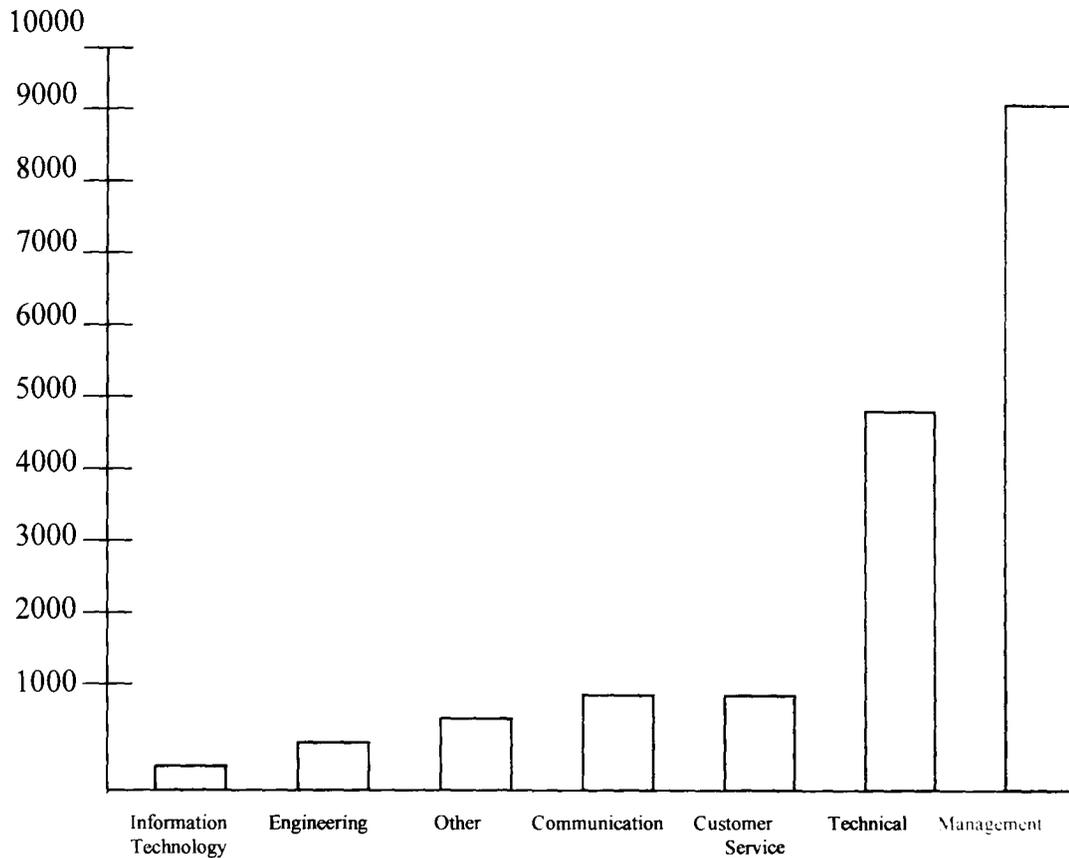
Figure 4. Historical Training Tendencies

For more information about MoPTT skill assessment see Appendix C.

6.3 MoPTT Management Practices Assessment

The MoPTT managers interviewed and consulted by the researcher believe that many of the challenges they face in trying to run the MoPTT effectively and efficiently result from the lack of adequate funding, a problem identified in the Enterprise Strategy Analysis report by the Ministry. However, lack of funding is not the sole cause of all the MoPTT problems. The management as a whole does not demonstrate strong, clear leadership characteristics to line employees. Additionally, the organisation's management practices are restricted by Government regulations. It is these regulations and the lack of sufficient funds force the MoPTT management to follow practices which are detrimental to the organisation.

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Management practices are affected in this way because two NFRs, in combination, are not being met. The restrictions imposed by government regulations are clearly legal requirements, while the lack of funding is a politically-determined constraint. Because these NFRs are being neglected, management efficiency is severely restricted.

Throughout the Review of Corporate Models Report by the Ministry, it has been noticed that as a whole the MoPTT management does not issue and enforce clear policies and directions for their organisation to follow. What appears to be either personality disputes or personal distrust between individual management staff members hampers the effectiveness of the MoPTT management to run the organisation. This problem is very unfortunate, and should be addressed openly within the MoPTT if the Ministry is planning to encourage greater interaction between its Departments.

A serious problem facing the MoPTT management is managing human resources. Several managers indicated that low employee morale, inability to provide adequate training to employees, and high employee turnover rates are the most critical problems the managers face. The MoPTT managers cannot, at their own discretion, hire and fire employees.

One factor which also has a profound effect is the fact that MoPTT wages are generally lower, for equivalent positions, than those paid in the private sector. Again these are things largely outside management control, as wage scales and pay increases are set by the government. The MoPTT management can make promotions, but cannot issue accompanying pay increases. Without an accompanying pay rise, the increased self-esteem an employee gains from a promotion is short-lived. In the long run, employee morale suffers even more.

Several MoPTT managers indicated that they were unable to send their employees to training programs because inadequate funds were allocated in the Departments' training budgets. It should be noted, however, that when funds were available for training, use of those funds was at times mismanaged. Much of the training allocation went to sending select employees to overseas training, something which was seen as a reward for service, not as a fulfilment of training needs. As with wages, determining the budget for training is outside MoPTT management control.

Under circumstances such as these it is no surprise that the MoPTT is experiencing a high rate of staff loss, and the current MoPTT policy is to hire new personnel only when replacing lost staff. Managers have indicated that the employees who leave are skilled employees with advanced education and good knowledge of the MoPTT practices. Managers feel that low morale, due to low wages and lack of training, and the availability of higher paying jobs in the private sector are the major reasons employees leave the MoPTT. Studies by the Strategic Planning group of the O&M Division of the MoPTT have indicated that the organisation is unable to retain enough experts to maintain properly a telecommunications network using modem technology.

In order to increase the effectiveness of the MoPTT management practices, two things should happen:
- Budget allocations for expenditure related to human resources should be increased.
- The MoPTT management should be given more freedom in deciding how those allocations are spent.

Even if these things do happen, the MoPTT management must demonstrate that it has the ability to manage the organisation effectively. The budgetary problems of recent years have eclipsed other major management practice problems. These fundamental problems may preclude the MoPTT from achieving their goal of becoming a world-class telecommunications provider.

Quality management is one area that the MoPTT management can control without being directly affected by external sources, and in the past a move to implement a Total Quality Management (TQM) system has been undertaken. TQM has led to the creation of a Customer Service Provisioning Process Improvement Team, which has made good progress in identifying and correcting inefficiencies in the provisioning process. However, Not all the MoPTT Departments have committed to implementing TQM. In many Departments quality control is limited to random spot-checks of employee performance, although in some areas, especially any areas that interface with information systems, quality control also includes verification of data being gathered and stored. This piecemeal approach to quality management, although well intended by the various Departments, simply cannot deliver overall quality of service and performance.

Indeed one of the key concepts of TQM is that of 'right first time' (Weirs, 1998). This means anticipating needs and requirements rather than attending to deal with them in a 'fire-fighting' way after the problems have arisen. The implementation of TQM would ensure that the MoPTT was well on the way to fulfilling the maintenance and usability requirements discussed in Chapter 3.

To improve quality of both service to the customer and internal procedures, the MoPTT should reinforce its commitment to a Ministry-wide quality management philosophy (such as TQM).

For more information about MoPTT management practices assessment see Appendix C.

6.4 MoPTT Assessment Outcomes

Several problems have been identified with the current organisational assessment of the MoPTT. These problems have existed within the MoPTT for several years.

The most serious problems facing the MoPTT are:

- A work force too large and inefficient for the size of the telecommunications network supported by the MoPTT.
- Numerous areas of duplicate and unco-ordinated efforts both across the MoPTT and within individual departments.
- A lack of basic and advanced skills needed to support a top quality telecommunications network.
- A management staff that is not allowed to, or is not willing to, influence any control over variables which could alleviate the problems mentioned above.

However, the MoPTT should consider other fundamental changes in its structure and policies in order to become a telecommunications provider of the highest quality.

Several common themes have been noticed from comments of the respondents in the course of the researcher's interviews and consultations with a number of Ministry, Headquarters, Regional, and District managers. While some of these themes represent perceptions of the MoPTT staff, all of them contribute to decreasing the productivity of the MoPTT. Many of those interviewed and consulted believe that organisational

problems with the MoPTT stem from practices followed in all government ministries, and these political and legal requirements impose constraints upon the options faced by the management. As such, these practices are not likely to change soon. Many respondents, especially at lower levels, express frustration with not being able to correct problems which they perceive as easily to rectify.

6.5 Summary

This chapter indicates the problems which face the Ministry in regard to employees' skills and management practices, which need to be considered in order to understand non-functional aspects more fully, and implies some of the potential ways to deal with them.

In describing the current MoPTT skills and management practices and discussing the issues facing those who have to make decisions about them, the researcher became more fully aware of the part played by the various NFRs, as identified earlier in this study, and the consequences for the efficiency and therefore competitiveness of the MoPTT in failing to meet some of them.

The chapter identifies many problems facing the MoPTT. For example, the work force is massive and inefficient for the size of the telecommunications network supported by the MoPTT, there are many areas of duplicate and unco-ordinated efforts both across the MoPTT and within individual departments, and there is a lack of basic and advanced skills needed to support a top quality telecommunications network.

In the course of the researcher's interviews and consultations a number of common themes have been noticed from comments of the respondents with a number of Ministry, Headquarters, Regional, and District managers. While some of these themes represent perceptions of the MoPTT staff, all of them contribute to decreasing the productivity of the MoPTT. Many of those interviewed and consulted believe that organisational problems with the MoPTT stem from practices followed in all government ministries, and these political and legal requirements impose constraints upon the options faced by the management.

Chapter Seven

INFORMATION SYSTEMS PROCESSES IN THE MoPTT

7.1 Introduction

This chapter describes and assesses the current status of the services and equipment that support the information systems within the MoPTT. The current situation is characterised by a heavy reliance on the central Information Technology Division (ITD) for data processing and support. Therefore, the largest part of this section deals with this Division.

This chapter lays out the basics of the organisation, the structures and practices, and the supporting information systems in the MoPTT. The chapter focuses on the corporate enterprise-wide level of organisation and activity.

Recently, the ITD issued a functional strategic plan which reflects the input from the ITD management in supporting the MoPTT's Corporate Strategic Plan. This functional strategic plan is partly used in this assessment.

The Operations & Maintenance (O&M) Section of the MoPTT, the Telex Section of the MoPTT, and the Ministry of Finance are part of the overall governmental organisation of the Kingdom of Saudi Arabia. As such, they follow the policies and regulations set up for governmental organisation, and these policies and regulations are outside the management control of those organisational units that are discussed in this chapter. As has been noted before, these restrictions are NFRs or constraints not related to the technical capabilities of the systems. These constraints arise from legal and political factors outside the control of the MoPTT (see Sections 3.4.1.1, 3.4.1.8, and 6.2.4). Their effect within the information systems of the Ministry is wide-reaching.

7.2 Major IS Processes

Processes are often derived from analysis of the life cycle of business resources, and may be analysed into other processes or elementary processes. The processes discussed in the

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following sections are derived from an analysis of the IS support functions. Some of these processes are carried out in more than one organisational unit or in more than one location, though with the current strong emphasis on centralisation, the ITD is mainly responsible for delivering those processes.

The precise nature and delineation of the processes we are considering is primarily derived from the Saudi Telecom Training Practices (STTPs). The current system configurations, set out by the STTPs, are maintained in the Technical Support Branch and are constantly updated.

Process staff are mainly centralised at the Riyadh Data Centre and the support functions for the mainframe are located in the ITD. There are also process staff in the Jeddah Data Centre, reporting to the Western Region, with ITD staff in the Riyadh Data Centre providing the technical support. The ITD also makes recommendations in respect of system configuration.

Data and database administration are provided by the Technical Support Branch, as are network management capacity planning, hardware planning, end-user computing support for mainframe connected systems, and other technical support.

7.2.1   Data/Database Administration

The ITD Database Support Group carries out database administration for the databases on the mainframe, with its responsibility extending to all data on the mainframe, migration issues, application development issues, performance and maintenance issues. The group also underpins all application systems of the MoPTT that are running on the mainframe. Where they exist, user support groups, like the information service centres (ISCs), support the PC base databases.

The ITD Application Development Section has a group for PC development, using mainly Clipper and Oracle, though Oracle is relatively new in this sphere. The support function for decentralised systems has not yet been taken over by the Database Group. Technical Support carries out the downloading of data to the end-users' premises or gives permission to qualified end-users to do so.

7.2.2　Applications Development

Responsibility for applications development is divided among several organisations:

- The ITD develops applications for the O&M Division of the MoPTT.
- The Telex group develops applications for Telex business.
- Computer Department Headquarters develops applications for F&A Division of the MoPTT.
- The ISCs develop PC-based applications.
- Users develop their own applications.
- Business units within the Ministry, e.g. Strategic Resources, also have their own programming staff.

The application development that is carried out in the ITD is the largest of the development operations; it is divided into mainframe systems and workstation-based systems development.

It is intended that Oracle Computer Assisted Software Engineering (CASE) and Structured Query Language (SQL) Forms become the preferred tools for workstation programs. There has also been a move to introduce Information Engineering in applications development, but this has been hampered by the fact that ITD is still searching for personnel with the right experience to support its effective introduction. The fact that this search is still ongoing is an indication that an operational requirement is not being met, in that the skills of the current staff does not meet the operational requirements.

Procedurally, all application development in the ITD must follow the Computer Service Requests (CSR) process, which takes in the end-users, business analysts (Method Group) and the ITD. The ITD has charge of the technical knowledge about implementation and interfaces to existing systems, while the role of the analyst is to help the end-user to specify their needs and translate them into IT specific requirements. However, due to a lack of resources, the end-user often bypasses the analyst and addresses the ITD directly with the request. Faced with this situation the ITD now seeks to define the development projects with the end-users in Joint Application Development (JAD) sessions in order to enhance the communication process.

This having been said, it must be noted that there has not been any major application development over the last seven years, although some smaller application development projects have been implemented. There are no productivity tools in place for life cycle management of applications. This failure to satisfy a maintenance non-functional constraint (see Section 3.4.1.7) means that proper anticipation of requirements has not taken place, so that the systems do not operate as efficiently as they might.

The Applications Support Section assists the application developers within the ITD regarding the process and quality assurance of the product, though the final sign-off of applications to ensure quality and proper implementation is in the hands of User Services in Operations.

In addition to all this, end-users have been known to develop their own PC-based applications. However, because of a lack of standards and support, there is no control over quality and little capability of maintaining those applications. Absence of standards means that a non-functional legal requirement is not being met and indeed this leads on to an inability to provide adequate maintenance, itself an NFR inadequacy (see Sections 3.4.1.8 and 3.4.1.7).

7.2.3   Application Maintenance

Application Maintenance is requested by users through the CSRs, as we have already indicated. The user is responsible for the specification of the functionality. Currently, the ITD tries to filter unnecessary (cosmetic) changes which may at times be requested.

The procedure followed is that the programs which have to be modified are moved to a test system. After testing, they are moved to the 'hold' status rather than receiving the immediate go-ahead for implementation. Only following the final testing and quality assurance attention the program will be moved back to the production system. There will have been no implementation of version control, changes to the code being applied directly to applications, without release or version control.

One weakness in this procedure is that, though the ITD has assigned programmers, with backups, to specific application systems, they do not document or monitor their changes, except to some degree amongst themselves. Shortage of personnel, documentation and

lack of version control result in a significantly high dependence on certain programmers who themselves know the code and what changes they may have made. Again, as we have noted in several contexts above, this is a case of the operation requirement for the skills of the staff to match the actual job they do not being fulfilled.

Application Support has been set up as a separate section to support application development and maintenance, with consultation with the Total Quality Management, Application Management and Information Engineering Methodology Groups.

7.2.4 Planning

The ITD carries out planning internally for its own ITD sections and externally for the computer environment in the MoPTT. Internal Planning is mainly directed to training programmes and set up of the organisation and practices of the ITD. Planning within the MoPTT is still in the start-up phase and Corporate Modelling is one part of it. The ITD planning can make recommendations, but has very little influence on the actual decisions of the Ministry. The alignment of business goals and IT recommendations are important. Introduction of Corporate Modelling methodology should carry out this alignment. The ITD planning introduced the measurement of indicators to support the corporate indicators that are maintained by Strategic Planning. These indicators are divided into applications and hardware. The application indicators contain number, type and the completion of the received CSRs. The hardware indicators contain the availability of the mainframe hardware, software system and communication lines. An additional indicator is the number of printed invoices. These indicators are a step towards showing the performance and utilisation of the ITD.

7.2.5 Technical Support

Help desk facilities for the mainframe are supplied by the Operations Branch of the ITD, though ITD Technical Support provides assistance on request. Normally, end-users have to go through the application co-ordinator for the application concerned as well as Operations in order to get support, indeed if end-users report a problem directly to the Technical Support, they will be advised to route their request through the application co-

ordinator. If widely used applications are not accessible, many users report the same problem.

One of the problems of which the ITD is most aware is the delay in response times when requests for help are made to Technical Support. These delays are for the most part related to the reporting of problems rather than to the tracking system. and the ITD is currently seeking to improve the reporting process. This would help the Ministry meet the non-functional performance requirement.

Amongst the other functions carried out by the ITD Technical Support is the circulation of technical specifications that are used to determine the hardware and software required for computer projects.

The ISCs provide technical support for distributed PCs and LANs, though the provision of ISC support is by no means uniform throughout the regional MoPTT locations. It is therefore no surprise that the quality of this support depends on the individual business units, and how importantly they view it. The ITD Resources Branch studies the requirements for outsourcing contracts to cover the PC/LAN environment maintenance.

7.2.6 Network Management

Within Technical Support network management is carried out by the Operations Branch and the Communications Support Group. Network management covers the mainframe related data network of the MoPTT and the operational network of its O&M Division.

While Operations support the users and run the network, troubleshooting, capacity planning, optimising and configuration set-up are all the province of by Technical Support. Currently LANs are not managed centrally. Local system administrators take care of the performance of the LANs, centrally performed functions being related only to the mainframe and connected devices.

7.2.7 Capacity Planning

The Technical Support Branch takes charge of capacity planning for network and mainframe, and maintains statistics relating to systems and network usage. which are

utilised in this planning. It is hoped that capacity planning will be enhanced by the introduction of tools affording more detailed usage statistics.

7.2.8 Data Centre Operations

Data Centre Operations are centralised in the MoPTT's two data centres. located in Riyadh and Jeddah. The major production system is in Riyadh, with very little processing being done in Jeddah, and the ITD has considered moving some of the processing applications to Jeddah in order to improve the system utilisation there. There are, however, license and hardware issues which will have to be resolved before any move involving major applications.

Backup scheduling is done on a system level, with backup requirements being specified for each application. Support for on-line applications includes a help desk function which co-operates with the business units, their application co-ordinators, the ITD Technical Support, personnel dealing with the application development of Telex, Telecom and the F&A Division of the MoPTT. Generally on-line support is given during normal working hours, but not during night shifts, when only batch jobs are carried out. In Jeddah Data Centre the Mechanised Directory Information System (MDIS) application requires 24-hour, 7-days-a-week operations support, which is covered in there.

The ITD Operations Branch is divided into:

- Invoice Systems.
- Production Control.
- Computer Operations.
- User Services.

7.2.8.1 Invoice Systems

A large part of the work of the Operations Branch, involving many staff, is the printing and preparation of invoices for telephones and pagers. There are two bills printed for every customer, with one being sent to the customer personally and one to the customer service office. The posting out of invoices was a manual process, and still is in some regional offices, since the four machines that automatically inserted the invoices into envelopes were obsolete and no longer received technical support. Indeed the mailing

machines could process only small envelopes holding invoices up to 11 pages, and the rest had to be sorted manually and inserted into envelopes. Furthermore, the laser printers used were unreliable, at times causing the mailing machines to send multiple invoices to the same customer. Invoice printing therefore relied on out-of-date devices and could properly support the billing process. The introduction of Al-Badeel (see below) sorted out this problem except, as noted, in some regional offices. This is an example of an NFR (that relating to usability – see Section 3.4.1.3) being fulfilled by an improvement in the system.

The weaknesses in the invoicing system were studied by a consultation group from AT&T (now Lucent Technologies), and various recommendations were proposed, including the possibility of dealing with invoices through the local implementation of the Al-Badeel application.

Recommendations were:

- To introduce the Al-Badeel application with the necessary equipment all over Saudi Arabia.
- To introduce electronic distribution of the large invoices.
- To ensure that equipment to print the invoices has up-to-date quality.
- To distribute the printing of invoices locally to save mailing costs, bearing in mind the disaster recovery plan. For example, printing invoices in Jeddah regularly would ensure that all equipment and processes are available should disaster recovery be required.

After consideration, the Al-Badeel application was adopted. By its use the printing of the second invoice in the data centre is now unnecessary as invoices can currently be viewed and printed in the local customer service office under this system. The Al-Badeel application, however, is in use in some locations but not throughout the Kingdom.

7.2.8.2 Production Control

Production control has three main functions:

- making sure printouts are carried out correctly and tapes are mounted on request:
- job recovery and rescheduling, ensuring the proper implementation of jobs:
- scheduling, ensuring the appropriate completion of requested jobs.

Proper track of production control is maintained through a control log which is passed on from shift to shift, and User Services looks after the annual schedule for all jobs which are within their capacity without referring to other units.

7.2.8.3   Computer Operations

Computer Operations ensure the execution of requested jobs, with User Services and Technical Support available to help in case of problems. The most time-consuming task this unit is involved in is the printing of invoices, difficulties with which we have noted above (Section 7.2.8.1). Frequent printer down times have made it difficult to ensure timely printouts. Additional contributing factors to this delay are the fact that the operations staff has to monitor missing spare parts and the system engineers are unqualified. As with a number of IS and other MoPTT operations, we note again the operational requirement for the appropriate staff to be doing the appropriate job.

7.2.8.4   User Services

The main role of the User Services unit is to supply a help desk function. In addition, it provides the last quality scrutiny for applications to ensure their integration into the existing production environment. The group maintains the job schedules and dependencies and offers operational support, in case specific knowledge for job recovery and rescheduling is called for.

7.2.9   End-User Computing

As a matter of policy all computer projects are supposed to go through the approval process and be scrutinised by the ITD Resources Branch. The ITD has laid down as the standard practice for the MoPTT that only PCs can be bought as new equipment is replaced, gradually replacing all terminals with multi-purpose equipment in a controlled and cost-effective manner, but the scheme laid down has not been followed.

Indeed there are no corporate standard guidelines for computing equipment in the MoPTT other than for mainframe and connected systems. While a standard guideline from the ITD is being prepared, it is not yet agreed and has therefore not been implemented. When the User Computing Group existed, it took responsibility in effect for the establishment

and maintenance of standards, issuing a regular newsletter, providing specifications, and being involved in purchase consultations. This is the kind of support in selecting equipment and in standardisation that the ISCs expressly required, and its withdrawal has led to their demise in some areas. Having in place suitable standards is a quality control issue, and the failure to do so is, as we have mentioned in the context of Management Practices Assessment (Section 6.3) means that maintenance and usability requirements are not being fulfilled.

End-user location have witnessed a considerable amount of software development using PC-based tools, and in this area end-users would like to have more support from the ITD, in order to help them select from new tools that are available on the market.

One inhibiting factor in the end-user's attitude to ordering software is the fact that the ITD is chartered to enforce software copyright law in the MoPTT. The Resources Branch of the ITD negotiates centrally with Microsoft in order to improve the situation with licensing contracts relating to the entire MoPTT. This is a good example of an NFR, in this case in the legal category, acting as a constraint upon the real options available to the MoPTT.

7.2.10   Technical Information and Administration

The Resources Branch is responsible for providing all technical information about the systems in the ITD and other facilities for library use. The ITD Application Development is currently developing a PC-based application in order to manage the documentation and technical information, which will replace the current inadequate library literature and documentation.

7.2.11   Standardisation

We have already touched upon standards, and how the lack of them in some areas inhibits the performance of the ITD (See especially Section 7.2.9). The question of standardisation covers two areas, functional standardisation and hardware/software product standardisation

Generally, all standards are defined through the STTPs. These publications set out processes and standards to be used in the ITD and in the MoPTT in general, as well as the systems configurations, such as the mainframe configurations, to be followed.

Specifications approved by the Deputy Minister are in place for a Standard Operating Environment (SOE) for desktop PC's. There now exists an update of these specifications, taking account of the new technology in the form of a PC Policy Framework document from ITD Planning. However, this is still only in a draft form, and has not been approved or circulated for use within the MoPTT. However, the Minister has sanctioned the general content of the proposals and asked for further particulars about the specifications.

Meanwhile, Hardware Support in the ITD puts into effect standards for PCs, and for software and communication products for small projects. Any large project requires specifications from the ITD Hardware Support through the Tender & Contract Department.

7.2.12 Security

In relation to this important concern, some applications and data are protected by the Resource Access Control Facility (RACF), a function carried out by the Technical Support group. Although not all applications are covered at present the steps are underway too involve them all. The issue of security takes on particular importance for the MoPTT, especially with requests to open up data to more on-line access. Security is one of the NFRs which we have identified (see Section 3.4.1.4). and we can see that it is fulfilled to some extent, though not entirely. in relation to applications access.

7.3 Applications

This section describes the MoPTT's applications that support the Information Systems. The detailed description of each application can be found in Appendix D.

7.3.1 Categorisation of Applications

There are several ways to structure the activities and supporting information systems

within the MoPTT. The following is the structure of the telecommunications activities supported by the MoPTT's information systems:

- Finance/Business Systems (The O&M Division of the MoPTT).
- Customer Services Systems (The O&M Division of the MoPTT).
- Network and Engineering Systems (The O&M Division of the MoPTT).
- General Support Systems (The O&M Division of the MoPTT).

7.3.2   Application Security

The two most critical security features for applications and data are:

- access control, ensuring that only users with assigned privileges can access applications and data, and generate business transactions;
- auditing, ensuring that it can be traced which critical applications and data have been accessed, by whom, and who provided which data.

The MoPTT has comprehensive access control for the vast majority of applications and data managed by the Riyadh Data Centre. The security mechanisms used allow for inspection to find out which users accessed a given application, but not specifically which data was altered.

The Riyadh Data centre uses primarily RACF (Resource Access Control Facility) and internal application security to protect applications and other resources in the MoPTT mainframe environment, and NDM (Network Data Mover) security is used each time a PC system accesses mainframe data. In some cases, a combination of two or more mechanisms is used.

The levels of security are also of interest. Some applications may have just one level of users, others have several groups: users with restricted access to read data only, users who can modify existing data, users who can delete data, and so on. Approximately half of the MoPTT's applications have only one security level, and little fewer than half have two or more levels. For further information about the security mechanisms of the applications, see Appendix D.

7.3.3   Application Usability

The users and IT staff were questioned by the researcher about whether the application was 'usable as is', 'usable with modifications', or 'needs replacement'. Appendix D shows the response for each application. The following pie charts summarise their responses.

Usable as is (2%)

Needs replacement (29%)

Usable with modifications (69%)
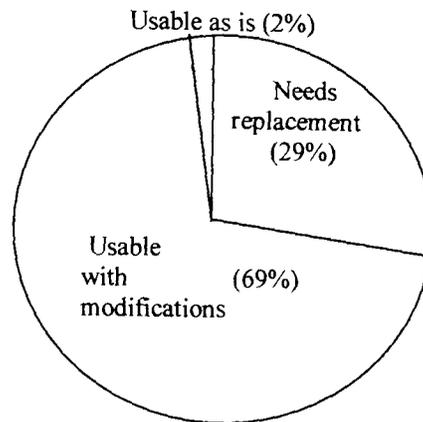
Figure 5. Application usability, as rated by Users

Usable as is (6%)

Needs replacement (9%)

Usable with modifications (85%)
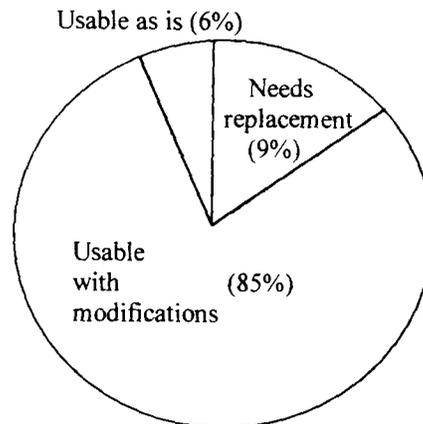
Figure 6. Application usability, as rated by IT Staff

As can be seen from Figure 5 and Figure 6 the users suggested replacing the systems more often then the IT staff (29% to 9%). Users and IT staff have responded from different perspectives. When rating the application the users have considered how well the functionality of the applications meets their needs. The IT staff may not have had this perspective, but may rather have considered how to implement the MoPTT requested changes from a technological viewpoint.

Some factors indicate that a number of the 'usable with modifications' responses should in fact be considered as 'needs replacement' answers. The number and substance of modifications suggested, and the cost associated with implementing these, point in this direction. Most applications are about 15 years old and have not had any significant modifications since installation. The current MoPTT staff will often not have the skills necessary to perform their jobs effectively, and this may have affected the nature of their responses to these jobs. The need for replacement is therefore almost certainly higher than shown above. This is yet another example of the failure to match current staff skills to the demands of their jobs which we have commented on before, and which we have identified as a shortcoming in meeting the operational requirement.

Users were also asked 'What improvements would you suggest to the current system?' and 'What would be the most urgent short term improvements?' The response more commonly given was 'Fix outstanding user change requests'. For more information regarding the type of questions that the users were asked see Appendix G. By this the staff meant, not that the system was not operating properly or that it was not properly maintained (although in some cases this may also have been true). Rather they were pinpointing the fact that the system simply did not provide, to an adequate extent, the information they required from it. In other words, while there was nothing technically wrong with it, it did not meet its usability requirements (see Section 3.4.1.3). IT staff were asked 'How many outstanding Computer Systems Requests (CSR) do you have?' The responses clearly indicate a large backlog of system fixes.

7.4   The MoPTT High Level Data Model

The O&M Division of the MoPTT data model supports the major business functions and encompasses several important areas. This section lends itself to analysis in stages: from the physical side (i.e. the applications and the business units, and their data) to the logical side, and then back to the physical side to get additional levels of detail. In order to define the data model in a top-down fashion, the concept of subject area is used. Based on this analysis, the six major data subject areas may be identified as:

1. Customer Services Data.
2. Financial And Business Data.
3. Executive Data.

4. Physical Assets (Inventory) Data.

5. Network and Engineering Data.

6. General Support Data.

For purposes of analysing the business areas and developing the information architecture, the major data categories or data subject areas of executive data and physical assets have been established. Telex, payphone, and PC-based systems fit into one or more of the six subject areas.
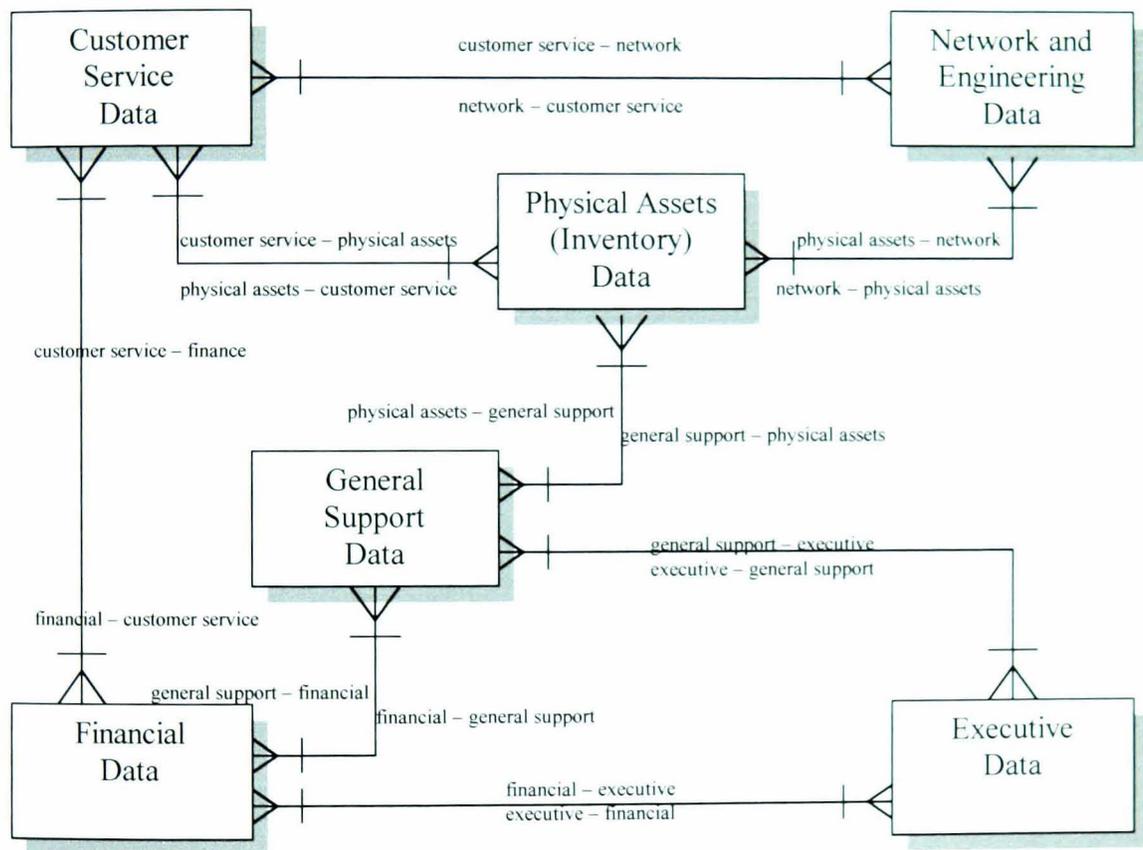
Figure 7. High-level entity-relationship diagram for the MoPTT data domains

The six major data subject areas in the MoPTT domain have been identified above as Customer Service Data, Financial Data, Network and Engineering Data, Physical Assets (Inventory) Data, Executive Data and General Support Data and are shown in the high-level entity-relationship diagram in Figure 7.

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Customer service data includes service order details to create the service data and network assignment facilities, subscriber details, and product information. It establishes a customer account. This data subject area exchanges information with network and engineering data, financial data, and physical assets (inventory) data subject areas.

Financial data contains financial information related to financial statements, financial plans, rate factors, business plan forecasts, capital budgets, deputy minister staff view, budget expenses and revenue forecast. It exchanges information with customer service data, general support data, and executive data subject areas.

Network and engineering data contains a record of all network facilities. This includes all carrier systems, channels, cables and units. This data subject area exchanges information with customer service data, and physical assets data subject areas.

Physical assets (inventory) data is a logical collection of accounting data related to the MoPTT. It includes information regarding real estate, furniture, vehicle, tools and network materials. This data subject area exchanges information with customer service data, network and engineering data, and general support data subject areas.

Executive data covers information regarding government policies and regulations, organisational plan, organisational structure, resource plan, product plan, job slot structure, positions, vacant and available jobs, skills for each position and tasks. It exchanges information with financial data, and general support data subject areas.

General support data is information that supports the every day MoPTT's functionality including work assignment, human resources, subscriber, order, and product. This data subject area exchanges information with financial data, and executive data subject areas.

At the next level, Table 3 reveals more specific MoPTT business areas.

Subject Area	Specific MoPTT Business Areas
Customer Service	Subscriber Order Product
Financial	Accounting Compensation
Network and Engineering	Circuit Network Forecast Network Assignment Network Configuration Network Equipment Network Facility Network Usage Outside Plant Structure Network Plan Status (Troubles, Orders, Alarms) Switching Network
Physical Assets (Inventory)	Material (Catalogue, Inventory, Movement) Property (Tools, Real Estate, Vehicles, Furniture/Office Equipment)
Executive Data	Strategic (Deputy Ministry, Finance, Government, Performance, Settlement), Product
General Support	Project (Work Assignment), Human Resources (Compensation, Employee, Health/Safety, Organisation, Training) Subscriber Order Product

Table 3. MoPTT subject areas

7.5 Summary

This chapter has offered a comprehensive account of the major IS processes which form the information systems of the Saudi MoPTT. This presentation will in itself not only have indicated the problems which face the Ministry, but will have implied some of the directions which might be taken to confront them.

In the course of this account, as elsewhere in this study, attention has been drawn where appropriate, to the NFRs distinctions discussed fully in Chapter 3, and to their usefulness

in identifying and categorising the constraints within which the MoPTT systems have to operate, and the requirements that the MoPTT systems have to fulfil in these operations.

Although the chapter concentrates on the corporate enterprise-wide level of organisation and activity involved in providing a telecommunications service across the Kingdom, it has become apparent that it is in fact the need more fully to streamline practices and procedures at all levels and in all parts of the organisation that is one of the main challenges facing the MoPTT.

Under circumstances of physical distance and varying local conditions an organisation is bound to find that standards and practices are adapted to meet these conditions, even if there are in theory corporate standards and a corporate ethos throughout the organisation. It is therefore not intended as a criticism of the management to state that the MoPTT has failed to unify practices and standards. Nevertheless, the clear impression has been gained by the researcher that very much more emphasis requires to be placed on the need to standardise processes and services so that the MoPTT can move forward and offer a high quality service compatible with the technological advances, in what may become a competitive market place. There needs to be a recognition that standards mean not just uniformity but also, more importantly, quality.

However, the various factors we have mentioned above have meant that STTP standards and other attempts at uniformity have not always been fully successful. However, it is not only the fact that the MoPTT is a large, scattered, and therefore unwieldy organisation which has caused a lack of uniformity and therefore a failure to maintain service standards throughout the Kingdom. There are other factors too.

Other aspects which lay down a challenge for the telecommunication enterprise of the MoPTT are related in large measure to resources, that is to say, to budget and to manpower assets. These two are, of course, in themselves connected: a failure to bill customers promptly will mean that revenue will be slow in coming in, and so on, so that each business activity affects the others.

Lack of funds means a number of specific areas will under-perform. In particular it means that equipment will be out of date and unable to execute efficiently the task for which it is nowadays required. This is manifested not so much in the actual telecommunications

equipment used by the customer, but in such things as the computer hardware found in various MoPTT locations. Lack of budget resources means that obsolete data storage and retrieval systems are not being replaced, or when there is a hardware failure spare parts are no longer available.

Old systems, even when operating as designed, can no longer deliver services as quickly as is nowadays required. For example, a specific set of data may be required at a location distant from Riyadh or Jeddah. If that data is stored on the mainframe the member of staff who requires it may have to go through a tiresome and time-consuming routine involving manual form-filling, telephone contact, batch dispatch, tape transfer, and so on, and possibly requiring the one-to-one contact with other (remotely located) personnel to facilitate the process. The result is that, when the data does arrive, it is often out of date. The routine is neither efficient nor effective, and if the member of staff concerned had direct access, this would be avoided.

Faced with such a situation some local managers have acted on their own initiative and installed PCs in their branch offices, which may help with some of the data handling. However, though it may temporarily solve a problem, this is in the long run one of the factors in the lack or organisation-wide standardisation which we mentioned above.

Budget shortages also affect the staff more directly. If the MoPTT is unable to afford competitive wages and salaries it will be unable to attract or retain quality staff. This means that not only the skills and the expertise, but also the drive and the initiative to move forward, will be in short supply in the organisation. Again, this is a factor in the compromise of service standards and a serious disadvantage should the market become more competitive.

There seem, therefore, to be two very broad substantive changes required in the MoPTT if it is to move forward into the new age of telecommunications provision: it needs to receive greater and more precisely directed financial support (and this will be, initially at least, government-driven); and it needs to have the will to address the demands of the new telecommunications environment (which will be largely management-driven). The two are, of course, related. Without the money there will be no quality staff, no quality service, and in a competitive market place, eventually no government telecommunications arm.

Chapter Eight

THE MoPTT STRATEGY ANALYSIS

8.1 Introduction

This chapter describes the strategy of the MoPTT. The intent is to understand and document the business perspectives that the MoPTT uses to manage its day-to-day and annual operations. It is these strategic and short-term business perspectives (i.e., goals, objectives, critical success factors and critical assumptions) that are used to prioritise and guide all subsequent Information Systems Planning activities.

The outputs of this chapter have been used to ensure that information systems architecture aligns properly with the MoPTT goals, objectives, and critical success factors. Plans for evaluating, enhancing, replacing, and building the MoPTT's new information systems should be guided by this business framework.

The MoPTT Strategy Analysis was carried out by using all the available information contained in key documents such as Corporate Plan and the Functional Strategic Plans, by interviewing and consulting key Executives in the MoPTT and by reviewing some works done by other consultants.

Information from interviews, consultations, documents, and experts was collated by the researcher. It was then used to create the MoPTT Strategy Models, which are computer representations of business factors such as the MoPTT goals, objectives, critical success factors etc. These Strategy Models are known as 'objects' in the Navigator Methodology. which is a proprietary methodology used by Lucent Technologies to identify the MoPTT goals, objectives, information needs, critical success factors, and critical assumptions etc. in a very specific way. The MoPTT itself had been struggling to identify them (most of the definitions they sought to use were very broad and vague). As a result the researcher decided to apply the Navigator methodology because of its clearer definitions of the MoPTT goals etc. These Navigator Methodology 'objects' have been created in the

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computer using the Application Development Workstation (ADW) CASE tool. In addition, descriptions of each object have been entered.

Object	Definition
Problems	Difficulties within the MoPTT business environment
Critical Success Factors	What is the critical to the success of the MoPTT
Information Needs	Data needed for decision-making in the MoPTT
Functions	What the MoPTT does to deliver products and services
Opportunities	Events that the MoPTT should capitalise on
Objectives	Measurements to track the success of the MoPTT business
Goals	What the MoPTT wants to achieve
Critical Assumptions	What the MoPTT must assume about external factors

Table 4. The relation of objects to business factors

Table 4 indicates the types of object are those identified by Lucent using Navigator Methodology to represent different kinds of business factors or parameters in relation to the MoPTT. These are the objects which the researcher opted to utilise to analyse the business factors of the MoPTT.

Building upon this work by Lucent, the researcher was able to determine whether logical relationships existed between the different business factors concerned (for example. a problem might affect a function, or an objective might support a goal). These relationships were documented by producing a computer matrix to link the different types of objects.

The matrixes in this Chapter and in Appendix E were created to document the relationships between different types of object. For example, a matrix lists the MoPTT's goals on one axis and the activities or functions it carries out on the other axis. A goal is one type of object and a function is another type of object. The ticks that appear in the Matrixes in this Chapter and in Appendix E are the responses of the MoPTT executives. Entering a tick on the matrix for one particular goal and one particular function shows that the function is especially important for achieving that goal. Figure 8 shows there are many possible relationships among the Navigator objects as identified by Lucent.

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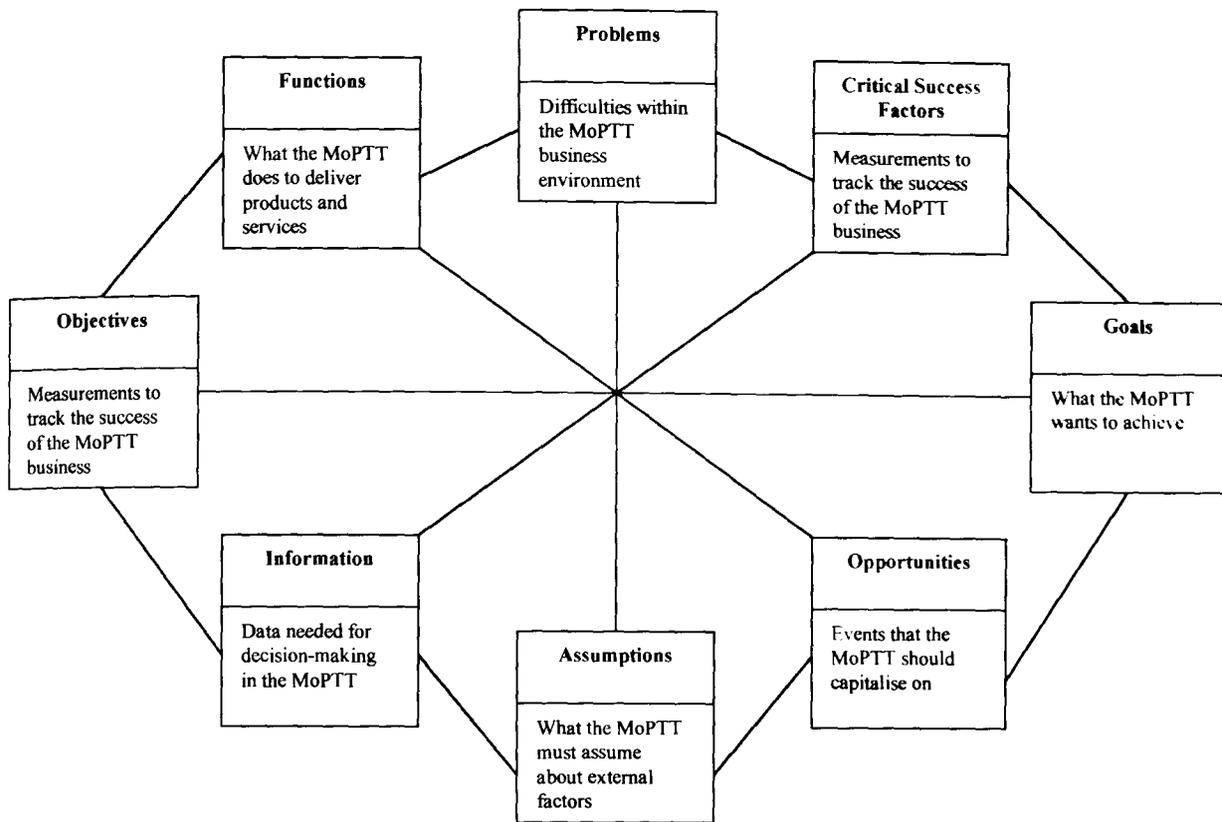
Figure 8. Relationships among the Navigator objects

The models were then used by the researcher as the basis for the observations and conclusions that are found in each section of this Chapter and in Chapters 9 and 10. The most relevant relationships are documented in this chapter.

8.2 Competitive Environment Analysis

In the course of his study it became clear to the researcher that the MoPTT as it currently operates has failed to recognise the importance of competition and to give appropriate weight to it in the way the company is organised. As long as the MoPTT is a monopoly this is at least understandable, but with the way now open in Saudi Arabia for other companies, perhaps even based outside the kingdom, to make plans for the provision of telecommunications services this attitude will lead to competitive disadvantage. In addition, Saudi Arabia is planning (hoping) to join the World Trade Organisation (WTO) by 2005 which means that the MoPTT has to be prepared for global competition by then.

There has been in the last few years a recognition, at least on the part of some, of the need to be ready for competition in telecommunications. The Seventh National Development Plan gives further momentum to the use of the new technology, particularly in information and telecommunications, to lead to economic advantage in the competitive climate of both the Saudi and the international markets. And as recently as September 2000, as we pointed out in Section 1.5, the President of Saudi Telecom, Abdulrahman Al-Yami, wrote that the company's job was to be ready for new competition by offering a world-class, customer-focused service.

It will perhaps be some time before such thinking finds its way fully into the minds of all the managers of the MoPTT. However, even if actual competition from other companies takes some years to materialise, the need to prepare for competition by raising and maintaining standards in all aspects of the MoPTT's operations means that certain directions are laid down for future development. In effect, competition acts as an NFR, if recognised, by eliminating certain unfruitful avenues and guiding it along other courses.

It thus becomes of critical importance for the researcher to identify the problems posed and opportunities offered by that competitive environment. That is why this analysis of the capacity of the MoPTT to compete in the telecommunications environment has been made. In particular the analytical techniques described below were used to help determine the present capabilities of the Ministry's systems. Only by having a clear account of what information systems can at present deliver will the MoPTT be able to assess what developments and improvements are required to give it a competitive edge.

To give an example, it has become clear to the researcher that the standardisation of processes and services in the MoPTT is of crucial importance if the organisation is to move forward and offer a high quality service in what may become a competitive market place. And competitive standards, as we have pointed out above (Section 7.5) mean not just uniformity but also, more importantly, quality.

However, in order to be able to address the questions of uniformity and quality which would give the MoPTT the edge in a competitive telecommunications market, a clear understanding of what the situation now is has to be reached.

As an aid to analysing the information that he has gathered which is relevant to competition, three models based on the methods and theories employed by Dr. Michael Porter of Harvard University have been developed. The three models are:

1. Value-chain analysis.

2. Strengths, Weaknesses, Opportunities, Threats ('SWOT') analysis.

3. Competitive Forces analysis.

8.2.1   Value-Chain Analysis

A company's Value-chain consists of the main activities or functions that it performs which add value to the product and services it brings to the marketplace. An understanding of the MoPTT's Value-chain can help determine which functions of the organisation give it a competitive edge in the market. In addition, it can indicate how to maximise the MoPTT's competitive ability by introducing information systems into the functions which belong to the MoPTT's Value-chain.

Porter states that there are two major categories of functions or activities that a company performs to provide value to its customers: primary activities and support activities.

In the case of the MoPTT, Value-chain analysis highlights the 12 functions which are central to the Ministry in delivering its products and services to its customers. These 12 functions will become the focus of the remaining activities because they are the MoPTT's Value-chain. They are listed and described in Appendix E (Section 1).

According to Value-chain analysis, the functions or activities that a company performs to provide value to its customers may be divided into two categories: primary functions and support functions.

Primary functions are the main functions that are directly related to the production and delivery of products and services. For the MoPTT, there are four primary functions:

1. Network Development.

2. Network Management.

3. Marketing.

4. Customer Services.

Network Development puts in place the required infrastructure upon which the MoPTT builds its products and services. In the Value-chain model Network Development provides the basic inbound logistics to it operational process.

Network Management is the production engine that operates and services the network upon which services are built and provided to the company's subscribers.

Marketing analyses customer needs and anticipated demand to determine the requirements and characteristic of products needed to serve the company's customers now and, more importantly, in the future.

Customer Service is the outbound logistic function that relates to the users of the telecommunications service, and ensures that the products and services operate properly so as to meet the needs of the customers.

Using the categories of Value-chain analysis, support functions are activities performed by the organisation in support of the primary functions. Support functions are not less important than primary functions. In fact, they may be, as in the case of Information Technology, crucial to the successful operation of the primary activities.

If an organisation carries out one or more of these support activities particularly well, it can give the primary activities a competitive advantage over competitors who are less skilled. Such an organisation is considered to have a 'core competency' that its competitors do not have.

For example, a company that is extremely good at attracting and retaining quality staff has an advantage over its competitors in markets where skilled individuals are scarce. This core competency for attracting and retaining skilled employees allows the company's primary functions to operate more effectively than those of its competitors. Using Value-chain analysis, we may identify eight major support functions in the MoPTT: they are:

1. Information Technology.
2. Strategic Planning.
3. Human Resources.
4. Training.
5. Financial Management.

6. Materials Management.

7. Buildings and Land Management.

8. Vehicles Management.

The primary and support functions at the MoPTT can be represented graphically as in Figure 9.

Support Activities

| Materials Management |
| Strategic Planning |
| Buildings & Land Management |
| Vehicles Management |
| Human Resources |
| Training |
| Information Technology |
| Financial Management |

| Network Development | Network Management | Marketing | Customer Service |

Primary Activities
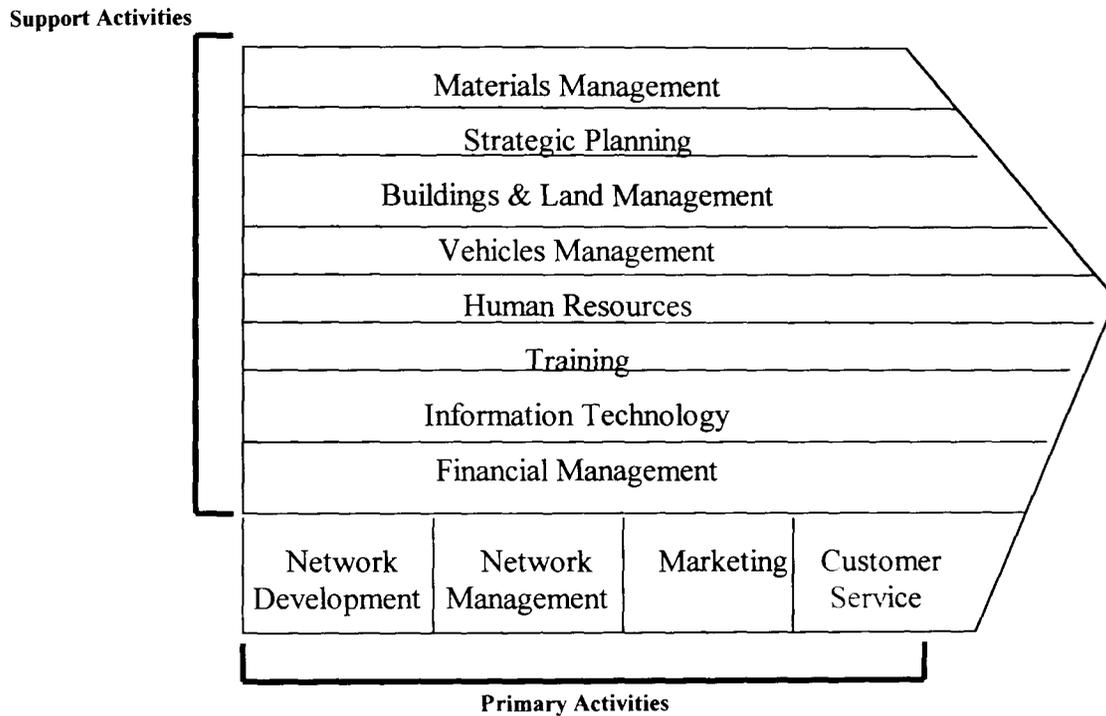
Figure 9. The primary and support functions at the MoPTT

8.2.2 Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis

As part of this chapter, a SWOT analysis model was completed, again based on the Porter constructs. SWOT stands for strengths, weaknesses, opportunities and threats. Figure 10 depicts the SWOT analysis that was carried out on the information gained from interviews, consultations and from documents supplied by the MoPTT. This SWOT analysis is intended to provide a broad view of the MoPTT's business environment. In addition, it is intended to point to high-priority areas, which would benefit from new or improved information systems.
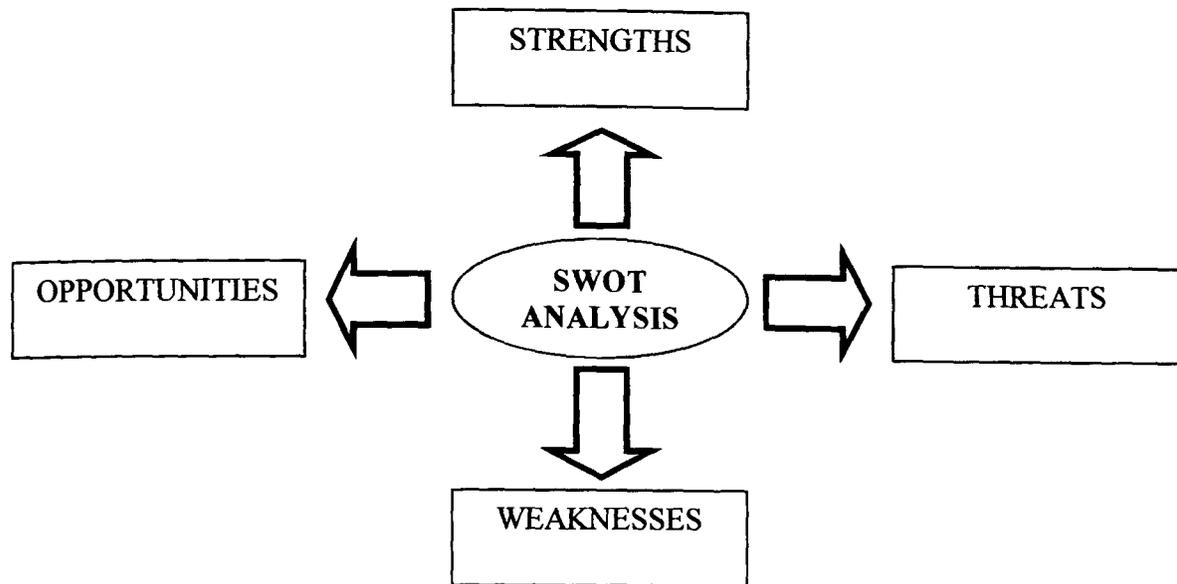
Figure 10. SWOT analysis diagram

Strengths: These allow the organisation to compete effectively in the marketplace. Strengths should be built upon, especially if the competitors are weak in the areas where the organisation in question is strong. The leading strengths of the MoPTT are:

- Profitability: The MoPTT appears to return more revenues to the Kingdom than it uses to operate its telecommunications systems. This strength, together with the opportunities associated with a growing population, demonstrate the solid investment potential of the MoPTT.

- Partial, increasing availability of digital network: The investments being made in digital technology also position the MoPTT to provide up-to-date telecommunications services and capabilities to its customers.

- Direct link to government: The Kingdom operates many businesses that require telecommunications networks and capabilities. As part of the Kingdom's business structure, the MoPTT is provided with the capability to lobby directly and to influence the government in order to further its goals. This direct link, together with the potential to form alliances with other Kingdom businesses and agencies, could allow the MoPTT to position itself as the major source of telecommunications services for Saudi Arabia.

- Ability to limit influence of competitors: Through its direct links to the country's government and as the current telecommunications regulator, the MoPTT can influence legislation and rulings to give it an advantage over its competitors.

Weaknesses: The weaknesses of the organisation can put it at a disadvantage, especially if competitors are strong in the areas in which it is weak. In the case of the MoPTT many of these weaknesses offset the strengths that the organisation has and limit its capacity to capitalise on the opportunities presented to the Ministry. The main weaknesses of the MoPTT are:

- Loss of experienced personnel: The loss of experienced and skilled personnel to other businesses is a significant weakness of the MoPTT. As a high technology industry, the loss of capable personnel is especially devastating to the Ministry in its attempts to provide a modern telecommunications service and to provide an effective service to its customers. This loss of staff is due in some measure to the salary structure and personnel regulations imposed by the government.

- Inability to affect staff reductions: There are many potential opportunities to reduce expenses through staff reductions. However, governmental regulations and national goals for employment deter the MoPTT from taking such actions. One avenue employed by most companies to effect cost savings and to release money for investment is thus not open to the Ministry.

- Shortage of skilled employees: There is a shortage of individuals with the skills needed to run a modern telecommunications company. This is due again to governmental personnel polices, which restrict pay and make it difficult for the MoPTT to attract and retain the skilled employees it needs to be successful both now and in the future.

- Little focus on customer service: Customer service does not enjoy a high profile in the MoPTT. This lack of focus, together with a shortage of funding, means that a large percentage of Saudi citizens wait a long time to obtain telephone services. If the telecommunications market becomes more competitive in the future, Saudi Telecom would be in an unattractive competitive position due to its lack of customer awareness and the dissatisfaction of the Kingdom's citizens with the level of service provided in the past.

- Budget rather than profitability focus: The Ministry lacks interest in investment and employs budgeting as the main financial and control tool. The budget process, however, does not adequately foster an investment perspective, which would generate income and make for profitable returns in future years. The budget perspective centres

on cost control and not on investment possibilities, and management risk taking is deterred.

- <u>Lack of management acceptance of threat of global wireless communications</u>: There does not appear to be an adequate understanding of the potential threat of the growth and potential for global wireless communications. Global telecommunications companies, which use wireless technology, will threaten the MoPTT's major markets, especially its international market. But the domestic market may at risk too: the growth of the capabilities of wireless technology could also allow residential consumers to obtain phone services through companies other than the MoPTT.

- <u>Lack of modern information systems capabilities</u>: All executives and managers interviewed and consulted indicated the need for more information systems to manage adequately their areas of responsibility. They expressed dissatisfaction with the level of the Ministry's use of adequate technology which would improve the productivity and effectiveness of operations. Information technology and systems are vital for operating a modern telecommunications company.

- <u>Lack of crisis management</u>: It is important for the MoPTT to establish a department that deals with any crisis that might arise within the organisation, rather than fire fight when an emergency takes place.

- <u>Lack of informatics strategic planning</u>: The discussions revealed an executive frustration with the organisation's inability to carry out adequate planning. Co-ordinated planning among all departments was felt to be an important success factor if the MoPTT was to capitalise fully on the opportunities presented. A switch from a focus on budget to a focus on strategic planning, particularly informatics strategic planning, would be a major step in resolving this problem.

Opportunities: These are environmental and internal factors that present opportunities for an organisation to capitalise on and allow it to gain a competitive advantage. The key opportunities for the MoPTT are:

- <u>Potential to become hub for Middle East multinational partnerships</u>: The Middle East represents a large potential market for telecommunications. It is a marketplace whose full potential is yet to be tapped. Telecommunications companies are expanding globally, though starting with the US, Europe and the Far East in order to capture the surge in international traffic resulting from the growth in multinational businesses. The MoPTT in the Kingdom is uniquely positioned to capitalise on such a trend in its

own region. The Kingdom shares a common religion, language and culture with many of its Middle East neighbours. It could, through effective partnerships with regional and global communications companies, install and operate a hub for international communications for Middle East countries.

- Capability to expand into the entire Kingdom: A significant population of the country still lacks a telephone service. This represents a large untapped market for local and international telephone provision, which offers an opportunity for increased revenues. Capitalising on this opportunity will require investment in an improved infrastructure and the goal of providing all citizens with their own phones.

- Potential for alliances with major government owned companies: The Saudi government operates many businesses, several of which require extensive telecommunications capabilities, something which is also required by other government-run organisations such as the armed forces and National Guard. Some of these organisations have or will establish their own networks. An opportunity exists for the MoPTT to provide telecommunications services in association with such bodies. Becoming the telecommunications provider of choice for the Kingdom's companies and agencies could significantly increase revenue potential and provide additional funding to the Ministry.

- Population growth: There is great population growth within the country, and this represents a growing potential for telephone and telecommunications services within Saudi Arabia.

Threats: These are environmental and internal factors that can menace the competitive ability or profitability of the company. The foremost threats faced by the MoPTT are:

- broad base of competitors in international market segments;
- dissatisfied customer base;
- growth of wireless communications.

These three items combine to present a threat to the future growth of the MoPTT. Saudi Arabia represents a growing market for international telecommunications services, and this market has been and will continue to be under attack by competitors. The future trends of telecommunications technology, mainly wireless systems, will give competitors greater potential to threaten the Kingdom's international market. Wireless and satellite

communications could also provide residential customers with choices other than Saudi Telecom for their telecommunications services.

8.2.3   Competitive Forces Analysis

Another model that has been built is the competitive forces model depicted in Figure 11.

- Call back companies
- Global alliance:
    o World partners
    o BT/MCI, Unisource
- International private lines
- GSM 'roaming'
- Satellite networks: IRIDIUM, GLOBE STAR

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                              ┌──────────────────┐
                              │   COMPETITORS    │
                              └──────────────────┘
                                                      • Strong bargaining power
• Suppliers with strong                                    o Government
ties/relation to the government                            o Business
and the MoPTT have strong                             • Weak bargaining power
bargaining power                                           o Residential

┌──────────────────┐      ⇦    The MoPTT    ⇨    ┌──────────────────┐
│    SUPPLIERS     │                              │    CUSTOMERS     │
└──────────────────┘                              └──────────────────┘


        ┌──────────────────┐   ┌──────────────────┐
        │    SUBSTITUTE    │   │    REGULATORY    │
        │    PRODUCTS      │   │     BODIES       │
        └──────────────────┘   └──────────────────┘
        • Wireless systems     • The MoPTT is the regulatory
                                 body for the Kingdom
                               • International standards committees
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Figure 11. Competitive forces diagram

The study has utilised this model to analyse the competitive environment in which the MoPTT operates. This model places the forces that affect a company as it attempts to compete in the marketplace it serves into five categories, and these forces were identified in the case of the MoPTT. The five categories are: competitors, suppliers, customers, substitute products and regulatory bodies.

Competitors: These are the other companies that offer the same or similar products and services. The effectiveness of these competitors and the strategies they employ (e.g.. low cost, product and service differentiation, targeting particular groups of customers) dictate how the company must react to overcome the threats they pose. The chief competitors faced by the MoPTT are:

- call back companies
- global alliances:
    - ° world partners
    - ° BT/MCI, Unisource
- international private lines
- GSM 'roaming'
- satellite networks: IRIDIUM. GLOBE STAR.

Suppliers: The bargaining power of a company's suppliers is a substantial factor in how a company can function in the marketplace. This is especially true if the bargaining power of the suppliers is sufficient to allow them to dictate prices or quantities supplied. Environments where only one or two suppliers are possible sources of resources can act as considerable constraints on the competitive strategy of a company. In such conditions suppliers can demand high prices for their products or they can limit supply. Environments where there are many suppliers who compete heavily among themselves are least restrictive. Forming strong alliances with major suppliers is an effective strategy that many companies in the wider world are now implementing to ensure quality supply at reasonable prices. Japanese companies are exceptionally effective with this type of strategy and tightly link their Value-chains with those of their suppliers.

Customers: Companies may have marketing segments in which the customer has strong bargaining power. This is true if the customer has a choice of several companies from which he can obtain the products and services he needs. Commodities such as soap and cosmetics are examples of such products: in this market many companies compete with similar products and the customer has a wide range of choices. The pharmaceutical industry, on the other hand, is an example of the opposite state of affairs. especially when a company produces a life-saving drug which gets patented. In such a case the custom drug is vital to the customer and he has no choice but to buy it from the company. This

means that the company therefore has a great deal of power in setting prices or in the amount produced.

Government and business customers have strong bargaining power with the MoPTT in that they can establish their own networks. Residential customers. on the other hand. have little bargaining power in that they have to go to the MoPTT for telecommunications services. However, the appearance of wireless technology may provide residential customers with greater choices, thereby increasing their bargaining power.

Substitute Products: It is important to analyse the development of substitute products (or services) as they can change the whole nature of competition in an industry. An instance of great significance was the arrival of aircraft, especially as an alternative mode of transportation to the train. In the case of the USA, for example. aircraft established the air transportation industry and toppled the railways as the major source of personal and business transportation in the country. It took years for the US rail system to recover from the impact of these substitute services and many railway companies went bankrupt or were merged with others. Only recently have railways been able to re-establish themselves, and it is now as a mover of goods rather than of people in the USA.

Wireless technology can be viewed as a substitute product that could radically change the environment in which the MoPTT operates. The advent of cheaper and more effective wireless technology could make obsolete the current network infrastructure which the MoPTT has put in place. Customers of the future may not be burdened with having to have cables and wires to communicate. More importantly, future customers using wireless technology may not need to obtain service from a telephone company that is geographically located close to them. Customers in this position will have a great deal of bargaining power in relation to telecommunications services.

Regulatory Bodies: In many industries, regulatory agencies greatly influence the environment in which competitors operate. The telecommunications industry in the USA is a prime example, where telecommunications firms who can interact effectively with the regulatory bodies often position themselves competitively in the industry.

The MoPTT is the regulatory telecommunications body for the Kingdom of Saudi Arabia and this provides it with a unique competitive advantage. It, in essence, is able to regulate many of its potential competitors.

International standards committees are also regulatory bodies in that they may set standards for telecommunications which the MoPTT must adopt if it is to provide its customers with global communications. It is clear, of course, that standards set by such international committees can direct the future types of products and network infrastructure that the MoPTT must adapt to and assimilate into its infrastructure.

8.3 Goals and Objectives Analysis

During information gathering, significant relationships between goals, objectives, critical success factors, and critical assumptions were analysed by the researcher. The Application Development Workbench (ADW), a computer aided systems engineering (CASE) tool, has been used by Lucent to document and assist with the analysis of this information. Before providing insights into relationships amongst goals, objectives, critical success factors, critical assumptions, and functions at the MoPTT, it is important to define each of these terms as they are used in Navigator. Definitions for these objects are given below.

8.3.1 Terminology Definitions

8.3.1.1 Goals and Objectives

The terms 'goal' and 'objective' have already been used by the MoPTT in the development of the MoPTT draft FSPs and the overall Corporate Plan. In the terminology of Ernst and Young's Navigator Systems Series (Navigator), 'goal' and 'objective' have very specific definitions that are slightly different from those used in the Corporate Plan. To remain consistent with the methodology selected by the MoPTT for IS Strategic Planning, the Navigator definitions have been used. To help reduce confusion, summarised Navigator definitions are shown in Table 5 together with the equivalent term in the FSPs.

Navigator Term	Navigator Definition	Corporate Plan Term	Functional Strategic Plan Term
Goal	A summarised statement of a major business aim that supports the overall purpose and mission of the organisation.	Corporate Direction	Objective
Objective	A more detailed business aim that is measurable and/or quantifiable and that directly supports the achievement of a goal.	Corporate Objective	Strategy Action

Table 5. Comparison of terms

Examples are given below:

- Navigator goal example: 'Improve customer service over the next three years.'

- Navigator objective example: 'Reduce the average time between a customer's first request for a service and the final activation of that service to three days by the end of 2002.'

In Navigator terminology, in other words, an objective is related to a goal as a means is to an end.

8.3.1.2   Functions

Functions are different from organisational units, such as Departments or Divisions. Functions are *what* a company does, while units are *how* the company organises itself to perform the functions. An organisation chart reflects the organisational structure of the company. Functions are reflected in the numerous processes that are performed and linked within the company to bring products and services to the marketplace. 'Marketing' is an example of a function.

8.3.1.3   Critical Success Factors (CSFs)

CSFs are key factors that the organisation can and must activate to ensure success in meeting its goals or objectives. An example of a CSF might be the completion of a management-training programme for level B managers.

8.3.1.4   Critical Assumptions

Critical assumptions are intelligent guesses that an organisation makes about factors in the environment external to the organisation itself. While not under the direct control of the organisation, these factors can and do affect whether or not the organisation meets its goals. One of the most significant external factors affecting how well most companies meet their goals is the state of the economy. To set realistic goals effectively, companies have to make intelligent guesses (critical assumptions) about the growth or direction of the economy.

The next few sections of this chapter provide insights into the relationships of greatest significance between goals, objectives, functions, CSFs and assumptions.

8.3.2   Significant Relationships

By means of the analysis carried out on the data collected from the documents, interviews and consultations with individuals in the various MoPTT units, eight significant factors have been discovered and are indicated in Figure 12. These factors, as identified by Lucent, are:

1. Objectives which measure how well the MoPTT is meeting its goals.
2. Objectives which measure the correctness of the critical assumptions made by the MoPTT.
3. Critical assumptions made by the MoPTT which can affect the attainment of its goals.
4. Functions which are important to meeting the goals of the MoPTT.
5. Functions which are important to meeting the objectives of the MoPTT.
6. Functions which are important to ensuring that CSFs are met.
7. CSFs that are critical to meeting the goals of the MoPTT.
8. Critical assumptions made by the MoPTT that can affect the CSFs that are vital to meeting of the MoPTT's goals.

These relationships are shown graphically in Figure 12.
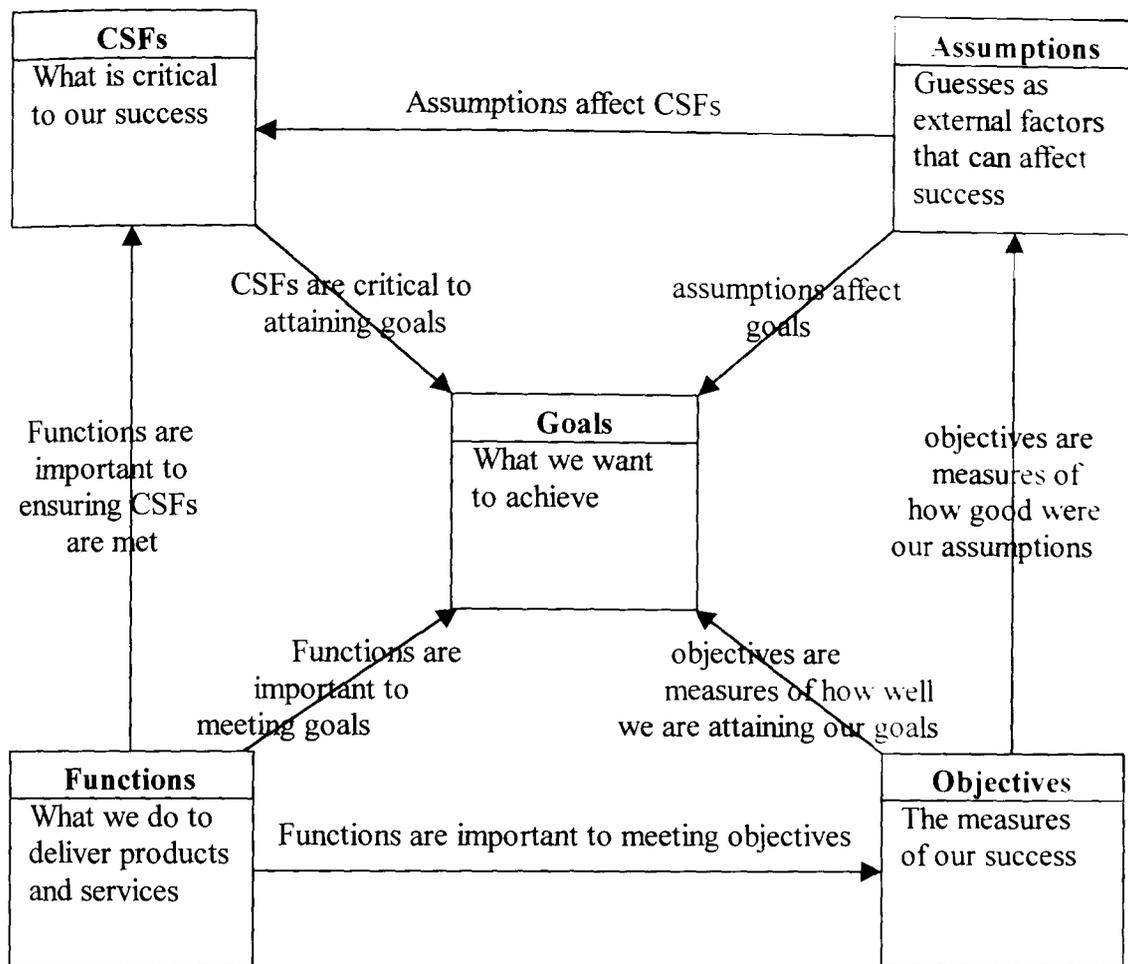
Figure 12. Actual strategy model relationships

Below is discussed each of the most important relationships in this diagram. For a more detailed explanation see Appendix E (Section 2).

Objectives as measures of goals – This is a critical relationship that can be used to measure how well the MoPTT is meeting its goals. Some objectives provide more appropriate measures of how well the MoPTT is achieving each goal than others.

Objectives as measures of critical assumptions – Objectives provide insight into how well an organisation has made critical assumptions or educated guesses about external factors it cannot directly control.

Critical assumptions affecting goals – Critical assumptions can affect either the setting of goals or their attainment. It is important, therefore, to understand the leading external factors that the MoPTT must make assumptions about. Furthermore, it is necessary to

understand these factors in order to judge what goals can be affected by the assumptions, especially if the wrong assumptions have been made.

Functions affecting attainment of goals and objectives – The functions that the MoPTT performs are the means adopted to attain the goals and objectives that it has set for itself. Understanding which functions are most critical to the attainment of the goals is therefore extremely important for the MoPTT.

Functions important for achievement of critical success factors – Functions are not only important to the attainment of goals; they are also important to ensuring that CSFs are met. Therefore, it is crucial to understand which functions can most influence the CSFs.

Critical success factors important for goal attainment – Another significant relationship is that of specific CSFs to the attainment of the goals of the organisation. This relationship highlights those CSFs that are most critical to the attainment of the MoPTT goals.

Critical assumptions affecting critical success factors – The accuracy of critical assumptions made by the MoPTT management affects the attainment of the CSFs crucial to the success of the organisation.

8.4   Strategy Analysis

Strategies set by an organisation indicate the broad directions that must be undertaken in order to achieve the organisational goals, ensure that CSFs are met, and ensure opportunities are capitalised upon. Goals, CSFs, and opportunities are indicators of what it is important for an organisation to achieve. Strategies indicate how the company will go about achieving what it considers important.

In this section, the strategies set by the MoPTT are analysed to determine which CSFs and opportunities are most affected by the execution of the strategies. This analysis will help in guiding and prioritising subsequent information system planning activities.

8.4.1 Significant Relationships

The following important relationships between strategies, goals, and functions have been identified by Lucent:

1. strategies crucial to attaining goals set by the MoPTT;

2. strategies crucial to ensuring CSFs are met;

3. strategies crucial to capitalising on opportunities:

4. functions most important to the successful execution of the strategies.

Further information regarding the above relationships is given in Appendix E (Section 3).

8.5 Information Needs Impact Analysis

8.5.1 Terminology Definitions

An executive information need is any information used by executives in the MoPTT which is essential to support the goals, objectives, or CSFs of the organisation. Executive information needs are usually distinguished from operational information needs, which are pieces of important information, used by operational management to run the day-to-day operations of the business. Although many of the information needs that were identified can be considered operational, they are nevertheless included. Operational information needs will be the focus of subsequent stages of the study and will be compared to the information systems that must provide such information to operational management.

8.5.2 Information Needs Analysis

Major information needs were identified. They were analysed to determine their relationship to important components of the enterprise strategy analysis provided by this study and possible impact they may have on these components. The results of the analysis are presented as significant relationships between:

* **Information needs and goals:** One specific information need (or more) may support the achievement of an FSP goal.

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- **Information needs and FSP functions:** An information need may be relevant for one or more functional areas from the FSPs.

Section 8.5.2.1 provides details of these relationships. Section 8.5.2.2 describes the impact of information needs on goals and functions. It describes each information need, its availability, and its impact on goals and functions.

8.5.2.1 Information Needs Relationships

The relationships between 'information needs and goals', and 'information needs and functions' are most easily documented in association matrixes. A more detailed description of each information need can be found in Appendix E (Section 1).

8.5.2.1.1 Goals Affected by Information Needs

In Matrix 1 goals are listed vertically and information needs are listed horizontally. If information of a particular type is needed to achieve a particular goal, the appropriate row and column are ticked for the goal and information needs. The more ticks in a column, the greater the importance of the information needs to the achievement of goals.

It should be noted that the ticks in the Matrixes 1 and 2 are the responses of the MoPTT executives. Although the ticks may show some unreliable information for some departments, the researcher prefers to show them in order to demonstrate the lack of knowledge that some executives suffer from. Moreover, this presents a concrete example of an NFR in that even some executives cannot understand the information needs that their department requires in order to achieve its goals and objectives. Matrix 2, for example, shows that a Materials Management executive responds that no financial analysis and statistics information are needed by the department. It is incredible that a Materials Management department could be run without financial analysis and statistics.

Matrix 1 shows that almost all goals need corporate planning information, particularly the goal of implementing strategic planning. However, this is difficult to obtain because current systems are manually based and fragmented.

Information Needs

Goals	Corporate Indicator	Accounting / Financial	Annual Operations Report	Business Customers	Corporate Planning	Demographic Information	Financial Analysis & Statistics	HR Information	Materials Management	Projects Status	Property Manage.	Residential Customers	Service Forecast	Switch Toll & Performance	Tariff Information	Tele-Traffic Information
Achieve Item Standardisation									✓							
Complete 1.3M Line Expansion	✓	✓		✓	✓	✓			✓	✓		✓	✓	✓	✓	✓
Deliver Customer Applications																
Deliver Network Performance	✓		✓	✓	✓					✓		✓	✓	✓		✓
Deliver Technical Training	✓				✓		✓			✓			✓			
Develop Security & Disaster Plan																
Develop Engineers	✓		✓		✓			✓		✓			✓	✓		
Develop Managers	✓		✓		✓			✓		✓			✓	✓		
Ensure Data Integrity																
Graduate Assistant Engineers	✓				✓			✓		✓			✓	✓		
Identify New Product Requirements	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓
Implement Strategic Planning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Cont.

Information Needs

Goals	Corporate Indicator	Accounting / Financial	Annual Operations Report	Business Customers	Corporate Planning	Demographic Information	Financial Analysis & Statistics	HR Information	Materials Management	Projects Status	Property Manage.	Residential Customers	Service Forecast	Switch Toll & Performance	Tariff Information	Tele-Traffic Information
Implement Training Programs																
Improve Morale & Motivation								✓								
Improve Skill Mix								✓								
Increase Revenue Old Product	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓
Introduce New Organisational Structures			✓		✓											
Leverage Bus Relationships	✓			✓	✓	✓	✓			✓		✓	✓	✓	✓	
Maximise Fleet Utilisation		✓	✓		✓		✓				✓	✓	✓			
Maximise Revenue	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓	✓
Minimise Maintenance & Repair Cost		✓	✓		✓		✓				✓				✓	✓
Optimise Use of Funds	✓	✓	✓		✓		✓	✓	✓		✓				✓	
Organise Seminars																

Cont.

Information Needs

Goals	Corporate Indicator	Accounting / Financial	Annual Operations Report	Business Customers	Corporate Planning	Demographic Information	Financial Analysis & Statistics	HR Information	Materials Management	Projects Status	Property Manage.	Residential Customers	Service Forecast	Switch Toll & Performance	Tariff Information	Tele-Traffic Information
Reduce Management & Administration Courses																
Provide Standardised Architecture																
Provide Financial Stewardship		✓	✓		✓		✓	✓	✓		✓					
Provide Maintenance Support		✓	✓		✓						✓			✓		
Provide Training Consultancy																
Recruit & Develop Marketing Staff	✓	✓	✓		✓		✓					✓	✓	✓	✓	✓
Recruit Skilled Non-Saudis		✓	✓													
Reduce Distribution Cost	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓				
Reduce Foreign Labour																
Reduce Stock Levels		✓	✓		✓				✓				✓			
Reduce Time to Contract					✓				✓		✓					

Cont.

Information Needs

Goals	Corporate Indicator	Accounting / Financial	Annual Operations Report	Business Customers	Corporate Planning	Demographic Information	Financial Analysis & Statistics	HR Information	Materials Management	Projects Status	Property Manage.	Residential Customers	Service Forecast	Switch Toll & Performance	Tariff Information	Tele-Traffic Information
Renovate Buildings		✓	✓		✓						✓					
Replace Electro-mechanical Equipment		✓	✓		✓						✓		✓	✓		
Supply Motor Vehicles		✓	✓		✓						✓		✓	✓		✓
Train & Development Staff																
Undertake Educative Role																

Matrix 1. Goals Affected by Information Needs

8.5.2.1.2 Functions Affected by Information Needs

In Matrix 2 functions are listed vertically and information needs are listed horizontally. If information of a particular type is needed to perform a particular function, the appropriate row and column are ticked for the function and information need. The more ticks in a column, the greater the importance of the information needs to functions.

The matrix shows that all functions need Corporate Indicator information. However, only some of this information is currently available and needs to be supplemented.

Information Needs

Functions	Corporate Indicator	Accounting / Financial	Annual Operations Report	Business Customers	Corporate Planning	Demographic Information	Financial Analysis & Statistics	HR Information	Material Manage.	Projects Status	Property Manage.	Residential Customers	Service Forecast	Switch Toll & Performance	Tariff Information	Tele-Traffic Information
Buildings	✓				✓			✓	✓	✓	✓					
Corporate Financial Plan	✓		✓		✓											
Customer Service	✓					✓	✓					✓	✓	✓		
Financial Management	✓	✓								✓						
Human Resources	✓	✓						✓								
Information Technology	✓															
Marketing	✓	✓		✓		✓										
Materials Management	✓	✓							✓							
Motor Vehicles	✓	✓														
Network Development	✓					✓				✓			✓		✓	✓
Network Management	✓												✓	✓	✓	✓
Training	✓							✓								

Matrix 2. Functions Affected by Information Needs

8.5.2.2   Impact of Information Needs on Goals and Functions

Table 6 shows the impact of information needs on goals and functions. The first column lists the same information needs as are listed horizontally in the matrixes. The second column of the table describes the availability of each type of information. (See Appendix E, Section 1, for definitions of each information need.) The third column describes the impact on goals and functions of any lack of information. These are derived from the relationships documented in the matrixes mentioned in the previous section (see Section 8.5.2.1 and Section 8.5.2.2).

Information Needs	Availability of Information	Impact on Goal/Function
Corporate Indicators	Partially available but need to be augmented to provide better performance measurements, (e.g. profitability).	Absence of a timely, accurate and comprehensive set of indicators make it difficult to monitor the business. Major gaols impacted are maximising revenue, and monitoring network performance.
Accounting/Financial	Available information is perceived to be incomplete or inaccurate because of time taken to gather it. Additional information on profitability and expenditures is needed.	Lack of additional information hinders the achievement of the goals of increasing revenue from old products and maximising revenue.
Annual Operational Reports	Current information is not accurate, e.g. network performance.	Inaccurate information prevents effective Corporate Strategic Planning and prevents Network Management from achieving its gaol of monitoring network performance.
Business Customers	Critical information about business customers is not available (e.g. connected dropped, type of service, etc.).	Lack of information about business customers hiders Commercial Services from achieving its goal of timely introduction of new products and better customer service.
Corporate Planning	Necessary planning information is difficult to obtain because of fragmented and manual systems.	Difficulty in obtaining planning information hinders the goal of implementing an integrated strategic plan.
Demographic Information	This information is not easily available, because efforts are not underway to gather data on current and potential customer needs.	Lack of this type of information hinders the ability to forecast demand and the achievement of marketing goals.
Financial Analysis and Statistics	Partially available, inaccurate and requires extensive manual processing.	Lack of such information hinders Customer Service and Commercial Services' ability to develop new products and monitor existing ones.
Human Resources	Incomplete information on manpower and tracking of number of positions.	Lack of this information hinders the achievement of the goals of delivering technical training, developing managers and improving skill mix.
Materials Management	No system is available to provide common material management throughout the Kingdom.	The goals of achieving item standardisation, reducing stock levels and distribution costs cannot be attained without such information.
Project Status	Information is available, but difficult to access due to government hierarchy.	Accessibility to this information is necessary for several departments, particularly Marketing and Customer Service, to achieve the goals of increasing revenue from old products and improving service provisioning, etc.
Property Management	Missing and inaccurate information on assets due to lack of interface between the on-line/batch and reporting systems.	Inadequate and unreliable information hinders the Building and Security goal of renovating Buildings, and Motor Vehicles goal of maximising fleet utilisation.
Residential Customers	Partially available and not accessible because of fragmentation across various systems.	Lack of a complete, accurate and readily available customer profile hinders Customer Service efforts to offer quality service.
Service Forecast	Partially available and inaccurate due to extensive manual processing.	The Network Development goal of delivering sufficient capacity and the Marketing goal of maximising revenue are most affected by the lack of this information.
Switch Toll Performance	No mechanism is available to poll switches to obtain critical customer information, (e.g. customer toll activity).	To offer quality Customer Service, a complete and accurate customer profile requires toll information.
Tariff Information	This information, needed to program the switch, is available but is manually generated and maintained.	Programming the switch with inaccurate information results in low quality service. This in turn hinders efforts to offer quality customer service, and negatively affects revenues and costs.
Tele-traffic Information	Most of this information is available. However, it is sometimes difficult to obtain because of inadequate technology or government regulations.	Lack of this information hinders network planning and monitoring, resulting in poor network development and customer service

Table 6. The impact of information needs on goals and functions

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8.6 Problems/Opportunities Impact Analysis

Major problems and opportunities that were identified during the research behind this chapter were analysed to determine their relationship to key components of the enterprise strategy and any possible impact they may have on these key components.

8.6.1 Terminology Definitions

In Navigator, an 'opportunity' is something that can enhance the organisation's ability to achieve its goals, objectives, or CSFs. A 'problem' is anything that hinders the organisation in achieving its goals or objectives, or interferes with a CSF.

8.6.2 Problem/Opportunity Relationships

8.6.2.1 Impact of Problems on Goals, Critical Success Factors and Functions

In Table 7 are some highlights of the researcher's findings and conclusions of the MoPTT Corporate Models regarding the impact of problems on goals, objectives, CSFs, and functions.

Problems	Impact on Goals/Critical Success Factor/Function
Lack of funds	Lack of adequate funding occurs throughout the organisation. Additionally, availability of the allocated and approved funds is unpredictable. This directly or indirectly affects the majority of goals (e.g. Network Development's goals of improving network performance).
Lack of skilled staff	The MoPTT has a high rate of labour turnover rate because of: • Inadequate human resource policies to recruit, compensate, develop and retain staff. • Inadequate staff training and development programmes. This is a significant problem across the organisation that affects productivity, moral and the MoPTT's ability to achieve its goals, particularly those that relate to customer service.
Saudisation	Reducing reliance on foreign labour is a problem that was expressed throughout the organisation. The process of Saudisation is slow and has an impact on CSFs such as increased numbers of skilled resources.
Complex costly maintenance	This problem is caused by: • Large number of heterogeneous equipment and the lack of monitoring tools. • Aging network components that cannot be replaced due to lack of funds. • An aging fleet of motor vehicles that cannot be replaced due to lack of funds coupled with unavailability of spare parts. This problem negatively affects the level of service provided by Customer Service to its customers.
Inadequate marketing process	The lack of integrated product positioning strategy, policy and modern marketing organisation id hindering the goals of developing the commercial market.
Inadequate planning	Budget driven planning is still focused on short-term individual department objectives that address immediate needs. The goal of optimising the use of funds to support strategic goals and objectives is affected by this short-term view.
Government policies	Management lacks authority to make decisions due to cumbersome government decision-making processes, particularly related to obtaining funds. This hinders the planning process and inhibits the effective implementation of strategic planning and TQM.
Cross functional issues	This is a major problem arising from an unclear definition of responsibility among HQ, regions and districts that results in duplication of efforts and rework. All functions are affected.
Lack of management control	Inadequate control due to lack of integrated policies and information systems is a major problem facing many functions. This has an impact on goals such as maximising revenue and CSFs such as delegation of authority.
Unreliable services	Overloading of the switches and transmission components of the network results in degradation of performance. This hinders Customer Services and Marketing from achieving their goals of offering quality service and further developing the marketplace.
Lack of information systems	Manual and labour intensive processes, caused by lack of appropriate information systems, mean that various functions (e.g. Customer Services) are performed less efficiently and goals (e.g. delivering network performance and optimising the use of funds) are difficult to achieve.

Table 7. The MoPTT Corporate Models: the impact of problems on goals, objectives, CSFs, and functions

8.6.2.2 Opportunities and Functions

By analysing the relationship between opportunities and functions, it was discovered that there were six functions that were vital to capitalising on the opportunities identified. This can be seen in Table 8.

Function	Opportunity
1. Information Technology	This is the most important of all functions with regard to capitalising on the opportunities presenting themselves to the MoPTT. It can support the automation of many tasks and processes and provide information critical to the decision-making of all tasks.
2. Network Management 3. Network Development	Network management and development are vital to almost all the opportunities as they install, operate and maintain the basic infrastructure upon which the MoPTT builds and delivers services to its customers. These opportunities include extending the services delivered to the marketplace.
4. Training	Training is crucial in that a skilled workforce is critical to the implementation, operation and maintenance of a high technical infrastructure needed to capitalise on these opportunities.
5. Customer Services	This function is important to capitalising on the revenue generating opportunities. Customer Services will be the key to satisfying new customers by optimising procedures such as service order processing, service provisioning, public relations and billing. Without these enhancements the opportunities cannot be sustained if potential customers leave or are turned away.
6. Financial Management	Financial management is also important in that the MoPTT is operating in a constrained financial environment. Effectively managing the available funds in an environment where funding is difficult to obtain is vital to successful capitalising on these opportunities.

Table 8. Six functions/opportunities relationships

8.6.2.3 Problems and Opportunities

Analysing the impact of problems on opportunities suggests that there are four major problems areas that could negatively affect capitalising on the opportunities that were identified. This can be seen in Table 9.

Problem	Opportunity
Lack of Funds	This theme was iterated often in all discussions. Inadequate funding and unpredictable allocation of funds could potentially affect 80% of the opportunity areas of the MoPTT.
Inadequate Planning	The discussions revealed an executive frustration with the organisation's inability to do adequate planning. Co-ordinated planning among all departments was felt to be an important success factor if the MoPTT is to capitalise fully on the opportunities presented. A switch from a focus on budget to strategic planning would be a major step in resolving this problem.
Lack of Skilled Staff	This is the major concern and problem area for the majority of executives and managers interviewed and consulted. Without an adequate supply of skilled technicians and professionals; it will be extremely difficult for the MoPTT to capitalise on the opportunity areas identified in the functional and corporate strategic plans.
Lack of Information Systems	Lack of modern, interconnected systems and databases were cited by many managers as deterrents to more efficient and productive work environments and processes. Many of the potential opportunity areas will require marketing information pulled together from different departments and outside sources to attract commercial customers effectively with incentives, establish international alliances and act as an international hub. More efficient operations and marketing activities will need modern computers to sustain an active marketing programme. Information systems will also be critical to decreasing operations costs.

Table 9. Four major problem areas

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8.7 Critical Function Analysis

The functions of the MoPTT have varying degrees of importance in:

1. meeting the goals of the organisation;

2. carrying out the organisational strategies;

3. ensuring that the CSFs are met;

4. capitalising on potential market and product opportunities.

An analysis was performed by the researcher to determine the degree of importance of each of the 12 functions in addressing each of these areas described above. This analysis was carried out sending questionnaires – some 3,000 altogether – to employees through executives, on the basis that these employees, as end users, would be able to assess the relative importance of the functions. 1,827 responses were received, and it is on the basis of these responses that the weight scores were reached. For details of this survey see Appendix G. The results of this analysis are shown in Table 10. The relative weight scores in each of the cells of Table 10 represent the importance of the functions to each of the MoPTT's goals, strategies, CSFs and opportunity areas. These individual cell scores were derived from the analysis discussed above in this chapter:

1. key functions affecting goal attainment;

2. functions of crucial importance to CSF attainment;

3. functions affecting opportunities ;

4. functions supporting strategy execution.

The 'total' cells represent the overall importance of each function in addressing all four areas.

Table 10 ranks the functions in critical importance order.

Function	Total Weight Score	% of Total Importance
Training	242	13 %
Information Technology	220	12 %
Network Development	207	11 %
Customer Services	198	11 %
Network Management	194	11 %
Financial Management	145	8 %
Strategic Planning	143	8 %
Buildings and Land Management	116	6 %
Human Resources	104	6 %
Marketing	91	5 %
Materials Management	85	5 %
Vehicles Management	82	4 %

Table 10. Functions in critical importance order

8.8 Analysis Evaluation

8.8.1 Value-Chain Analysis Evaluation

The Value-chain Analysis approach has proved useful for the researcher in discerning which business areas of the MoPTT add value to its service, in other words the areas which make it more viable in a post-privatisation competitive market. In particular it has shown how this competitive edge can be achieved through the implementation of information systems in the business areas concerned. Value-chain Analysis can therefore be utilised by the MoPTT to give the telecommunications service which it offers an advantage over potential rivals.

8.8.2 SWOT Analysis Evaluation

The researcher used the SWOT analysis technique to reach an overview of the environment in which the MoPTT operates. It enabled him to focus on business areas to

receive particular consideration for the application of updated information systems. These are functions to which the MoPTT itself could apply SWOT analysis in order to ensure that it maintains its business competitiveness in new circumstances where rival companies may appear offering telecommunications services. However, in the present situation, where the Ministry does not fully understand its own strengths, weaknesses, opportunities, and threats, the practical application of SWOT analysis is difficult. The MoPTT should therefore make every effort to identify these four factors.

8.8.3   Competitive Forces Analysis Evaluation

Competitive Forces Analysis has enabled the researcher to identify the customer profile of the MoPTT, its suppliers, potential substitute products, and, most importantly, the regulatory framework within which it has to operate. At present its value to the Ministry itself may appear limited, since it is the only telecommunications service provider in Saudi Arabia. However, this will change in a competitive market, and it is advisable for the MoPTT to take steps now to carry out this type of analysis of its own functions so that it can compete more effectively in the future.

All of these three analysis methods, as well as being of value to the researcher and of actual or potential use to the MoPTT in examining its own business areas, might be used by the MoPTT in the future competitive market to study any rival telecommunications providers. Using these tested techniques in this way will help it to maintain its competitive edge.

It should be noted that the three analysis methods described above are in fact recognised analysis techniques, developed, as we have seen, in the West. They are typically westernised in their approach, particularly in that they attempt to anticipate and deal with problems before they happen. This is to some extent alien to the Saudi way of thinking, and this is one reason why they have not been fully followed. However, if the researcher's understanding of the developing concept of Saudisation is correct, it may prove possible for these techniques to be adapted and used in such a way that they become Saudi solutions arising out of Saudi understandings.

8.8.4　　　Goals and Objectives Analysis Evaluation

This is not so much a recognised analysis technique; rather it is simply a consultation approach which the researcher had to use in order to investigate whether the MoPTT has been on the right track in identifying what is important for them to achieve. It emerged that the Ministry was not always clear about their goals and objectives, and it is for this reason that the researcher held interviews and consultations with MoPTT managers in order to asses their understanding of CSFs, goals, critical assumptions, functions, and objectives. The researcher found that it is essential for the Ministry management to understand these factors, as they inter-relate with each other in a way that is vital for the achievement of the organisation's overall aims. The researcher was unable to find a complete understanding of these factors in the case of any one MoPTT manager, or indeed any documents which displayed and understanding of the relationship between them.

Clearly this lack of appreciation of the role and relationship of these factors is something that has to be addressed by the Ministry, as a proper understanding of this can play a crucial part in the activity of Strategic Planning.

8.8.5　　　Strategy Analysis Evaluation

Like the goals and objectives analysis this is an approach used by the researcher in order to find out information which he did not have. The literature produced by the MoPTT mentioned strategic matters only in the broadest of terms without spelling them out specifically. The analysis has enabled the researcher to distinguish which elements of strategy were of the greatest importance. The researcher has been able to identify the key relationships between the execution of strategy, CSFs, opportunities, and the achievement of goals within the MoPTT. In particular this analysis will be useful in planning information system requirements. The MoPTT itself needs to acquire a clearer and more specific appreciation of its strategic aims.

8.8.6   Information Needs Impact Analysis Evaluation

A proper understanding of information needs is crucial to the business success of the MoPTT. In order to identify where the areas of greatest information needs lay the researcher consulted with one individual in particular the Director of Information Systems in the MoPTT. The areas identified were examined in order to establish their importance for the enterprise strategy analysis overall. The fact that it was one individual in particular who proved able to tell the researcher about information needs is an indication that there is a lack of knowledge about this in general in the MoPTT. Because this lack is crucial, it has to be dealt with if the MoPTT is to gain business success in a competitive market.

8.8.7   Problems/Opportunities Impact Analysis Evaluation

The researcher found this analysis useful in identifying problems faced generally by the MoPTT. It is important for the Ministry to understand the obstacles which they are faced with in the current situation.

8.8.8   Critical Function Analysis Evaluation

This analysis proved to be of considerable value to the researcher. The responses of MoPTT managers enabled him to identify which functions were seen by Ministry personnel themselves as of greatest significance. It has aided the researcher in identifying areas, such as Training, which need attention by the MoPTT in order to enable it to achieve business success. As with other factors discovered by the analysis approaches of the researcher, it is important that the Ministry itself is aware of the information this analysis has uncovered.

8.9   Summary

This chapter has drawn together data gathered by the researcher in the course of his fieldwork, has analysed it, and has related it both to the current structure of the MoPTT and to the potential paths that it might take in the face of the challenge of privatisation. Based on the information gathered and the analysis techniques employed. this study has

enabled the researcher to look at a number of directions that the MoPTT might take in the future. The work laid out in this chapter may be referred to as the Enterprise Strategy Analysis.

A brief overview of the approach and techniques used by the researcher in gathering his data has been provided.

In the course of his fieldwork the researcher interviewed and consulted with senior and executives mangers of the MoPTT. Questions, consistent with the level of executive or manager being interviewed or consulted, were put to the respondents in order to gain from them information and opinions about the MoPTT and its operations.

Information relevant to the research was also gleaned from documents produced by the MoPTT and by consultants. Further, various telecommunications experts who, because of their specialist knowledge were able to provide valuable insights into procedures, trends, and strategies, were also interviewed and consulted by the researcher. The documents utilised and the information supplied by experts in the field were used as sources for the understanding of significant relationships and processes.

Using for the most part techniques developed by Dr. Michael Porter of Harvard University, an analysis has been provided of the telecommunications environment in which the MoPTT operates and of the opportunities, in the face of privatisation, which are open to it.

The main functions and processes of the MoPTT, identified and described in detail elsewhere in this study, have been analysed in terms of their relationships and interfaces. The interactions revealed by this analysis have been presented by means of a series of tables and matrixes, which indicate the correlations between the diverse elements within the Ministry. The analysis carried out by the researcher and presented in text and graphic form in this chapter has enabled him to identify key functions within the MoPTT's operations, and to pinpoint areas of major concern to an organisation faced with the threats as well as the opportunities offered by privatisation.

Based on his Enterprise Strategy Analysis, the researcher has been able to suggest specific operational, managerial, and commercial developments which should enable the MoPTT to meet the challenge and grasp the opportunities offered by privatisation, and to

move forward to become a major player in the telecommunications market, not just within the Kingdom of Saudi Arabia, but regionally or perhaps even globally.

The output of this chapter will be used to ensure that information systems architecture aligns properly with the MoPTT gaols, objectives and critical success factors. In addition, it has been used as a background for writing the next chapter.

Chapter Nine

THE POTENTIAL INFORMATION SYSTEM ARCHITECTURES OF THE MoPTT

9.1 Introduction

Throughout this chapter the term 'IS' is used to indicate the information system(s) within all ten business areas, as well as information system(s) in general. 'IS' will indicate both singular and plural; the context will indicate which.

The objective dealt with in this chapter is to develop an Enterprise Information Architecture (EIA) for the MoPTT. An EIA is the strategic IS and technology vision that will enable, as well as support, the achievement of the MoPTT's business plans and objectives. This chapter describes that architecture

From the understanding which the researcher gained in the course of his description and analysis of the structure, functions, and information systems of the MoPTT (provided in Chapters 5, 6, and 7) and of its strategic business perspectives (Chapter 8) it has been possible for him to develop suggestions for an IS framework for the organisation in order to help it achieve its aim of providing a competitive quality telecommunications service.

The EIA is itself composed of three fundamental architectures: applications, data, and management. These architectures were designed by the researcher using input from the preceding chapters.

The EIA provides a framework to guide the future implementation, integration, and development of IS. It is therefore critical to the development of an integrated IS environment.

The purpose of the information architecture includes the management of the scopes of projects and systems. The strategic perspective of the information architecture addresses such issues as the scope of the organisation, particularly as this affects the organisation's

relationships with the outside world. But the information architecture itself has a scope, which is not quite the same thing. The scope of the information architecture can be the entire enterprise or organisation, together with its immediate environment (including customers, suppliers and other business partners). This enables a systems development plan for the entire enterprise to be drawn up, including opportunities to automate links with the computer systems of business partners.

9.2 Business Areas Covered

Chapter 5 has identified ten functions (or business areas) for the MoPTT, and the architecture presented in this chapter covers these ten business areas. The business areas covered are Strategic Planning, Network Operations (including Network Management and Network Development), Customer Services, Financial Management. Human Resources, Marketing, Training, Buildings & Land Management, Materials Management, and Vehicles Management.

9.3 Development Process

The development of the EIA was carried out using all of the available information from earlier stages, and bearing in mind the NFRs (or aspects) which have been identified as so important for the success of the MoPTT's enterprise (see especially Chapters 3, 4, and 5). A key step in the development of the architecture was the definition of the IS principles, which are the basis for IS decision-making. These principles were developed in three focus sessions that included top management from business and Information Technology. The availability of the EIA provides valuable knowledge to the future information system needs of the MoPTT.

9.4 Information Systems Architectures of the MoPTT

Four interlocking architecture components together comprise the IS vision for the MoPTT. Those components are shown in Figure 13 and described below.
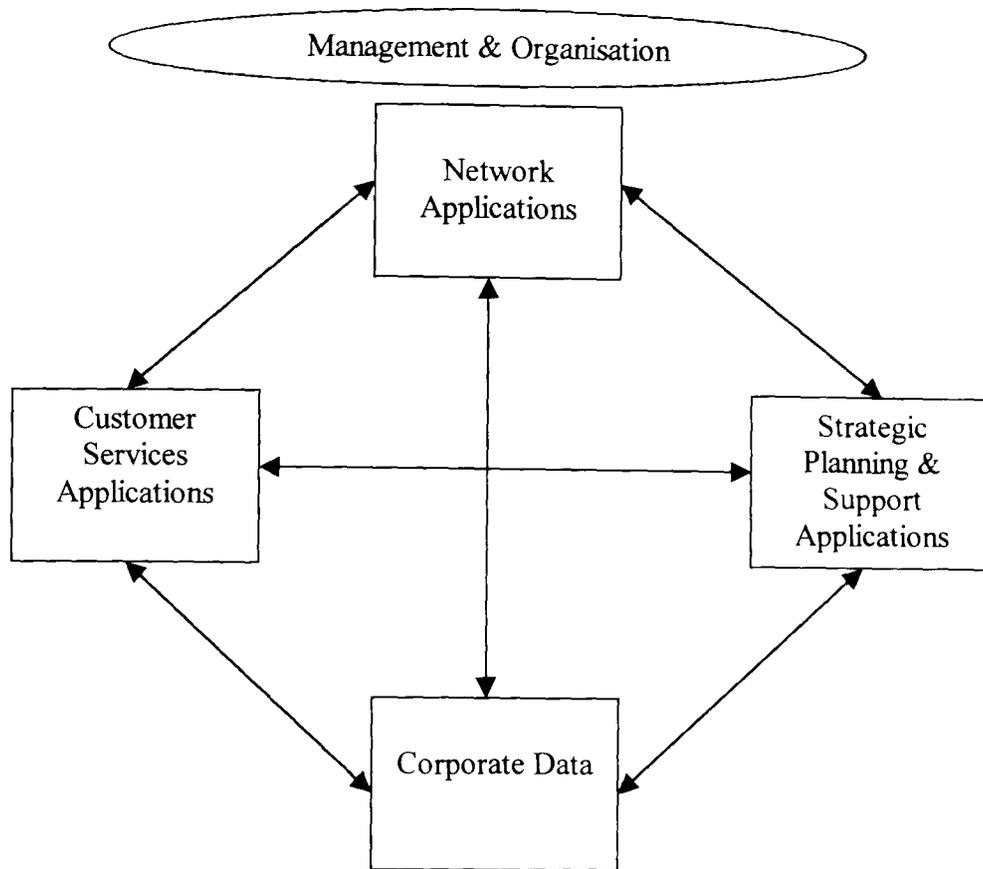
Figure 13. The MoPTT Enterprise Information Architecture (showing the four architecture components)

9.4.1　　　Applications Architecture

As we have seen in Section 3.1 an expressed requirement may be understood as 'a statement of a system service or constraint' (Kotonya and Sommerville, 1998, p. 6). Requirements are therefore in effect descriptions of constraints on the operation of a system or systems (in this case the current MoPTT applications), or specifications of their properties or attributes. As we have already noted (Section 7.3.3) users and IT staff, although in different percentages, are both dissatisfied with the operability of these present applications. They are not currently meeting their functionality needs, and as a result the non-functional usability requirements are not being met. A new applications architecture along the lines described by the researcher would satisfy the needs which they have identified. The point is not that the current applications should be used differently: it is rather that they cannot fulfil the requirements however they are used. What is required is a new applications architecture, the EIA as described by the researcher.

Application architecture is the structure of the MoPTT's business processes from a conceptual point of view. According to the structure of the telecommunications activities supported by the MoPTT's information systems, which we discussed in Section 7.3.1, applications architecture can be divided into three categories: Network Applications, Customer Services Applications, and Strategic Planning and Support Applications. These applications process data for the organisation.

The purpose of the applications architecture is to set out the framework of applications that are required to realise the strategic IS and technology vision of the MoPTT. It is not a design for systems, nor is it a detailed requirements analysis. Rather, it sets out how applications will manage critical data and provide information access to individuals performing business functions.

The applications enable the Information Technology function to provide access to the needed data and information in a useful format at an acceptable cost. It is subject to refinements as more detailed design specifications are developed in later stages.

The applications architecture determines the framework of business systems which are needed to realise the MoPTT's IS vision. It refers to the major kinds of applications needed to manage the data and support the business functions.

The applications architecture for the ten target Business Areas and 23 IS consists of 34 conceptual applications. Conceptual applications make use of information engineering to define applications based on the business and their use of data. The applications are presented in terms of their role in the performance and management of the business and can be seen in Figure 14 as the three highlighted boxes:
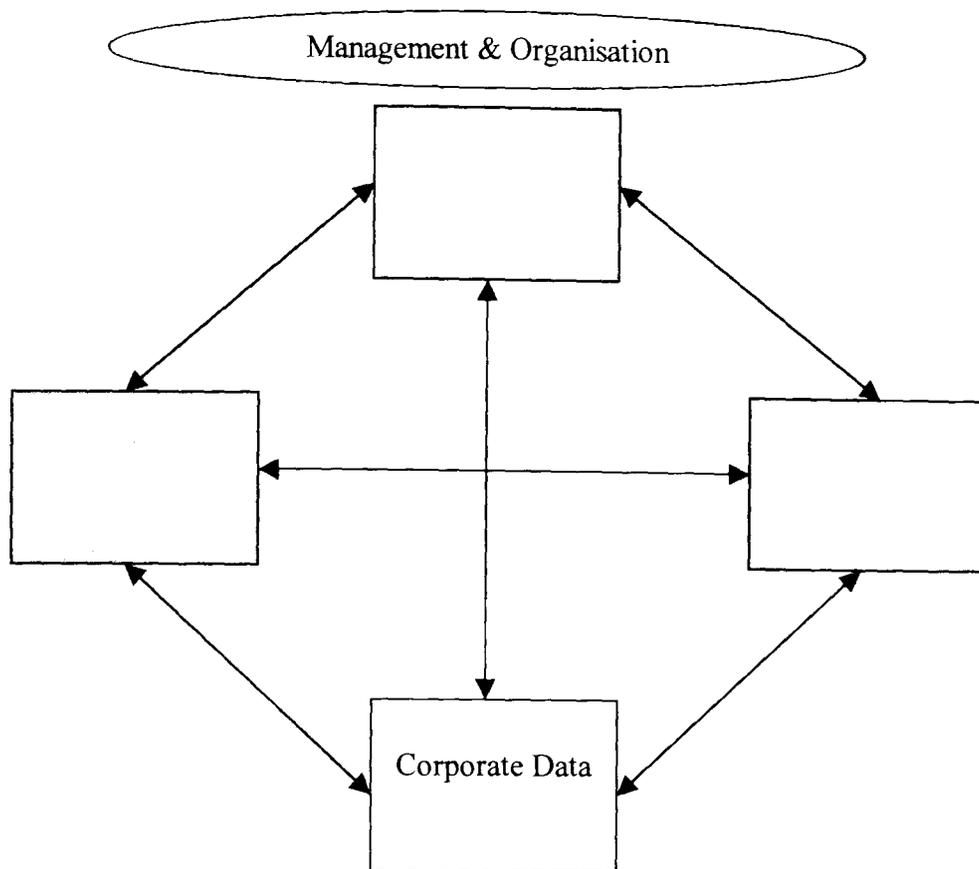
Figure 14. Applications

9.4.1.1   Customer Services Applications

Customer Services is an area which has to operate under considerable constraint since it receives much criticism from outside because of its interaction with the public. Customer services applications are those which directly support the organisation in the delivery of services to its customers.

As has been noted in Section 8.6.2.2 the Customer Services function is important in capitalising on revenue generating potential. Customer satisfaction can be created and maintained by enhancing operations such as order processing, public relations, and billing. However, one of the weaknesses facing the MoPTT, as is noted in Section 8.2.2. is that the customer service does not enjoy high priority in the organisation. When lack of funding is added to this shortcoming then one result, amongst others. will be that if the telecommunications market in Saudi Arabia becomes more competitive in the future. the STC will suffer and lose out to competitors.

The Customer Services function also suffers from lack of integration. Because services to clients relate to so many areas they are dealt with by MoPTT staff from diverse units, with the result that, for example, breakdowns are not dealt with promptly or new lines supplied speedily. This is a non-functional constraint (see Section 5.4.1) which would be dealt by the proposed EIA.

The architecture consists of a set of integrated applications and a unified customer database, thus reducing redundancy and improving the dependability of customer information. Not only does this approach provide the advantages of reduced development and support costs and increased flexibility, but also it improves features and performance. The importance of NFRs has already been identified (see in particular Section 5.4), and a properly designed EIA would be a major factor in fulfilling such requirements and meeting the objectives of the MoPTT. Customer services applications serve also as a major point for the acquisition and provision of knowledge about the organisation's customers.

The application architecture for customer services represents a clear departure from the current environment (at present information collection and dissemination is done manually, with a duplication of paperwork) in the direction of the future environment. Today's stand-alone batch oriented applications will be replaced by a set of integrated on-line applications, an approach which provides the advantages of reduced development and support costs and increased flexibility. It will enable the Ministry to handle increased volume, and also provide more effective customer support and service.

The customer services business area and its IS consist of seven conceptual applications:
- service order management;
- fault management;
- customer billing;
- work force management;
- directory production;
- customer enquiry;
- customer survey support.

9.4.1.2 Network Applications

The network business area and its IS contain five conceptual applications:

- network planning and forecasting;
- network configuration management;
- network fault management;
- network construction management;
- network performance management.

It has already been noted (Section 8.6.2.2) that two of the functions of crucial importance to capitalising on opportunities identified are Network Management and Network Development. Their key importance lies in the fact that they install, operate and maintain the basic infrastructure upon which the MoPTT builds and delivers services to its customers, and the opportunities in question include extending the services delivered to the marketplace.

These applications represent the infrastructure of the business and provide support for effective network planning, development, management and control. Not only do these systems provide construction and configuration management, but they also offer sizeable opportunities for improving overall network performance and operation. The basic intention is to provide an organised architecture to achieve integration between various types of software and telecommunications equipment. As we have noted in Section 5.7, there is no single division for the management of networks, and the resultant dispersed and non-integrated features constitute a non-functional aspect which hinders efficiency and effectiveness. Along with the Customer Services applications they provide monitoring and statistical reporting for planning and forecasting; representing opportunities for improving overall performance.

9.4.1.3 Strategic Planning and Support Applications

Strategic planning is the key feature for all the other functions (support activities) of the MoPTT, which are Financial Management, Human Resources, Marketing, Training, Vehicles Management, Buildings and Land, and Materials Management. Through the Strategic Planning function these other support functions can be managed (by developing strategic and operational goals and objectives for them). That is why these support

activities have been merged under the Strategic Planning application in such a way that this application would deal with this non-functional aspect.

At present there is no systematic computerised gathering and dissemination of data in relation to the Strategic Planning function, a sign of the current lack of commitment to this area (See Section 5.2.1). Effectiveness and efficiency are also hampered by the fact that the MoPTT has only limited control over its financial resources, with the budget assigned centrally each year not meeting the requirements of the externally imposed five-year Strategic Plan in the MoPTT.

We have already noted that one of the problems facing the MoPTT is inadequate planning (Section 8.6.2.3), something which causes intense frustration to many within the organisation. Support applications for strategic planning would be a step towards resolving this problem.

These are the applications which directly support the MoPTT in strategic and enterprise planning, financial management, human resources and all other Ministry administrative business functions. The architecture covers those applications that can be viewed in Table 11. These applications were grouped together as a summary because they represent similar activities in the MoPTT's Value-chain, which we discussed in Section 8.2.1. They are crucial to the successful operation of the enterprise. The fact that Strategic Planning is not taken sufficiently seriously is a non-functional aspect which plays a major part in inhibiting the operational success of Strategic Planning, as is pointed out in Section 5.2.

Strategic Planning	Financial Management
Budget Planning & Tracking Strategic Planning Executive Information System	Payments Accounts Receivable Accounts payable Asset Management General Ledger
Human Resources	**Marketing**
Human Resource Planning Human Resource Management Payroll / Benefit Administration	Product Research and Development Campaign Management
Training	**Vehicles Management**
Programme Development Course Management Scheduling	Fleet Control Vehicle maintenance
Buildings and Land	**Materials Management**
Land Management Buildings Management	Purchasing Inventory Control

Table 11. Strategic Planning and Support applications covered by the EIA

For more information about application architecture see Appendix F.

9.4.2   Data Architecture

As we noted above (Section 3.4.1.6), data between functional areas at the MoPTT is at present poorly integrated. There is thus an NFR within the operational category to utilise the newest techniques of information engineering so that the operating environment demands are met. Personnel who require data stored on the mainframe may have to go through a tedious and slow process involving manual form-filling, telephone contact, batch dispatch, tape transfer, etc. in order finally to receive the data. This means that when the data does arrive, it is often out of date. The procedures are neither efficient nor effective, and if personnel had direct access, this would be avoided.

The structure or model of the MoPTT's information assets (principally databases) which are essential in operating and managing the business and which are accessed and manipulated through the applications.

The purpose of the data architecture is to establish the structure of the databases needed to realise the strategic IS and technology vision of the MoPTT. It sets out each candidate subject database, its structure and contents, and its relationship to other subject databases.

The data architecture does not communicate the design or implementation of physical databases; what follows is a discussion of logical databases.

The data architecture determines the boundaries of the information needed to operate and manage the business. This information is accessed and manoeuvred through the applications. The highlighted box in Figure 15 shows the data as an asset which is owned by the corporation.
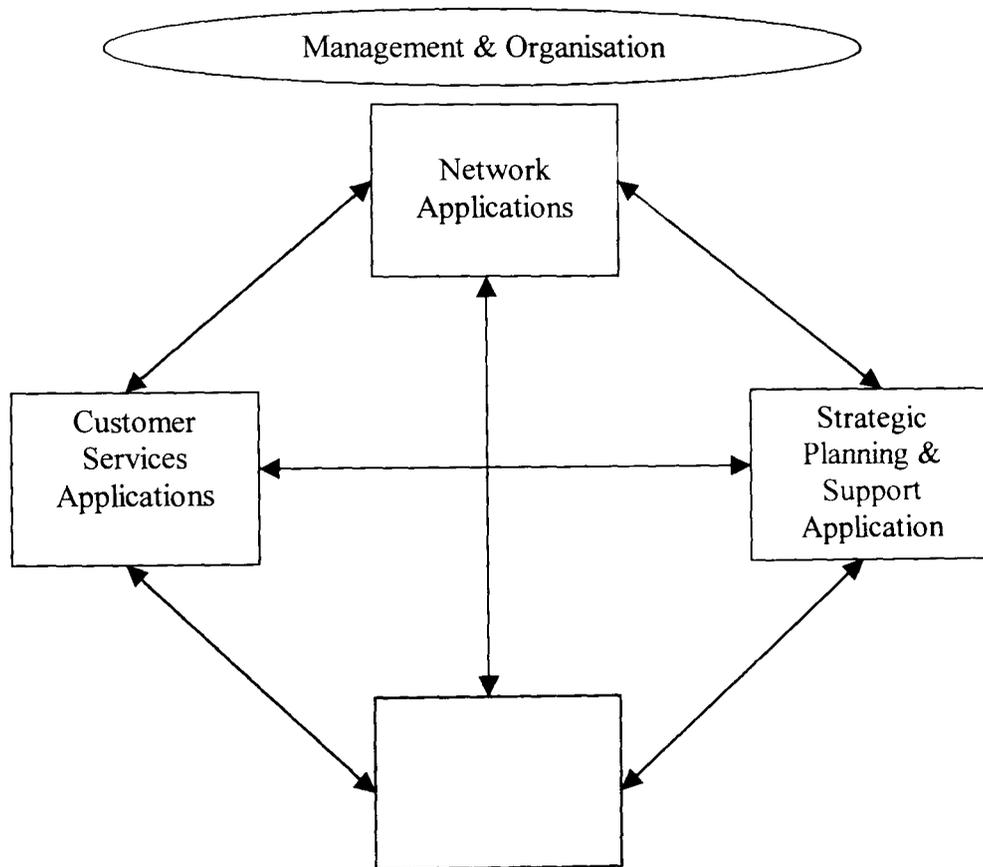

Figure 15. Data

This idea of data as a corporate asset is the foundation upon which the proposed data architecture strategy is founded. Responsibility, accountability, and common standards for data must be defined and enforced and that data must be independent of, but accessed by, individual applications.

The key elements of data architecture are:

- Describing the data entities within each subject area and subject database,

- Identifying the data requirements for each information system within each subject database,

- Developing a distribution scenario: making use of databases,

- Discussing a data management approach; addressing update and query issues, and

- Introducing the concept of the data warehouse to meet the MoPTT's information needs.

The data architecture consists of 23 miniature databases called 'subject areas'. Each of these subject areas is required by one or more of the applications described in the applications architecture section. These subject areas are grouped into ten 'subject databases'. Examples of subject areas for the network operations database are network plans, network components and network events. Figure 16 illustrates this structure.
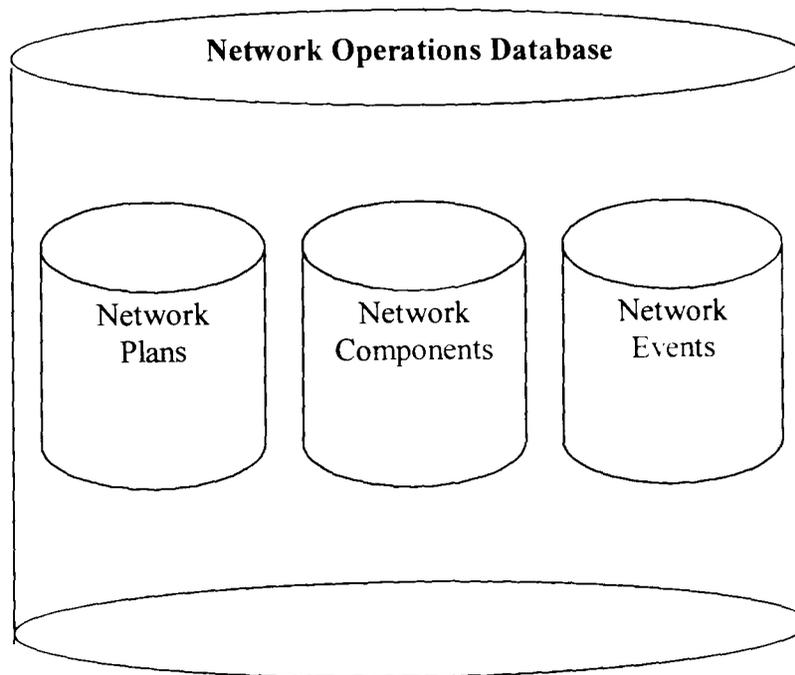

Figure 16. Subject areas for the network operations database

The network components and the network events data are needed by the customer services database to complete facilities assignment and customer billing: thus the sharing of data is an essential strategy. This can be viewed in Figure 17.

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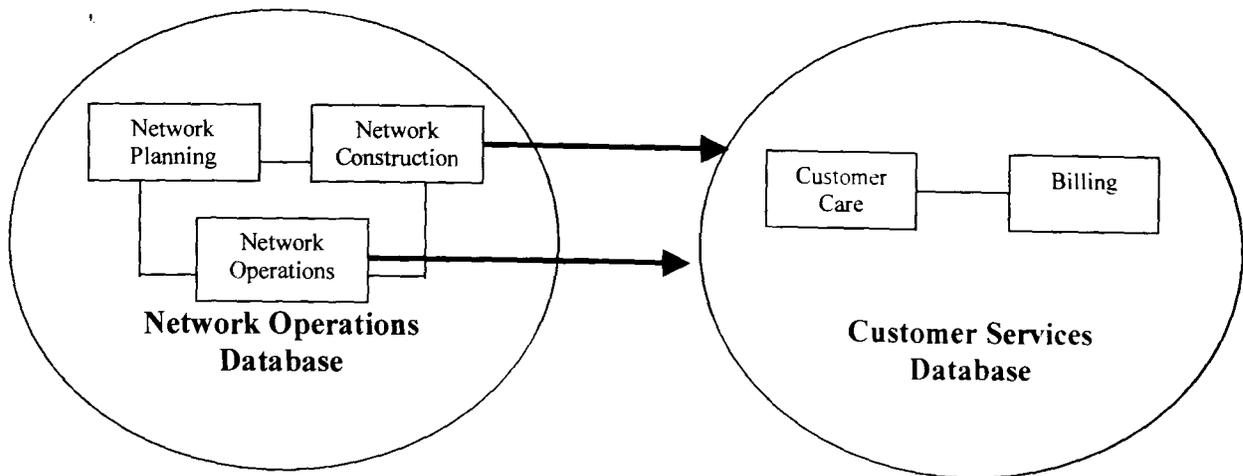
Figure 17. Data requirements between databases

This sharing of data is carried out through 'information systems' which request or update data in any number of databases. Each information system maintains a subject area and may request data from another subject area in another database. This requires an integration of applications software and databases.

For further information about data architecture see Appendix F.

9.4.3 Management and Organisation Architecture

The structure and roles of the people and processes that are necessary to ensure the delivery of services and the stability, flexibility and ongoing viability of the IS environment of the MoPTT.

By their very nature, data and, especially, applications architectures must be closely linked coupled to business processes. Since these processes are increasingly dynamic, applications and data architectures must be dynamic as well. In contrast, the technology architecture must emphasise stability for the long term, and provide a general base upon which applications and data architecture may be constructed.

By management and organisation architecture we mean the overall management and organisational infrastructure necessary to support the development, operation. and maintenance of IS effectively. It covers the design and location of the IS organisation and the identification of policies and procedures that will have a significant role in integrating

applications and databases, and ensuring the successful achievement of the MoPTT's information system strategy. The management and organisation architecture can be seen in Figure 18 as a highlighted ellipse.
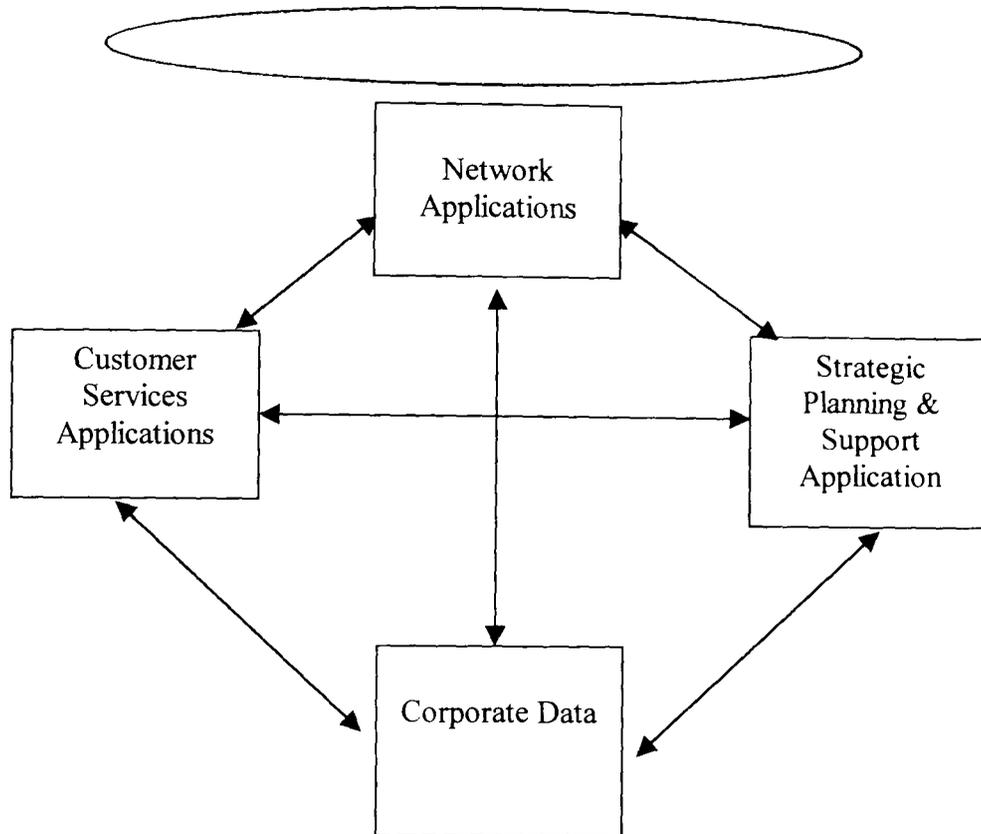
Figure 18. Management and Organisation

The design of the IS organisation is targeted to support all IS that operate on general-purpose computers. This includes systems which support central operation and maintenance (COM) of the telecommunications network, and run on general-purpose computers. It is advisable to keep specialised applications on certain equipment of this network under the control of the business area.

9.4.3.1   Service Relationships

The first key element of the strategy and architecture of IS is that it should reflect an alignment to the business objectives. At the highest level, this implies an ongoing partnership between the two. The goal of providing a responsive cost-effective service

also implies that there is a need to instil and maintain a business perspective in the delivery of IS products.

This perspective is achievable through establishing a service/customer mentality, and working hard at maintaining closer working relationships with users, who are, after all, the customers of IS. This business perspective would be reinforced by education programmes, and a study and understanding of information engineering. The business process models developed in Chapter 5 are another source of education and reference related to efforts to introduce and implement change. In addition, this development indicates that the IS organisation should ensure a balanced business and technical orientation, something that will require some short-term to mid-term adjustments in the orientation of the present staff.

The key is the interface of IS with Strategic Planning and other senior executive functions within the MoPTT which set and monitor strategic direction. At a lower level this implies that those controlling IS are aware of and responsive to the information processing needs of those in the operational business areas.

9.4.3.2 IS Management

The second key element in the EIA is IS management, which is the administration of the policies, standards, procedures, and practices required by the MoPTT in the IS field. They enable the IS function effectively to develop and operate systems that provide the required support to the organisation's business management and operations.

The first question to be answered is 'What business is IS in?' In the context of the MoPTT, as in the organisational world generally, IS may be recognised as playing a supporting role to its business activities. In the course of providing this support, those who run IS must develop structures, designs systems, and create databases to support the goals, objectives, strategies, functions and plans of the Ministry's business operations.

The infrastructure that supports such services becomes a platform, a productive facility, which enables value-adding services to be created. Understood in this way an infrastructure view is much like a manufacturing plant, and can be planned and ordered so as to meet current and future product plans.

The platform and effective IS organisation of this architecture have several key characteristics:

- Being a **business partner** at a level with the heads of business groups (i.e. 'business aligned').

- Having a **focus on data management** – with clear roles and responsibilities for defining the core data requirements, and implementing a physical data architecture to support those requirements. This includes such things as Database Administration. Data Analysis, Data Design, and Corporate Data Modelling, and requires the establishment and enforcement of standards.

- Striving for **continuous improvement** – provision for the continuous improvement of IS practices, including evaluation of tools, techniques, and methods

- Practising **effective project management** – recognition of the importance of the project manager role in managing scope, time, and resources on a project-by-project basis.

- Developing an **enterprise view** – including mechanisms for defining, planning, prioritising, budgeting and monitoring the overall systems efforts, and measuring the return on IS investments.

- Being **process oriented toward end-users** – user oriented procedures to support contact with the users and responsiveness to the requirements of the users, and to requirements relating to administration, enquiries, and development.

9.4.3.3 IS Functions

The third key element of the architecture is the IS function component. The following IS functions are the basis of the organisational design. They are distributed over organisational units to serve best the use of information technology. The functions described below are necessary for the operation of a quality information system.

The future IS structure is user-oriented and follow the appropriate functions and processes to support this. The main IS functions and processes have been identified as the following:

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Office of Enterprise IS	IS Functions/Processes

Find/Create Solutions

Create Enabling Infrastructure

Planning, Control and Administration

Infrastructure Operations

Integrated User Services
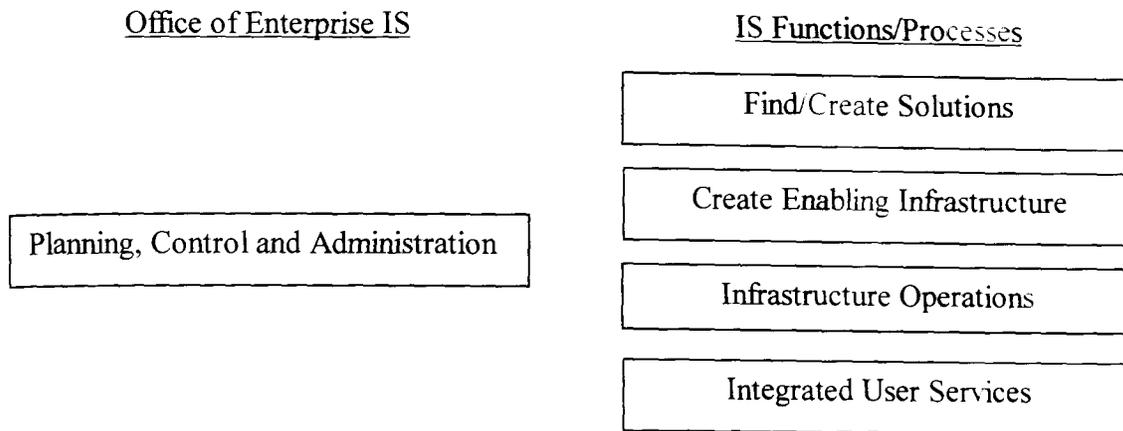
The basic assumption for the functional descriptions is the support of a distributed multi-vendor environment with a tendency to a highly or fully integrated and automated operations environment.

Planning, Control and Administration will be broken down into the area it addresses, e.g., strategic IS planning, network planning, etc. Quality management will be implemented in all areas so that it becomes an inherent aspect of the daily execution of each function.

9.4.3.4   IS Organisation

The last key element in the architecture is IS organisation, which focuses on the overall guidance of the IS functions within the corporation to assure its effective utilisation. The IS management unit works through committees and regular contacts with business areas to facilitate communication and decision making-processes among the IS organisational units. This ensures the alignment of IS strategies to business goals.

The main guideline for the organisation structure is the alignment of IS practices and user support with defined IS functions throughout the MoPTT.

The key organisational characteristic of the new infrastructure of IS is the management of distributed and integrated computing operations consisting of a series of diverse technologies communicating via a common network. The IS function must provide a structure which will effectively support those IS services. One important aspect will be the end-to-end user support.

An organisational framework must be maintained with regard to communications, data resource management, and processing management as well as application development and support. This can best be achieved by integrating a strong central support group with local support staff.

Some of the main parameters for the IS organisational structure are:

- IS strategies and objectives should be aligned with business strategies.
- Integration of IS services will be necessary for the effective management of a distributed environment.
- IS organisation must reflect a functional structure.
- Responsibility for the successful implementation of information technology projects by both the business area and IS organisation is necessary.
- The importance of information technology for the future business of the MoPTT has to be reflected in the MoPTT organisational structure.
- End-user computing support is a factor of increasing importance for the future infrastructure of the MoPTT.

These parameters are the basis for the organisation as described in the organisation chart in Figure 19.

Information technology is one of the critical resources to fulfil the corporate strategies. It provides all Deputy Ministries with services. An alignment with the overall strategies of the MoPTT requires direct reporting to the Minister. Control of the infrastructure would then be distributed throughout the Deputy Ministries.

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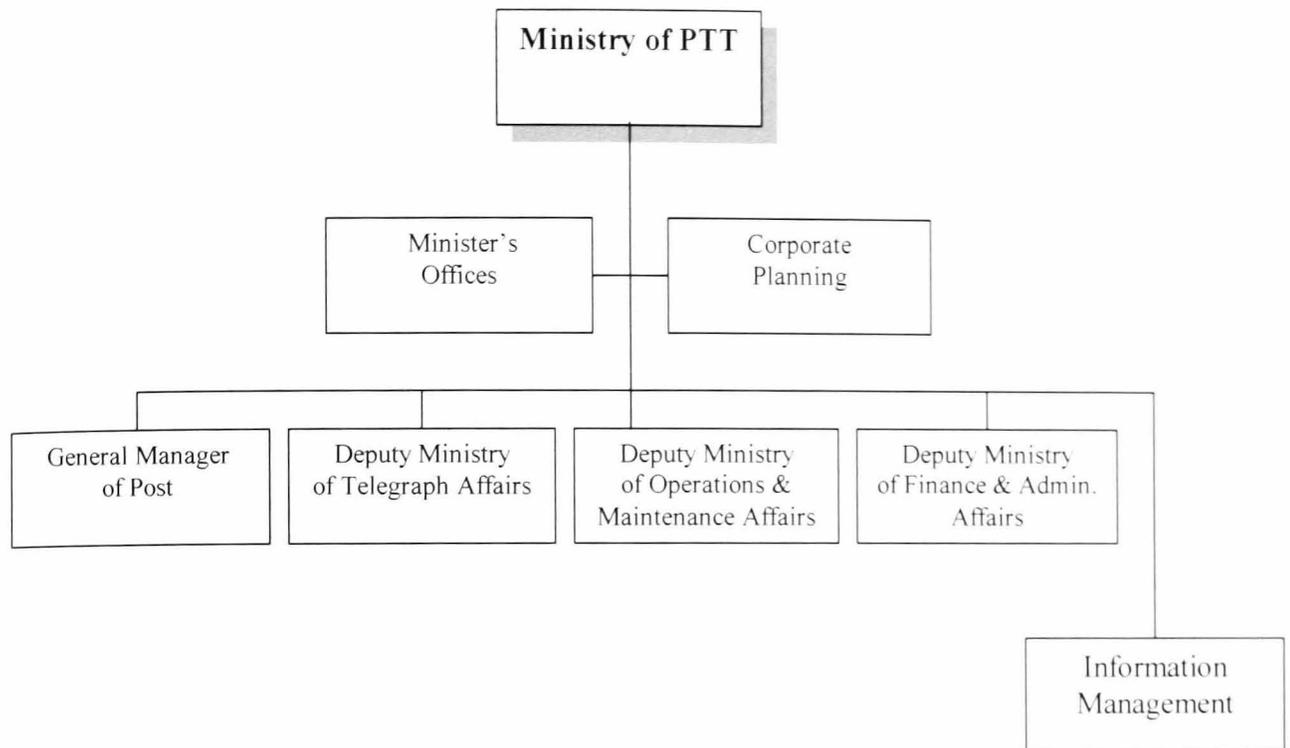
Figure 19. Future IS Organisation Architecture chart, the MoPTT

The advantages of having the information management function report to the Minister of the MoPTT or to the President of the STC are:

- Empowerment of the IS organisation to acquire resources to fulfil its charter will result.
- Direct link to business strategies by reporting to the same executive can be achieved.
- All business areas as customers of information management can expect equal treatment in service delivery.
- Service distribution and integration with all Deputy Ministries will be easier.

It is imperative that both business areas and IS participate in an ongoing process of corporate planning. A high-level MoPTT corporate IS management committee is necessary to make decisions about strategic directions and the implementation of information technology. A sub-committee, such as an IS planning group, would work to propose future technology and directions, prepare proposals and documents, and support the decision-making process.

The current IS support units, with a strong link to the overall strategies of the Ministry. should allow as much initiative in the local business areas as possible.

One factor which would be very closely related to the deployment of technology is the distribution of IS service locations. The IS units have to ensure the ongoing and effective operation of the equipment in place. The following elements to support the IS function will be necessary:

- a committee for corporate IS direction-setting and prioritisation,
- working subcommittees,
- business analysts to be located in business areas,
- audit function outside the IS units,
- centralised planning and major application development,
- data centres in Riyadh and Jeddah,
- system administrators and end-user computing support in districts, with on-site technical maintenance as appropriate.
- end-user computing forum between the IS organisation and the end-users.

The central IS support unit will be chartered to set the directions of the IS infrastructure development throughout the MoPTT. Decentralised personnel will be gathered into support organisations called 'IS Support Centres (ISSCs)', and these groups will be governed by the central IS group, something which can best be managed by assigning local IS teams dual responsibilities. The first is to report to the local business area, while the second is to report to a central IS structure and control group in a matrix organisational arrangement. While this is more complex to manage, it is more effective.

9.4.4   CIO (Corporate Information Officer) Role

The centralised information management support group will be led by a Corporate Information Officer (CIO) who will have to provide leadership to the MoPTT in the evaluation and development of a quality IS service facility to support effectively the evolving business needs of the MoPTT.

The advancement in management nomenclature from an IS manager to a CIO is a sign of the movement from a technology management to a business management orientation.

This reflects the change from a support function to a line-management function. A related concept is the business-within-a-business idea: the IS organisation provides products and services to its customers, in this case the business areas of the MoPTT. In both cases. one consequence is a shift in view from applications development and operations as processes that serve user needs to a product focus, where products are part of the list of facilities offered to the business.

9.4.5 Overview of Skill Needs

Skill requirements to support the architectures will change dramatically. Individuals within the central IS group must show a comprehensive knowledge of the applications deployed throughout the organisation and the data these applications create and use. Improved communications and project management skills will also be in demand. and the personnel involved must continue to provide operational support. The following will be of particular importance:

- knowledge of LAN concepts, PCs, LAN topologies, systems and operations management, operating systems (LANs and PCs). tools for administration. security. performance, etc.

- knowledge of IBM hardware and operating systems software

- knowledge of UNIX operating systems, LANs, server technology and related hardware and software

- knowledge of current industry and technology trends.

This knowledge and the skills required can be developed most suitably and cost-effectively by training Saudi staff. The advantages of this Saudisation process are stated more fully in Section 9.6.1.3 below, where the alternatives are also discussed.

The central IS group will have strong internal communication links and interactions. as well as to the necessary units outside the central organisation.

For more information about management and organisation see Appendix F.

9.5 *Data Warehouse*

As we have noted (Section 8.6.2.3) lack of modern information systems and databases were seen by many managers as inhibiting more efficient and practical work environments and processes in the MoPTT. There is much labour-intensive and tedious duplication of data between units, which is one result of the failure to introduce new technology into the recording, storage, and retrieval of information. Much of this is currently done manually, so that it cannot be remotely entered or retrieved. A more thoroughly integrated system with information gathered from different sources and capable of being speedily accessed and exchanged within Ministry units is required to make the MoPTT more competitive in the likely future telecommunications market in Saudi Arabia. More efficient operations and marketing activities will need to make full use of the latest technological developments to sustain a successful marketing programme. The adoption of such a system (often called a 'data warehouse') would assure that there is no duplication because all MoPTT functions would be in the same warehouse, and it would also prove crucial to the achievement of decreasing operations costs.

9.5.1   Overview

This section is a discussion of the role and data structure of a 'data warehouse' as envisaged by the researcher for the enterprise of the MoPTT. Once the Ministry commits to re-engineering its data, it should determine the most cost-effective and efficient method to ensure complete success. With the majority of historical legacy data to be managed within the data warehouse coming from operational databases, a data warehouse becomes a critical part of the overall data architecture.

As we indicated in Section 3.4.1.7 the present development environment at the MoPTT is often unable to offer the users a shared data environment and information access tools. The adoption of the data warehouse model would remedy this deficiency and would permit more effective development and maintenance. Indeed the data warehouse could be re-used by several applications and this would streamline development requirements.

9.5.2　The Data Warehouse Model

Many industries make use of vast amounts of historical information to make plans and forecasts for their businesses and to determine the level of their efficiency and success. Data warehousing, in practice, focuses on a single device that provides a consolidation point of the enterprise, historical data from diverse production systems. It protects production data sources and gathers data into a single unified data model. Data warehousing as an architectural model has four fundamental goals:

- To build an enterprise data model in the warehouse so that data from disparate production systems can be related to data from other production systems in a logical unified fashion. This would align processes across the organisation using a common vocabulary (for example, 'customer' would have the same meaning throughout the enterprise) which would simplify the modelling of complex future business behaviour and performance based on historical data.

- To protect production systems from unproductive queries by moving query processing onto a separate system dedicated to that task, and extracting all the relevant information from each production data source at predictable times.

- To separate data management and query processing issues from end-user access issues so that they can be treated as distinct problems.

- To provide a traditional, highly manageable data centre environment for decision support systems using tools and practices comparable to those used in data centre on-line transaction processing.

Before planning a full design of a data warehouse, the MoPTT should evaluate its data integrity. Any serious data re-engineering effort begins with an analysis of the current level of data quality and a specification of the desired level of quality.

9.5.3　Limitations of the Traditional MIS

Thinking of the MoPTT information as the dominant factor in improving customer services reflects the importance of enterprise decision-making. It also reflects the origins of the traditional MIS. The traditional MIS was not designed to provide widespread access to information; it was designed to control factors of production. A traditional MIS

collects transactional data as raw material that is combined with labour and capital to offer work-in-progress and eventually finished goods. This transaction data is not processed until it reaches the level of management where decision-making on this particular matter takes place.

The MIS is designed to summarise transactions, which is not information. The Ministry managers do not use transactions to make decisions; they use information. Before transactions are useful to decision makers, they must be placed into a meaningful context, and the data warehouse would facilitate this. Data warehouse architecture should include extracts of operational data that are 'frozen views of information' collected in time capsules, which generally have some level of summation and history associated with the view of information.

9.5.4   Data Warehouse for the MoPTT
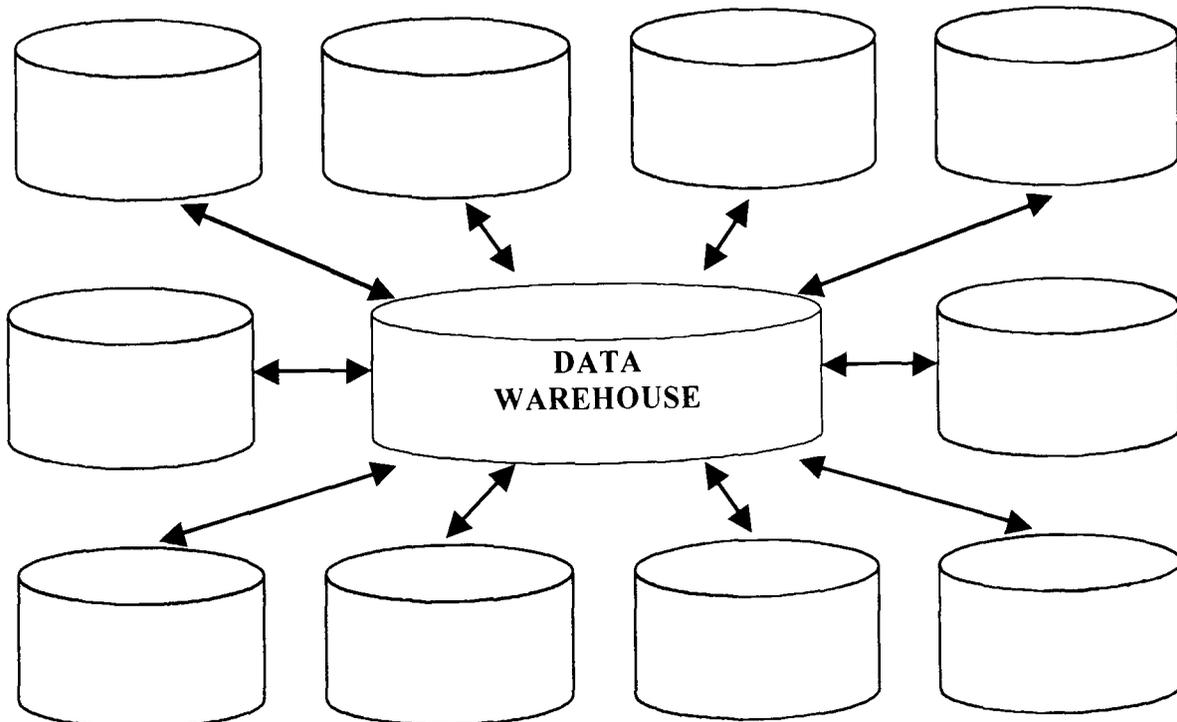
Figure 20. Data Warehouse Model for the MoPTT

Figure 20 represents a proposed MoPTT data warehouse. The data warehouse consists of historical data extracted from various data sources, external and operational.

Data warehouse implementation requires users to locate, transform, consolidate, integrate and aggregate data before it is made available.

As an example three business areas, information from which is covered in the data warehouse architecture, described in Figure 20, are covered: Customer Services, Network Operations and Human Resources.

The customer information gathered in the warehouse is consolidated from the Customer Services database. This information would be a collection of aggregated service order, fault report, and customer data 'rolled up' to a higher level of summarisation. As an example, the data warehouse would keep information on the following:

- number of service orders completed within seven days.

- total number of held orders in served areas.

- percentage of faults cleared within eight working hours.

- amount of held orders per 1,000 working lines for each geographic region.

This data is located, transformed, consolidated, integrated and aggregated from all necessary data sources on a regular basis (daily, weekly, monthly, etc.). The network operations information gathered in the warehouse would be consolidated from the network operations database. In particular it would consolidate network events and network components information. As an example, the data warehouse would keep the following information related to network operations:

- increase in installed exchange lines

- percentage of objectives met, etc.

The human resources information gathered in the warehouse would be consolidated from the human resources database. It would gather all employee information. The following data directly related to human resources would be consolidated:

- total number of employees

- total number of corporate employees

- total number of executive employees

- percentage of Saudisation of key management

- percentage of total Saudisation

- percentage of staff loss (Saudi).

If the MoPTT implements a data warehouse architecture, it should design it separately from the operational systems.

The high cost of running decision support systems (DSSs) on mainframe platforms directly against the operational data is always very high. Therefore management is currently recommending that a separate data architecture should be created. Lengthy queries result in higher charges during prime time hours than during off-peak hours. Most strategic data analysis is conducted during prime hours, therefore, high charge-back costs are inappropriately associated with a data warehouse. Successful data maintenance begins with an understanding of the MoPTT organisation's quality expectations. In approaching maintenance matters, it is essential to first establish data standards, policies and procedures. If data is being entered in batch mode, editors are still needed to check the new data. Potential errors should be automatically fed to a report, if not to a separate database. In short, data warehouses fail when the attention is on the warehouse and not the data.

Although this chapter is primarily about systems and technology, consideration of the design and operation of a data warehouse illustrates one way in which the EIA relates to NFRs, which have been identified in earlier chapters as particularly important for the MoPTT if it is to be efficient and effective. In the traditional MIS information from data collections comes in the form of large batch reports. Not only is the information in these reports gathered in a cumbersome way, but it is also accessed by the time-consuming method of looking through the batch reports. A data warehouse system would mean that information was being consolidated and integrated more frequently. and also that it was being accessed more readily so that jobs were being carried out in good time. NFRs. such as performance requirements, would be more fully met (see, for example, Section 3.4.1.5).

9.6 Architecture Assessment

The information architecture proposed to support the MoPTT has been designed using an information engineering approach. Information engineering considers the connections between people, organisations, workflows, and computers; data and object models; physical data translation and translation rules constraints; document-centred workflow processing; and simple and joint enterprise environments. While architecture based on this engineering, if implemented and used properly, will significantly enhance the MoPTT's ability to serve its customers, there are nevertheless some important issues that have to be taken into consideration before decisions to adopt and implement it can be taken. This section discusses the major issues that top management must address, presenting an overview of the risks involved in the decision to go ahead and a brief discussion of some alternative strategies for mitigating those risks.

9.6.1   Risks

There are two sets of risks that management should consider. One may be characterised as the 'risks of doing'. These are the dangers associated with the migration of the current MoPTT environment to the future architecture described in this chapter. Just as important, are the 'risks of not doing'. These are the risks associated with not migrating, the 'do nothing' approach.

9.6.1.1   Risks of Doing

The projected architecture has been designed to minimise the technology risks. That means that only proven technologies have been proposed to support the MoPTT. The major risks associated with this strategy are organisational and lie in not having the required skills available. The risks potentially affect both the users (the MoPTT business areas) and the IS organisation.

The applications, data, and technology described require major changes to the business processes and to the IS organisation, and the risks involved in this should not be understated. As described in one of the MoPTT reports, the current business organisational structure will be unable to cope with the new business processes. As will

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be indicated in this chapter, the IS organisation will have a very difficult time changing to support the new processes and technology being deployed.

Organisational risk is an assessment of the degree to which an organisation depends on new or untested skills, management capabilities, or experience. In the present context the risk assessment focuses on the extent to which the MoPTT is capable of carrying out the structural and other changes required by the architecture. The new architecture and the proposed reorganisation of IS and alignment of services represents a serious risk. The reasons for this are:

- IS does not, at this time, have the support of top management.
- IS could potentially fail to fulfil the expectations of its new role.
- There is a shortage of necessary skills and background in the new technology amongst existing IS staff.
- There is a shortage of necessary skills and background in the processes required to support an open, distributed systems environment amongst existing IS staff.
- The current IS organisation is reluctant to change.

Given the risks just described, it would be natural for the top management of the Ministry to question why this new architecture should be implemented.

9.6.1.2 Risks of Not Doing

These risks are dominated by the potential impact upon the business of the MoPTT of failing to act. Chapter 8 describes the goals, critical success factors, opportunities, and problems facing the MoPTT. If the MoPTT does not move forward, its ability to achieve its goals will be severely compromised.

Since network expansion projects require major upgrades in the supporting IS systems without being prepared to move in the direction of such upgrades, the MoPTT will simply not be able fully realise the benefits of enhancing the network. Not only will project aims fail to be realised, the penalty of doing nothing is that the MoPTT will fall further behind in IS technology. This will make it even more difficult to address these problems later. There is the further drawback that, if it does not show initiative in leading its staff forward in the technological field, skilled staff will go elsewhere until the organisation effectively shuts down.

9.6.1.3   Alternatives to Consider

Given the problems of a high risk path forward and a high risk path of 'doing nothing'. the correct response would appear to be to move forward strategically. The risks that have been presented architecture associated with the migration of the existing set-up to the new set-up. Alternatives that could mitigate the risk must be explored. Three alternatives for the IS organisation are presented here:

- **Temporarily contract out all or part of the IS service.** This has been referred to as a 'build-operate-transfer' approach. In this scenario an outside contractor is hired to build the required system, operate it for a set number of years. and then transfer a viable system back to the MoPTT. Most of the outside contract staff involved in this will be non-Saudis. This will allow the MoPTT (through the contractor) to bring in skilled and experienced people early, with MoPTT employees. all of them Saudis. undergoing a training programme to be able to take over operations after a certain time. This will also prepare the IS organisation to become competitive in the business of information management.

- **Contract out the IS service completely.** In this case the MoPTT will have to define carefully the conditions of the contract to ensure the ongoing delivery of IS services. One advantage of this approach is that it will quickly free IS from the restrictions imposed by government regulations and budget constraints. In this case most of the staff used, being outside contract staff, will be non-Saudis.

- **Build staff competency during project implementation.** Although very similar to the first alternative, the use of outside non-Saudi staff would be, in principle at least, not temporary. Under this option the MoPTT has an opportunity during the projects to hire skilled technicians, analysts, and engineers and retain them as permanent employees while continuing with its endeavours to train existing employees. This alternative also appeals in that it brings in skilled, experienced people quickly and retains them after the projects have been completed.

- **Retain only existing Saudi staff (except for replacements of staff who leave), and train them to the job.** This scenario uses only Saudi staff, although of course existing contracts involving non-Saudis would be allowed to run their course. The existing Saudi staff would be trained by establishing a training unit whose remit would be specific to IS. and not general. training. This would speed the Saudisation process and

would work out cheaper than the other alternatives. It would also be a better long-term response as it would mean that the system was being dealt with by locally trained and available staff, familiar with Saudi requirements and expectations. This is the researcher's favourite alternative for the IS organisation, because this alternative would speed Saudisation. This Saudisation would not be realised in terms of simply employing Saudis, but by using Saudis who have received appropriate training to provide the answers to Saudi questions.

9.7 Summary

This chapter has set out in some detail the proposed new architecture or design, intended to apply to the MoPTT's IS operations and enterprises. This architecture, the EIA (Enterprise Information Architecture), will supply a structure to guide the adoption, implementation, operation, and further future of IS within the Ministry. It is therefore critical to the development of an integrated IS environment, and it is the concept that will make possible the achievement of the MoPTT's business plans and objectives.

The EIA and measures proposed will not only set in place an IS structure that will enable the MoPTT to meet the challenge of a competitive telecommunications market, but they will provide an ongoing support system which will permit the IS units within the Ministry to stay receptive to technological advance. The MoPTT, if it adopts and successfully implements the EIA for its IS, will not only come up to speed with quality telecommunications providers throughout the world, but, through the EIA's inbuilt capacity to accept and utilise technological advances, ought never again to be in the position of having to catch up. Indeed the researcher has investigated the implications for the MoPTT of not proceeding with a radical restructuring of the Ministry's IS provision along the lines suggested in this chapter, and has indicated the consequences of such a stance.

Ten business areas in the MoPTT have been identified, and the proposals expounded in this chapter cover these ten areas.

Following intense discussions with senior MoPTT personnel, the researcher has focussed on three related architectural components – applications, data, and management – and

upon sets of principles which relate to these components. Concentrating in particular on the IS principles, the definition of which is a key step in the development of the architecture and which are the basis for IS decision-making, the researcher was able to develop the proposals in some detail.

Extensive use of diagrams, tables, and matrixes has been made to illustrate the detail of how the units, processes, functions, and other operations within the IS unit(s) will relate both to other units, processes, etc. within the IS area, and to other areas within the wider MoPTT.

The interfaces of the proposed IS with other agencies and individuals, such as suppliers, outside contractors, and customers has also been indicated.

The chapter has discussed the measures and procedures which will be established with the implementation of the IS architecture proposals, and has itemised the processes and operational activities which will characterise it. Attention has been paid to such matters as the costing both of the implementation of the IS proposals and of the ongoing infrastructure which will be required for backup and development once it is in place. Matters such as the extent to which the IS proposals will be put in place and carried on by the MoPTT's own personnel and that to which outside contracted staff will be required have been given full treatment. Staffing structures and training implications have also been examined, and details of areas of operational and support activity have been set out.

The researcher has discussed management structures in relation to the new IS scheme, and has set out proposals about the location of operational and support IS units and personnel, indicating how the Ministry's IS units can most efficiently and effectively deal with corporate and local requirements. In particular the advantages of Saudisation, training and developing indigenous specialists with specific Saudi backgrounds and attitudes, is considered.

Furthermore, the researcher suggested a 'date warehouse' for the MoPPT, based on his understanding of the ministry's data and information systems architecture.

This chapter has presented in a comprehensive manner the principles, practice, details, and beneficial implications of the implementation of the EIA for the MoPTT's IS operations.

Chapter Ten

CONCLUSIONS

10.1 Introduction

Following upon his study of the structure, management, and operations of the STC, the privatised arm of the Saudi MoPTT, the researcher has been able to reach some conclusions in relation to them. He has also felt it possible to contemplate some options in relation to business areas (or functions) which need further attention within the STC.

In addition to conclusions about and proposals in relation to the MoPTT, the researcher will also offer recommendations for further research relating to the area which he has been investigating.

This study is concerned to a large extent with non-functional requirements (NFRs). It is important for an understanding of the study to stress that these NFRs are constraints. They are not in any way aims to be achieved; indeed they are factors which can prevent any organisation from operating properly if they are not recognised and analysed. However, it is difficult to identify and specify NFRs, because there is no clear delineation between functional and non-functional requirements. What some categorise as non-functional requirements others see as functional requirements. Nevertheless, the aim has been to shed the light on the non-functional aspects within the MoPTT, while discussing the functions, management, and the information systems of the organisation. Indeed the ten primary functions (or business areas) of the MoPTT have non-functional aspects, which need to be appreciated by the MoPTT in order for it to operate successfully. Amongst the non-functional requirements particular attention has been paid to the role of cultural and political requirements. It was a consideration especially of these that have led the researcher to some of his most important proposals for the MoPTT.

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10.2 Research Framework

In order to identify these NFRs an understanding has to be gained of the general environment of the organisation under investigation, and that is a major reason why an account has been given of this. The background to the thesis in terms of the growth and use of telecommunications in the Kingdom of Saudi Arabia is therefore set out. The history and the current situation of telecommunications in Saudi Arabia are introduced. as are issues such as Saudisation, the opportunities offered by the private sector. and development plans. It has also been of central importance for the concepts examined by this study to lay out the infrastructure of the telecommunications system in Saudi Arabia and describe the features and extent of the services which it provides to its customers. Recent developments in telecommunications, such as the Internet, e-commerce. and the general rise in information technology use in all sectors of the Saudi community are described and examined.

As well as reviewing the literature, and adopting the appropriate research and data gathering techniques, the researcher also regarded a fieldtrip to Saudi Arabia as essential for his study. The purpose of the fieldtrip was to enable the researcher to collect all the data and information needed in order to complete his research, and in particular to meet with key figures involved in the current structure and operations management of the MoPTT (and indeed in their future). A close investigation of the current situation in the MoPTT was needed to gather the required data and information.

The account given of the environment and operations of the MoPTT along with the data gathered on the researcher's fieldtrip paved the way for the detailed investigation of requirements in relation to the telecommunications industry in Saudi Arabia.

It has been especially important for this that a full account should be given of the ten functions or business areas identified by the researcher on the basis of the information gathered. An examination of the business processes, involving a breakdown of the activities and procedures followed in each unit, has been carried out in order to establish their efficiency and effectiveness. In the course of this account attention has been drawn. where appropriate, to the NFR distinctions already mentioned, and to their usefulness in identifying and grouping the constraints within which the MoPTT systems have to operate.

As a consequence of the account by the researcher of the ten business areas of the Ministry some suggestions for the redesigning of the business procedures seem advisable. As well as the adoption of a strategic plan (which is discussed more fully below) other concerns identified include better customer care (with a common point of contact for a range of customer requirements), the greater automation of telephone billing, a more thorough implementation of network planning, and the mechanisation of procedures dealt with by network technical personnel.

An account and assessment has also been provided of general policies and attitudes within the MoPTT, and in particular the need of a current strategic plan within the organisation, has been identified and examined. The lack of a strategic plan, or even of widespread support for such a thing, has undermined the MoPTT's position in relation to requests for financial support to the Ministry of Finance are concerned. Quite apart from this crucial disadvantage, it means that the organisation cannot be given direction in an ever more competitive environment.

This lack of direction at the top within the MoPTT has been shown also to manifest itself in the lack of integration as far as common Ministry-wide requirements and procedures are concerned. There is much labour-intensive and tedious duplication of data between units, which hampers efficiency in a number of ways. This unnecessary repetition is one result of the failure to introduce new technology into the handling of information. Much of the recording and storage of data is done manually, so that it cannot be remotely retrieved.

This failure to keep pace with new technology is associated with the shortage of properly targeted funding, which is itself, as we have remarked, related to the absence of Ministry-wide strategic plan initiatives. It is also connected to a lack of manpower resources. Lack of financial backing means in particular that equipment will be out of date and unable to execute efficiently the task for which it is nowadays required. This is manifested so in such things as the computer hardware found in various MoPTT locations. Shortage of budget resources means that out-of-date data storage and retrieval systems are not being replaced, or when there is a hardware failure spare parts are no longer available. Under these circumstances some local managers have acted on their own initiative and installed

PCs in their branch offices. This may help with some of the data handling, but it is only a temporary solution.

The researcher's examination of the overall structure (including its non-functional requirements) of the MoPTT, that is to say of its processes, departments, units, staff, and equipment, and of the interfaces and relationships between them has also led him to the conclusion that very much more stress requires to be placed on standardising processes and services. Practices differ between HQ and local offices, and amongst individual local offices themselves (for example the installation of PCs in some local offices but in others, which is noted above). To some extent the very business of the MoPTT, with its large and unwieldy structure, means that some diversity is inevitable since the nature of the undertaking means that there must be local offices and units. Attempts to introduce uniformity have been made, but Saudi Telecom Training Practices (STTP) standards and other such initiatives at uniformity have not always been fully successful. As with the failure to keep up with new technology, the need for proper budgeting support plays a part in this, as does lack of manpower.

Nevertheless it can only be by seeking to streamline practices and procedures at all levels and in all parts of the organisation that the MoPTT can move forward and offer, in what will become a competitive market place, a high quality service compatible with technological advances.

Competitive edge and all round service deficiency are also associated with the comparative shortage of appropriate training MoPTT staff, something which affects all aspects of the Ministry's operations. An unsatisfactory level of technical skill, as found in MoPTT personnel, is not made up for by the high general level to which some staff are educated. There is no adequate in-house training to deal with this shortcoming.

A further concern in the personnel area is the fact that the MoPTT is unable to afford competitive wages and salaries and thus is unable to appeal to or retain expert staff. This means that not only skills and the expertise, but also the drive to move forward, will be in short supply in the Ministry. Again, this is a serious disadvantage should the market become more competitive, and again, as with other matters noted by the researcher, it is associated with the lack of a strategic plan and the lack of adequate funding.

A most important part of this study is that which deals with the IS of the organisation. The account provided of the processes, departments, units, staff, and equipment, and of the interaction amongst them, which form the information systems of the MoPTT not only indicates the problems which face the Ministry, but implies some of the directions which might be taken to address to those problems.

The researcher has considered management structures in relation to the new IS scheme, and has set out his proposals about the location of operational and support units and staff in such a way that IS units can best deal with both corporate and local requirements. In particular, so that in the future answers will flow naturally out of the situations in which the questions arise, the advantages of Saudisation, training and developing indigenous specialists with specific Saudi backgrounds and attitudes, is advocated.

It is in respect of the MoPTT's IS that the researcher has detailed a proposed new architecture or design. This architecture, the EIA (Enterprise Information Architecture), will supply a structure to guide the adoption, implementation, operation, of IS within the Ministry. It is crucial to the development of an integrated IS environment, and it is one of the ideas that will enable the achievement of the MoPTT's business plans and aims in a competitive telecommunications market.

The researcher has focussed attention on three related elements of the EIA – applications, data, and management – and upon sets of principles which link with these elements – and has developed his proposals in detail. The interfaces of the proposed IS with other bodies and individuals, such as suppliers, contractors, and customers have also been laid out.

The costing both of the implementation of the IS proposals and of the continuing supporting infrastructure has been considered, as have such concerns as the degree to which the IS proposals will be implemented by the MoPTT's own personnel and the degree to which outside contractors will be needed. Staffing and management structures, training requirements, and details of operational and support activity have been examined. In this context the particular advantages of Saudisation – the employment, training, and development of indigenous specialists with specific Saudi mind-sets and approaches – is dealt with. In addition, the researcher suggested a 'data warehouse' for the MoPPT, based on his perception of the Ministry's data and IS architecture needs.

The proposed EIA will not only set in place an IS structure that will permit the MoPTT to meet such the challenge of a competitive telecommunications market, but it will provide an continuous support system which will allow the IS units within the Ministry to stay open to technological advance. Thus, by reason of the EIA's inbuilt capacity to accept and use technological development, the Saudi telecommunications system should never again have to play catch up.

The researcher concludes that the implications for the MoPTT of not going ahead with a restructuring of the Ministry's IS provision along the EIA lines suggested will have serious consequences for the competitiveness of the organisation in the future.

One striking point that emerged during the progress of the researcher's study was that the MoPTT was not always clear about its goals and objectives. This has already been highlighted when the lack of a strategic plan was mentioned. However, the researcher found that there was a more general overall lack of awareness within the Ministry staff of how operations and functions within the business related to each other, how shortcomings (or for that matter strengths) in one area could have an affect in other areas, and so on. It was impossible to discover an appreciation of such factors in the case of any one MoPTT manager, or indeed to identify any documents produced or used by the MoPTT which displayed such an awareness.

Yet these were matters which, after discussion with relevant managers, staff, and consultants, and after careful analysis, were in fact quite straightforward to identify for the researcher. Even allowing for the fact that it is easier to stand back from a situation and assess it critically if one is not involved in it, there seemed to be a lack of essential understanding of the dynamics of a successful organisation. One reason for this may be that the researcher utilised techniques, such as SWOT analysis and Value-chain Analysis to identify and describe critical factors. These, however, are techniques which have been developed in western countries and need familiarity with western analytical methods to apply them properly (see Section 8.8.3). They are not approaches or techniques that would be adopted readily by managers accustomed to Saudi business practices or Saudi ways of thinking.

However, the Value-Chain, SWOT, and Competitive Forces Analysis have been recognised as such valuable analysis techniques that it would be unadvisable to abandon

them altogether in a Saudi environment. Might they not be areas which are open to Saudisation? It is because they are, in their present form, to some extent alien to the Saudi way of thinking that they have not been fully followed. If the understanding which has been developed of the new concept of Saudisation is correct, it may be that techniques such as those can be modified so that they become Saudi answers arising out of Saudi questions.

10.3 Non-Functional Requirements

Mention has been made already in this present chapter about the importance of requirements, both functional and (especially) non-functional, which has been thrown up by this research. Making use of insights gained by previous writers on the subject, of his own study, and of the data that he was able to gather, the researcher has examined the term 'requirement' as used in the software industry, and has arrived at a useful working distinction between the two main types of requirement (while noting the contested nature of some of the functional/non-functional differentiations): functional requirements and NFRs. Functional requirements, in general terms, relate to the ability of a product, service, or system to do what it is supposed to do in technical terms. NFRs are associated with the qualities of a product, service, or system, and they relate to attitudes, perceptions, and understandings. Indeed a useful rule of thumb to distinguish between functional and non-functional requirements would be to ask: 'Can I have this matter dealt with by calling a maintenance technician?' If the answer is 'Yes', the requirement in question is a functional one, since it relates to workability and is capable of being handled following technical specifications.

Although they do not have to do with the technical capacity or workability of products or services, nevertheless non-functional aspects are of crucial importance for their effective and efficient operation; they relate to the system as a whole and therefore if neglected they restrict the successful running of, for example, a telecommunications system.

The place of requirements and their related specifications in a system is discussed, and the study concentrates particularly on NFRs and the way in which they might be categorised and identified. It is clear that functional requirements will need to be specified in detail, perhaps in a handbook. Specifications for NFRs, like NFRs themselves, are less

easy to deal with. The central importance of NFRs in this study deserves a listing of the major non-functional aspects discovered by the researcher.

Any list of non-functional aspects will have been compiled from three broad sources: stakeholders (who, in the case of the Saudi telecommunications system might be the members of the MoPTT Board; they would also include users and customers); from simple relationship models produced by designers etc.; and from change. Such change may be change in people, in operating environment, in cultural and political factors, or a combination of these. Requirements related to cultural and political factors are often elusive and hard to identify. Nevertheless they can have a great effect on the extent to which products, services, and systems succeed or fail. It is our conclusion that this is especially so in respect of Saudi cultural and political factors, and future research on non-functional aspects in those areas may prove beneficial.

Because of the importance of NFRs as discovered by this present research, some of the main types of NFR/non-functional aspect are listed below, with brief examples and/or comments. This is not meant to be an exhaustive list, nor are any examples given necessarily to be categorised as belonging only to the heading under which they are mentioned.

The Saudi Political, Cultural, and Legal Environment. These are considered together since, in Saudi Arabia, this is the reality of the situation. In particular it is hard to distinguish between legal and cultural aspects in an Islamic country. As a political example, the budget of the MoPTT comes from two separate sources. The MoPTT distributes it over the different units and departments. This process should be from a single source rather than two sources. Further, this budget does not provide sufficient funding for the MoPTT. Education. A further example of a non-functional constraint imposed by government policy is the tendency to appoint an individual to a managerial position purely on the basis of how long he has been with the company. As a cultural/legal example, if the choice of where to site cabling and other technical features means that a landline telephone handset can only be located in a Saudi home in an area where the traditional culturally determined privacy requirements of the household are compromised, then this would be a case of failure to meet a non-functional requirement. It would have nothing to do with the technical capacity or functionality of the system, but

rather with failure to appreciate the non-technical (non-functional) limits under which a system must operate.

Government Regulations. These hamper the MoPTT's capacity to carry out its tasks efficiently and effectively, and consequently affect the environment in which the MoPTT can operate. For example, government regulations make it difficult to hold on to skilled employees because of policies in respect of wage and pay increases. These policies and regulations are outside the management control of the organisational units of the MoPTT, or indeed of the MoPTT as a whole.

Government Policies. Management lacks authority to make decisions because of unwieldy government decision-making processes, particularly as regards obtaining funds. This hinders the planning process and inhibits the effective implementation of plans and TQM. The needs of government policy mean that a constraint has been placed upon the use of the national telecommunications system.

Saudisation. This cannot any more simply mean imitating the western way of doing things. A telecommunications system that has been designed and implemented entirely along western lines by non-Saudi designers and engineers has overlooked a number of crucial (non-functional) aspects. These can vary from a simple failure to realise that Saudi cultural traditions relating to privacy dictate a non-functional requirement about where telephone points can be located in homes, to a failure to appreciate the complex and shifting nature of cultural requirements and political control dictate requirements about Internet access.

Information System Deficiency. Cumbersome processes associated with a lack of appropriate information systems, mean that various functions (e.g. Customer Services) are carried out less efficiently and objectives such as delivering network performance and making the best use of funds are not easy to attain.

Sharing Electronic Information within the MoPTT. Access control and auditing are the MoPTT the two most critical security features for applications and data, and it was to address these aspects that the idea of the data warehouse has been suggested. This failure to share electronically held data is to be distinguished from the failure to hold data electronically at all, mentioned elsewhere (including immediately below).

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Cross-functional Issues. There is an unclear definition of responsibility among HQ. regions and districts that results in duplication of efforts and rework affecting all functions. Most Ministry functions suffer from manual rather than computerised record keeping and communication with other units, and there is much duplication and out-of-date of processes throughout the company. Clearly, this acts as an operational constraint.

Unreliable Services. Overloading of the network results in poor performance, which hinders Customer Services and Marketing from achieving their service and development goals. Inefficiency is also caused by the lack of integration associated with the Customer Services function. Services to customers cover so many operations and are therefore dealt with by personnel from different units within the MoPTT. so that unacceptable delays result.

Training. Only Saudi nationals are allowed to attend training courses, although most technical positions in the MoPTT are held by non-Saudis. This poses a major problem, especially since in-house training does not provide the latest technological training. This lack of technically skilled staff is a major handicap to the MoPTT. with only management practices receiving full treatment in training.

Competition. Competition acts, in effect, as a non-functional requirement, provided it is identified, by eliminating certain unfruitful courses and guiding an organisation in other directions. The problem is that the MoPTT currently fails to recognise the importance of competition and, if and when it ceases to have a telecommunications monopoly in Saudi Arabia, this will stand in the way of the company's success.

Lack of Business Awareness. The MoPTT clerical and technical personnel in particular do not appreciate how their work affects the work of the organisation as a whole. This is particularly important because any development of new manual procedures and computer systems will lead to greater integration at departmental function level, which means in turn that most staff will not be able to perform their individual tasks without directly affecting some other individual's work.

As already stated, this list of types of non-functional aspect affecting the performance of the MoPTT is not intended to be exhaustive, nor is the categorisation under one heading or another meant to be exclusive. One type of NFR or non-functional aspect in particular,

however, has appeared to be of greater significance than others for the efficiency and effectiveness of the MoPTT, and the researcher's discoveries on this form a major part of his research conclusions. It is discussed below.

The researcher's examination of NFRs has led him to focus especially sharply on those relating to cultural/social concerns. From the perspective of the Saudi telecommunications system such NFRs are of particular interest, and are often associated, as we have remarked, with change. A particularly good example of an NFR which is undergoing transformation, while still acting as a constraint on telecommunications usage, is the case of Internet access in Saudi Arabia, and this is one reason why it receives such full treatment.

The Internet case is also of importance because it is connected with a new understanding of Saudisation, already mentioned above in the context of the staffing requirements in relation to the proposed EIA, whereby Saudi engineers and software developers are no longer repeating the operations and replicating the skills they have learned from outside, but rather are finding Saudi solutions to Saudi problems.

The researcher has also considered the current structure of the MoPTT and the possible responses that it might make in the face of the challenge of privatisation. Based on the information gathered and the analysis techniques employed (including the SWOT technique), this study has enabled the researcher to offer, in an Enterprise Strategy Analysis, specific operational, managerial, and commercial proposals which should allow the MoPTT to confront the challenge and seize the opportunities offered by privatisation. If it follows the proposals it could become a major player in the telecommunications market both inside and outside Saudi Arabia.

10.4 Potential Developments for the MoPTT

The possibilities which have struck the researcher in relation to the business areas within the MoPTT which would most readily repay attention if the MoPTT is to improve its service are based primarily on his own analysis of the structure, management, and operations of the system as set out in the preceding chapters. However, he has also been

guided by the responses which he received from the actual users of systems within the MoPTT, that is with MoPTT staff that he interviewed and consulted on his fieldtrip.

These responses give an impression of how the users and the IT staff view the applications and data environments, and serve to highlight why applications are often rated low by users on usability and satisfaction. The comments illustrate and confirm many of the impressions that the researcher himself formed.

10.4.1   Key Areas of Concern

The researcher feels that a number of areas of primary concern within the MoPTT may be identified. These areas may correspond to some of the functions described in Chapter 5 or may be more general considerations covering a range of processes and procedures. They have been selected because they have been identified as impacting most strongly on the quality of service provided by the MoPTT.

10.4.1.1   Strategic Planning

Strategic Planning is one area of the MoPTT which would repay careful consideration. We have already seen in Chapter 5 that Strategic Planning suffers through emanating from two primary sources, namely the Division of the Deputy Minister (DM) for Finance and Administration (F&A) and the Division for Operation and Maintenance (O&M). The fact that there is no harmonisation of the plans of these two places of origin means that there is on occasion a divergence between the plans which MoPTT personnel are required to follow. Indeed we have remarked that harmonisation between the two sources is hardly possible as long as the current procedures and processes prevail. Under the current system policies go straight from the F&A Division to service delivery as well as through O&M. This means that, while some orders may benefit from MoPTT experience and scrutiny (O&M policies), others may not (F&A policies), since in effect F&A are the government and O&M are the MoPTT.

The fact that this anomaly exists is one indication of the fact that, as has been highlighted, Strategic Planning appears not to be taken seriously enough within the MoPTT. Although heads will nod in agreement when the importance of Strategic Planning is mentioned, the

routines associated with it indicate that no genuine and methodical endeavour to streamline it has been made.

The researcher's understanding of Strategic Planning is that it is of central importance to quality of telecommunications service offered by the MoPTT. Since Strategic Planning is not yet widely accepted within the MoPTT the plans that are developed reflect the thinking of a few organisations and not that of the Ministry. As such, the plans do not drive other important functions such as budgeting or capital allocation. The objective of strategic planning is to drive the direction of a company or organisation. Allocating funds and capital to those strategic plans is critical to the plan's success. It is the five-yearly plans of the Strategic Planning business area that budget allocations are supposed to be largely based upon, but in fact the budget allocated from central funds each year does not meet the requirements of these five-year plans of the MoPTT. This is an indication Strategic Planning does not have sufficient practical backing at a high level within the MoPTT. Without sufficient funds, other vital areas of the MoPTT, such as ensuring that the Ministry personnel are properly trained or that the needs of customers are efficiently met, become neglected.

Strategic Planning is most critical in times of heavy competitive pressure and when resources are limited. At times when funding, for example, is limited Strategic Planning would allow the MoPTT to focus its limited funds on those projects of most strategic significance and direct funds away from projects of lesser strategic value. Without Strategic Planning, precious funds may be allocated to projects that will not prepare the MoPTT for the future.

A budgeting and capital allocation process should be driven by a strategic plan that positions the organisation for the future. Wide acceptance and adoption of strategic planning within the MoPTT is therefore critical to the meeting of any plans that are made. Widely accepted plans can be published and actively shared with the entire organisation. This sharing of committed plans involves all levels of the organisation in the execution of strategic plan.

It is therefore suggested that consideration should be give to a campaign to involve Ministry executives in Strategic Planning process. There is a need within the MoPTT to develop a strategy and campaign to gain acceptance of Ministry-wide and Ministry-driven

Strategic Planning. Effective Strategic Planning starts with the key executives setting broad goals and strategic direction for the organisation. These drive the goals and strategies of lower organisations. In this way, executive vision and direction can be reflected in the plans and goals of all units within the company. If such a campaign is adopted then one helpful feature might be a programme of seminars for key Deputy Ministers on the importance of Strategic Planning. These seminars would educate them on the process, the importance of their role in the process, and also on how effective companies carry out Strategic Planning.

The importance of education in this area is considerable. Those doing Strategic Planning need a better understanding of how to set and define goals and of what makes up a good strategy. More focus should be set on having fewer but more quantifiable goals and on fewer but executable strategies to attain the goals that are set. Too many goals and strategies can defeat the process. The researcher found over one hundred goals that had been set by a combination of corporate plans, functional strategic plans and individual department goals. While all these could be related together, it is doubtful that all will be met or that all strategies will be successfully executed. It would be better to concentrate on half a dozen goals for each functional area that can be measured and on executing a small number of strategies essential to those goals.

To assist in setting a few key goals and supporting strategies, it is suggested that Critical Success Factor (CSF) concepts, as discussed in Chapter 8, should be introduced into the MoPTT. CSFs state that managers can only concentrate on a small number of things in directing an organisation. Since this is true, then the managers need to carefully consider what are the key things that they must provide attention to which are absolutely critical to the success of the organisation. Understanding the CSFs in the MoPTT would be a key to knowing what the organisation must do or monitor in order to be successful. Adding CSFs to the Strategic Planning process, and developing strategies to ensure the CSFs are met, would provide more focus to the process and lead to more effective goal and strategy definition.

It is vital that those in charge of Strategic Planning should understand how the process can help them be more effective in attaining their own goals and objectives of providing a telecommunications service in Saudi Arabia that is both efficient and, in an environment of privatisation, competitive.

10.4.1.2 Marketing

Another area of the MoPTT operations which would repay consideration is that of Marketing, not least because the MoPTT, though the STC. are now in a competitive environment and because of the possibility that the service which is provided by the MoPTT might be threatened by rivals, perhaps even from outside Saudi Arabia, whose ideas on marketing and other key areas may be more progressive. Indeed Marketing has been identified as one of the primary activities or business areas of the MoPTT, a function essential to the MoPTT's achievement of its objectives.

Despite this, as we have already noted, Marketing, like Strategic Planning, is not held in particularly high esteem in the MoPTT (see Chapter 5). This has repercussions for its effectiveness and efficiency. Marketing operates reasonably well as far as accurate estimates and forecasts are concerned, but unless its value as a promotional operation is perceived and acted upon by MoPTT management it cannot achieve its full capacity as a business area which can contribute substantially to a quality telecommunications service. Because of the low regard in which Marketing is held its endeavours get inadequate funding, and money has to be found from other budgets to finance such promotional initiatives as are carried out.

Though one reason why Marketing receives a low profile is that it does not fit in with the customary Saudi way of doing business, which relies on personal communication and influence and has no tradition of an emphasis on corporate image and promotion as in the western world. While it may be some time before changes are seen in this, nevertheless the MoPTT management would be wise to look closely at this business area in a competitive era. There is little doubt that the lack of integrated product positioning strategy, policy, and modern marketing organisation is hindering the goals of developing the commercial market.

If marketing is to be targeted as an area worth scrutiny by the Ministry, however, it is suggested that it should not be seen in isolation as a discrete business process. Since Marketing is concerned, or should be, with the promotion of services it is essential that these services should be worthy of promotion. If they are not, it may be no bad thing that Marketing receives little emphasis. We have already noted in Chapter 5 that the MoPTT

has at present little in the way of spare capacity. If a marketing initiative were to lead to a substantial increase in demand from customers this could be embarrassing the Ministry, who would be unable to fulfil the demand which they had themselves created.

The researcher therefore suggests that Marketing is an area of the business operations of the MoPTT which should receive particular attention. However, although this attention should make immediate recognition of the importance of Marketing for the future success of the MoPTT, it should focus on its more gradual development. Until the MoPTT can supply the extra services and facilities which might be promoted by Marketing and until attitudes gradually change to absorb and naturalise the most appropriate aspects of western marketing methods (without a loss of the traditional way of doing business), then the emphasis should be on examining the structure and the long-term character of the Marketing function. Exactly how Marketing could absorb this Saudisation would be a matter of some detail and of a developing understanding of the concept of Saudisation, but it may prove a commercial necessity.

In order for Marketing to be developed in a way which can make a major contribution to business success it cannot be seen in isolation. In particular it should be associated with Customer Services (as well as keep pace with the actual capacity of the services as mentioned above). One example which has already been noted is that information about services and facilities could be included on telephone bills. One concept which might be considered by the MoPTT in relation to Marketing is that of customer relationship management. This is a process of gathering complete customer and product information and making it available to Customer Services, and to any other organisational units which may require it. In this context the benefits of using integrated data are clear, and this is something to which we will return below (see Section 10.4.1.5).

10.4.1.3 Customer Services

Customer Services is another operation which would repay a close examination. It is a business area with which the customer comes close contact and which has a high public profile. This will be of increasing importance in a competitive commercial environment. The value of considering Customer Services in conjunction with Marketing has been noted above.

It is suggested that the MoPTT should look at Customer Services from two basic points of view. One of these concerns the actual services that are provided. While facilities such as caller ID and ring back may have been available for some time, there has been some reluctance on the part of the customer to make use of them. This is in part due to cultural influences. Caller ID has been successful in western countries, but in Saudi Arabia it appears to have been seen as an intrusion into the privacy that individuals expect to receive and are expected to extend as a courtesy to callers. Indeed it is a non-functional requirement or constraint upon the operation of the telecommunications system (see Chapters 3 and 4). Decision-makers in the MoPTT will have to consider such matters as whether such a service should at present be withdrawn in the country, or whether the cultural situation is changing to the extent that it is now worth persevering with and indeed promoting.

The MoPTT management should also consider the actual operation of the Customer Services unit. This is the side of Customer Services which the customer meets, and the customer's attitude to the telecommunications service provided by the MoPTT is much affected by what he encounters. Following privatisation this will be of great competitive importance. We have noted in Chapter 5 that one factor affecting the operation of Customer Services is the shortage of exchanges in the MoPTT system. This means that there are often insufficient lines available to deal with customer requirements, and they can often simply not get through to Customer Services. In a competitive environment this will be compared with other telecommunications providers, and the MoPTT will suffer a commercial disadvantage. Thought should therefore be given to the straightforward but far-reaching benefit if making it easier for customers to contact the STC.

But a more sophisticated streamlining of the Customer Services unit is also something which should be considered by decision-makers. Because services to customers cover so many operations they are handled by staff from different sections within the MoPTT, and this means that new lines are not supplied be or faults rectified as quickly as they might be. Greater integration, perhaps involving the restructuring of operational relationships within the MoPTT, is needed.

One possible approach in this area is the integration of various customer services personnel found in different units (e.g., Subscription Office, Enquiries, Construction, Engineering, etc.) into a 'common point of contact' (group and telephone number). This

centralised group would address customer initiated enquiries and issues, such as service availability, billing, or service concerns, based on customer type (for example, government, residential, business or long distance carrier). The group should be publicised as the most convenient access point for customers wishing to communicate with the O&M Division of the MoPTT. This would mean that a customer would make a single call, rather than many, to satisfy questions or concerns. Overall, the number of calls and/or visits that a customer presently makes would be reduced. This approach would also have a direct positive impact on customer satisfaction, thus reducing the threat of 'by-passing' the MoPTT for telecommunications services.

Organisationally, personnel in the Customer Services Department responsibilities would be redeployed from other groups (for example the 900 services) into a centralised unit, which can increase management's area of control to lead to greater efficiency. A manager's time spent answering customer calls would be better used to lead and direct their staff unit. Sufficient resources such as proper 'customer care' training, technology, personnel and systems must be provided to ensure success. Customer feedback must be measured and action must be taken, based on the results, to ensure the quality of this service.

Any effort to redesign would consider the impact on current systems. For instance, data must be shared from a common database accessible within this customer services group and based on security administration guidelines.

The potential results and benefits of this move would support established goals and strategies identified in the Ministry's Enterprise Strategy Analysis report, and will also stress the opportunity to become customer focused. Therefore, it should be given a high priority for implementation.

As with some other functions within the Ministry, efficiency and effectiveness are compromised because so much of the information collection and dissemination is done manually, with a duplication of paperwork. Since more efficient ways of dealing with reporting and the instigation of action, such a computerised centrally available records, could be employed, the Customer Services function has to operate in an environment which is not an essential aspect of its nature. Billing, for example, is a tedious and slow process, which could be speeded up considerably by the use of integrated IT techniques.

The need for a common and easily accessible database across many of the operations of the MoPTT is something to which we shall return.

Several of the suggestions for change indicate that users are not able to give a satisfactory service to customer enquiries, whether the customers are external or internal to the MoPTT. A month's turnaround time for data is far from unusual. A conclusion from the comments is that an improvement of the MoPTT's service to its customers also requires change to, or replacement of, several or most systems.

Billing Data Collection is another area of Customer Services which would reduce the time and effort spent collecting the 'call details' data (as it is called) from exchanges throughout the Kingdom. This data is eventually processed in the Riyadh data centre to generate billing invoices for customer requested services. At present the call details data is contained in exchange tapes that are almost always delivered to the data centre by mail or vehicle. However, most exchanges are capable of transmitting this billing information electronically. The suggestion being made is based on the following assumptions: the electronic interface exists to accept data that is electronically sent to the data centre for all types of switches; the remaining exchanges are converted to eliminate the need to collect tapes physically.

The organisational implications of going down this road would include the redeployment of resources currently used to collect tapes. The impact on current information systems would seem to be minimal. This move would also support the strategic goal of decreasing operational costs; therefore, it should be given serious consideration as a measure that could be introduced in the medium term to make the telecommunications service provided by the MoPTT better able to survive in a competitive environment.

10.4.1.4 Training

Training is another area of the MoPTT which the researcher would suggest should be examined closely. Like some other MoPTT functions, Training suffers through a lack of adequate funding. Within the Ministry the budgetary allocations for in-house staff training has a low priority. There is another concern in that at present only Saudi nationals are allowed to attend training courses, although most technical positions in the MoPTT are held by non-Saudis. Although the long-term future for any national

telecommunications provider must be that it is primarily staffed by Saudis, this poses a major problem for the MoPTT management, since it is the training of technical staff that would provide the most benefit to the Ministry.

As things stand currently, the single area where MoPTT employees have received the most training is management. However, because of the organisational policy of sending only Saudi-nationals to training and having over 90% of management positions filled by Saudis. The Time Management course offered by the Training Centre is the single most popular course offered, and continuing to send employees to this type of course should be advantageous to the entire MoPTT: however, consideration should be given to directing more Training funds towards other types of course. especially customer services and interpersonal communication courses.

Indeed the entire matter of Training budgeting is something that needs consideration. We have noted in Chapter 6 that determining the budget for training is outside MoPTT management control. This needs to be addressed, since it means that those with the expertise are not necessarily those who make the decisions on what types of training enterprises are funded. Some MoPTT managers indicated that they were unable to send their employees to training programmes because of inadequate funds. When funds were available for training, use of those funds was at times mismanaged. Much of the training allocation went to sending select employees to overseas training, something which was seen as a reward for service, not as a fulfilment of training needs. Again, this clearly needs to be addressed.

One beneficial development in the MoPTT would be the exploration of strategies and plans for improving the Training function and enhancing the skills of the workforce as soon as possible. In relation to the development of new information systems, the Ministry should aim to retrain those trained employees so that it can successfully use them in future development.

As with other areas which need to be given consideration, Training cannot be divorced from other concerns within the MoPTT. Training is a waste of time and resources if. for example, the Ministry cannot retain quality staff because of low wage levels. This is a matter which cannot be addressed by Training personnel alone, or by human Resources

staff. It has to be something which is tackled at strategic level as part of an aim of having quality personnel providing quality services.

Training is also associated with another area which the researcher has raised and which he believes needs to be considered, and that is Saudisation. With the increase in the number of staff appointments to Saudis, there will be increased training requirements, at least as long as the policy of training only Saudis persists. In addition, however, the approach to training will have to change in the light of the new understanding of Saudisation which the researcher believes is emerging. We shall return to this below.

10.4.1.5   Integrated Information Systems

It has been noted in this present chapter and also earlier in this study (Chapter 7) that many operational areas of the MoPTT suffer because data and other information is not integrated and is not available electronically.

There is simply a clear requirement to address the matter of updating the systems for the storage and dissemination of information. Accessing and distributing data manually has two main drawbacks: it slows procedures and processes down; and it increases the likelihood of mistakes (through copying errors). In other words, it is simply not as efficient as using electronic systems. In a post-privatisation competitive environment the use of networked up-to-date information systems throughout the MoPTT is a move which must be made.

The researcher's reflection on network integration envisages the co-ordination and mechanisation of network utilisation data (facilities, equipment and circuits) among several work groups and geographic areas within the MoPTT. This information would then be analysed to improve forecasting and results. The analysed forecast data would be distributed more frequently (preferably biannually) to users, such as appropriate personnel in the Districts and Regions, on a need-to-know basis.

Benefits derived from the successful implementation of this idea would include: a reduction in the time required to collect and analyse data, closer integration of network forecast and budget tasks, a reduction in administrative costs by reducing the number of groups involved and manual contact between them, and a better focus on the current condition of the network rather than on year-end budget related tasks.

Organisationally, existing planning-oriented groups should be integrated (realigned) without creating additional administrative inefficiencies between them or their client groups. The ultimate object of this reorganisation is to perform integrated planning of the entire network (inter-exchange, exchange and outside plant). Therefore, interfacing with existing systems that collect utilisation data would require further analysis. Other systems may be introduced to automate the collection, integration and analysis of other data (for example data services) as well as to summarise and distribute this information.

The successful implementation of this development is based on a critical assumption, namely that the yearly-allocated funds are a stable, dependable figure and a solid base on which to establish integrated network planning tasks.

The processes related to the development and integration of the network are critical to supporting the goals and strategies of the O&M Division of the MoPTT. Therefore any initiative that improves them should be considered a high priority.

10.4.1.6   Network Management – Work Force Management

This is another area where improvements might be considered. The researcher's observations have led him to the view that to mechanise tasks would improve the identification, scheduling, dispatching, and tracking of available resources, especially the technical workforce. This improvement would result from better co-ordination and mechanisation of these tasks, thereby reducing non-value added ones, thereby saving money.

Mechanising tasks would derive the following benefits: a reduction in paperwork involved with managing the installation, maintenance, and repair technicians; an improvement in the co-ordination of tasks among different operations groups (for example RMCs (Regional Maintenance Centres), NNCC (National Network Control Centre), contractors, etc.), and other groups such as Construction and ACC (Assignment Control Centre) in the restoring or provisioning of services; an improvement in customer satisfaction through more efficient scheduling and completion of requested service installation, maintenance, and repairs: a reduction in time needed to schedule, dispatch and track orders and technicians; and the opportunity to adopt a proactive, rather than reactive, approach to related work flows.

The successful implementation of task mechanisation depends on necessary funds being available for system implementation, and on the qualified O&M Division personnel being available or trained, especially as new technologies are introduced into the network.

This potential step forward supports the goal of improving customer services identified in the Ministry's Enterprise Strategy Analysis report; therefore, it should be considered a high priority.

10.5 Recommendation for Further Research

In the course of his study the researcher has sought to describe and analyse the structure, management, and information systems of the MoPTT in order to assess their viability following the Saudi government's decision to privatise the national telecommunications sector. This has enabled him to identify areas of primary concern which the Ministry should consider if the STC, the privatised arm of the MoPTT, is to be competitive in the provision of a telecommunications service. These are, for the most part, stated above in Section 10.4.1.

One other factor, however, has emerged in the course of his study which is more elusive than the areas discussed above but nevertheless of great importance. It could have been discussed under Section 10.4.1 as a key area of concern, but it is worth dealing with separately because it is a factor which seems to have, in essence, its own momentum independent of any decisions made by the MoPTT or even the government of Saudi Arabia. It also deserves separate treatment because it is an area which seems appropriate for further academic research. The factor is Saudisation. It has already been discussed in Chapter 4.

As far as the policy of replacing non-Saudis with Saudis in the work force is concerned Saudisation is, in a restricted sense, under the control of the government, if not the MoPTT in particular. But the concept of Saudisation which now seems to require study and development is somewhat different. It is no longer helpful to understand it simply as the taking over of jobs previously held by westerners by Saudi nationals who have now acquired the necessary technical skills and experience. That this was an inadequate and

indeed self-limiting understanding emerged more clearly when the researcher considered the matters of non-functional requirements (see Chapter 3) and of the non-functional aspects related to the main MoPTT business areas (see Chapter 5).

It was clear from an examination of these issues that the Saudi telecommunications service was handicapped by the application of a telecommunications system developed outside a Saudi cultural environment. Technical aspects and customer services which had proved to be desirable in a western context were simply not developed or implemented in a way which was appropriate for Saudi culture. This being the case, Saudisation which consists simply of Saudis taking over western systems and technologies and continuing to try to develop them along the same lines would be a deficient Saudisation. What is required is an understanding of Saudisation which involves Saudis applying Saudi solutions to Saudi problems.

This is more, however, than a simple understanding of such things as what aspects of a telecommunications system would, for example, clash with the Saudi understanding of privacy requirements. Privacy is of particular importance in a Saudi context because of the rules and customs of segregation, whereby women are usually separated from all but close family members. That particular instance might be relatively easy for Saudi engineers and designers to deal with. But Saudisation is not a static matter; rather, it is dynamic. We have seen from the example given of the changing attitudes within the Kingdom to Internet use that Saudisation is a concept which, though indigenous, relates to developments in the outside world (see Chapter 4). Thus, although Internet use has been limited, for a variety of reasons, within the country, this is now changing. Partly this is due to an appreciation of the communication power of the Net; but it is also partly due to a greater exposure in the generation of Saudis now reaching decision-making positions to ideas and trends outside Saudi Arabia. These Saudis have increasingly been educated outside the country and have carried out business with western firms and in western countries. They have thus been able to take the most appropriate of the ideas and developments which they have met and apply them, adapted culturally if necessary, within the Kingdom.

It is this understanding, namely that Saudisation means Saudi treatment of Saudi issues but that the treatment and indeed the issues are not static, which needs to be developed and which needs further academic research. Saudisation applies, of course, to much more

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than just the MoPTT; it touches developments in all areas of national life. But a proper and enriched understanding of Saudisation would be particularly useful for a national telecommunications service provider in a privatised environment, because, if the other areas discussed in the earlier part of this chapter are dealt with, this would give it a competitive edge in the provision of a quality telecommunications service. It is therefore recommended that further research into the concept of Saudisation should be undertaken.

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