



**SUDAN UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

**COLLEGE OF GRADUATE STUDIES
CIVIL ENGINEERING DEPARTMENT**



تحديات تنفيذ مشاريع الإتصالات في السودان

دراسة حالة المرحلة H مشروع توسعة شبكة الإتصالات

**The Challenges of Implementing
Telecommunication Projects in Sudan-A Case
study Phase-H Network Expansion Project**

*A THESIS SUBMITTED TO THE COLLEGE OF GRADUATE STUDIES IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF M. Sc. IN CONSTRUCTION MANAGEMENT*

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DEDICATION

To my mother for her ongoing love and support

. . .

*and to my father who could not see this thesis
completed. . . .*

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I owe special thanks and acknowledgement to Prof. DrMudathir as a professional and academic experience for his guidance and valuable directives that have assisted me a lot to completing this study.

I deeply appreciate the effort and high collaboration from my exceptional colleagues in Project Management Office (**PMO**), **Sudatel Telecom Group**, towards the successful completion of this research.

Last but not the least I am thankful to my family for their understanding and continuous support ...

Most of all, I thank my wife **SaharSaif** for her encouragement, support and love

ABSTRACT

The Study talks about the challenges of implementing telecommunications projects in Sudan through four chapters: project selection, selection of the team, the organization and the impact and influence of external factors. And that with modern references and that the importance of these factors in the field of accelerating communications.

Which it should be referred to the detailed study for the (**Phase-H Networks Expansion Project**) as main activities:

- ☐ Network Design & Planning
- ☐ Site Survey
- ☐ Site Selection and Validation
- ☐ Site Acquisition
- ☐ Soil investigation
- ☐ Site Design and Development
- ☐ Site Construction
- ☐ Installation and Commissioning
- ☐ Acceptance and Integrations (site on air stage).

During the study we have enough space about the inflation event 2012 in Sudan, with complex and multi-dimensional and compound impact. Which has an important role in rising costs?

The project contractors rejected to continue the work until **PMO, Sudatel Group** increase the remaining work 25%.

For innovative solutions to the problems facing us and the importance of this project has been our intention from which, contrary to what has been set of procedures and quality in order to be given to those who are knocking on the field. We use Sand Modeling Foundation (SMF) Tower for temporary sites and areas that have difficulty to transport materials.

The information and documents selected and revised for those who need to go forward in this field.

مستخلص

البحث عبارة عن دراسة تتحدث عن تحديات تنفيذ مشاريع الاتصالات وذلك من خلال أربعة مراحل : اختيار المشروع ، اختيار فريق العمل ، و تأثير المنظمة و تأثير العوامل الخارجية. وذلك بمرجعيات حديث وذلك لاهمية هذه العوامل في مجال الاتصالات المتسارع.

مما ينبغي الإشارة اليه أن الدراسة التفصيلية لتوسعة الشبكة وهو عبارة عن ادخال عدد 240 موقع جديد للخدمة وتبدأ من التخطيط والمسح الفني و اختيار الموقع وفحص التربة والتصاميم وتشيد الموقع وتركيب المعدات والاختبارات والاستلام الابتدائي (مرحلة دخول الخدمة).

خلال مسيرة هذا المشروع لقد خصصنا مساحة كافية لذلك الحدث الاقتصادي المؤثر تضخم 2012 م المعقد والمركب متعدد الابعاد. والذي له دور مهم في ارتفاع التكاليف و الذي أثر بصورة واضحة علي المشروع برفض المقاولين من مواصلة الأعمال الا بعد الزيادة 25% للأعمال المتبقية . ولأننا في حاجة ماسة الي حلول ابتكارية للمشكلات التي تواجهنا ولاهمية هذا المشروع فقد قصدنا من خلال هذا البحث عكس ما تم من اجراءات و ضبط للجودة حتي تكون معين للذين يطرقون هذا المجال اذ ان المشروع تم تنفيذه في مناطق التي بها صعوبة توصيل المواد ، أو المناطق المؤقتة .بالإضافة الي حلول انشائية مبتكرة بإستخدام القواعد الرملية للأبراج.

خلص البحث الي أهمية التخطيط المسبق والمستمر خلال تنفيذ المشروع لمواجهة التغيرات التي لامجال لتفاديها وابتداع حلول ادارية وفنية مبتكرة لتحقيق مشروع الإتصالات.

TABLE OF CONTENTS

TITLE	Page No
DEDICATION	I
ACKNOWLEDGEMENTS	II
Abstract	III
Table of Contents	V
List of Tables	VII
List of Figure	VIII
Chapter 1	
Introduction	
1.1 Background of the Research	2
1.2 Research Objectives	2
1.3 Research Question	3
1.4Justification of the Research	3
1.5 Research Methodology	4
1.6 Thesis Layout	4
Chapter 2	
Factors influence in implementing telecommunications projects	7
2.1Factors Related to Telecommunication Project Selection	7
2.1.1 Factors Related List of Common Telecommunication Project Selection Criteria	11
2.1.2 Causes of Telecommunication Project Failure	13
2.2 Factors Related to the Project Team	18
2.2.1 Factors for Selection Team Members	19
2.2.2 Team Building	20
2.2.3Effective Leadership	23
2.2.4 Leadership in a Project Environment	27
2.3Factors Related to the Organization	28
2.3.1 Top Management	30

2.4 Factors Related to the External Environment	34
2.4.1 Inflation:	34
2.4.2 The Risks commonly considered	38
Chapter 3	
Phase-H Network Expansion Project	38
3.1Any site classified into 9 main activities	43
3.1.1Network Design & Planning	43
3.1.2Site Survey	44
3.1.3Site Selection and Validation	45
3.1.4 Site Acquisition	45
3.1.5 Soil investigation	46
3.1.6Site Design and Development	47
3.1.7Site Construction	49
3.1.8Installation and Commissioning	53
3.1.9Acceptance and Integrations	54
3.2 Quality Issues	57
3.3 Sand Modeling Foundation (SMF)	59
3.4Major problems was facing Phase-H Networks Expansion Project	62
Chapter 4	
Research Conclusion and Recommendations	69
4.1 Introduction	69
4.2Conclusion	70
4.3 Limitation	71
4.4 Recommendations for further research	71
4.5 Recommendations for industry	71
4.6 Contributions to knowledge	72
References	73
APPENDIX	74

LIST OF TABLES

Table Number	Title	Page No
Table (2-1)	project selection criteria	10
Table (2-2)	project selection economic criteria	12
Table (2-3)	Elements of effective teamwork	22
Table (2-4)	Barriers to effective team building	20
Table (2-5)	The project Management in Mature Organization	33
Table (2-6)	The Executive Management in Mature Organization	33
Table (3-1)	Showing Phase _H sites Distribution	43
Table (3-2)	Site construction steps	50
Table (3-3)	shows detailing of tasks for every site	55
Table (3-4)	SMF_Steel box Base Dimensions	59
Table (3-5)	SMF_ Sites Distribution	60
Table (3-6)	D&B Country Risk Line Report	63

LIST OF FIGURES

Figure Number	Title	Page No
Figure (2-1)	Team-building Requirements and Outcomes	27
Figure (2-2)	Top management Support Processes	32
Figure (3-1)	MSF	61
Figure (3-2)	MSF _Tower Erection	62
Figure(3-3)	Exchange Rate of Bank of Sudan	63
Figure(3-4)	Exchange Rate in the Market	63
Figure (3-5)	Materials price increasing rapidly	64
Figure (3-6)	Audit on Site	66
Figure (3-7)	Access difficulties due to heavy rain	67
Figure (3-8)	Security check points	67

Chapter 1

Introduction

Chapter 1

Introduction

1.1 Background of the Research:-

Telecommunication Projects comprise of real challenges. A thorough study is required to investigate the difficulties in these types of projects. In this study, the work will not focus on documentation only, but also an evaluation of weaknesses and strengths of current practices in Sudan will be carried out. Many companies have procedures to speed up the work. However, telecommunications companies have a special technique of the operations and projects, which calls for investigation.

Competition between telecom operators requires them to accelerate project implementation for market share.

In this thesis the challenges of implementing projects in the telecommunications industry in Sudan will be investigated by studying four major factors. The project (Phase-H Networks Expansion project) one of Sudatel's recent project will be presented as a case study. The thesis is presented in four chapters. Analysis and classification of the different phases will be performed taking into account the requirements and goals of all parties associated to the project. The Phase-H Networks Expansion project was implemented successfully by planning, control and organizational structure, which enabled avoiding most of the obstacles that encountered the project.

1.2 Research Objectives:-

The aim of this research is to improve project management performance in construction industry in Sudan with special emphasis of telecommunication projects. The objectives of the research are:

- (1). To identify the factors that affect project performance delivery.

- (2). To identify the most effective processes in all implementation stages, to avoid the waste of time and material by approved QC/QA/ISO: 14001 systems.
- (3). To identify the best practices for Safety in implementation such type of projects.
- (4). To identify, the best contract administration procedures for these special types of projects based on turnkey contracts.

1.3 Research Question:-

Questions posed for this research are:

- (1). What are the real factors influencing the telecommunication project implementation in Sudan?
- (2). How are these factors influencing the project delivery?

1.4 Justification of the Research:-

Telecommunication projects are important as in infrastructure projects. It faces by many threats:

Compliance threats:

originating in politics, law, regulation or corporate governance.

Operational threats:

impacting the processes, systems, people and overall value chain of a business

Strategic threats:

related to customers, competitors and investors

Financial threats:

stemming from volatility in the markets and in the real economy.

This thesis beside the above threats, investigates the key factors for project success the outcome of it may serve other studies and could developed for future projects in terms of different culture , social , political and environment issues.

1.5 Research Methodology:-

The research methodology adopted in this work:

- 1.**Stage _1**: literature (Analytical and descriptive) to determine the research focus.
(Project management Books & Internet)
- 2.**Stage _2** : Data collection for (Phase _H Networks Expansion _240 new sites)
implemented by Sudatel
- 3.**Stage _3**: General survey of the relevant stakeholders (audit).

1.6 Thesis Layout:-

The Thesis is organized into four chapters, and discusses four factors that influence in project implementation as follows:

Chapter 1 Introduce the subject of this research ,its methodology and research justification

Chapter 2 deals with the Factors influencing the implementing telecommunications projects as follows:

- Factors Related to Telecommunication Project Selection

Firms working in telecommunication industry are literally bombarded with opportunities, but of course, no organization enjoys infinite resources to be able to pursue every opportunity that presents itself. Choices must be made, and to ensure that they select the most viable projects.

- Factors Related to the Project Manager& Project Team Members:

In today's organizations, teams are the way work gets done. To be sure, individual contributors still have brilliant ideas and continue to make insightful decisions, but eventually those ideas and decisions are improved or implement in context of team.

- Factors Related to the Organization:

(Every system is perfectly designed to produce the results you are getting. If you want different results you probably have to change the system)

- Factors Related to the External Environment:

Telecom Project is affected by quite a number of external factors. It is not enough for a business only to consider and control resources and functions. External factors may have a great deal of influence over a company's business activity or its managers' decisions, and may prevent its growth, development and profitability. But these external factors are usually beyond the control of the business.

Chapter 3 contains a detailed description of the CaseStudy (Phase-H Network Expansion Project), which the expansion project of Sudatel Mobile Network (commercial denoted as Sudani) in Sudan.

Emphasis was on the factors related to this project planning ,design and implementation . Along with the challenges associated with each of the project phases.

In Chapter 4 theConclusion , Recommendations and limitations of the research are presented together with its contribution to knowledge .

Chapter 2

Factors influence in implementing telecommunications projects

Chapter 2

Factors influence in implementing telecommunications projects

Organizational commitment, senior management involvement, team involvement and external factors management are typically expected to have a positive impact on the achievement of project objectives. That is, more commitment and involvement should produce greater success.

Firms working in telecommunication industry are literally bombarded with opportunities, but of course, no organization enjoys infinite resources to be able to pursue every opportunity that presents itself. Choices must be made, and to ensure that they select the most viable projects. Many managers develop priority systems—guidelines for balancing the opportunities and costs entailed by each alternative. The goal is to balance the competing demands of time and advantage.

The pressures of time and money affect most major decisions, and decisions are usually more successful when they are made in a timely and efficient manner. For example, if your firm's sales department recognizes a commercial opportunity, you need to generate alternative projects quickly to capitalize on the prospect. Time wasted is generally opportunity lost. On the other hand, you need to be careful: You want to be sure that, at least and as far as possible, you are making the best choice among your options. (Trevor,2007)

2.1 Factors Related to Telecommunication Project selection :

Identifies six important issues that managers should consider when evaluating projects:

i. Realism: An effective model must reflect organizational objectives, including a firm's strategic goals and mission. Criteria must also be reasonable in light of such constraints on resources as money and personnel.

Finally, the model must take into account both commercial risks and technical risks, including performance, cost, and time. That is: Will the project work as intended? Can we keep to the original budget or is there a high potential for escalating costs? Is there a strong risk of significant schedule slippage?

ii. Capability:

A model should be flexible enough to respond to changes in the conditions under which projects are carried out. For example, the model should allow the company to compare different types of projects (long-term versus short-term projects, projects of different technologies or capabilities, projects with different commercial objectives). It should be robust enough to accommodate new criteria and constraints, suggesting that the screening model must allow the company to use it as widely as possible in order to cover the greatest possible range of project types.

iii. Flexibility:

The model should be easily modified if trial applications require changes. It must, for example, allow for adjustments due to changes in exchange rates, tax laws, building codes, and so forth.

iv. Ease of Use:

A model must be simple enough to be used by people in all areas of the organization, both those in specific project roles and those in related functional positions. Further, the screening model that is applied, the choices made for project selection, and the reasons for those choices should be clear and easily understood by organizational members. The model should also be timely: It should generate the screening information rapidly, and people should be able to assimilate that information without any special training or skills.

v. Cost:

The screening model should be cost effective. A selection approach that is expensive to use in terms of either time or money is likely to have the worst possible effect: causing organizational members to avoid using it because of the excessive cost of employing the screening model. The cost of obtaining selection information and generating optimal results should be low enough to encourage use of the models rather than diminish their applicability.

vi. Comparability:

It must be broad enough to be applied to multiple projects. If a model is too narrowly focused, it may be useless in comparing potential projects or foster biases toward some over others.

A useful model must support general comparisons of project alternatives.

Table (2-1) shows the general criteria for telecom project selection: (Harold K, 2009)

Table (2-1) project selection criteria

	CRITERIA	-2	-1	0	1	2
TOP MANAGEMENT	CAPITAL REQUIREMENTS			X		
	COMPETITIVE REACTION				X	
	RETURN ON INVESTMENT				X	
	PAYOUT TIME				X	
ENGINEERING	REQUIRED EQUIPMENT					X
	AVAILABILITY OF PERSONNEL				X	
	KNOW-HOW					X
	DESIGN DIFFICULTY			X		
	EQUIPMENT AVAILABILITY				X	
	LAYOUTS				X	
RESEARCH	PATENTABILITY			X		
	LIKELIHOOD OF SUCCESS					X
	KNOW-HOW					X
	PROJECT COSTS		X			
	AVAILABILITY OF PERSONNEL	X				
	AVAILABILITY OF LABORATORY	X				
MARKETING	LENGTH OF PRODUCT LIFE		X			
	PRODUCT ADVANTAGE		X			
	SUITABILITY TO SALESFORCE	X				
	SIZE OF MARKET	X				
	NUMBER OF COMPETITORS	X				
PRODUCTION	PROCESSABILITY					X
	KNOW-HOW					X
	EQUIPMENT AVAILABILITY					X
	NUMBER OF Xs	-5	-3	2	7	7

KEY: (+2 = EXCELLENT, +1=GOOD, 0= FAIR, -1 = BAD, -2 =UNACCEPTABLE)

LIST OF COMMON TELECOMUNCATION PROJECT SELECTION CRITERIA:

1. Alignment with core business
2. Availability of raw materials
3. Top-management support
4. Potential market for output
5. Positive impact on stakeholders
6. Probability of adequate share of potential market
7. Stage of technology development
8. Ability to reach market in timely manner
9. Adequate organizational knowledge of technology
10. Ability to reach market in timely manner
11. Existing facility and equipment
12. Adequate payback period
13. Project should comply with the organization's mission.
14. The need of its constituency is a primary factor.
15. Profit not primary but often must produce revenue.
16. Selection based on cost/benefit analysis is critical.
17. Selection is driven by a desire to obtain public goodwill.

The characteristics of Telecom projects :

Generally any project is characterized by the followings :

1. has a specific purpose that can be readily defined;
2. is unique because it is most unlikely to be repeated in exactly the same way by the same group of people to give the same results;
3. is focused on the customer and customer expectations;
4. is not usually routine work but may include routine-type tasks;
5. is made up of a collection of activities that are linked together because they all contribute to the desired result;

6. has clearly defined and agreed time constraints – a date when the results are required;
7. is frequently complex because the work involves people in different departments and even on different sites;
8. has to be flexible to accommodate change as the work proceeds;
9. involves many unknowns: within the work itself, the skills of the people doing the work and the external influences on the project;
10. has cost constraints, which must be clearly defined and understood to ensure that the project remains viable at all times;
11. provides a unique opportunity to learn new skills;
12. forces you to work in a different way because the 'temporary' management role is directly associated with the life of the project;
13. challenges traditional lines of authority with perceived threats to the status quo;
14. involves risks at every step of the process, risks that must be managed to sustain the focus on the desired results;
15. May comprise more than one sub-project.

Table (2-2) project selection economic criteria (Keith Potts ,2008)

Performance Measure	Formula
Return on Investment (ROI)	$\frac{\text{Total benefits} - \text{total costs}}{\text{Total costs}}$
Break-Even Point	$\frac{\text{Yearly Net Cash Flow} - \text{Cumulative Net Cash Flow}}{\text{Yearly Net Cash Flow}}$ <p>Use the yearly net cash flow amount from the first year in which the project has a positive cash flow. Add the above amount to the year in which the project has a positive cash flow minus one.</p>
Present Value (PV)	$\frac{\text{Cash flow amount}}{(1 + \text{interest rate})^n}$ <p>n = number of years in the future</p>
Net Present Value (NPV)	$\Sigma \text{ PV Benefits} - \Sigma \text{ PV Costs}$

- The Net Present Value (NPV) model

Uses management's minimum desired rate-of-return (discount rate) to compute the present value of all net cash inflows.

Positive NPV: the project meets the minimum desired rate of return and is eligible for further consideration.

$$\text{Project NPV} = I_0 + \sum_{t=1}^n \frac{F_t}{(1+k)^t} \quad \text{where}$$

I_0 = Initial investment (since it is an outflow, the number will be negative)

F_t = net cash inflow for period t

k = required rate of return

- Return on investment (ROI) is calculated by subtracting the project costs from the benefits and then dividing by the costs.

$$\text{ROI} = (\text{total discounted benefits} - \text{total discounted costs}) / \text{discounted costs}$$

- The higher the ROI, the better.
- Many organizations have a required rate of return or minimum acceptable rate of return on investment for projects.
- Internal rate of return (IRR) can be calculated by setting the NPV to zero.

2.1.2 Causes of Telecommunication Project Failure:

(Desmond,2004)

It is required many projects are not successful. In order to understand how to best manage projects, we need to understand not only what makes a project successful but also what causes projects to fail.

1- Failure to define scope:

Often people accept projects without taking the time to fully understand the complete scope requirements. In some cases, say on a software development project, or a research project, it might not even be possible to fully define the scope in the initial project stages. But until this has been done, how can anyone determine whether or not the required scope can be delivered, particularly within the budget and time restrictions

2- Scope creep:

On every project, people encounter some suggestions for additions or changes to the project. If these occur before the planning is finished, they can be built into the design. However, these suggestions and requests continue to arrive throughout the project. In some cases, the request is for something that is necessary in order to properly complete the project.

Sometimes the request is for an addition or change which will enhance or improve the product, and which can be completed in a very short timeframe for very little cost. Once the budget and schedule are set even small additions cannot be properly accommodated. Perhaps one or two of these can be included, but generally the number of these requests is so large that there would be an impact on the results if they were all implemented. Even those additions, which are necessary, need to be properly accommodated.

3- Unreasonable or unrealistic expectations:

Many projects are undertaken before the team has any opportunity to analyze the possibilities. In some cases the project is the result of a competitive bid, and the bid is prepared by well meaning people who have objectives for furthering the corporate business, but not necessarily a solid understanding of the implications of some of the promises. Perhaps market or customer requirements are create creating stretch objectives for the company, but and in order to be successful in business the company needs to aim to meet them. Think about projects you have seen in which the expectations were unrealistic. Who had those expectations? The customer. Many times we think our customer has unrealistic expectations. The customer doesn't usually think so, however. So there is a need for some honest discussion to determine how the provider help can assist the customer to meet his requirements. Senior management of the company undertaking the project may also have unrealistic expectations, based on needs of the company, which are often different from those of the project team. Who else might have those unrealistic expectations? Upper management. In fact, for some projects both of these different

sets of unrealistic expectations exist. When such expectations exist, the PM and the team need to include time and work in the project to deal with them.

4- Insufficient funding:

When this happens project managers expend a lot of effort addressing the funding issues when they would prefer to be working directly on the project. But frequently projects are under-funded – either from the beginning, or because things happen: SARS, earthquakes, national economy, etc. We all have hundreds of examples of things that have caused our projects to be under-funded. In the real world we're working in, we often cannot predict many of the things that can impact our projects. How many people predicted that WorldCom would be accused of unethical behaviour, and that subsequently MCI would be forbidden from taking on government projects? Some things we can predict: probably ninety eight percent of these things that go wrong could be anticipated ahead of time. For those at least, we could be prepared.

5- Failure to accept full accountability:

This can be a major problem. The project is destined for trouble all the way if not everyone understands what their responsibilities are, and what they are accountable for. In addition to understanding, the PM needs to ensure that he or she has their commitment to these as well.

6- Insufficient resources:

Resources could be people, space, money, equipment, skills, etc. The team may lack some expertise or knowledge. If so, the quality is liable to suffer, and working with less than optimal people generally increases the time durations as well.

7- Not learning from past failures:

Learning from past mistakes can save huge amounts of time and money – if people just take the trouble to do so. In a mature organization, there is a recognition that failure will occur from time to time. If people are expected to take risks, then sometimes they will fail.

And risk taking is inherent to some degree in every project. So having a failure, while not pleasant or desirable is not completely unexpected, or negative. If nothing else, failures provide learning opportunities. But we must ensure that people learn from them. Why don't we learn from past failures? Many times teams are so pressed to complete the 'real work' of the project that they neglect to take the time to document the failure. Or, if the management does not recognize the value of making the failure public, perhaps it is kept quiet, ensuring that people cannot learn from it unless they were directly involved. Or, even when this information is documented, there

is no process in place to ensure that new project teams can and will find the information. For Project Management to work, companies need to put processes in place to allow and encourage learning from past failures and mistakes. Since the cost is being incurred, some value might as well be forthcoming.

8. Time pressures pushing people too hard:

People often start doing their work too fast, not leaving enough time to do things properly. Of course, this will impact the quality, and probably also increase the overall time requirements, as additional work will be required to correct the inevitable mistakes, or forgotten activities. Lack of proper planning. PMI identifies 47 different processes that should be in place for good Project Management. Most of these are related to planning. So there are many different aspects of the project that require planning. It's not necessary to cover all of these for every project. But it's very clear that if there is not enough planning, focused planning, a project cannot be run as efficiently as it should be.

Not identifying decision makers. This is a mistake that can easily happen. Most project teams do identify their key players. But, what do we mean by key players? We need to include not only the team, and the extended team, but also the stakeholders, including anyone who needs to be informed, consulted, etc. These are all stakeholders in the project, and some, such as those whose approval is required, can have a major impact on the project. If we identify who those people are ahead

of time, then we can establish the plans and the schedules to ensure that we have those approvals when they are needed.

To kill projects, don't communicate. If we want to keep the project vibrant, we need to decide what communications need to happen, and when, and then ensure that they do happen. Creating and distributing the appropriate documentation is mission critical. If people don't have time to be bothered communicating because, they are "too busy" getting the 'real' work done, problems are inevitable. But we've can all identify with the person who says "It's already eleven o'clock tonight, and I have to be back in the morning at six. I'm just not going to write this up". But it's also clear that if the documentation is not done reasonably close to the actual work time, something will be lost if and when it is ever produced.

Lack of professional environment or lack of professionalism on the team. If nothing else, this can make the working environment unpleasant for many people. And in the worst case, people will be distracted from the tasks at hand while they use precious time and energy dealing with issues that should not exist. Who sets the standards and the tone for the project environment? Project managers have the responsibility to ensure that there is an objective, professional atmosphere. As soon as the project manager hears talk that is not professional, he needs to take action to create a better atmosphere. When he becomes aware of such behaviour as finger pointing, either within the group or towards others outside the group, he needs to immediately set a more professional tone. It's up to the project manager to turn around the behaviour, and this includes not doing these things themselves, which a lot of project managers do! Even if the PM sympathizes with the motives for this behaviour, he has to encourage more professional ways of dealing with the problems. This is not always easy, especially if the culture in the company is not totally professional. Losing resources. Even if the lost resources are replaced, there is usually an initial slowdown, followed by a learning curve to get everything back on track again. If we know that this might happen we need to build enough time into the schedule to allow for the retraining.

By using all these techniques the organization becomes more effective, focuses on programmes and projects that are completed on time and obtains the benefits of becoming more profitable, with delighted customers.

But this chapter only allows for the establishment of a mechanism for the selection and disciplined management fancies away personal or political, which abound in the third world countries. And our country is replete with many of the projects that were not up to their finishes, projects implemented in different areas of water / Agriculture / Housing.

2.2 Factors related to the Project Team

(Importance of project teams for project success)

Because most programmes and projects involve more than one person, teamwork is crucial to achieve success. To get effective teamwork you start by taking a group of people from different backgrounds, with different experience, skills and personal needs, and build them into a cohesive working unit. If the team members are only giving part of their working day or week to your project activities, they have divided loyalties to different line managers and different working practices. The complexity increases if they are working in more than one programme or project team at the same time.

The first time you bring your core team together they are really a group of individuals. They may not have worked with each other before even if they know one another. They come from different functions and their normal operational environment conditions their behaviour at work. You are an unknown entity to them if they have not worked with you before.

They expect you to break down the barriers and start to build the group into a team. This will test your communication skills to the limit as you get to know and understand your team – and they get to know and understand you.

Before the staffing function begins, five basic questions are usually considered:

1. What are the requirements for an individual to become a successful project manager?

2. Who should be a member of the project team?
3. Who should be a member of the project office?
4. What problems can occur during recruiting activities?
5. What can happen downstream to cause the loss of key team members

2.2.1 FACTORS FOR SELECTING TEAM MEMBERS

(Trevor, 2007)

The criteria for selecting team members depend on the type of project:

1. What is their relevant technical experience?
2. Have they specialized knowledge essential to the project?
3. Have they experience of similar projects?
4. Have they worked in project teams before?
5. Do they have relevant technical knowledge?
6. What is their departmental authority?
7. Have they other project commitments now?
8. When do these commitments end?
9. What is their capacity for project work (as a percentage of the working week)?
10. What is their current non-project workload?
11. Can this loading be reduced?
12. What is their forecast future non-project workload?
13. Can they be assigned for the whole project duration?
14. Do they get on easily with other people?
15. Do they like working alone?
16. How do they feel about taking on a leadership role sometimes?
17. Are they interested in joining your team?
18. What do they expect to gain from joining your team?
19. Do they have a track record of commitment to high performance?
20. Are they well organized and good time managers?
21. Do they take their current responsibilities seriously?
22. Are they perceived as good team players?

23. Is their line manager in agreement with the possible assignment?

Selecting team members solely on the basis of functional role is no guarantee the individual can contribute to your project team effectively. You must guard against the possibility that the setting up of a project team is seen as an opportunity by others to dump someone on you. This may be perceived as a training opportunity or as a chance to move someone who does not fit in their current team. A project team is an exciting place to work and you want creative, enthusiastic people with a strong sense of responsibility and commitment. A successful team consists of a carefully designed mixture of the right skills and personalities – people who can work together without dissension and conflict. You select people for your team because you value and respect their ability to do a good job under pressure and not because you like them or they are popular!

Numerous tests and models are available to help you understand the different personality types and how each behaves in a team. These instruments will help indicate which of these are better suited to programme and project work; they can also guide you on how to communicate effectively with the different personalities you meet. If possible, make use of these techniques when selecting your team members. Time spent on this activity now will be rewarded with an effective team and raise your chances of success.

A balanced team encouraged to mature its working norms quickly can overcome overwhelming difficulties and achieve what appears at times to be a ‘mission impossible’.

2.2.2 TEAM BUILDING:

Pay particular attention to avoiding:

1. Confusion over any aspect of the project;
2. Unclear responsibilities.
3. Unclear lines of authority.
4. Uneven workload distribution.
5. Unclear task assignments.

6. Unclear overall objectives.
7. Failure to identify stakeholders.
8. Communication breakdowns.
9. Mistrust between team members.
10. Personal objectives unrelated to project work.
11. Lack of commitment to project plan.
12. Lack of real team spirit;
13. Lack of concern about quality.
14. A climate of suspicion.
15. Lack of direction.
16. Conflict and personality clashes.
17. Rigid attitudes . (Trevor,2007)

Six key elements for effective teamwork:

Table (2-3) Elements of effective teamwork

	Team identity	Shared vision	Communication	Collaboration and participation	Issue negotiation and resolution	Reflection and self-assessment
Level (4)	The team takes ownership of the problem and accepts joint responsibility for its achievement	The team has a shared vision and set of objectives, developed collaboratively and regularly reviewed	Team members actively and openly share their knowledge and ideas around the whole team	Familiarity, honesty, mutual trust and full participation harness the collective expertise of the team	Divergent views are welcomed as a source of energy and a spur to the team's creative problem-solving	The team regularly reviews members' roles and their impact on the team and acts on the outcome
Level (3)	The team recognizes that its members have individual and team goals and tasks are framed accordingly	The team has developed for itself both a shared vision and clear objectives	Team members communicate information and knowledge freely around the team	All members are given opportunities to contribute and build on suggestions from others	Sources of disagreement are addressed openly and resolved head-on through constructive negotiation	The effect on the team of each member's different roles and responsibilities is clearly recognized and discussed
Level (2)	The focus of the team is on the tasks that individual members need to solve	The whole team is working to a set of common objectives	Team members communicate information when others need it	The team seeks ideas, proposals and solutions from all its members	Team members are prepared to explain their underlying assumptions and negotiate options	Different roles and responsibilities are discussed from time to time
Level (1)	Team members take limited interest in issues that lie outside their own immediate area of responsibility	Members of the team are clear about their own objectives but the team has no shared vision	Individuals are protective of their own information and share it reluctantly in response to specific requests	Team members prefer to work alone and give more priority to their own concerns than to those of the team	Contentious issues are skirted over or avoided completely; conflict is dealt with only superficially	The team acknowledges its members have several roles and responsibilities but they are not reviewed
Level (0)	Team members concern themselves only with their own responsibilities	Team members, both individually and collectively, lack a common vision and clear objectives	Information is passed to team members strictly on a 'need to know' basis	Insularity, lack of trust or power struggles reduce participation and collaboration	Conflicting opinions remain unaddressed and consequently slow progress	The team places no value on considering and negotiating how they work together

2.2.3 EFFECTIVE LEADERSHIP (Trevor L, 2007)

. The team leader is the person responsible for ensuring that members work effectively together to achieve their goal or objective and must facilitate the co-operation necessary for the team to perform well. The leader must also ensure that the team has the resources and information necessary to complete its task. It is required:

i. Build trust and inspire good team working:

- Focus on behavior and problems, not the person.
- Maintain the self-esteem of others.
- Keep relationships constructive.
- Keep the team well informed at all times.
- Encourage ideas and suggestions.
- Involve them in decisions.
- Clearly define roles and responsibilities for all project tasks.

ii. Create a team identity:

- Clarify purpose and objectives.
- Confirm understanding and acceptance.
- Set clear personal targets.
- Recognize and praise effort.
- Celebrate team achievements.

iii. Encourage personal development:

- Assess individual abilities and experience.
- Assess training needs.
- Coach individuals to enhance skills.
- Appraise individual performance.

iv. Seek continuous improvement:

- Evaluate team processes and practices.
- Evaluate team performance.
- Encourage creativity and innovation.

- Devalue tradition and find better methods.
- Reward success.

v. Resolve conflict and grievances promptly:

- Treat team members with respect.
- Encourage active participation.
- Listen to the team's views.
- Support problem solving constructively.

vi. Champion and support the team:

- Help the team to reach consensus.
- Support team decisions.

Table (2-4) BARRIERS TO EFFECTIVE TEAM BUILDING

Barrier	Suggestions for Effectively Managing Barriers (How to Minimize or Eliminate Barriers)
Differing outlooks, priorities, interests, and judgments of team members	Make effort early in the project life cycle to discover these conflicting differences. Fully explain the scope of the project and the rewards that may be forthcoming on successful project completion. Sell “team” concept and explain responsibilities. Try to blend individual interests with the overall project objectives.
Role conflicts	As early in a project as feasible, ask team members where they see themselves fitting into the project. Determine how the overall project can best be divided into subsystems and subtasks (e.g., the work breakdown structure). Assign/negotiate roles. Conduct regular status review meetings to keep team informed on progress and watch for unanticipated role conflicts over the project’s life.
Project objectives outcomes not clear	Assure that all parties understand the overall and interdisciplinary project objectives. Clear and frequent communication with senior management and the client becomes critically important. Status review meetings can be used for feedback. Finally, a proper team name can help to reinforce the project objectives.
Dynamic project environments	The major challenge is to stabilize external influences. First, key project personnel must work out an agreement on the principal project direction and “sell” this direction to the total team. Also educate senior management and the customer on the detrimental consequences of unwarranted change. It is critically important to forecast the “environment” within which the project will be developed. Develop contingency plans.
Competition over team leadership	Senior management must help establish the project manager’s leadership role. On the other hand, the project manager needs to fulfill the leadership expectations of team members. Clear role and responsibility definition often minimizes competition over leadership.
Lack of team definition and structure	Project leaders need to sell the team concept to senior management as well as to their team members. Regular meetings with the team will reinforce the team notion as will clearly defined tasks, roles, and responsibilities. Also, visibility in memos and other forms of written media as well as senior management and client participation can unify the team.
Project personnel selection	Attempt to negotiate the project assignments with potential team members. Clearly discuss with potential team members the importance of the project, their role in it; what rewards might result on completion, and the general “rules of the road” of project management. Finally, if team members remain uninterested in the project, then replacement should be considered.

Credibility of project leader	Credibility of the project leader among team members is crucial. It grows with the image of a sound decision-maker in both general management and relevant technical expertise. Credibility can be enhanced by the project leader's relationship to other key managers who support the team's efforts.
Lack of team member commitment	<p>Try to determine lack of team member commitment early in the life of the project and attempt to change possible negative views toward the project.</p> <p>Often, insecurity is a major reason for the lack of commitment; try to determine why insecurity exists, then work on reducing the team members' fears. Conflicts with other team members may be another reason for lack of commitment. It is important for the project leader to intervene and mediate the conflict quickly. Finally, if a team member's professional interests lie elsewhere, the project leader should examine ways to satisfy part of the team member's interests or consider replacement.</p>
Communication problems	<p>The project leader should devote considerable time communicating with individual team members about their needs and concerns. In addition,</p> <p>the leader should provide a vehicle for timely sessions to encourage communications among the individual team contributors. Tools for enhancing communications are status meetings, reviews, schedules, reporting system, and collocation. Similarly, the project leader should establish regular and thorough communications with the client and senior management. Emphasis is placed on written and oral communications with key issues and agreements in writing.</p>
Lack of senior management support	<p>Senior management support is an absolute necessity for dealing effectively with interface groups and proper resource commitment. Therefore, a major goal for project leaders is to maintain the continued interest and commitment of senior management in their projects. We suggest that senior management become an integral part of project reviews. Equally important, it is critical for senior management to provide the proper environment for the project to function effectively. Here the project</p> <p>leader needs to tell management at the onset of the program what \resources are needed. The project manager's relationship with senior management and ability to develop senior management support is critically affected by his own credibility and the visibility and priority of his project.</p>

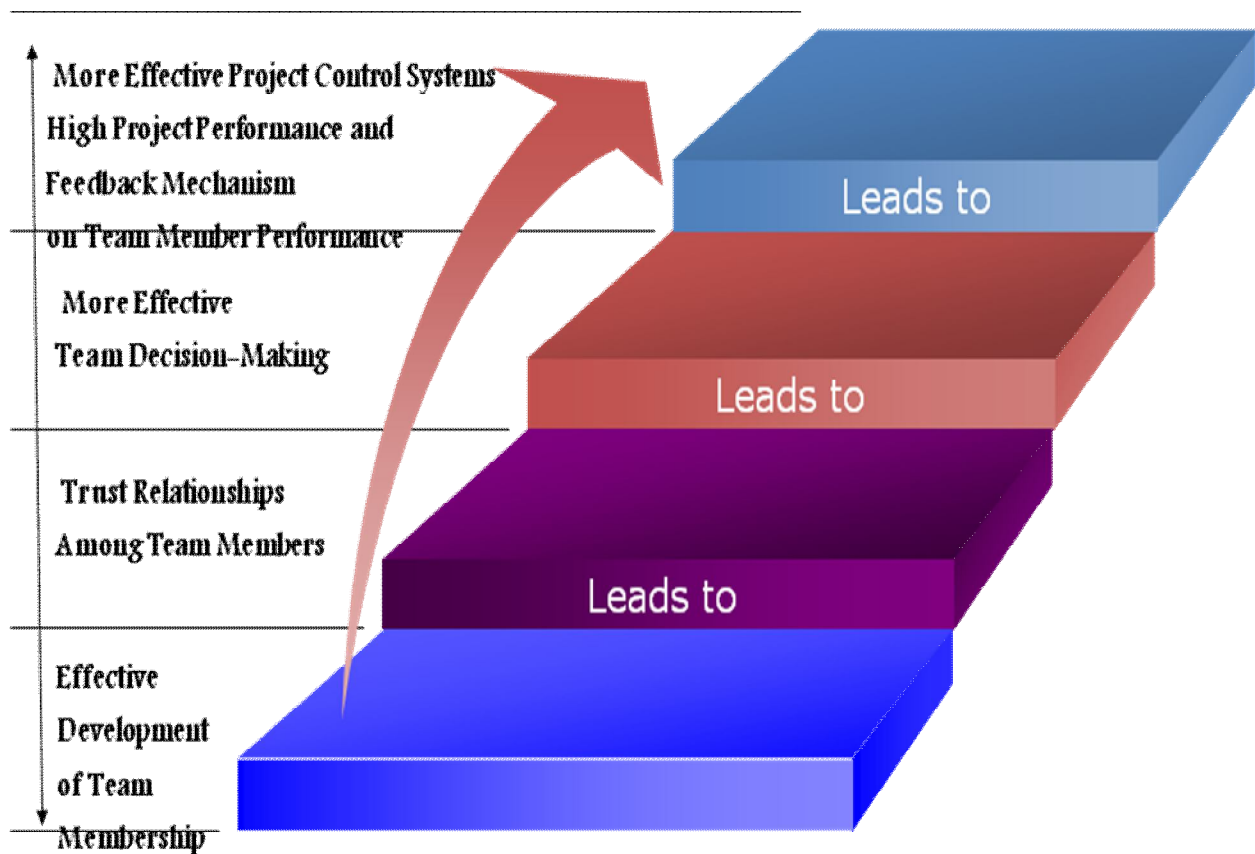


Figure (2-1) Team-building Requirements and Outcome

2.2.4 LEADERSHIP IN A PROJECT ENVIRONMENT

Leadership can be defined as a style of behavior designed to integrate both the organizational requirements and one's personal interests into the pursuit of some objective. All managers have some sort of leadership responsibility. If time permits, successful leadership techniques and practices can be developed. Leadership is composed of several complex elements, the three most common being:

- The person leading
- The people being led
- The situation (i.e., the project environment)

Project managers are often selected or not selected because of their leadership styles.

The most common reason for not selecting an individual is his inability to balance the technical and managerial project functions. Wilemon& Cicero have defined four characteristics of this type of situation:

- The greater the project manager's technical expertise, the higher his propensity to

Over involve himself in the technical details of the project.

- The greater the project manager's difficulty in delegating technical task responsibilities, the more likely it is that he will over involve himself in the technical details of the project (depending on his ability to do so).

- The greater the project manager's interest in the technical details of the project, the more likely it is that he will defend the project manager's role as one of a technical specialist.

- The lower the project manager's technical expertise, the more likely it is that he will overstress the nontechnical project functions (administrative functions).

2.3 Factors related to the Organization

1. The pyramidal structure.
2. Superior–subordinate relationships.
3. Departmentalization.
4. Scalar chain of command.
5. Organizational chain of command.
6. Power and authority.
7. Planning goals and objectives.
8. Decision-making.
9. Reward and punishment.
10. Span of control.

2.3.1 Top management

Firm resources generally are not unlimited, and top managers must support only those projects that offer the most potential. The following are suggested steps that top managers can take to avoid allocating resources to failing projects:

1- Avoid bias of past investment/commitment:

Technology projects must be periodically reevaluated throughout the life of the project to determine whether continued top management support is warranted. This process of reevaluation should focus solely on the future expected payoff and should not be influenced by previous commitments and sunk costs. Techniques such as zero-based budgeting should be used to avoid such biases.

2- Separate responsibilities:

The objective evaluation of project progress is critical to avoiding misallocation of resources. To this end, top managers responsible for making funding decisions must be detached from the project participants. A separation of these responsibilities ensures that personal commitment to a faltering project does not bias the allocation of valuable resources.

3- Minimize penalties of failure:

An organization that punishes for past mistakes encourages project leaders to mask project failures and continue their commitments to projects that should otherwise be abandoned.

To avoid such tendencies, top management should adapt reward/incentive structures that promote an environment that does not penalize for past errors, but rewards future success.

Not only should top management avoid investing in the wrong projects, they should focus on investing in the right projects.

The following are suggestions for ways that top management can better identify and adequately support high potential projects:

4- Establish a process for evaluating expected payoff:

As the key funding decision-makers of the organization, top management team members are tasked with assessing the expected payoff of various competing projects. To this end, top management must establish a formal process of evaluation that does not rely solely on financial models for evaluation, but also evaluates the strategic importance of a potential project.

5- Establish a process for tracking project status:

Project teams vary to the extent that they can effectively communicate project

Continued on next page

The value of a project is not always obvious, and failure to articulate the expected payoff will severely reduce top management's interest in a project. status to upper management. Some project leaders are ardent promoters of their projects while others are more reticent. Given these differences, top management should not rely solely on a project team's ability to communicate when measuring and tracking project status. Instead, management should establish a consistent and formal process of evaluation that ensures all projects are assessed fairly and that high potential "under the radar" projects are not missed.

6- Participate in steering committees:

Top management involvement in the review and evaluation of technology projects is critical to the identification of high potential opportunities. Top management should be active participants in steering committees and intimately involved in all key funding decisions.

For a strategic technology project to be successful, it must have the support of top management.

Indeed, hundreds of studies have shown such a connection. What is surprising then is that we know so little about top management support and the reasons for why it is or is not given

Top management support is considered to be an area that has high impact on project success. However, previous studies have also stated that effective top

management support practices may vary across industries. This paper focuses on top management support for projects executed in the software sector. The objective of this study is to identify those top management support processes that have the greatest impact on software development project success and to compare these critical processes with the actual type of support provided by organizations. The two major problem areas in the project environment are the “who has what authority and responsibility” question, and the resulting conflicts associated with the individual at the project–functional interface. Almost all project problems in some way or another involve these two major areas.

Top Management support is always required for project success. Figure (2-2) identifies the main support processes leading to project success:

Figure (2-2) Top management Support Processes



Table (2-5) & (2-6) show situation of project Manager and Executive in Immature Organization and Mature Organization: (Harold K, 2009)

Table (2-5) The project Management in Mature Organization

Immature Organization	Mature Organization
<ul style="list-style-type: none"> • Project manager is vested with power/ authority over the line managers. • Project manager negotiates for best people • Project manager works directly with functional employees. • Project manager has no input into employee performance evaluations. • Leadership is project manager-centered. 	<ul style="list-style-type: none"> ▪ Project and line managers share authority and power. • Project manager negotiates for line manager's commitment. • Project manager works through line managers. • Project manager makes recommendations to the line managers. • Leadership is team-centered.

Table (2-6) The Executive Management in Mature Organization

Immature Organization	Mature Organization
<ul style="list-style-type: none"> • Executive is actively involved in projects. • Executive acts as the project champion. • Executive questions the project manager's decisions. • Priority shifting occurs frequently. • Executive views project management as a necessary evil. • There is very little project management support. • Executive discourages bringing problems upstairs. • Executive is not committed to project sponsorship. • Executive support exists only during project start-up. • Executive encourages project decisions to be made. • No procedures exist for assigning project sponsors. • Executives seek perfection. • Executive is not involved in charter preparation. • Executive does not understand what goes into a charter. • Executives do not believe that the project team is performing. 	<ul style="list-style-type: none"> • Executive involvement is passive. • Executive acts as the project sponsor. • Executive trusts the project manager's decisions. • Priority shifting is avoided. • Executive views project management as beneficial. • There is visible, ongoing support. • Executive encourages bringing problems upstairs. • Executive is committed to sponsorship (and ownership). • Executive support exists on a continuous basis. • Executive encourages business decisions to be made. • Sponsorship assignment procedures are visible. • Executives seek what is possible. • Executive recognizes the importance of a charter. • Executive takes responsibility for charter preparation. • Executive understands the content of a charter. • Executives trust that performance is taking place.

Project management is more behavioral than quantitative. Effective project management requires an understanding of:

- Quantitative tools and techniques
- Organizational structures
- Organizational behavior

Most people understand the quantitative tools for planning, scheduling, and controlling work. It is imperative that project managers understand totally the operations of each line organization. In addition, project managers must understand their own job description, especially where their authority begins and ends. During an in-house seminar on engineering project management, the author asked one of the project engineers to provide a description of his job as a project engineer. During the discussion that followed, several project managers and line managers said that there was a great deal of overlap between their job descriptions and that of the project engineer.

Organizational behavior is important because the functional employees at the interface position find themselves reporting to more than one boss—a line manager and one project manager for each project they are assigned to. Executives must provide proper training so functional employees can report effectively to multiple managers. .⁽²⁾

2.4 Factors related to the external environment

The followings are the major external factors effecting telecom project success or failure:

2.4.1 Inflation:

For world economic markets, inflation is a fairly new experience as for much of the pre-twentieth century there had been little upward pressure on prices due to gold and other metallic standards. These backed currencies limited governments' abilities to create new money. So at the end of the gold standard strong political

pressures often caused governments to issue more money increasing the money supply and therefore the price level.

Inflation reflects a situation where the demand for goods and services exceeds their supply in the economy .Its causes could be triggered by the private sector and the government spending more than their revenues, or by shortfalls in output. Price increases could also be triggered by increases in costs of production. For instance increases in prices of imported raw materials will cause inflation if not managed. Whatever the initial cause, inflation will not persist unless accompanied by sustained increase in money supply. In this sense, inflation is a monetary phenomenon.

But what effect does inflation have on the economy and on investment in particular? Inflation causes many distortions in the economy. It hurts people who are retired and living on a fixed income. When prices rise these consumers cannot buy as much as they could previously. This discourages savings due to the fact that the money is worth more presently than in the future. This expectation reduces economic growth because the economy needs a certain level of savings to finance investments which boosts economic growth. Also, inflation makes it harder for businesses to plan for the future. It is very difficult to decide how much to produce, because businesses cannot predict the demand for their product at the higher prices they will have to charge in order to cover their costs. High inflation not only disrupts the operation of a nation's financial institutions and markets, it also discourages their integration with the rest of the worlds markets. Inflation causes uncertainty about future prices, interest rates, and exchange rates, and this in turn increases the risks among potential trade partners, discouraging trade. As far as commercial banking is concerned, it erodes the value of the depositor's savings as well as that of the bank's loans. The uncertainty associated with inflation increases the risk associated with the investment and production activity of firms and markets.

The impact inflation has on a portfolio depends on the type of securities held there. Investing only in stocks one may not have to worry about inflation. In the long run, a company's revenue and earnings should increase at the same pace as inflation. But inflation can discourage investors by reducing their confidence in investments that take a long time to mature. The main problem with stocks and inflation is that a company's returns can be overstated. When there is high inflation, a company may look like it's doing a great job, when really inflation is the reason behind the growth. In addition to this, when analyzing the earnings of a firm, inflation can be problematic depending on what technique the company is uses to value its inventory.

The effect of inflation on investment occurs directly and indirectly. Inflation increases transactions and information costs, which directly inhibits economic development. For example, when inflation makes nominal values uncertain, investment planning becomes difficult. Individuals may be reluctant to enter into contracts when inflation cannot be predicted making relative prices uncertain. This reluctance to enter into contracts over time will inhibit investment which will affect economic growth. In this case inflation will inhibit investment and could result in financial recession (Hellerstein, 1997). In an inflationary environment intermediaries will be less eager to provide long-term financing for capital formation and growth. Both lenders and borrowers will also be less willing to enter long-term contracts. High inflation is often associated with financial repression as governments take actions to protect certain sectors of the economy. For example, interest rate ceilings are common in high inflation environments. Such controls lead to inefficient allocations of capital that inhibit economic growth (Morley, 1971).

The hardest hit from inflation falls on the fixed-income investors. For example, suppose one year ago an investor buys a \$1,000 T-bill that yields 10%. When they collect the \$1,100 owed to them, is their \$100 (10%) return real? No, assuming inflation was positive for the year, the purchasing power of the investor has fallen

and thus so has the real return. The amount inflation has taken out of the return has to be taken into account. If inflation was 4%, then the return is really 6%. By the Fisher equation (nominal interest rate – inflation rate = real interest rate) we see the difference between the nominal interest rate and the real interest rate. The nominal interest rate is the growth rate of the investors' money, while the real interest rate is the growth of their purchasing power. In other words, the real rate of interest is the nominal rate reduced by the rate of inflation. Here the nominal rate is 10% and the real rate is 6% ($10\% - 4\% = 6\%$).

Inflation causes anxiety particularly for retirees who are uneasy about inflation adjustments to their pensions and financial investments. Planning for retirement requires expectations of future prices. Inflation makes this more difficult because even a series of small, unanticipated increases in the general price level can significantly erode the real value of savings over time. Social Security payments are now indexed to inflation, a policy change that has reduced the effects of inflation uncertainty on retirement.

There are securities that offer investors the guarantee that returns are not eaten up by inflation. Treasury Inflation-Protected Securities are a special type of Treasury note or bond that offers protection from inflation.

With a regular Treasury bond, interest payments are fixed, and only the principal fluctuates with the movement of interest rates. The yield on a regular bond incorporates investors' expectations for inflation. So at times of low inflation, yields are generally low, and they generally rise when inflation does. Treasury Inflation-Protected Securities are like any other Treasury bills, except that the principal and coupon payments are tied to the consumer price index (CPI) and increased to compensate for any inflation.

As with other Treasury notes, when you buy an inflation-protected or inflation-indexed security, you receive interest payments every six months and a principal payment when the security matures. The difference is that the coupon payments and underlying principal are automatically increased to compensate for inflation by

tracking the consumer price index (CPI). Treasury Inflation-Protected Securities are the safest bonds in which to invest. This is because the real rate of return, which represents the growth of purchasing power, is guaranteed. The downside is that because of this safety and the lower risk, inflation-protected bonds offer a lower return.

Sustained inflation is damaging to long-run growth and the financial system in general. Increases in inflation lead to lower real returns not just on money, but on all other assets too. These low returns interfere with the functioning of financial markets and the allocation of investment. Lower real returns have the effect of severely damaging the credit market. As a result, higher inflation contracts the supply of credit available to fund capital investment damaging the economy (Blume, 1978).

It has been shown that inflation affects investment in several ways, mostly inhibiting economic growth. The source of inflation is money and the supply of it. Investors need to be able to expect returns in order for them to make financial decisions. If people cannot trust money then they are less likely to engage in business relationships. This results in lower investment, production and less socially positive interactions. Among other effects, people may start to attempt to trade by other, less efficient, means in order to avoid the unpredictable price levels due to inflation.

Risks can be assigned to each level of the Project. For simplicity's sake, the risks can be labeled as low, medium, and high. The level of risk is most frequently associated with the impact of having to change cost or schedule.

There are several risks that must be considered to understand project financing. The risks commonly considered are :

5-2Financial Risks:

- i. Use of project versus corporate financing
- ii. Use of corporate bonds, stock, zero coupon bonds, and bank notes
- iii. Use of secured versus unsecured debt

- iv. The best sequence or timing for raising capital
- v. Bond rating changes
- vi. Determination of the refinancing risk, if necessary

5-3 Development Risks:

- i. Reality of the assumptions
- ii. Reality of the technology
- iii. Reality of development of the technology
- iv. Risks of obsolescence

5-4 Political Risks:

- i. Sovereignty risks
- ii. Political instability
- iii. Terrorism and war
- iv. Labor availability
- v. Trade restrictions
- vi. Macroeconomics such as inflation, currency conversion, and transferability of funding and technology.

5-5 Organizational Risks:

- i. Members of the board of directors
- ii. Incentives for the officers
- iii. Incentives for the board members
- iv. Bonuses as a percentage of base compensation
- v. Process for the resolution of disputes

5-6 Execution Risks:

- I. Timing when execution will begin
- II. Life expectancy of execution
- III. Ability to service debt during execution

Chapter 3

Phase-H Network Expansion Project

Chapter 3

Phase-H Network Expansion Project

Sudatel Telecom Group (STG) is one of the leading telecom companies in the region, serving the needs of customers in Sudan and Africa. Since its foundation on 13th September 1993, STG has grown steadily from local to regional markets, setting a good example for privatization policy. STG is the bridge for telecommunication movement between the Arab world, Africa and the rest of the world.

STG offers various telecom services and keeping its competitive edge with other companies. STG main services include provision of mobile services, fixed-line services, as well as carrier and wholesales services.

STG provides services in 2G, 3G, and NGN technology levels. STG services are expanded into many cities and rural areas, achieving the widest coverage and most significant presence.

STG's infrastructure integrates well together in harmony with all the modern elements of modern communications in optical fiber networks, copper and wireless networks so that all these networks are based on a common technology base which is the best and most modern in the field of communications.

STG is running now a telecom business (telecom operators) in five African countries (Sudan - Mauritania – Senegal – Ghana and Guinea Conakry) covering the areas of Mobile, fixed, Internet and broadband services.

Sudatel contribute 13% in the submarine cable to east Africa extending from Port Sudan to cape Town linking 13 countries in the eastern coast of Africa and owns 50% of (SAS1) and(SAS2),which are huge projects for transmission linkage between Port Sudan and Jeddah, in addition to Sudatel Contribution at the continental cable ACE with 9% that links the western coast countries extending

from Cape Town to France. Sudatel is also linked with Ethiopia and Egypt via the fiber optic.

STG is the first Sudanese company to be listed on the regional stock markets. On 4th July 1997, it was enlisted on Khartoum Stock Exchange. On 6th November 2000, it was enlisted on Bahraini Stock Market and on Abu Dhabi Stock Market on 31st March 2003.

STG deals with investors from Saudi Arabia, Yemen, Qatar, Bahrain, Iran, Oman and Jordan and with more than 14 Local and Regional Banks as well as more than 80 Sudanese and Regional Companies. Since its foundation STG paid more than 36 million dollar for the social responsibility activities to cover the needs in education, health, water project.(Sudatel.sd,2015)

One of the major projects recently carried out for Sudatel Group, with TK contract the amount is \$ 86 million, in order to contribute to market share and depend on:

- (1). maintain current market position;
- (2). consolidate market position;
- (3). Open up new markets.
- (4). Another reason security and political, like South Kordofan&Darfur.

The table (3-1) below shows sites numbers & regions:

Table (3-1) Showing Phase _H sites Distribution (Sudatel Group, PMO, 2011)

Phase	Item	Region	Site Qty.	Remark
H.2	1	B&W Nile	13	With access problem during raining season
	2	Eastern	12	
	3	Gizera	11	
	5	River Nile	6	
	4	Northern	10	N/A
H.1	6	North Kordofan	29	With access problem during raining season
	7	South Kordofan	52	With Instable social environment and access problem during raining season
	8	Darfur	107	Security Issues and Raining Season
Total			240	

3.1 Any site classified into 9 main activities:-

3.1.1 Network Design & Planning

Assessment of current status include:

- Startups/ Expansions RF and MW spectrum allocations
- Existing infrastructures and networks Formulation of system criteria
- Market studies and research Regulatory bodies
- License requirements Equipment specifications
- Demography and geography .
- Network dimensioning (OMC, BSS, Transmission)
- Design criteria, definition and integration

3.1.2 Site Survey

Application of the precautionary approach to site selection from (NTC) to site selection :-

These guidelines require, as a minimum, that for each site the operator shall have regard to:

1. the reasonable service objectives of the operator including:
 - the area the planned service must cover;
 - power levels needed to provide quality of service;
 - the amount of usage the planned service must handle;
2. minimization of EMR exposure to the public;
3. the need to avoid proximity to existing or planned establishment of a community sensitive location/facility e.g., residential areas, childcare centres, schools, care centers for the aged, hospitals and landmarks;
4. relevant central and local government communication planning policies;
5. the outcomes of consultation processes with Councils and communities as set out in Annex E
6. the need to preserve anything of heritage significance (built, cultural and natural);
7. the physical characteristics of the locality including elevation and terrain;
8. the availability of land and public utilities;
9. the availability of transmission to connect the radio communications infrastructure with the rest of the
10. network, e.g. line of sight for microwave transmission;
11. Guidelines for sitting of Communication Masts and Towers and use of mobile and wireless devices 19
12. the radiofrequency interference the planned service may cause to other services;
13. the radiofrequency interference the planned service could experience at that location from other

14. services or sources of radio emissions;
15. Any obligations, and opportunities, to co-locate facilities.

Intensified template was reviewed by three teams, civil, radio & transmission.

Every team added all the information they will need to complete their part of the design. After finalizing the template it was also sent to the PM for approval.

Training the contractors was also very important to insure the new template is properly used and well understood, we held trainings in the office for contractor engineers both in Arabic and in English, we also did a demo site near the office and discussed the feedback in another training.

This template is successfully used now by site acquisition team, to acquire the right area we need.

It is also used by soil test team, to locate the exact location of the site, and contact the owner in advance.

It is also the most important source to prepare the detailed site design folder (rented area, north direction, path loss data, required tower height, ...).

3.1.3 Site Selection and Validation

Field investigations, including all regulations, prior to definitive radio site choice

These target areas are then investigated and evaluated as to their suitability.

Given a search area radius, several potential locations are identified for each site, which are then investigated from RF point of view

3.1.4 Site Acquisition

Though there may well be some issues to resolve, as there are in most real estate transactions, if the resolution of the problems could in any way delay a project, a 'cleaner' site is considered. All appropriate engineering studies are completed and submitted to the relevant authorities.

Ownership

Sign lease or purchase agreement by customer

Manage easements and multiple site frame agreements

Estate management and rent renewals

Permitting and application filing

Aviation requirements and restrictions on tower heights

Build permits, electricity meter... ..

Agriculture, city council, civil defense, municipality certificates

Zoning conditions and restrictions

Environment and health

Unavailability of a certain site can have a serious and negative impact on an overall project schedule, the experienced team at TSSR are acutely aware of this, which is why their teams blend with system design engineers and together they know how to pick sites that meet the requirements, saving money and time.

3.1.5 Soil Investigation

Site investigation and soil testing before construction of communication towers is very

important activity that should be done for the following purposes:

- 1.The total cost of the project depends mainly on its foundation cost, which is mainly affected
- 2.by the need for soil replacement under its foundations and the possibility of using the excavated material as backfill material over the tower foundations.
- 3.Based on Item (1) above, each site should be tested and investigated to determine its bearing capacity for foundation design purposes, and the need for replacement under foundations or using local or imported materials for backfilling above its foundations.
- 4.Soils have different types, layers, and properties for different sites in each country and all over the world.
- 5.Each soil type has its own recommendations for foundations. Furthermore, under the same soil type soil may have a totally different treatment and recommendations. For example silt or clay soil layers could be highly expansive and/or highly plastic that needs large replacement depth to avoid the expected large variation in expansion upon wetting. The same soil types may not need such large

replacement is they have low expansive properties and/or low plasticity. In all cases, the excavated silt and clay soils are not allowed to be used as backfill for the tower foundations for many reasons.

6.Sandy soils also should have their own recommendations for foundations depending on many factors. Lower silt contents in sandy soils means cleaner sands with relatively high bearing capacity and with the ability to use the excavated materials as backfill for the tower foundations. Higher silt contents are usually associated with collapsible soils when dry and may necessitate the use of replacement under the tower foundations and avoiding the use of excavated materials as backfill for tower foundations.

7.Sites containing rock should also have its own recommendations for foundations. The hard nature of the rock in some sites may necessitate elevating the tower foundation level to minimize the excavation depth and consequently elevating the final foundation level.

8.Moreover, sites may have any combination and sequence of soil types and layers necessitating special recommendations for foundations depending on the type and thickness of each layer.

Based on the above, soil testing and investigation should be performed for every tower to be constructed in any site.

3.1.5 Site Design and Development

The design and development of sites is critical not only to optimal functioning of the system, but also to reducing running O&M costs, assuring safety of personnel, enhancing quality of service and extending cycle time.

All design and construction drawings and specifications for a new site are provided by HUAWEI Telecom engineering teams ensuring that the design is adequate for the site conditions and customer approved prior to construction.

Site walks and Site layout

Access and load considerations

Fabrication area for construction activities

Temporary power, Utility sources and Resources needed

i.Geotechnical considerations

Size and shape of the guy anchors if applicable

Tower and shelter foundations

Grounding system design and Soil resistivity

ii.Temporary facilities

Access and communications

Water, light and power

Waste removal and dumpsters

Storage and security

Staging, fabrication and construction areas

iii. Electrical supply and/or generators

Poles required

Meter if applicable, ATS, MDB

Point of entrance and cable runways

Rectifiers, UPS, batteries, generator, breakers, wiring

v.Tower design

Self supporting, guyed, monopole, stub or pole

Tower and antenna mounts heights and azimuths

RF and MW antenna loading and future growth, cable runways

Wind load, twist and sway

Platforms, ladder or pegs, marking and lighting

vi.Tower Feature

- Design Standard: ANSI/TIA-222-G last version.
- Survival Wind Speed: 160km/h
- Operation Wind Speed: 120km/h
- Wind Load: $14m^2$
- 9*RF Antenna(GSM)
- 5*1.2m MW Dish

vii.Shelter or equipment room design

Amount, type, weight, size and configuration of equipment and ancillaries to be housed, along with adequate space for movement and systematic growth of communications equipment outwards

Shipping and delivery issues, weight and size concerns

Heat insulation, lighting, grounding, power, alarm system, fire fighting, feed-through, door, RF, cable trays, anti-static, etc.

Floor plan and equipment connectivity

viii.HVAC design

Temperature, humidity, and cleanliness requirements

Site specifications for construction materials, insulation type, size and distance, existing conditions, and predicted growth

Thermal loading of equipment including future growth

Ambient outside temperature

lead Delay kit, lead–lag cycle, alarms, economizer, emissions, automatic shutdown, redundancy, seismic design, etc.

ix.Site development drawings

Site plan, existing and/or new road profiles

Grounding system drawings

Drainage requirements, grading and sediment control plan

Utility plan and installation details

Shelter, tower and relevant foundation plans

Fence enclosure and guy anchor fence if applicable

Drawings are maintained to reflect the intended design of the site and keep track of the way the site was actually built

3.1.6 Site Construction

Every 240_ Sites constructed as follows:-


1. Excavation (dimensions must be checked and recorded).
2. Soil replacement (if any, but the depth must be checked and recorded and the

compaction of soil must be checked).







3. Plain concrete and steel formwork (main steel bar/additional bar and stirrup, the length, diameter, quantity must be checked and recorded).
4. Shuttering (must be done by our subcontractor for any tower foundation, check the dimensions of shuttering).
5. Casting of concrete (anchor bolts, setting template, raft foundation and the column foundation);
6. Curing of concrete (with water and cover);
7. Backfilling (compaction with the suitable load) .
8. Site Leveling .
9. Fence Installation (Steel Fence /Brick wall).
10. Site Power work management.
11. Site Telecommunication work management
12. Site finishing.




Site construction steps :

Table (3-2) Site construction steps (Sudatel Group, PMO, 2012)

Activity	Duration	Tools& Materials	Photos
Kick_off meeting & Land Mark	6hrs	theodolite tape roll ruler GPS	

Material Mobilization	10hrs	truck bulldozer/cart spade	   
Excavation	10hrs	hammer vibrator spade mixer compactor tape meter	 
Formworks: raft foundation	2 days	hammer saw nail plywood wood panel	 
Reinforcement: Raft foundation and column	2 days	tape meter gradient rebar stirrups	 
Concreting: raft	8 hrs	mixer vibrator spade slumper	 

Template and anchor bolts fixation	4hrs	leveling ruler anchor bolts template	
Concrete : column casting	4hrs	Pump Vibrator Temperature Slump test Meter	
curing	7 days	Water container/ water	
Backfilling and compaction	1 day	compactor bull dozer Sand Water	
outdoor foundation	2 days	mixer vibrator formwork system	
Tower delivery and checking on site	4hrs	truck	

Tower Erection/ Foot installation	5 days	Derrick mast Winch Pulley Steel wire rope Plastic conduit Theodolite Torque wrench Bayonet wrench	
Final Painting	4 hrs	brush paint	
Earthing Test	2 hrs		

4 Installation and Commissioning

4.1 Installation, testing & commissioning of RF and MW antenna systems and accessories.

4.2 Mounting brackets, RF and IF feeders, jumpers and connectors, Grounding kits, clamps, hangers/angle adapters, tie wraps, hoist grips, strain relief

4.3 Transmission line identification and labeling

4.4 A/C power, generators and/or solar panels and alarms

4.5 Fuel tank and piping, Backup generator with sound proof, solar panels if applicable

4.6 Power cabling, ATS, alarms and grounding

3.1.9 Acceptance and Integrations

All sites inspected, tested and documented before operation, according to :

- Access road construction
- Utility connection
- Tower construction and installation according to specs
- Shelter placement and/or construction
- Concrete compressive strength requirements
- Site AC power, transfer switch functionality and alarms
- HVAC equipment and alarms (including high & low temperature and high humidity)
- Generator functionality and alarms
- Smoke detection and fire fighting equipment
- UPS functionality and alarms
- Tower lighting functionality and alarms
- Antenna and transmission line installations
- Equipment properly installed, spacing and level, cabinets and racks secured
- Cable runway system properly installed
- Proper sealing for floor and transmission line entry ports, holes and opening
- Adequate lighting requirements
- Safety items available, fuel tank in secure place
- Proper grounding at transmission line entry port, tower, fencing and gate, generator and support skids
- Surge protectors
- Feeder and cable installation (length, inter–distance, bending, labeling)
- DDF properly installed and inter–connected
- General workmanship
- Signage posted
- Site and building clean and free of trash and debris
- As-built site, building and tower drawings

The table below copied from(MSProject 2010),shows detailing of tasks for every site:

Table (3-3) shows detailing of tasks for every site (Sudatel Group, PMO, 2011)

Task Name	Duration	Start	Finish	Predecessors
Type1: 45M - Hybrid	83 days	Sun 17/07/11	Thu 20/10/11	
SA documents submitted to STG	0 days	Sun 17/07/11	Sun 17/07/11	
SA contracts signed by STG	2 days	Sun 17/07/11	Mon 18/07/11	2
Payment delivered by STG to Owner and Localities	3 days	Tue 19/07/11	Thu 21/07/11	3
Locality permission issued	1 day	Sat 23/07/11	Sat 23/07/11	4
Soil Test	14 days	Sun 24/07/11	Mon 08/08/11	5
Site Design approval by STG	2 days	Tue 09/08/11	Wed 10/08/11	6
Sites Hand over between SA and Civil contractor and sites initial preparation	3 days	Thu 11/08/11	Sun 14/08/11	7
Civil works:	46 days	Mon 15/08/11	Thu 06/10/11	8
Material Mobilization	3 days	Mon 15/08/11	Wed 17/08/11	
Excavation	6 days	Mon 15/08/11	Sun 21/08/11	
Soil replacement	2 days	Mon 22/08/11	Tue 23/08/11	11
Plain concrete	1 day	Wed 24/08/11	Wed 24/08/11	12
Raft / footing	2 days	Thu 25/08/11	Sat 27/08/11	13
Columns	2 days	Sun 28/08/11	Mon 29/08/11	14
Curing	7 days	Tue 30/08/11	Tue 06/09/11	15
Backfilling	5 days	Wed 07/09/11	Mon 12/09/11	16
Tower Erection	5 days	Thu 22/09/11	Tue 27/09/11	17,20,21
Site Leveling & back filling	3 days	Sun 18/09/11	Tue 20/09/11	26FS-2 days
ODU foundation	2 days	Tue	Wed 21/09/11	19FS-1 day

		20/09/11		
Generator Foundation & umbrella	2 days	Tue 20/09/11	Wed 21/09/11	19FS-1 day
Generator Installation	2 days	Wed 28/09/11	Thu 29/09/11	21,18
Outdoor Cable tray installation	2 days	Wed 28/09/11	Thu 29/09/11	19,18,20
Earthing /Grounding system installation and testing	2 days	Sat 01/10/11	Sun 02/10/11	23
Fence foundation & Columns (2 sides)	7 days	Tue 30/08/11	Tue 06/09/11	16SS
Fence foundation & Columns (2 other sides)	7 days	Mon 12/09/11	Mon 19/09/11	17FS-1 day,25
Brick fence and Gate 1	7 days	Sun 04/09/11	Sun 11/09/11	25FS-3 days
Brick fence and Gate 2	7 days	Wed 28/09/11	Wed 05/10/11	18
RFI	0 days	Wed 05/10/11	Wed 05/10/11	28
CW acceptance	1 day	Thu 06/10/11	Thu 06/10/11	29
TE installation	11 days	Sat 08/10/11	Wed 19/10/11	30
MW Installation	3 days	Sat 08/10/11	Mon 10/10/11	29
BTS installation	2 days	Tue 11/10/11	Wed 12/10/11	32
Power system installation	2 days	Thu 13/10/11	Sat 15/10/11	33
System Integration	1 day	Sun 16/10/11	Sun 16/10/11	34
Transmission Granted by Operator	0 days	Sun 16/10/11	Sun 16/10/11	35
Commissioning	1 day	Mon 17/10/11	Mon 17/10/11	36
RF acceptance	2 days	Tue 18/10/11	Wed 19/10/11	37
Ready for commercial launch	0 days	Wed 19/10/11	Wed 19/10/11	38
PAT	1 day	Thu	Thu 20/10/11	39

		20/10/11		
Commercial Launch	0 days	Thu 20/10/11	Thu 20/10/11	40
PAC	0 days	Thu 20/10/11	Thu 20/10/11	41

3.2 Quality Issues :

In this fast changing environment, the single most important factor for good performance of any organization is the the quality of product or service.

Quality yields many benefits. It reduces complains, production costs and production time. It improves customer satisfaction, morale of the people an efficiency of the system.

Product quality management is that aspect of the overall management function witch determinates the quality policy, objectives and responsibilities and implements them by means such as quality planning, quality assurance, quality control and quality improvement.

Product quality management aims to ensure that the product will satisfy the needs for which it is undertaken. There are two aspects regard to quality in project management.

The management must focus on both the quality of product and the quality of the processes.

Quality Issues Broadly classified into 7 categories based on site:

1. Material/Equipment Availability

- ✓ Aggregates, Sand, Cement
- ✓ Steel for reinforcement
- ✓ Labor
- ✓ Pump for water pumping
- ✓ Vibrator for concrete
- ✓ Pulleys and bolts for tower erection
- ✓ Rubber soling to prevent seepage of water (foundation)

2. Formwork/Reinforcement

- ✓ Quality of shuttering material
- ✓ Irregularity of Foundation bolts
- ✓ Leveling of formwork
- ✓ Early removal of formwork

3. Geotechnical Issues

- ✓ Soil Investigations
- ✓ Lack of laboratory in vicinity
- ✓ Achieving required depth for foundation _ Min. required foundation depth is 2.5m

- ✓ Validity of the soil test report when compared to the actual conditions

4. Issues related to Concrete

- ✓ Proper mix design
- ✓ Concrete cover for bolts/members
- ✓ Segregation
- ✓ Lack of proper cube testing for checking concrete strength

5. Structural Issues

- ✓ Design Standard: ANSI/TIA-222-G last version.
- ✓ Survival Wind Speed: 160km/h
- ✓ Operation Wind Speed: 120km/h
- ✓ Wind Load: $14m^2$

6. Labor Issues

- ✓ Poor skill of labor
- ✓ Safety rules not followed at sites
- ✓ Lack of coordination among labor

7. Site Management Issues

- ✓ Supervision at sites
- ✓ Drawings/reports of tests
- ✓ Poor Handling & Storage of materials
- ✓ Accessing the site

3.3 SAND MODELING FOUNDATION (SMF)

One of high achievement in Telecommunication filed in Sudan is (SMF), because it Increased competitive ability on technological innovation and product quality

without a sacrifice in profitability. It used for temporary sites and areas that have difficulty to transport materials.

(SMF) Client: Sudatel Telecom Group.

Manufacture by: TOLAN Project For Manufacturing & Assembly of Electrical and Metal Products.

Consultant office: ZAROUG ENGINEERING .CO.

Specifications :

- Design Wind Speed 120KM/H service – 160 KM/H Ultimate.
- Windage Area 13M².
- Max. Tilt & Twist : 0.5 degrees
- Design code : TIA/EIA -222-G

Table (3-4) shows MSF- Steel Box Base Dimensions

Tower Height	Steel Box Base	Dimensions	
	Length (M)	Width (M)	Height (M)
35M	4	4	1.45
45M	6	6	1.50

Consultant Recommendation:

1. The foundation _the Box filled with sand _ stable against Pullout off the ground and against Overturning.
2. (Steel Box Base) is capable to transferring the tower loads to the ground.
(Zaroug Eng.Co,2012)

Flow Chart for manufacture (MSF) :- (Tolan CO.,2012)

- Raw Materials
- Fastening.
- Quality Check.
- Storage.
- Cutting of Materials.
- Marking & Measurement.

- Machining &Drilling.
- Grinding.
- Welding.
- Quality &Inspection.
- Hot Dip Galvanizing.
- Quality Check &Final Inspection.
- Loading and To site.
- (Steel Box Base) Erection.

Distribution of sites:

Table (3-5) shows MSF- Sites Distribution

State	Numbers	Remarks
Blue Nile	2	displaced Villages – Dam heightening
N.Darfour	4	Displaced camps & Gold mining areas
River Nile	2	Gold mining areas
Gadarif	1	Gold mining areas
Northern	2	Gold mining areas
Khartoum	1	temporary site
Total No	12	

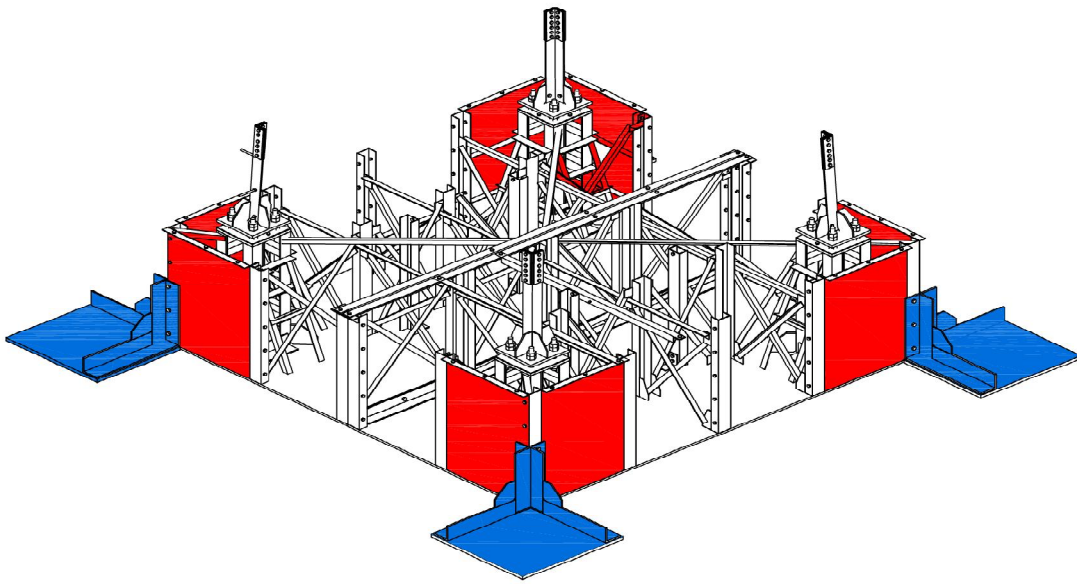


Figure (3-1) (MSF)

installation steps after site leveling:

- Install the anchor bolts and base shoe.
- Install the sides of the box.
- Fill the soil inside to the top angle level.
- Cover the top of the box by checker plates.
- Tower Erection.

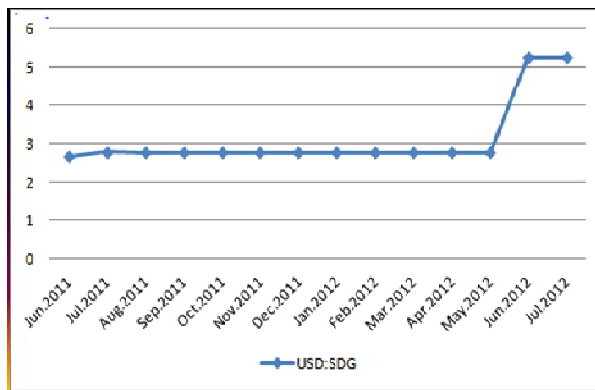


Figure (3-2) (MSF) & Tower Erection in Blue Nile State , displaced Villages (1)&(8) – Dam heightening.

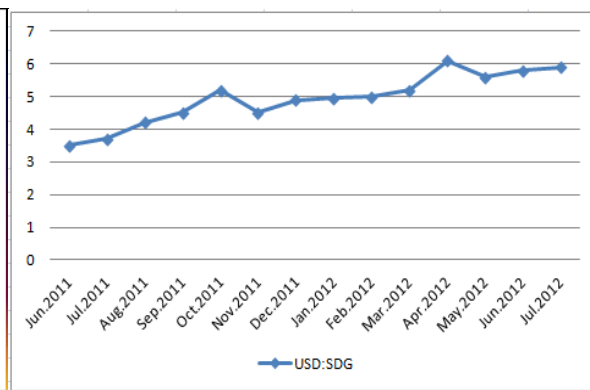
3.4 Major problems was facing Phase-H Networks Expansion Project :

a. Inflation:

- ✓ The exchange rate of Bank of Sudan is 2.78 before Jun.2012, and the exchange rate in the market is increase from 3.4 in Jun of 2011 up to 6.1 in Apr of 2012.
- ✓ The bank rate change to 5.26 in Jun.2012



Figure(3-3) Exchange Rate of Bank of Sudan



Figure(3-4) Exchange Rate in the Market

- From D&B Country Risk Line Report, the annual inflation rate of Sudan in 2011 is 40%.
Table (3-6) D&B Country Risk Line Report

	2008	2009e	2010e	2011f	2012f
Real GDP growth, %	6.8	4.5	5.2	5.3	5.5
Inflation, annual ave, %	14.3	11.3	15.4	40.0	30.0
Govt balance, % GDP	-1.4	-4.7	-5.1	-3.0	-2.8
Oil price, USD/b	96.6	61.8	79.6	111.7	115.6
C/A balance, % GDP	-2.1	-6.8	-2.2	-1.0	0.8

Been affected by the inflation, the materials' (Sand, Cement, Steel, Gravel) price are increasing rapidly:-



Figure (3-5) Materials price increasing rapidly

b-Risk management :

- Climate and rain season
- Policy change from government.
- Delay for permission or approval
- Hazard areas security management

c- Subcontractor capability &management:

- Low production capacity.

d-Cost management :

- Lack of raw material and price increase continuously
- Political situation is not clear ,US dollar reserve insufficient
- Poor infrastructure leads to high construction cost

e-Quality management:

- No strict standard and quality control for construction material



Figure (3-6) Audit on Site:- (Sudatel Group, PMO, 2012)



Figure (3-7) Access difficulties due to heavy rain:(Sudatel Group, PMO, 2012)



Figure (3-8)Security check points: (Sudatel Group, PMO, 2012)

Chapter 4

Conclusion and Recommendations

Chapter 4

Conclusion and Recommendations

4.1 Introduction

The literature review revealed that the Telecommunication industry is one of the most significant industry contributors to the economy in terms of gross domestic product and employment. As a result, the success of Telecommunication projects became a fundamental issue for most governments, users and communities. However, the concept of project success remains somewhat of an enigma and an area of continued research as there is no agreement on what should be the success criteria on Telecommunication industry despite several studies

The Thesis findings were discussed and evaluated throughout the previous chapters and the purpose now is to state the conclusions of the achievement of the main aim of this Thesis.

The review also revealed that project success is repeatable, once we know certain factors that greatly impact on the success in certain aspects, and highly related to project. The actual work of the project is accomplished by the project team during construction or execution stage. Hence, the appointment of the right project team will not only ensure the success and overall quality of a project but also have the opportunity to save on costs.

The review also shows that it is impossible to generate a universal checklist of project success criteria suitable for all projects and these criteria will differ from project to project depending on a number of issues including size, uniqueness and complexity of project. In addition, these criteria are often related to the perceptions and expectations of project participants and their definition of project success.

The iron triangle (on time, under budget, according to specifications) has been a widely accepted criterion for project success during the last couple of decades. The review, however, shows that the change in the demands of users, evolving

environmental regulations, and shifting functions of project creates new criteria for success such as health and safety, environmental friendliness, technology transfer, risk containment, and stakeholder' satisfaction.

4.2 Conclusion

This section reviews and highlights the extent to which those objectives of thesis is adopted :

Objective I: To identify the factors that affect project performance delivery.

There are Several models for classification the factors influence in telecommunication projects but the four factors, project selection ,project team selection ,organization and external factors are more affective and satiable

The factors above are accurate to measure project performance delivery.

Objective I I: To identify the most effective processes in all implementation stages, to avoid the waste of time and material by approved QC/QA/ISO: 14001 systems.

There are many quality programs such as TQM and the ISO standards. Each has it's own criteria and methodology for ensuring quality. If one such technique is used by the company, this one should also be used by the project. Using one of these techniques for a project only, rather than corporately would probably create too much overhead for a project. But some technique should be used on every project to control quality.

Telecommunication industry, the real factor is influence in competitors market share are adopting the standard above in their companies and project.

Objective III: To identify, the best contract administration procedures for these special types of projects based on turnkey contracts.

Telecommunication projects and their success are closely related to contract and contract administration. Turnkey contracts are valuable, because most of risks transferred to contractors.

4.3 Limitations

This research, like any other, is not without limitations. some are presented as follows:

1. Some factors that may influence Telecommunication Projects such as the organizational structure of contractors and the extent of client involvement in the construction process, were not considered. Other factors such as the government and legal system.
2. The Thesis focused on all types of Telecommunication projects together and no analysis was made on the bases of individual types.
3. The survey results are within the Phase (H) _ Sudan. These factors might impact project success on a nationwide scale.

4.4 Recommendations for further research

Several lines of research are recommended for further studies as follows:

- 1- The Thesis focused on all types of Telecommunication projects together. It would be of interest to study project success on the basis of individual types. This can be achieved by collecting more data on individual project types.
- 2- While this Thesis is mainly focused on the impact of four factors on Telecommunication project success. Encourage to conduct study similar study, focusing on subcontractors' impact and other stakeholders on project success. Other aspects of contractor performance, such as supply chain management, can also be evaluated and compared.
- 3- Create new study about strict standard and quality control for construction material in Sudan.

4.5 Recommendations for industry:

The following points are recommended to industry:

1. Add more new coverage area for Sudani network.
2. improvement of services quality for old Areas
3. contribution in country development by facilitating communication services in poor rural areas

4. Provided good business chance for contractors and individuals.

5. Increasing the company revenue.

4.6 Contributions to knowledge:

In this respect this Thesis contributed to existing knowledge by the followings:

1. Project selection must be a controlled process with specific tests for alignment with strategic objectives.
2. The world marketplace is continually changing and every organization, irrespective of the service or product it offers, must accept that internal change is a normal process to meet the demands of external change.
3. The effective team builder is usually a social architect who understands the interaction of organizational and behavior variables and can foster a climate of active participation and minimal conflict.
4. The solution to the majority of corporate problems involves obtaining better control and use of existing corporate resources, looking internally rather than externally for the solution.

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