The ComSoc Guide to Managing Telecommunications Projects

CELIA DESMOND

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Nim K. Cheung, *Series Editor*
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Preface

Telecommunications is a well-known, well-established and highly regarded industry that has been in place for more than 100 years. Over this time, the industry has been always growing, always evolving, and always playing an important role in the evolution of society in general. In most countries of the world, telecommunications has been deemed important enough that companies in the business have been encouraged by their governments to provide high-quality and reasonably ubiquitous service. Due to the high cost of equipment and associated work involved, governments put regulations in place to ensure that quality service is provided at reasonable rates for businesses and consumers who form huge customer bases for these companies. These service providers have generally been large companies that operate with some of the most sophisticated technologies and processes in the world. Of course, this requires high-level business planning and implementation. It also requires that tens of thousands of projects be undertaken each year worldwide, to keep the industry viable with new technologies, new service offerings, new mechanisms for operation, and new approaches. Projects have always driven the evolution of the telecommunications industry, which, today, is maybe most appropriately called the "electronic communications" industry. In this book, these names are used interchangeably to refer to the industry that provides voice, data, and multimedia services to both business and residential customers. Projects will continue to be very crucial to the success of the companies offering products and services in this area going forward.

The electronic communications industry is experiencing such rapid and disruptive change that in the early 2000s it is probably the industry with the highest overall rate of change. Within this industry, many players exist: very large established companies and small start-ups with innovative and clever products and ideas. Chapter 1 provides an overview of the evolution of the telecom industry over the later 1900s and the early 2000s, to illustrate the environment in which these projects are undertaken. This chapter also addresses some of the types of projects encountered in telecommunications. Chapter 2 discusses the importance of using project management within this environment, and Chapter 3 gives a general idea of what is needed for good project management. Of course, projects and the need for project

management are discussed throughout the book. Next, Chapter 4 looks at what is needed to get a project going, looking at the source of the proposals and what might be considered in making the decision to go ahead. Stakeholders of these projects and how they look to the different types of companies in the business are discussed in Chapter 5.

For any of these companies to succeed they need to have a solid business proposition, strong products that meet the needs of the market, and operational capacity and capabilities to allow them to provide their services. The purpose of this book is to address the management of telecom or electronic communications projects. Although these are quite varied, and often have a very wide scope, the basics of project management can be applied to improve the chances and degree of success. These projects all occur within an industry evolving so rapidly at this time that it is almost impossible for any one person to even keep up with all developments. Implementing any project in this environment is difficult, but very exciting. And it is critical that project management concepts and techniques be applied to minimize the potential problems, make the work flow much more easily, and maximize the chances of success.

In the telecom industry, a high percentage of project managers (PM) are selected from the engineering ranks. The project teams, however, include people from many different departments and disciplines. Chapter 2 discusses the telecommunications industry environment and shows that the range of project types undertaken in this environment is extremely broad. It is not really possible to pinpoint a type of project, or even a set of project types, to label as telecom projects. Most telecom projects are technology based in some way, but many are related to the processes and the business environments in which the technologies are managed. Most involve working with or designing networks, services, or technologies; but to do this, people must have the corporate support and infrastructure enabling development of salable products and services as expeditiously as possible.

Some telecom projects are not strictly technology based. Even in highly technical projects, the team will need to understand the need for the service or product that it is developing or designing, the uses or applications of the product and the impact of the project implementation on its own company. The PM relies on the skills and knowledge of all team members, so project aspects will be considered from various perspectives. When mathematical concepts are presented, an understanding of mathematics equivalent to that attained by engineers is assumed. Many concepts are presented in a manner that allows easier understanding and use by engineers.

Why engineers? First, as mentioned previously, in telecom, as in other high technology industries, it is quite usual for project managers to be selected from the engineering ranks because most of technologies used are very complex and a solid technical background is needed to understand how they work, what they can potentially do, and the impact of many technology-related decisions. One of the main responsibilities of the project manager is making solid decisions for the company in all aspects of the project, especially technical issues or those that impact technologies. So

it is critical that the project manager have this solid technical background. Next to engineers, probably the most likely choice for a PM is someone from an operations group, which usually also have a technical area. In telecom, operations tend to include all the background support needed to keep networks and services running, including trouble handling, testing provisioning, and other systems such as ordering or billing. Thus, people working in these groups generally also have a technical education, often an engineering degree. Even if the PM is not an engineer, engineers participate in almost every telecom project team. It is important for team members to understand project management as well as help reduce the frustration of overhead work, and just to understand the extent and value of work necessary to ensure that the project produces the best possible output in the required time, within the allocated budget.

Subsequent chapters look at other aspects of project management and how these can be handled in a telecommunications environment. Chapter 6 addresses project objectives and how these differ from business objectives. Chapter 7 talks about defining the project scope clearly and Chapter 8 outlines the procurement cycle. Chapter 9 reviews various aspects of project risks and Chapter 10 looks at different aspects of the planning for the project communications and the communications requirements. Chapters 11, 12, and 13 address some of the core concepts of project management: building and managing a schedule, the budget, and activities. Various aspects of handling people and the problems people face are addressed in Chapter 14. Finally, Chapter 15 rethinks why project management is important.

But, before any discussions become too involved, the scene must be set with some definitions to enable the reader to understand just what is being discussed. The first question that should be answered is "What is a project?" The answer to that question is found in a book called *The Project Managers Guide to the Book of Knowledge,* or *PMBOK,* published by Project Management Institute (PMI). The PMBOK defines a project as "a temporary endeavor undertaken to produce a unique product or service, with limited resources,

- Start and end dates
- Clearly defined objective
- Budget and other resource constraints
- Temporary team
- Perhaps initially defined deliverables
- Performed by one or more people, or organizational units."

So a project is not something people work on in their daily job but rather something that is undertaken for a defined period of time, to produce a defined outcome (product or service), which is different from anything existing. Generally, teams are multidisciplinary, although this is not necessarily the case. Certainly, it is more often true for project teams than it tends to be for day-to-day work, which is usually more

focused within a functional department. Team members are selected based on the skills needed to complete the project. The outcome needs to be available, in full working order, by a date that is either predefined or defined before the project proceeds too far, and the budget also usually suffers from serious constraints. So we have a group of people who think differently, working together for a temporary period, to produce something different from their usual output, under time pressure. What fun! In order to do this effectively, project management is needed, and a defined discipline constitutes project management. The next question then, is "What is project management?" The answer to this question is also in the *PMBOK:* "Project Management is the application of knowledge, skills, tools, and techniques to project activities in order to meet stakeholder needs and expectations." This book discusses the knowledge needed, and many of the techniques or tools that can be used.

Just as food for thought, let us consider some initial examples of telecom projects. As we will see, the nature of these projects covers a huge range, but this short list gives some idea of the types of project that might be encountered:

1. Design, install, and configure a network to support certain services.
2. Provide conversion plans to convert the entire network of an incumbent telecom company (telco), including replacing the technology and changing the architecture from circuit-switched to packet-switched.
3. Construct a new facility, data center, or POP.
4. Develop a new feature, product, or service according to a specific client's requirements.
5. Lay in a new fiber optic link.
6. Develop a new technology to enable the provision of new services.
7. Design a content-based, peer-to-peer application to run on the current high-speed Internet network.
8. Develop a new business model, including a new rate structure that encourages customers to subscribe to your company's services while at the same time ensuring that profit margin is maintained.

Clearly, the requirements for one of these projects differ drastically from those of another, and the skills needed to complete these projects also differ across the projects. Each of these is highly interesting, and obviously critical to the corporate success, so each needs to be managed in a way that will best ensure success.

CELIA DESMOND

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Acronyms

ACWP—Actual Cost of Work Performed
ANSI—American National Standards Institute
BCWS—Budgeted Cost of Work Scheduled
CPI—Cost Performance Index
CV—Cost Variance
EAC—Estimate at Completion
ETC—Estimate to Complete
EV—Earned Value
FF—Finish–Finish
FS—Finish–Start
GPS—Global Positioning System
ICC—International Conference on Communications
ICT—Information and Communication Technologies
IEEE—The Institute of Electrical and Electronics Engineers
IP—Internet Protocol
IT—Information Technology
LAN—Local Area Network
NPV—Net Present Value
P & L—Profit and Loss
PDM—Precedence Diagram Method
PM—Project Manager
PMBOK—A Guide to the Project Management Body of Knowledge
PMI—Project Management Institute
PMP—Project Management Professional
POP—Post Office Protocol
PV—Planned Value
R & D—Research and Development
RBOC—Regional Bell Operating Companies
RFI—Request for Information
RFP—Request for Proposal
RFQ—Request for Quote

SF—Start–Finish
SPI—Schedule Performance Index
SS—Start–Start
SV—Schedule Variance
TDM—Time-Division Multiplexing
VOIP—Voice Over Internet Protocol
WBS—Work Breakdown Structure
WCET—Wireless Communications Engineering Technologies
WCP—Wireless Communications Professional
WEBOK—Wireless Engineering Body of Knowledge

CHAPTER 1

EVOLUTION OF THE TELECOMMUNICATIONS INDUSTRY

MONOPOLY STATUS

In order to gain insight into the telecommunications industry, first it is best to look at its history. Each country has its own way of handling this type of service, but there are many similarities in the treatment of telecom around the world. This chapter considers the trends of the evolution of telecom, which are mainly common around the world. Most of the background for this section comes from North America, and even in North America there were always some differences between the industry in the United States and that in Canada. The intent is not to give totally accurate specifics, since these vary country by country and also over time, but to show the trends that are essentially common to the telecom industry in most areas.

Initially, telecommunications service was treated as a "natural monopoly" essentially everywhere. The governments believed that this service, although very expensive to provide, was a basic right, and that it should be available to everyone at a reasonable price. Thus, in many countries, certainly in North America and in much of Europe, the government played a large part in the offering of telecommunications. In many countries, this service was provided by governments themselves, in a manner similar to the provision of other utilities such as electrical power. In North America, this was not the case, but the service was heavily regulated and many requirements and restrictions were placed on the companies that provided telecommunications. Regulation protected both the companies providing the service and the customers. Rates for basic service were kept low so that the service would be affordable by the masses, and requirements were often stringent, governing both the type and level of service that could be offered, as well as the rates that could be

charged for the service. Basic service was essentially voice service, and in North America the requirement was that local voice service capability should be offered at rates that were affordable to almost everyone.

In addition, companies providing basic telecommunications services were required to provide the capability of using the phone for immediate emergency support (medical, fire, and ambulance). This placed a requirement on the network that it be always available, so that someone who needed to place an emergency call would not be faced with an outage at a critical time. Since equipment and systems cannot be 100% reliable, the requirement placed on the telcos was that the lines and network be available 99.999% of the time. Thus, in North America the incumbent companies today provide very high quality telecommunications services at very reasonable rates, and almost everyone in these countries has access to telecom service. Because of this, most people have landline connections. This is not true in much of the developing world, where wireless services have blossomed due to the lack of affordable landline service in many areas.

Services that are not required for basic communication, such as data services, became known, generally through regulation, as enhanced services, or something a step above the basic service. These services, since they were not deemed essential by the regulators, did not have to meet the stringent criteria applied to basic communication services. So anything other than the basic landline voice services developed along somewhat different paths in many cases. But in many cases, these services were actually offered by the same carriers who provided the basic voice service, under separate regulatory rules.

Local voice service was provided to allow callers to place calls to others within a local calling area, generally the municipality in which they were located. In addition, these local networks were interconnected to each other, allowing callers to place long distance calls to people in other municipalities and even other countries. The interconnecting networks are often called backbone networks. In the United States, there were companies offering local service within towns and cities, and also interconnection between these towns and cities as long distance service. The names and sometimes the nature of these companies changed over time. Perhaps the largest ones were most notably known as the Regional Bell Operating Companies, or RBOCs. These companies were in turn interconnected with each other by one large interconnector called AT&T. The local calling capability was considered to be basic, whereas the long distance calling was discretionary. So the providers were allowed to charge more for the long distance calls than for local. Given the stringent requirements on the networks and the rates for local calls, companies were generally providing local service at a loss. They could balance this loss by making money on the long distance calls. However, even here they were restricted by the regulators. The provision of data services was also not basic, but data service was also regulated, and in the early days, not a large enough part of the service providers' business to really matter.

Because of the rules and restrictions, and also due to the high expense of providing such service, telecommunications grew to be a monopoly service almost every-

where. Even when there were other providers on the scene, they were generally either limited in what they could provide, or in the volume that they were allowed to provide, protecting the interests of the monopoly provider.

Thus, initially, incumbent providers were heavily regulated and provided basic local voice services at low rates. They generally also provided long distance calling, usually at rates that were higher than the costs, to cover for the noncompensatory local services. And many of these companies also provided some other services, generally in small amounts, to make additional profit. This was the trend almost everywhere for many years, even though the specific rates and services offered varied over time and location, and by company. As mentioned earlier, trends were generally similar around most of the world and in most companies, although the changes that occurred happened at different times in different locations. Initially, also, the incumbent companies were government owned, or at least government controlled, which caused some differences by country. Most incumbents provided mainly voice services and small amounts of data. Generally, in the late 1900s the networks carried about 80% voice and 20% data services. And until the 1980s, most of the voice services and some of the data services were carried on analogue networks, in both the access and the backbone. Data services were a mix of analogue and digital until the late 1980s when the trend was to convert networks to digital technologies end to end.

COMPETITION FOR LONG DISTANCE SERVICES

In North America, new technologies that allowed different methods of carrying traffic and also changes in the attitudes of those using the services caused pressures to begin attacking the business models. Initial attacks targeted the long distance services, since the incumbent telcos were making good profits on these services. Others understood the economics of these services and wanted part of the action. They recognized that they could provide this service at low cost and charge rates much lower than those charged by the incumbents, still making a profit. So the initial successful attacks on the established business of the incumbent telcos targeted lucrative long distance services. These attacks came from new long distance providers, resellers, and value-added carriers who leased network capacity from the incumbent telcos and used it to provide services of their own. Today, everyone is quite familiar with this evolution and the competition has driven the rates for long distance to a fraction of what they were 10 or 15 years ago. As we will see below, other factors are also impacting these rates, as everyone is also aware.

The next stage in the trends was the change in the providing of data services. Initially, except for the earlier telegraph services, data was carried, by the incumbents at least, on the same analogue backbone as the voice services. Data entered the access network via a modem, which had an analogue output, or a dataset, which outputs signals in a digital format. From there, it traversed usually private lines, some-

times multipoint lines allowing many terminals to share a port on a host, or it operated in a switched mode along the same (circuit switched) lines as the voice services. In the 1970s to 1980s, this started to change with the advent of packet switching.

The access and the backbone of the telephone network were designed to accommodate the patterns and needs of voice traffic. The network is optimized as a network that receives a call on a single circuit, checks the destination number for that call, and sets up an end-to-end circuit for the duration of the call, dropping this at each step along the path when the call has been completed. This type of network is called circuit switched, and huge numbers of man years of research and implementation went into optimizing the circuit switched networks to very efficiently serve voice traffic. Much of this development was done by Bell Laboratories in the United States, where hundreds of research projects were underway at any time.

Around the 1970s, packet switching technology started to emerge. This had been used earlier for private and small networks, and it was optimized for data traffic. This traffic did not need to have a circuit established end to end for the duration of the call and, in fact, given the nature of the traffic, establishing an end-to-end circuit was quite wasteful. Packet switching technology began to be deployed widely around the world by data services providers and also by incumbent telcos. Initially, these packet switched networks served only specific data services—digital data services—and the traffic volumes were low in relation to voice traffic volumes. Some data continued to be carried on the old analogue networks, with certain services being carried on the packet switched networks. During this period, the Internet started its well-known growth and, of course, that growth continues even today. As the Internet expanded from researchers and universities initially, then to companies, and finally to individuals, it was to be expected that the amount of data traffic and the routing patterns of that traffic would change drastically. And, at least initially, this Internet traffic was data traffic. So by the year 2000, that 80/20 ratio of voice-to-data traffic on the network was changing to a much higher percentage of the traffic being data. In parallel, technology development enabled video and multimedia traffic to be carried on the network. And as these enhanced services spread, the amount of traffic and especially the amount of nonvoice traffic continued to increase.

COMPETITION FOR LOCAL SERVICES

One of the next developments was the attack on local service provision by many other companies. In some cases, this was cellular service, since mobile companies had been growing even in North America, where essentially everyone had access to reasonably priced land line service. By the mid 1990s regulation allowed companies other than the incumbent telcos to offer local service, so other companies started to move into territory previously covered by telcos. New companies sprang up and other utilities, such as cable companies and even power companies, also decid-

ed to offer data and voice services. At the same time, telcos requested permission to expand their service offerings to include those offered in the past by other providers. Specifically, telcos requested, and often gained, permission to provide broadcast video service.

The net result of all of this was the creation of competition in every stronghold of the incumbent telcos. By the time this happened, they had already been struggling to change their internal culture and focus to ones equipped to deal with competition. The competition for local service and for the provision of data services just heightened that requirement.

Initially, companies offering competing local services positioned these as secondary services to avoid the requirement that they provide emergency call service. Over time, developments in the mobile service technologies have made it possible for some of the emergency capabilities to be provided even from mobile phones. Specifically, it is now possible to locate someone with a medical emergency within very short distances, even if they call for help using a mobile phone. This ability is one of the reasons that many people today are quite comfortable having a mobile phone as their only phone, even in areas with the well-established, high-performance, and low-rate landline service

As this evolved, the nature of the traffic carried on the networks also changed over time. As all facilities became digital, all traffic, whether it was initially voice, data, or video, was carried in a digital format. While it is still possible to determine the nature of the traffic at the end points (and, with the right protocols, information identifying the traffic type can also be carried through the network), once traffic is converted to bits, it becomes less relevant to distinguish the difference between voice and data. And when we add to the picture other traffic such as video and multimedia, the picture becomes even more cloudy. Even though the actual nature of the traffic might be known, the fact is that as it travels through the network it looks like data, so the most effective mechanism for carrying this traffic is packet-switched networks.

COMPETITION STARTS TO SPREAD

By the early 2000s, telcos faced serious competition to all aspects of their business from many others, most of whom had not been on the horizon of telecom a decade earlier. These other companies were starting into the telecom business from different starting points. Some had established networks, as the telcos did, which reached most or at least many of the clients interested in voice and data services. However, most of these established networks had been initially designed for other services and were not optimal for the provision of two-way, high-quality voice and data services. So those other providers with established networks faced the problem of high costs of conversion of their networks to ones that could effectively provide the voice services.