Improving Project Management Performance

A Case Study of Mobile Telecom Site Rollout Project in MTN Syria

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Abstract
This paper examines the application of Six Sigma DMADV methodology to improve project management performance of telecom site rollout projects carried out by MTN Syria. In their technical department, the company uses generic project management models to deploy new sites into their networks. Prior research suggests that these models vary distinctively according to the aim and objective of the project. This research further highlighted the disposition of a range of project management tools using a case study. The case study was developed to demonstrates how Six Sigma DMADV methodology is applied for the site rollout project, how the site is constructed, the different phases of project execution, the project management model currently in use, the shortcomings from the current model and their causes, and how to combat the problems accrued from these model. The process of site deployment project is discussed and analyzed.

This thesis adopted already existing framework of project management model to investigate current practices at MTN Syria site rollout project. In particular, the research focus on completing the site rollout projects on time through the enhancement of existing methodology. Based on extensive literature review, suggestions and recommendations were made on main practices that can be improved through the analysis of the case study. However, there are numerous challenges associated with the application of Six Sigma as well as handling the data collected from each job performer which can be improved.

Furthermore, the research adopted case study strategy which provided an in-depth knowledge into the subject under investigation. The result of this research suggests that six sigma DMADV methodologies can be used to improve project management performance by developing new enhanced project management model. By adopting the suggestions and conclusions derived in this paper, MTN Syria will be reaping from the synergies of effective project management through the enhancement of current practices, in addition to allowing the execution of more projects on time and within the budget constraint. The data used in this paper are validated and reliable due to the fact that it adopted a rigorous partway to derive the conclusions.
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1. Chapter One: Introduction

This chapter includes a background for the subject of this thesis, which is improving project management performance in mobile telecom site rollout project in MTN Syria; this chapter also includes problem description and the thesis questions, the purpose of the thesis, and the outline of the paper.

1.1 Background

Business opportunities in mobile telecommunication are flourishing significantly in developing countries in Africa and the Middle East. Mobile telecom companies have been extensively carrying out network deployment projects to target this emerging market. Thus, project management has become a core competence that telecom operators sought after to excel in their operations and a key success factor in executing their projects. However, mobile telecom operators undergo many challenges such as the need to keep their existing subscribers satisfied in order to prevent them from switching to competitors, and the need to face the harsh competition with other operators on attracting new subscribers. These challenges require the mobile phone operators to extend their networks’ coverage and capacity as quickly as possible to meet subscribers’ demand for better network quality and to target the potential subscribers. Another challenge is the decreasing revenues due to the aforementioned competition which requires the mobile phone operators to carefully consider their investment in network deployment and expansion with due attention to the role of project management in controlling both the capital and the operational expenditures.

Therefore, time and cost management is an integral and essential competence for mobile telecom rollout projects which are persistently growing and evolving, thereby inducing the improvement of project management performance to sustain growth. It is imperative to mention that the aim of improving performance is to guarantee that project management does not suffer with respect to time, performance and cost overruns. Considerable cost discounts are only conceivable with significant variations in project management models. Subsequent pressures will result to innovative mindset and the capability to reason a bit outside the box.

The project of deploying a new site into the mobile network usually faces challenges and difficulties that will necessarily affect the execution or implementation of the project. MTN Syria has adopted aggressive network rollout plan since its launch in 2007. Successive projects were carried out countrywide to expand the coverage and capacity of the network or to fine-tune and improve its performance. Even though these projects seem to be identical in terms of the way they have been executed, the project management model used, the human resources and competences employed, processes and procedures followed, they usually encounter difficulties, changes and unpredicted issues that in many cases force unavoidable deviation from the moment of project initiation to the project closure. This variation usually takes place due to numerous external and internal factors related to human, operational and technical aspects in the project, in addition to factors related to the way the project is managed i.e. the project management model used in the project.
In order to confront the challenges in telecom technical operations, project managers are forced to find new ways to improve performance, avoid delays, reduce costs and meet the requirements and expectations of their project sponsors and stakeholders.

One potential solution to such challenges has been integrating Six Sigma into project management practices through the adoption of DMADV methodology for performance improvement to ensure effective and proficient outcome of the. According to Magnusson et al. (2003), one of the aims of DMADV is to pursue a system of enhancement of current practices in addition to allowing the completion of more projects on time, within budget accompanied with high customer satisfaction.

This case study aims to shed light on how the technical department at MTN Syria carry out the project of deploying new sites into its network, how the project is managed and coordinated and what problems can be encountered and should be addressed by the project manager, and subsequently to examine how Six Sigma framework can be applied to analyze the current project management model in use and to explore the possibilities of improving this model.

1.2 Research Problem

The capital project management group in MTN Syria is responsible for managing site rollout projects which encompass planning, acquisition, construction and integration of new sites into the existing network. These projects are associated and entangled with many critical issues that cause cost overrun, underperformance and more critically project delays which consequently lead to unsatisfied project sponsor or customer. Therefore, there is a need to investigate the causes of the delays and underperformance and to find a way to cover the shortcomings and improve the performance of these projects.

1.2.1 Research Questions:
The major research questions in this thesis are:

- What are the causes of underperformance in site rollout projects? (More specifically; why some sites could not be delivered on time?
- What is the project management model that MTN Syria is currently using in site rollout projects?
- How the causes of underperformance are related to the project management model?
- What are the potential improvements that could be implemented to address the underperformance?
- How can Six Sigma framework help in analysis, design and implementation of these improvements?

1.3 Research Aim:
The aim of this thesis is to investigate the current project management model and practices in site rollout projects at MTN Syria, and to understand how the different activities are carried out and subsequently explore the applicability of Six Sigma into project management through the use of DMADV improvement methodology model. This paper will further identify the
underlying issues and propositions for performance in the execution of mobile telecom site rollout project.

1.4 Delimitations

Due to time constraint and inaccessibility to all needed sources, the research was limited to available resources at our disposal.

The amount and quality of knowledge acquired is limited to the expertise and know-how of the expert because the study is based on theoretical framework of existing project management models and data gathered from expert interview.

Moreover, only the major processes of the studied project are regarded and investigated, other processes, sub-processes and functions that might affect the performance and execution of the project where neglected due to the limited scope and size of this research.

This research is limited only to discourse the mobile telecom site deployment processes from the defining to the closure. Technical related matters are not within the scope of this research. The research is focused on projects done by MTN Syria and as such cannot be generalized.
Figure 1 Thesis Outline
2. Chapter Two: Theoretical framework

This chapter includes theoretical approach and the frame of reference which encompasses literature review of articles and previous studies on project management models, improving performance in projects, Six Sigma, DMADV and their various applications. The theoretical framework provides the basis for the thesis empirical research part.

In today’s turbulent and dynamic mobile telecom rollout project, determining the time, cost and specification for project have given rise to Six Sigma breakthrough models. Determining the main area of application of Six Sigma is an essential critical success factor. Project performance depends upon time, cost and quality. However, there is evidence in research and development that even some of the best practices have yielded low performance and remains vulnerable in projects outcome due to inefficient adaption of the right project improvement methodology. The time component in projects management can consistently result to circumstances in which project managers take action only when they see that there is a time and cost overrun in an on-going project; usually known as fire fighting approach which will result to reactive action. Using Six Sigma framework to identify improvement opportunity makes it proactive.

Magnusson et al. (2003) have developed a model which illustrates the scope of the framework and deployment process of Six Sigma into different areas of application. Substantially, Six Sigma can be applied in four main areas:

- Six Sigma for process improvement.
- Six Sigma for design improvement.
- Six Sigma for project management
- Six Sigma for new product and technology development.

![Six Sigma breakthrough model](image)

The aim of this thesis is to examine how Six Sigma can be applied in the area of project management to achieve improvements for the model currently in use.
2.1 Project management

Project management is the planning, organizing, directing, and guiding an organization's resources for a reasonably short-term goal that has been established to complete specific aims and objectives (Kerzner, 2009). Project management helps in the co-ordination, development and discovering of improvement opportunities. New methods to reduce cost, improve quality, increased speed and flexibility are all elements of project management. As a result, they help us detect what is significant and where most emphasis are led which is vital for organizational continual existence.

Consequently, to keep an edge over your competitors, several organizations are faced with complex processes which needs cross functional expertise. These complex activities are classified into macro and micro levels. On the macro-level, project management has the responsibility to ensure that the project undertaken is delivered on time, within the agreed budget and meets with performance level or technology.

**Time:** All projects are subject to time constraint during which they must be completed. They are not meant to last forever. Projects are characterized with basic requirement and should normally be established before scheduling, i.e. meeting deadlines.

**Cost:** Another unavoidable constraint for all projects is said to be entangled by limited budget. For project to be effective and efficient, it should meet the required budget allocation. There is no miracle to heaven; project should be completed within the budget constraints.

**Performance:** Projects are planned and developed in order to meet certain set initial criteria determined by the technical specifications. Project manager should be away of what the project is supposed to accomplish. The essence of measuring performance is to ascertain whether the finished output operates according to the specified objective. The project’s clients obviously presume that the project being developed on their behalf meets their expected value. Jeffrey K. Pinto (2010), stipulated that this process is usually referred to as conducting a “quality” check and the center of gravity usually falls within the available resources.

![Figure 3 An overview of Project Management adopted from Kerzner, 2009](image-url)
On the other hand, the micro level project management is expected to keep the work place attractive for team work, meet with the objective of deadlines and minimize cost. From the above definition, it becomes obvious that effective project management depends strongly on the following:

- A decent regular working condition between the project manager and theme members who are charged with the responsibility of allocating resources to projects.
- The capability of teams to exchange ideas and share know-how with project managers.

Prerequisites for effective project management

- Quantitative tools and techniques
- Organizational structures
- Organizational behavior

According to Kerzner (2009), most individuals recognize the quantitative tools for planning, scheduling, and controlling work. It is essential that project managers comprehend completely the operations of each department. The only way to minimize risk is for organizations to plan better. Since organizations now exist in turbulent environment where competition, uncertainty and unprecedented complexity of new task has become the order of the day, One will unarguable recommend project management as one of the best methodology to foster better planning. These have become one of the reasons why more organizations are integrating project management as a way of life in their endeavor.

Nevertheless, Jeffrey K. Pinto (2010) in his publication motivated that, Project management is one of most prevalent tools for attaining competitive advantage over rivals in public and private business, use to improve internal operations, react quickly to external opportunities, achieve technological innovations, and more significantly robustly cope with the challenges arising from various business acumen. Project management serves as a brilliant technical tool to train future executives in most entities such as budget selection, resource allocation, planning, scheduling and fast tracking their project. (See appendix1.)

2.1.1 The Role of the project Manager

Co-coordinating the various tasks in project is a challenge that requires the desire to excel and strong management commitment. It is appropriate to assign an experience project manager to lead the various activities involved. Paramount to the responsibilities of a project manager will be the planning, integrating, and executing the plans of these various activities due to the time constraint. It is vital to properly integrate the planning activities to avoid misappropriation of activities by the various functional units working under the project.

According to Kerzner (2009), planning is described as the occupation of selecting the enterprise objectives and establishing the policies, procedures, and programs necessary for achieving them. Planning in project context is instituting a predetermined cause of action.
within a forecasted situation. The project’s requirements set the main milestones for these predetermined action. The project manager is the fundamental key to successful project planning and should be involved from the project beginning (conception) through finishing (closure). The project planning should be systematic, flexible to deal with exclusive events, channeled through reviews and controls, and capable of tolerating multifunctional inputs.

The key tasks of the project manager include also the following:

- The project manager should work close with team members to help them improve.
- The project manager, by virtue of his ethic should be responsible to get the cross functional group work towards a common goal and objective.
- The project manager is responsible to realize the end-item within available resources, time constraints, cost and performance.
- The project manager is required to make all decision regarding alternatives, termination and to meet contractual profit objectives.
- The project manager should act as the communication focal point; resolve all pending and impending conflicts.
- The project manager should monitor and control progress in accomplishment of the essential work packages within the planned resources (time, cost, performance)

2.2 Six Sigma

Six Sigma is becoming more and more widely applied in improving project management performance especially in industries such as manufacturing, construction, services, etc. Nevertheless, lots of misconceptions have been deduced among users. Many project companies have problems in applying Six Sigma. Apart from the problems encountered in the integration of Six Sigma into projects, the adoption of projects management is a major challenge. Leyer, et al. (2011) argued that the idea of Six Sigma is not limited to the execution of a single project. It should be used as an instrument to establish a quality philosophy in the whole company.

Six Sigma process management methodology is a practical approach that focuses the tools and rigor of lean Six Sigma on critical process in order to help identifying the most strategic and customer focused opportunities for lean Six Sigma project in an organization (Hayler and Nichols 2005). It is imperative to note that the intent of this thesis is to help us identify performance improvement opportunities in telecom rollout project. Despite the much usefulness of lean Six Sigma, project managers must take into account a number of other considerations when planning their improvement process. The facts were according to Hayler and Nichols (2005) that the method, tools and technique you subsequently deploy to execute these performance improvement will be assessed on a situational basis depending on the scale, scope and complexity of each opportunity.

Six Sigma originated from Motorola to affect the quality outcome of project management. Its major objective is to reduce defects through the customer initiative. DMADV is a
methodology use for design improvement projects on existing product, process and system. It systematically involves defining, measuring, analyzing, designing and verifying project management. According to Kerzner (2009), Six Sigma prescribes disciplined gathering and analysis of data collected to effectively identify solutions. The data collection and analysis is done with lean Six Sigma. The aim of the lean is to remove waste and improve process efficiency. Lean is made up of essential tool designed to help in the identification and constant removal of waste which helps to improve quality, reduce time and cost.

It is therefore important to notify that Lean and Six Sigma are not the same thing. They are two different concepts with variable strength but complementing each other. Bicheno & Holweg (2009) argued that lean sets the philosophical background of value focus thinking whereas the Six Sigma provides a powerful toolkit to address specific issues that have been identified. They suggested that project managers should not do Six Sigma before they understand end-to-end process. Rather they should develop a complete understanding of value, value stream and then pull in Six Sigma when it becomes due and necessary.

No matter the wordings deferent authors have used in explaining Six Sigma process management methodology, it remains the fundamental principle in building blocks for establishing a robust system of management that enables project managers to identify the optimum opportunity in achieving set objectives (Hayler and Nichols 2005).

2.3 DMADV Methodology

In order to achieve the aim of Six Sigma in performance improvement, it utilizes several frameworks such as the DMADV methodology. Six Sigma encompasses a distinct process improvement methodology which is systematically designed to aid users. It starts with a define phase, where the process that needs improvement is identified. DMADV (Define, Measure, Analyze, Design, and Verify) is a methodology for designing and improving new services, products or processes. Due to its systematic approach based on data and timely identification of measures of success, DMADV is said to be a useful methodology in the enhancement of project management to accomplish set goals and objectives. It encompasses five steps and will require the commitment from senior management.

Time is limited so, customers need are highly prioritized. Project teams need to be specific with respect to the project objective. According to Bicheno & Holweg (2009), Six Sigma is strong on financial returns so a cost saving estimate should be made with the scope of the project properly defined. Their argument was that a “project” could be found within a process and not necessarily a department. Determining the extent to which these theories can be applicable to operations in project management becomes an important issue which needs to be thoroughly addressed by project managers in order to strategically impact the successful outcome of their projects. Magnusson, Kroslid & Bo (2003) elaborated that this methodology works well for improvements of critical to quality characteristics, critical to customer, critical to process, critical to compliance and should be carried out in a professional way.
DMADV methodology was designed to develop ways or rather process that will effectively address identified issues and sustain it through standard normal operations. Because of its emphasis on success through in-depth analysis, DMADV can be a useful system to improve project management performance.

2.3.1 Define

According to Magnusson et al. (2003), a good starting point is to find guideline for the model and collect information about past projects that have followed the same procedure. It is useful to investigate the current state of the used project management model through:

- Standardization: In terms of language used, documentation, processes, procedures, etc.
- Development, improvement and flexibility: Is the model frequently developed and improved? Can the different stages and activities in the model be modified or replaced easily?
- How regular is the model applied across the organization and to what extent is everyone involved?
- Supporting & control systems: How is the project management model reviewed? Is it checked on constant basis through the performance of the input to output measure?
- Benchmarking: Is the project management model unique in contrast to similar model established by competitors?

The result of the aforementioned investigations will determine the need and possibility of applying improvements on the current model. A project enhancement proposal is submitted to the senior management who will then decide when it is appropriate to infuse the proposed design improvement project on the ongoing project management model. A kick off meeting will be initiated where the project team will be established and the team charter developed.
Conferring to Magnusson et al. (2003), recommendations for critical-to-quality characteristics (CTQs) for the enhanced project management model is collected at a later stage. What is significant to the numerous clients of the model, what is important to the process and the significance of compliance? A good foundation for the CTQs should be to invoke the seven initial questions raised in the first stage of the project comprising standardization, strictly scripted, supported by tools, etc.

Supplementary samples of CTQs for a project management model are as follows:

- Project initiation (date and resources)
- Project specifications (quality)
- Resource allocation (Cost)
- Deadline for completion

Critical assessments of the recommendations are then prepared to hash out a list of CTQs. At the end point, customer requirements for the CTQs are determined.

2.3.2 Measure

This phase focuses on customer (clients) requirements. Historical data collected is used to detect those things that are critical to quality (CTQ) from customer's opinion. The process map of the current state in which the problem is occurring or the detailed improvement needed would be mapped out which will include the time, human resources and eventually the material element to ensure that the current state is comprehensible. The critical success factor relative to the customer’s quality is also established through main input and output variables. All these measures are essential to infuse the capacity and stability of the ongoing process improvement. Six Sigma places strong emphasis on measurement. Since risk in project management remains inexorable, it is advised to conduct risk assessment at this phase through instruments like FMEA.

The risk associated with the gravity of not accepting the recommended solution will be carried out. Operating tolerances will be documented and validated in order to chart the consequence of the impact on the project. According to AS/NZS 4360, the Project risk response planning should be done to ascertain different options and deciding on which actions to enhance the performance which is an integral part of this phase. Responses are checked for preciseness and cost effectiveness and are accepted by all team members involved in the project. Common strategies deployed here include:

- Avoiding the risk
- Transferring the risk
- Mitigating the risk
- Accepting the risk

The Risk treatment involves selecting a treatment option, assessing the appropriateness and effectiveness of the risk treatment option, preparing risk treatment plans and implementing
them. The accountability for taking or for not taking action remains with the Risk owner and the Risk management team approving the preferred option.

2.3.3 Analyze

At this phase, the key element is to transform the identified CTQs into physical design parameters of the project followed by a systematic identification of the design parameters that are critical. The relationship between the input factors with respect to the output factor will be ascertained. Subsequent activities such as the use of The House of Quality or process mapping should be performed at this phase and the results obtained are expected to assist in analyzing the CTQs which will be vital in decision making to improve performance. The House of Quality and the process mapping allow a team to identify, explore, and graphically display in increasing details the conditions that require improvement.

The House of Quality

- The HOQ is used to analyze the correlation between customer requirement and product characteristics
- It depicts how the numerous customers rank their requirement and a benchmark with other competitors.

The house of Quality is a place where the “Hows” and the “Whats” questions are answered. It also illustrates the correlation between the “Hows” and the “Whats”. (See appendix2.)

Process Mapping

Process mapping is described as the step-by-step explanation of activities embarked by employees as they integrate a definite set of inputs to create a defined set of outputs. According to Marrelli (2005), the resulting process maps represent the inputs, the performers, the sequence of actions the performers take and the outputs of a work process in a matrix or flowchart format which is usually done with a combination of the words and graphics. The process maps may also comprise the elapsed time necessary to accomplish each step respectively, the feedback the performers receive, the conditions of work, consequences and other essential elements.

Rummler et al. (1995) stated that before restructuring a process map, it is subservient to sketch an “Is map” which is the current state of how work is done. This mapping depicts how all functions are involved and processed which help the project team to see the critical interfaces, overlay the time to complete various sub-processes on the map, identify the disconnects (illogical, missing, or extraneous steps) in the process. It is the responsibility of the project team to document and analyze the current process and identify a number of disconnects for improvement. The process map is then constructed to reflect and improve the already existing processes.

Understanding the process map is the principal step in process improvement Projects. In fact, it remains the paradigm of Improving Project Management Performance in mobile Telecom rollout project. Rummler et al. (1995), further stimulates that a successful process
improvement project results in an affirmative answer to the key process design question. As Marrelli (2005) put it, process mapping can provide a useful method for evaluating the effectiveness of both the design and its execution which indwells both successes and problem areas. The resulting target work process is mapped before and after design and the maps are compared for efficiency and effectiveness of process execution.

2.3.4 Design

The ultimate goal of this phase is to ascertain and compile all alternatives to the existing project management model and then develop them utilizing the knowledge already generated in the project. Consequently, a more comprehensive model is prototyped. There is also an effort to identify where faults may occur and address them through modifications, thereby reducing the cost of reoccurring activities at a later stage. According to Magnusson et al. (2003), the alternative model should include a specification of content with respect to what activities, tollgates, deliverables, tools and mental model. They stressed further that in the seven-times-seven toolbox, there are instruments that can add value to the project management model like the project management tools etc. (See appendix 2 for Seven-Times-Seven toolbox).

2.3.5 Verify

The Verify Phase is the last step of the DMADV methodology for design improvement projects on existing product, processes and system. The focus of this phase is to thoroughly capture and document what have been improved and to evaluate the performance, satisfaction and results. It is therefore important to measure the performance of the modified project model for the CTQs and to ascertain if the performance is predictable or not.

By incorporating DMADV methodology, a consistent and standardized ways of design improvement project have been established throughout the process. According to Bicheno & Holweg (2009), hold the gains and verify, measure again and set new operating standard. Putting in place a change to sustain the improvement over time is challenge as we acknowledged that this part of project management does not change so fast. A principle of checks and balances is established to ensure that performance improvement continue to deliver without distortion.

Finally, the modules and experience learned in the DMADV process should be properly documented and distributed among team members together with suggestions for imminent improvement in the modified model.
3. Chapter Three: Methodology

The methodology chapter contains the practical approach of this study, it describes the method used to collect primary and secondary data, data sources and research implementation. To achieve the purpose of the thesis, case study is used as research strategy and the method to conduct the research is based on expert interview for the primary data and documents with desk research for the secondary data.

3.1 Research strategy

Case study is used as research strategy.

3.1.1 Case Study

Choosing the appropriate project to administer using Six Sigma DMADV design improvement methodology is a critical success factor for the project. One of the main success factors for Six Sigma methodology is establishing good project starting points through adequate problem definitions (James Török, 2010). Case studies provide one of these few instances of a particular circumstance with the aim of providing an in-depth account of events, relationships, experiences or processes occurring in that particular occasion (Denscombe, 2007). The adoption of case studies approach has become increasingly used in social research, especially with small-scale research.

Denscombe (2007) further stressed that the reason for concentrating efforts on one case than many is to gain a deep insight from looking at the individual case that can have wider implications and importance. Although researchers should not put their heads on one basket due to the shortcomings from case study approach such as the credibility of generalization accrual from its findings, the use of unwarranted assumptions such as “though it may be” which is perceived to produce soft data, difficulty in the choice of relevant data due to technical boundaries.

Nevertheless, the advantages of the case study outweigh the cons due to the fact that it is discovery and theory led. The case study research methodology suits our research because the relationship and processes in Improving Project Management Performance are interconnected and interrelated. According to Denscombe (2007), in order to understand one thing, it is necessary to understand many others and crucially, how the various parts are linked.

Different authors have developed extensive theories about the selection of a good project. According to Kumar, Cho et al. (2007), Selecting, managing and completing projects successfully are integral components of any business improvement effort. The provided a criterion for the characteristics of a good project selection as follows:

- The problem that is chosen in project is significant to the organization.
- The project chosen should be realistic with respect to time, cost and quality.
- The project critical success factors should have fixed parameters and be measureable.
The importance of the project is clear to everyone in the organization.
The Project should seek the backing and approval of the management.

For the case study chosen in this research, a standard procedure of fulfilling these criteria and requirement has been adopted. The case study will systematically use Six Sigma and process mapping to investigate area of performance improvement. The process mapping will help the researcher develop a system view of a situation due to the fact that it highlights the interactions of job performance level and how the job of one entity is affected by the job of others. Supporting this view, Marrelli (2005) stated that creating the maps guides the researcher through a thorough step by-step appraisal of a performance situation. Our thesis will be conducted simultaneously with mobile Telecom rollout project. The current performance state is mapped and its performance is evaluated using Six Sigma. Therefore, an accurate and trustworthy comparison between the different research strategies was performed to obtain reliable results. We constructed the process map as a precondition to complement the Six Sigma DMADV methodology taking into consideration performance improvement criteria.

3.2 Research Methods

The methods used to conduct the research are, expert interviews for the primary data and desk research along with documents for the secondary data.

3.2.1 Primary Data

It is worth mentioning that through this case study research methodology, we deployed or rather retrieved both primary and secondary data. The Primary data is said to be first-hand information retrieved directly from project management team at MTN Syria including capital project management group director, project manager and rollout manager, in addition telecom projects consultant from Aircom International. Interviews were systematically and structurally conducted through direct telephone calls, video conferences over the internet and through emails.

Semi-structured interview was used to obtain a clear list of issues to be addressed and questions to be answered. This is to accommodate flexibility by the interviewer in matters relating to changes and to broadly develop concepts and integrate it to the subject matter under investigation.

Unstructured interviews are integrated to give the researcher access to how project are currently carried out by the interviewee. This process was deployed to allow the interviewee speak his own mind about the project while gathering, assimilating and developing the logic behind their thought. According to Denscombe (2007) “allowing interviewees to ‘speak their minds’ is a better way of discovering things about complex issues and, generally, semi structured and unstructured interviews have as their aim ‘discovery’ rather than ‘checking’.”
The analysis of the results of the interviews was conducted based on gathered information on Improving Project Management Performance on telecom rollout project. This gave the researcher an in-depth knowledge on the critical factors affecting performance improvement before mapping the process and using Six Sigma DMADV design improvement methodologies to identify performance improvement opportunities.

### 3.2.2 Secondary Data

The secondary data is mainly data gathered from scientific journals, course literature books, project management reports, technical reports, web sites and databases. The literature books and scientific journals were chosen based on the relevance to our research problem which focuses on improving project management performance. We relied on articles by well-established authors in project management, Six Sigma and improving performance like Magnusson et al. (2003), Bicheno & Holweg (2009), Hayler and Nichols (2005), Kerzner (2009), Rummler (1995), Cho et al. (2007), Anne F. Marrelli (2005), etc. whose names are well known and cited in most scientific Journal.

The theoretical ideas and empirical results that were presented in these literature books were sources of inspiration and guide towards achieving our goal in performance improvement. Nevertheless, this involves gathering data from different sources such as existing research, published information, statistics, etc. According to Denscombe (2007) documents can be alternative to questionnaire, interviews, or observations as a source of data. Documents as a research method can include government publications and official statistics, information from journals, textbooks, magazines, newspaper articles, and other printed materials, in addition to electronic materials from the internet.

The data collected in this thesis includes information and existing measures covering performance improvement under our investigation. However, there are limitations in the use of secondary data which according to Denscombe (2007) is perceived when researchers use documents as a source of data. He stressed that they heavily rely on something which has been produced for other purposes and not for the specific objective of the investigation in question.

### 3.3 Analysis

The analysis in this thesis was done based on theoretical framework of existing project management models. Furthermore, Six Sigma DMADV methodology was used to identify project management model improvement opportunities and other implementation of data gathered through the interviews. Where sequence of the theories brings up an academic view, the result of interviews provided more clearly a practical view that can easily be connected to existing performance improvement methodology. There are two ways to analyze data which Miles el al., (1994) described in their book, namely within case and cross case analysis. Within-case analysis deals with data analysis a researcher can apply for a single case study. It compels the researcher to go within the case and compares it to previous research whereas the cross case analysis requires the researcher to compare one case with respect to another. In our
thesis, we are going to apply the most appropriate case analysis to our empirical data which will inevitably make sure that our gathered data answers our research problem and aim to bridge and support improving project management performance.

4. Chapter Four: Empirical Framework

The case study is based on the information of different mobile telecom site rollout projects done by MTN Syria which is the leading provider of mobile services in the country, and it is part of MTN Group, a multinational telecommunications group, operating in 21 countries in Africa and the Middle East.

The information was gathered primarily from interviews with project management team members with different responsibilities within the site rollout projects, in addition to a consultant and expert in telecom projects from Aircom International.

The following points were addressed during the interviews:

- Understanding the site deployment process.
- Understanding how the project is executed.
- The role of the project manager in the company.
- The challenges that faces the project manager.
- The causes of project underperformance.

Supportive and secondary information was gathered from different sources including technical reports provided by the interviewees in addition to literature, books and scientific articles about telecommunication network rollout projects. Finally a thorough examination of the gathered information has been performed to provide a comprehensive and simplified view of the project.

4.1 Mobile telecom site rollout project

The deployment of new mobile telecom site usually done through different successive processes, a little variation could be identified in these processes depending on the location where the site will be built and installed. Basically, based on their location, we can identify two types of sites:

Greenfield Sites: Sites installed in rural or nonurban areas in open terrain such as fields, desert, mountain, woods, etc. This type of sites is usually erected with a tower and is normally intended to provide coverage in a wide open area of several kilometers.

Rooftop Sites: Sites installed on buildings in urban areas and are usually intended to provide coverage in dense area in towns and cities.

Whether it is Greenfield or rooftop site, the different phases of mobile telecom site deployment encompass four major processes, each of them comprise numerous sub-processes
that are performed by different teams from the operator’s different departments in addition to subcontractors who are usually assigned to carry out the site construction work.

The early phase of mobile telecom network deployment starts with strategic planning done by top management of the company where network architecture, design, strategic coverage plan and rollout roadmap is set up typically for five years. Then the strategic plan is divided into yearly operational plans which are executed in the form of monthly rollout projects.

The yearly operational coverage plan is always tailored and adjusted to fit into the business objectives of the mobile operator which exists to serve the customers in the best possible manner, therefore the input of commercial departments and the customer care department is a key element in identifying the network expansion requirements. The call center in the customer care department has a dedicated team for customer complaints regarding the network problems; its main function is to gather detailed information about the customer complaints in different areas where the operator has its coverage. A special application is used to record every single detail about the problem, its technical description, location, duration, etc. Figure (6) illustrates a snapshot of the customer complaint form application.
Another important input to this process comes from the marketing department, specifically from the market research team who can provide valuable information about the customers’ needs, geographic and demographic distribution, income level, trends and habits related to mobile phone usage, etc. Sales department has also valuable input regarding potential customers that need to be provided with the network in order to acquire them as new subscribers.

4.1.1 Site rollout processes

**Site planning and design**

The site rollout process starts when the site is included in the monthly rollout plan. The planning engineers start to do their virtual assumption to simulate where the site should be located, how the site coverage should look like and what are the requirements considering the terrain and population in the area. This process ends with the submission of the technical site survey report.

**Site Acquisition**

After the planning phase, the site acquisition work begins through a team from the administration and legal department whose task is to initiate a long and rigorous process of negotiation with the property owner or landlord to finalize the necessary administrative, legal and financial aspects of the contract that will permit the operator to use the chosen location for building the site.

**Site construction**

Once the site acquisition is completed, the work of an assigned subcontractor starts to prepare the necessary foundation and structure to build the site and install the equipment. The work in this step varies tremendously depending on the special requirement of the site location and type. This step includes land preparation, excavation, building access roads, tower and shelter building etc. this work is known as civil work (CW). Once the necessary preparations has been created the technical equipment installation (TI) starts, this includes the installation of infrastructure equipment i.e. base station, microwave equipments, etc. in addition to the electrical engineering, cabling work, power generator, air conditioning, firefighting system, etc. many teams of engineers and technicians are involved at this phase.

**Site integration**

The final step in this process is to integrate and configure the different network elements, hardware, software and applications into the existing infrastructure network and perform predefined set of tests for each element of the installed site as well as a comprehensive test for the whole system to ensure that the site is meeting the demand of the final cell plan and overall level of network performance. Once the work is completed and approved, the site is commissioned and formally handed over to the operation and maintenance department to be put into service. Figure (7) illustrates the flowchart of the site rollout different processes.
The next section includes presentation of the technical department at MTN Syria including the project management function inside the department, in addition to a view of how the project of site rollout is planned and executed.

4.2 Project management and the technical department structure at MTN Syria

The technical department at MT provides a complete portfolio of telecommunications construction, engineering and operational services that are run throughout the country with teams from different departments carrying out the daily work. The project management function is part of the technical department structure; it falls under the capital project management group in a subgroup called Project Management Office (PMO). In the project management office we find several project managers each of them has the responsibility of the projects in one zone, i.e. the projects are geographically divided into different regions and each region is assigned to one project manager who will be responsible for all the technical projects in his region.
Within the scope of one project, tasks and processes are carried out by teams from different technical groups in the technical department. Each team is reporting to a line manager in the sub department they belong, the efforts and work of all teams are coordinated, followed up and monitored by the project manager responsible for the project.

To better understand the function of the technical department and the relation between the Project Management Office (PMO) and the different groups and subgroups, a short description of the structure of the technical departments and its units is provided.

In the technical department there are three major groups, Radio Network group, Capital project management group and Operations group.

- The Radio Network group is responsible for all the work related to the radio network. The work is done by dedicated teams of personnel, mainly engineers, who perform radio planning, design and optimization including BTS, BSC, microwave and transmission planning, switching dimensioning and design, network performance
monitoring, etc. Intelligent Network (IN), Billing and Value Added Services (VAS) are also a subgroup in the Radio Network group.

- The second group is the capital project management group which includes subgroups of mainly non technical teams working in vendor management and subcontractor relations, site acquisition, governmental relations and the rollout team who is responsible for installation and production including civil work, electrical work, cabling work and site equipment installations along with testing and commissioning. This group also encompasses the Project Management Office unit where project management function is found.

- The operations group is mainly responsible for operating the existing network and making sure that it performs with good quality and generates the foreseen revenue. The subgroups found under the operations group are: the Maintenance and support unit which is responsible for providing turnkey corrective & preventive maintenance for all elements and sites within the network. The finance system and revenue assurance that handle the financial revenues generated from the network usage by subscribers. And finally, the quality assurance unit which is responsible of keeping the network in the best possible performance.

4.2.1 The function of the project manager in the site rollout project

The project manager role covers the entire site rollout from network design and planning to site-on-air phase with a final target to meet the project goal and finish on time within the budget and the predefined quality.

The deployment of several sites is usually undertaken simultaneously, this will require the involvement of many resources that should be properly allocated and managed in order to avoid costly bottlenecks or other issues that could affect the execution of the project.

It is also the responsibility of the project manager to coordinate the work of multiple teams and groups towards harmonizing all the efforts to get the work performed right the first time with optimum quality. Intra-team communications is also regarded as the responsibility of the project manager during the project execution. Another important responsibility of the project manager is to create database for all sites in the coverage plan and follow up the progress of work in each site. Nevertheless, the ultimate function of the project manager is to synchronize the different processes with the project deadline.

The project management in the mobile telecom site rollout project has to find the balance between using the available resources while working to meet the needs and expectation of the stakeholders within the scope, time plan and budget of the project.
4.2.2 The scope of the project management activities

The scope of project management activities in site rollout projects covers:

- Rollout of sites in the coverage plan
- Site planning and transmission (survey, layout and design)
- Site Acquisition (permits, contracts, leasing)
- Site Implementation (construction, installation, integration and commissioning)
- Coordination and Liaison (teams, subcontractor, vendor, logistics, warehouse)
- Quality Assurance and Auditing (Activity monitoring, reporting)
- Project Commissioning and Closure

Challenges facing the project Manager

The major challenge for the project manager is completing the site rollout project on time, within the budget and scope. In addition to various technical and non-technical related issues that usually encounter the execution of the project and lead to delays in completion, there are factors related to the way the project is managed which affects the performance of the project and might directly or indirectly contribute to the underperformance and delays of delivering the site on time. Three major factors recognized are:

- **Lack of control over the Project execution**: the project manager coordinates and monitors the work of different teams within the project. However, when the project work encounters difficulties at any stage of execution, the responsible team tries to solve this with their line manager or team lead, in most cases the project manager will be only notified with this issue in order to update the status of the site in his data, however, the project manager does not have enough power to get involved in addressing and troubleshooting the encountered issue.

- **Need for more standardized documentation and reporting**: silo-like phenomenon prevails across departments in the project, especially within technical personnel who used to be so caught up with the work under their responsibility and consequently they used to produce and maintain documents and reports in the way that suites their work in the department, this leads to different teams using different reporting and documentation processes, which at the end challenges the effectiveness of the project management.

- **Need for better project communication**: like documentation and reporting, the silo phenomenon affects the communications between the people and teams working on the project, there is a need to regulate communication within the project so that all project people and teams use timely communication and proper methods, channels and format to ensure effective flow of information.

4.2.3 The project management model used for site rollout project at MTN Syria

The technical department at MTN Syria is using a generic model that takes the waterfall lifecycle format; i.e. it is a linear sequential development model with different stages with clearly defined deliverables from every stage.
The model encompasses four stages which are described below:

**Project definition phase**
The primary assignment of the definition phase in the telecom site deployment is setting project objectives, identifying the specifications and requirements of the project and defining the required outcome based on these requirements and specifications. The definitions are done with respect to the project schedule, budget and scope. The project manager updates the rollout plan with the sites that should be deployed, with all necessary technical and non-technical specifications of these sites, in addition to the general requirements to carry out the project. The definition of the requirements and specifications of the project is done in collaboration with the technical line managers and team leads who will carry out the deployment of the planned sites. The overall goal is divided into sub goals and set of processes that lead to accomplish the project objectives. To achieve the objectives of the project, an action plan is developed with description of the desired results out of each action in this plan.

In this phase, the project manager develops the project charter with clearly defined project start and finish date, project objective description, departments and teams involved, roles, responsibilities and authorities necessary to deploy the allocated resources to the project activities. Stakeholder’s identification is part of the project definition phase. Project stakeholders are people, organizations or entities who are interested in the project, its objectives, goals and outcomes, in addition to those who are involved in setting the project objectives, specifications and requirements, etc. The project manager is responsible for identifying and managing the project stakeholders, this include internal “organizational” stakeholder like executive officers, line managers, employees, and external “product/market” stakeholders such as subscribers, subcontractors, vendors, general public.

Upon the completion of defining the project objectives, specifications, stakeholders, and establishing the broad framework of the project, the project will be moved to planning phase.

**Project planning phase**
Project planning is about integrating all the activities necessary to develop a project plan. Proper project planning is crucial for successful implementation of the project. The planning phase includes planning the project scope, scheduling the activities and setting timeframes and milestones, budgeting human and financial resources.
Project scope planning: This involves planning the number of sites to be deployed, their types and specifications. It also involves work breakdown structure; this entails identification and description of all the work, tasks and processes that have to be performed to successfully deploy the sites.

Scheduling project activities: The project manager incorporates the schedule for site rollout plan with milestones and timeframe for the sequential tasks that comprises the project execution process. The input of different technical teams is needed to specify the time required to complete each task and process in the project. Subsequently, the project manager uses project management software, namely Microsoft Project, to automatically create project time plan with Gantt chart illustrating the actual schedule of the project with activities, durations and sequences based on tasks’ start and end dates.

Planning project resources: The input from the involved technical teams is used by the project manager for man/hour estimation, i.e. estimating necessary manpower and time needed to complete each phase, step and process in the project. Planning other resources, such as competencies, tools, materials, equipments, etc. planning of work by subcontractors and suppliers is also included.

Budgeting and cost allocation: the project manager work on project budget planning in cooperation with the line managers in technical department and financial planning in the finance department. This includes cost estimation for the manpower and labor resources that will contribute in carrying out the project and the cost of equipment, materials, tools, etc. budget allocation and cost breakdown to all activities and personnel is determined and integrated into one project financial plan.

Other planning for risk management, communication procedures and guidelines, issues management, etc. is also done in this phase.

**Project execution phase**

Project execution requires the integration of the planned resources, activities and tools necessary to put the rollout plan into action. The execution of the project is a collaborative effort between the project manager, various teams in the technical department, and teams of subcontractors and external suppliers.

The project execution starts with kickoff meeting where the project manager and the line managers and team leaders in the technical department discuss the sites which should be put on air during the month and the current status of the work in each site. Accordingly, a detailed time plan for the remaining work is agreed upon. The list of sites is discussed and confirmed according to the priority of the operators’ network coverage, quality, marketing and business requirements, taking into consideration the availability of resources, equipment and manpower.

The project manager monitors and follows up the execution of the project and reviews each completed step on daily basis to make sure that the executed work has been done according to
the plan, any deviation from the schedule has to be reviewed and any change in specifications or in the quality of work performed has to be inspected and corrected.

Weekly status meetings are also held between the project manager, line managers and team leaders to discuss the progress of the work in the site rollout plan. The need for including new unplanned sites in the rollout plan can emerge due to changing in priority of covering certain area, this will leave the project manager in contingency situation to secure the necessary resources and materials, to change resource allocations, schedules, priorities, and to integrate and communicate changes to the project teams.

Like in all projects, completing the site deployment on time within the assigned budget and scope is always challenged with difficulties, risks and unforeseen factors that cause deviations and delays. Some of the sites in the rollout plan cannot be brought on air according to the schedule, the major reasons behind the delays are:

• Many steps in the site rollout process take longer time than they should due to many internal factors related to different processes of the project, or to external factors related to logistics, governmental and legislative, weather conditions. Some of these factors are:
  o Access restriction to site location to start the site planning work.
  o Site rejection, for technical non-feasibility.
  o Reworks for work not properly done.
  o Delay in handover between teams and phases.
  o Availability of human resources.
  o Stopped negotiation with landlord/owner, owner rejection.
  o Logistics, vendor and supplier equipment delivery delays.
  o Problems with licensing and permissions.
  o Harsh long-lasting weather conditions (mainly affect civil work).

• Shortcomings related to the way the project is managed such as:
  o Lack of sufficient control by the project manager
  o Communication inadequacy (between people or departments)
  o Different documentation and reporting practices.
  o Coordination issues.

The project manager maintains and update site database which includes all information and input from different site rollout phases in order to use it in monitoring and reporting. Monitoring the progress of the work in each phase is done by tracking the output of every team. Progress reports are maintained with details for each site in the plan and its current status. The action plan is continuously reviewed and revised according to the current status of each site; corrective action will be taken accordingly when needed.

Reporting the progress of the project to the senior management is done by the project manager, this requires the project manager to gather the input of all teams working on the project and to summarize the detailed technical reports and other documentation provided into a comprehensive project management report. The project management report is discussed in
monthly board meeting and necessary changes, revisions, approvals and actions are done in this meeting. The project management report covers the major aspects of the project, i.e. schedule, budget, resources (financial and human), equipment and materials.

The balance between the need for speed deployment of new sites in the network and the quality of the work performed challenges the capabilities of the project manager. The executive management and other stakeholders always push towards speeding up the network deployment to achieve maximum coverage in shortest time possible, since the faster the network is rolled out, the faster the revenue generation and return on investment are. Nevertheless, the focus of the executive management is on meeting coverage targets at minimum level of investment i.e. increasing the efficiency of network deployment by achieving maximum coverage with minimum number of sites possible and consequently reducing the capital expenditures.

**Commission and Close**

Once all activities are completed, the result of the project is accepted, “As built” report is prepared and submitted, the site is commissioned and handed over to the operation and maintenance team who will run the site and put it in service. The project manager marks the site as done in his database, prepares final reports and documentation, close the project financial accounts and coordinate with the finance department to settle all pending payments and invoices, document issues and problems that the project encountered and the action taken during the execution of the project to be used for reference in future projects. Finally, the site folder is handed over to the operation group to be used in further optimization and maintenance work.

### 4.3 Applying Six Sigma into project management

The application of Six Sigma in process and design improvement usually follow well-established methodologies, however, when the question is about how to improve the way projects are managed, there is no defined methodology available, this is because every project can be improved according to its specific features and needs. Improvement methods can be customized and combined with other tools of Six Sigma that can help in the very project under investigation.

Numerous projects that adopt traditional project management model suffer from variation between the planned and the often realized resource utilization, moreover, such projects are more likely to experience deviation between the planned and the realized completion date.

Six Sigma enhanced project management models contribute to more effectiveness in project’s results compared to the traditional models. In the enhanced model, the realized completion is closer to the planned date and the utilized resources are closer to the budgeted ones. Drawing the planned and often realized curves in projects elucidate the advantages of the Six Sigma enhanced models.
According to Magnusson et al. (2003), Six Sigma enhanced project management model is more likely to follow the planned curve than a traditional model. This is mainly because the enhanced model is characterized by:

- Better management of variation and critical to quality characteristics (CTQs).
- More accurate project start.
- Investment of more resources in the early stages of the project
- Avoiding costly fire fighting once the project nears completion.

One of the known methodologies that can be used for project management model enhancement is termed DMADV (Define, Measure, Analyze, Design, Verify). This methodology is used for developing enhanced project management models that contribute to better project performance. It allows the management to investigate and analyze the current model, identify drawbacks and weaknesses in it and develop a revised model that should work better in the project.

In the following section, the DMADV method will be applied to the current project management model used by MTN Syria for telecom site rollout projects.

**Define**

The ultimate aim of this phase is to thoroughly examine and identify how the work is currently done by properly investigating the contemporary status of the project management model in place and the problem with the existing model. We questioned the current practices
and were able to discover few problems associated with how the work is done at the moment. One of the major problems is that the project managers has only monitoring, coordination and reporting function over the work of the teams and the departments involved in the project including the subcontractor work.

Another illusive problem is that different teams in different departments are working in silo mindset, the functional teams like engineers, technicians, administration staff are focusing on the technical aspect of their job overlooking the project management side which is important i.e. they are more interested in what goes around their department and as a result, are held accountable with what goes within their department. The project is rigidly scripted and mapped. There was no adequate controls of authority over other departments due to the fact that the project management model is not standardized enough to routinely follow procedures and activities as the requirement might demand. The project management model is not adequately measured and monitored with respect to the input and output.

It remains inevitable at this stage to set quantifiable goals from the telecom project perspective and stakeholders through adequate development of the project and team charter. By so doing, we are blocking the chances of reoccurring activities thereby saving a valuable time. In mobile telecom rollout project, Six Sigma requires a business process management that delivers significant and confirmable business outcomes at the end point through improving project management performance and arguable reducing variation. Thus, Magnusson et al. (2003) supported this argument and reiterated that six sigma offers a robust link amid customers and internal processes and services of the organization including measures of improvement.

Subsequently, a suggestion for the critical to quality characteristics for the enhanced project management model is endorsed, validated and the proposal should be complied and submitted to the senior management who will decide when to lunch the proposed design improvement model on the current project management model. At the end, customer requirements from the CTQ can be retrieved and incorporated into the project management model.

Furthermore, projects are initiated to improve the performance of CTQs by means of process improvement, design improvement and project management. Critical to quality are those elements or offer that a client regard to conform to his expectation, compliance and process. For improving our project management performance, the CTQs have been identified in alliance with the theories we earlier described as the following.

Critical to Quality for the anticipated enhanced model are:

- Project lunch on target (date and resources)
- Project deliverables in accordance with the specifications
- Resource utilization on target (cost – hours)
- Control over the work through all project phases
- Accurate project completion.
- Sufficient support for project management function
- Adequate Standardization of reporting and documentation.
- Effective communication scheme

Additionally, process mapping is used to systemically view the interactions, sequence of actions performed in the project and the outputs of the work process at a given time. The process mapping is basically a graphical representation of the work and processes carried out within the project; it is used as a tool for visual analysis and a method that provides better view of the existing project work under investigation.

![GSM Site Deployment Process Map](image)

**Figure 12 Site rollout process map**

The process map enables the identification of lapses, inadequate work support, the workflow and other impediments that may hamper the performance of the project. The amount of time and process it takes to co-ordinate the various teams is much denoting that it takes rigorous time from one department to the order. There are numerous factors believed to have an impact on the time factor such as the communication, control, coordination, negotiation, etc. Whatesoever the reason of this time and performance is, the ultimate aim for project management is to minimize and improve it.
Measure

Once the current project management model is examined and the critical to quality characteristics of the prospective enhanced model are identified, evaluated and shortlisted; The performance of the identified CTQs should be monitored and measured by inspecting the data from projects currently under execution or by looking to data from previous projects.

First a measurement plan is developed to specify how the data should be collected, what types of characteristics are necessary to be included and how the collected data should be used. The next step is to put the measurement plan in action to collect the data of the CTQs performance.

For the identified CTQs of the Mobile telecom site rollout project management model, a measurement of a current project can inspect the following characteristics:

- Number of sites that were timely planned and completed according to schedule.
- Number of sites that needed extra resources for site acquisition
- Amounts of extra resources needed.
- The effectiveness of reporting system with subcontractor for civil work and the technical equipment installations.
- The degree to which the completed sites are matching the set specifications and the user requirements.
- Efficiency of the communication between different teams in one department and inter-department communication.
- Processes and steps that experience delays.
- Frequency of cause of delays in each process.

The measure phase should also include risk assessment. Risk assessment is part of the risk management which is one of the fundamental functions of the project manager; proper application of risk assessment will definitely contribute to the success of the project.

Risks in the project will have impact on the effectiveness of the project management model and the performance of its critical to quality characteristics. Therefore, conducting risk assessment should complement the measurement of critical to quality characteristics. Risk assessment includes risk identification, analysis and evaluation.

The risk in the telecom site deployment project can be classified into four main areas:

- Risk related to the technical work in the project, this includes risks in the different phases of site deployment such as.
  - Inadequate technical competencies.
  - Unsuccessful lease negotiation
  - Site cancellation
- Risk related to project management of the project such as:
- Risks in project development phases i.e. project initiation, planning, execution and closure. This includes risks in scope, schedule, budgeting, resource allocation, etc.
- Risks related to manpower availability and competency.
- Risks related to vendor, subcontractor and logistics such as:
  - Risks in vendor equipment delivery.
  - Risks related to the reliability and integrity of subcontractors
  - Risk in transportation of people and equipment
- Risks related to external factors such as:
  - Legal and governmental risks.
  - Weather conditions.
  - Lack of security in remote areas.

Once risks are identified, they should be analyzed and assessed according to the likelihood of occurrence and consequences of the risk, this can be done by using risk matrix, subsequently the risk is evaluated against set criteria and risk response plan is created. Risks should be documented and continuously monitored and controlled.

**Analyze**

The analyze phase in six sigma focuses on determining the root causes of the variation. It is vital to study the already collected data’s (CTQs) in the preceding step based on the significance to the project and to find reasons behind their critical source of variation. Major steps and techniques include using the CTQs and process map to access the job processes. Based on the assessment of the collected previous data, it is necessary to identify potential drawbacks and then classify their causations, then propose suitable reactions to address those drawbacks.

**Identifying the Cause of Variation**

The main element of the analyze phase is to classify the issues that require the utmost responsiveness based on the CTQs variations. The control over the work through all project phases varies tremendously due to the fact that various stages lack follow up measures from the project manager to contribute information and recommendations to the strategic plans of the project. In order to conduct a proper investigation and analysis of variation in the CTQs, it is beneficial to classify the overall project and identify the critical source of variation. One of the causes of variation in the site rollout project is inadequate standardization of reporting, documentation, workflow and processes involved in the pre and after site rollout process and activities. Another eminent problem in the case study is cost overruns as a result of project not completed on time and resources not underutilized.

Cause and effect diagram will complement the measuring step, cause and effect diagram is one of the seven quality control tools and it helps to identify the root causes for deviations and delays in the project critical to quality characteristics.
Conferring to the case study at MTN Syria, An illustration of the result and reactions identified through the fishbone analysis is demonstrated below.

Result: Impairment of materials used for the installation in site rollout project
Reaction: Use special packaging materials for fragile goods in order to prevent damages during transportation.

Result: The delays at customs due to ineffective payment of customs duty
Reaction: Get business assurance coordinator involved to solve this problem

Historical records of past project are also essential to track down the root cause of these problems. By doing so, the project manager will be able to predict the performance of the ongoing projects in relation to the goal of the project depending on the analysis done on the root cause of these problems.

Most of the delays that are encountered during the installation of equipment are caused as a result of materials not available on time. Delay at the site construction which resulted to lengthy installation period of the telecom equipment is caused sometime times due to bad weather conditions, inadequate materials and some technical issues that are accrued as a result of improper planning. Although these problems can be mitigated with adequate risk planning, it however, remains an impediment that causes the major delays of projects at MTN Syria. It is the responsibility of the project manager to configure the project management plan which will outline proactive measures necessary to complete the project on time, on agreed budget and within the specification required by the project charter. As part of this phase, the project management teams should examine all possible root causes of these delays and incorporate the project management plan to solve them during the next design phase.
The communication in the cause and effect diagram implies failing or missing to attend to the required emails and meeting request which is an integral part of the planning information needed to facilitate the project. These in some way adversely hamper the progress report. A good policy, defining how project are carried out and the expectation from project team members adhering to a standard working procedure is essential to foster the goal of effective communication. These instruments will guarantee that when communication and coordination is passed among team members, there is a system in place to confirm that it is appropriately implemented.

As part of the cause of project delays at MTN Syria, the control over the project phases becomes critical. The project manager is charged with the enormous responsibility to ensure that their understanding and management of the different phases are adequately maintained with the project schedule. Suitable project assurance team such as the business assurance coordinator, technical assurance coordinator, user assurance coordinator is selected to control specific project phase. The best standards for project reporting and project documentation should be communicated to the various team members to avoid role conflict and misunderstanding of the project goals and objective. It is vital that the team members do not interpret project documentation as the end job of the project but as part of the integral process of improving Project Management Performance, the focus needs to be directly on removing variation from the project and improving performance.

**Design**

This step involves developing an enhanced project management model which can cover the shortcomings of the existing model. The major issue in the existing model is the lack of control over the work executed by different teams throughout the project, the need for more integrated reporting and documentation system, and the need for better communication scheme. Therefore the new model should include a mechanism that allows the project manager to have control over the project. The control should be through all project phases with focus on implementation and closure phase, it must also give the project manager objective and visible means of comparing the actual-to-predicted performance at anytime during the project. The model also has to aid the project management function in assuring proper and timely reporting and documentation for all steps and processes of the project; moreover, it should enhance the communication between all project teams and stakeholders.

One generic and widely used project management method is (PRINCE) model; the term comes from the concept of “Projects In Controlled Environments”. This model features structured way for more effective project management and permits more control over the project, it has a unique characteristic called “assuring progress” which allows follow up, monitoring and controlling the progress of the project from three different interconnected perspectives; namely, technical, business and user. The “progress assurance” is normally carried out by Project Assurance Team which is a centralized group of professional staff who have the skills necessary to support the project management across the organization. The team encompasses three coordinators working on the project side by side with the technical staff and reporting to the project manager. The three coordinators are:
**Technical Assurance Coordinator (TAC):** Who has a supervision role over the technical aspects of the project and has a task to ensure that project execution does not get into technical difficulties. The technical assurance coordinator should have a technical background in telecommunication with sound understanding of the telecom site deployment processes and procedures in addition to strong project management skills. The TAC should be involved in all project management phases and should contribute to the effectiveness by:

- Working proactively to identify potential obstacles that might encounter the technical processes within the project.
- Tracking punch points and propose solutions in coordination with the technical teams.
- Deploying best practices and learning points from previous projects.
- Supervising and ensuring smooth handover between different phases of the site deployment project.
- Recommending necessary countermeasures for good work execution.
- Ensuring the quality of work performed in each phase of the site deployment.

**Business Assurance Coordinator (BAC):** Responsible for monitoring and reporting the project progress from the business perspective, in addition to making sure that the project is aligned with the business mission of the organization and corresponds to its objectives. The business assurance coordinator should have strong business management skills with focus on telecom business in addition to sufficient understanding of the technical aspects of the site deployment project. The BAC will help in project administration and contributes to the performance enhancement through:

- Monitoring the progress of the project activities versus the project plan.
- Liaising between different teams and other assurance coordinators.
- Appraising change requests and their effect on the project progress.
- Assisting in subcontractor and supplier relations.
- Ensuring that the project deliverables meet the business requirements.
- Ensuring quality control from the business perspective.

**User Assurance Coordinator (UAC):** Who represents the user of the project’s final outcome. This coordinator can be a representative of the technical department with technical background, it is important that the UAC understands the requirements from the project’s final product. Major contributions by the UAC are:

- Liaising with project different teams to ensure user’s interest, needs and expectations.
- Representing project’s external stakeholders’ interest.
- Monitoring and reporting user related issues.
- Insuring that the outcome of the project is in line with the users interest.
• Assisting in project overall appraisal review.

The project assurance team should have particular expertise in the area they are responsible for, in addition to very good project management knowledge. The project assurance work should be applied throughout the project in an instant manner in order to avoid bottlenecks and unexpected difficulties.

The primary purpose for introducing the project assurance team in the site deployment project is to help the project manager in addressing the challenges that encounter the project management i.e. the control, documentation and reporting and communication issues.

The project assurance team has invaluable role in helping the project manager to strengthen his authority over the project work. Regular visits to the site location where the work is being executed helps the project management to have instant picture of what is going on, and what bottlenecks might encounter the work, subsequently, the issues are taken and discussed with the responsible manager or team leader to see how the actions should be taken to address the encountered issue. Thus, the project management will be part in deciding the best solution for problems. In respect to project schedule, the progress assurance team should assist in better control over the project time plan by inspecting milestones, and checking tasks completed versus timelines. All this should reinforce the project management control over different phases of the project.

Tackling the communication issues in a project is not an easy task especially when the project involves large number of people in different teams. A common phenomenon in the project is that not all personnel hold sufficient level of effective communication within the project. Moreover, some employees do not follow the proper procedures in communication within the one team or with people from other teams; they use, for example, informal, verbal, face-to-face and telephone communication when they are supposed to use more formal communication methods. Informal or unofficial communication are regarded by some project personnel as practical and easy way to exchange and convey information, however they are not recommended since they might result in missing or misunderstood and therefore lead to conflicts, delays and problems. Formal and official methods such as documented and written communication, emails, memos, and paper correspondences, official meetings, etc. are always recommended although they are not as fast as informal and direct communications.

The involvement of the project assurance team helps in ensuring effective communication within the project. First the coordinators contribute to the communication plan which should clearly state project communications guidelines, this should be as specific as possible so that it defines the information flow channels and methods, what information should be communicated to whom and in what format, also the timing and who is responsible for the communication should be predetermined if possible. Subsequently, while interacting with all teams across the project, the coordinators monitor the adherence of the people in the project to the set communication procedures, appraise the used communications and identify improper practices that need correction. This will help people working in the project to have the right
necessary information on time, the thing which will consequently lead to better performance in project execution.

The project assurance team can help also to standardize the reporting and documentation function across all units and teams throughout the project different phases. Different styles in reporting and documentation can hinder the flow of work between departments. If an instruction or an order is not properly described and explained in a document, it will require asking for clarification, this will take time and delay proceeding with the order or the request. Likewise, if a report is not properly produced, it will affect the reporting done by the project manager as further corrections might be requested and so on. The project assurance team helps the project manager in setting measures and processes that all project members must follow, and deciding upon definitions, templates and forms that should be used by everyone throughout the project. The project assurance team will also help in directing the administrative function for proper way of maintaining and documenting the project records, plans and papers, in addition to ensuring backup copies for all project documentation and data.

Deploying the function of progress assurance through the project assurance team requires investing more resources in the early stages of the project. However, it will be a valuable contribution towards starting and completing the project on time through controlling the critical to quality characteristics of the project, closely monitoring its progress, and taking timely corrective actions when needed.

Redesigning the project management model to include a control phase aligned with the execution phase and incorporating the project assurance team into the project management model can improve the efficiency in project execution and empower the control over the project different phases, it will also emphasize the project management mindset across teams and moreover, it will accentuate sense of discipline in the project through:

- Providing the project with effective control support.
- Tracking problems and difficulties once they occur to instantly tackle them.
- Contributing to effective quality management.
- Improving the communication within the project.
- Managing standardized reporting and documentation in the project.
- Provide valuable feedback about the different project management phases.
As proposed, the project assurance team should be involved in all the processes in the project across all project phases, therefore it should be added to the process map.

Finally, in order to get the desired improvements out of the proposed enhanced project management model, the commitment of the senior management must be guaranteed to support the application of this model and to ensure that all necessary requirements and changes are approved to guarantee successful implementation.
Verify

Successful deployment of six sigma enhanced project management model depends on the way the project members embrace and adopt to the applied changes, the interaction and cooperation with the introduced project assurance team and the credibility in the project management function. Therefore, the integrity, support and commitment of the senior management is crucial. It is absolutely important that all people involved in the project to understand the idea behind applying the changes and to be informed that the changes are mainly deployed to cover the shortcomings of the project management model and not because poor performance by certain team or by individuals. The changes should be properly communicated with all project members and staff and one language should be used throughout the project to communicate the new expressions, processes and practices and to ensure that they are well understood and adopted. Moreover, it is equally important to make sure that the right mental model exists across the project so that the new model is smoothly adopted and verified.

The wind of change is blowing and telecom companies need to be more flexible to survive with customer’s expectation and requirement. Meeting customers requirement remains inevitable otherwise customers will switch to your competitor. The shareholders themselves are demanding for a better return on investment otherwise they will flip their investment elsewhere. We must continually improve and serve our shareholder needs.

Change remains eminent in MTN Syria hence the main objective is to improve current practices. In order words, the encountered problem is impacting some of the changes on the technical workforce due to resistance to new ways of running effective project management. To ensure successful application of the enhance model will require the project management team to apply structural element of Six Sigma framework to stimulate changes such as training, measurement system and dedicated roles for performance improvement. The adaptation and implementation of the changes will rely heavily on the employees at the technical department of MTN Syria.

One of the well-known models that could be used to introduce the needed change in the project management model is John P. Kotter’s eight steps towards leading a successful change which embeds establishing a sense of urgency, creating the guiding coalition, developing a change vision, communicating the vision for buy-in, empowering broad-based action, generating short-term wins, never letting up, and incorporating changes into the culture.

As the enhanced model is developed according to the requirements derived from the organizations’ needs, it should be put into application in coming projects and the performance of the identified CTQs must be measured to see if the new model managed the shortcomings and realized the foreseen improvements. Learning points and experiences of the project should be recorded and shared. Also recommendations for further improvements should be provided.
5. Chapter Five Discussion and Conclusion

The thesis was adopted to help the development of project management in mobile telecom projects. The goal of the thesis was to use Six Sigma DMADV methodology to enhance project management performance in telecom project. DMADV is an effective methodology use for improving processes and management projects. Due to its dynamics in the enhancement of management project performance based on data and timely identification of measures of success, it will absolutely require the commitment of the senior management. At the inception of this paper, A lot of research work such as data collection, analysis, evaluation was conducted which were meant to answer the research questions. Based on the goal and suggestions derived from the research, a concise project management model for mobile telecom site rollout project was integrated. During this process, some new phenomena were injected with the help of brainstorming to facilitate the ongoing Projects. The result and analysis in this thesis can be recommended for improving project management performance in mobile telecom site rollout projects.

Process mapping was used to systemically view the work process and the interactions between different teams and departments at a particular time. Once a process is mapped and understood it becomes easier to spot ineffective communication and what is needed to facilitate the workflow. Furthermore, alternative methods were generated and chosen based on the analysis and process mapping that was conducted for the case study with respect to meeting the deadlines and specifications i.e. the performance. As a result of the analysis, an ultimate proposal was integrated in the process map to enhance the performance of the project. Alternative methods are evaluated and enhanced processes are established based on prioritization of the processes involved that will yield the utmost effective outcome before integration into the project management model.

After analyzing the data, the research was able to identify that the project assurance team should perform periodical site visits to check the performance of work on site on every stage of the construction as well as verifying at the end of site completion that the result is in line with the documentation process and specification. A project management support team is created to deal with different processes in order to reduce the time factor in the case study. The technical department should take necessary actions with the aid of the project management tools to have all job delays resolved at a reasonable time in order to meet the deadline of the project. The project team should also make sure that the Project deliverables are in accordance with the specifications in the charter and that the main functions within the requirements are prioritized.

Proactive planning helps in increasing the efficiency of the overall site acquisition processes by focusing on the key areas that cause delays for their improvement. A periodic weekly seminar between the project manager and the responsible team leaders should be convened to discuss the plan progress and the twisting issues. The concept of delays in key deliverables resulting to cost overruns as raised in this research has been answered as the paper focuses on to improve the performance of mobile telecom site rollout project. DMADV methodology was adopted in this paper to sort out time delays based on its bad impact to the project performance. By adopting the suggestions in this paper, Project managers will be able to monitor any performance improvements or dilapidations within mobile telecom site rollout
project. Project management team should consistently follow up the time schedule and report any delays in the schedule with the different teams. All the DMADV requirements can't be defined by strict procedures, as they depend on the availability of information project team members. The experience of qualified project manager is irreplaceable on the proper execution of a valid plan for a mobile telecom site rollout project.

The introduction of the project assurance team (PAT) is to fill silo mentality that will result from project team members and the ultimate goal of the project assurance team is to ensure that the objective of the project from the business perspective, technical fulfillment and the user’s viewpoint is accomplished. Furthermore, adequate performance from the implementations stage means superb support system from the project assurance team (PAT). PAT is subdivided into three departments that help to break the barrier of information flow and to ascertain that the planned curve is achieved with respect to the project objective.

The DMADV methodology was efficiently designed to develop processes that will effectively address identified issues and improve project management performance. The suggested improvement if well adopted will aid telecom project management become more effective and efficient in their operations. The essence of measuring performance is to ascertain whether the finished output operates according to the specified objective of the project. For project to be effective and efficient, it should meet the required specification. There is no safe passage to heaven, projects should be completed within the constraints of cost and time. This research explored and explained project management tools through an empirical study which examined generic project management model across mobile telecom site rollout project. The findings from this thesis support effective and efficient management of project time and scope as a base for performance improvement.
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Appendix

1. Overview of the project management

Figure 5 Overview of the Project Management Institute's PMBoK Knowledge Areas
2. The house of Quality

Key to roof / correlation matrix symbols
+ Positive / Supporting
- Negative / Tradeoff

Figure 6. Illustrating the House of Quality
3. Seven-Times-Seven Toolbox

- **Six Sigma toolbox**
  - **The seven design tools**
    - Robust design, quality function deployment (QFD), TRIZ, Pugh concept selection, FMEA/VMEA, fault tree analysis, tolerance design
  - **The seven statistical tools**
    - Factorial experiments, capability analysis, regression analysis, multivariate analysis, statistical testing (ANOVA/ANOM/t-test/z-test), probability plots, gage R&R analysis
  - **The seven project tools**
    - Arrow diagram (Cantl chart), project and team charter, CTO/Analysis, tree diagram, capability analysis, cost-benefit analysis, control chart
  - **The seven lean tools**
    - Standardisation, waste analysis, bottleneck analysis, flowchart, supply chain matrix, setup-time analysis, red tag analysis
  - **The seven customer tools**
    - Kanban model, requirement structuring, house of quality, loss function, customer interviews, customer surveys, conjoint analysis
  - **The seven quality control tools**
    - Check sheet, histogram, Pareto diagram, cause-effect diagram, stratification, relationship diagram, control chart
  - **The seven management tools**
    - Problem decision chart, affinity diagram, relation diagram, tree diagram, matrix diagram, matrix data analysis, arrow diagram