PROJECT SCOPE MANAGEMENT

A Practical Guide to Requirements for Engineering, Product, Construction, IT and Enterprise Projects

JAMAL MOUSTAFAEV, MBA, PMP

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for Engineering, Product, Construction,
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To my son Shamil, whose arrival in this world midway through the creation of this book has changed my perspective on so many things…

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Foreword

> One of my favorite quotes attributed to Yogi Berra, but adopted and modified by many other authors, reads as follows:
>
> "If you don't know where you are going, you'll probably end up some place else."

This is the essential challenge of every project. Let me repeat that: *every project,* no matter the project type or domain. In short, for any type of project to have any realistic chance of success at arriving at a desired outcome, there must be a generally accepted set of goals and objectives. The goals will be represented by broad statements of aims or results that are sought by the sponsoring organization, statements that are more specific than mission or purpose,[*] but less specific than objectives. Objectives, on the other hand, are represented by predetermined results toward which the project's effort will be directed.[†]

But herein lies the difficulty. Just exactly what are the results that are expected? The project management theorists will have it that the answer is a thorough examination, almost prosecution of the project's stakeholders to elicit their exact requirements, before even starting the project. This would be followed by, or at least implied by, "Speak

[*] Wideman, *Comparative Glossary of Terms,* vol. 5.5.
[†] Ibid.

now or forever hold your peace!" The practical reality, of course, is entirely different. A woman does not go into a clothing store and give the salesperson an exact set of "requirements" to achieve the general impression she wishes to accomplish. Rather, she will search a number of racks, even search in a number of stores, before alighting on what appears to fit her expectations most nearly. And even then, there is the question of whether the chosen garment actually achieves the desired effect.

And so it is with projects, and certainly for first-time projects. You cannot expect project sponsors and associated stakeholders to spell out their exact requirements to the level of detail necessary to be able to produce the final product. Back to the woman in the clothing store: Her approach is, "I'll know it when I see it!" And so it is with real projects, any sort of projects, including large engineering projects of any kind. There has to be a period of development in which ideas are tested in real-time and the necessary decisions are taken to proceed with the next steps. In fact, projects are all about progressive decision making in the development and production of the desired end product. Or in simpler words: "Uncover the details as the work progresses!"

Perhaps because this reality flies in the face of idealistic theory, there has been a dearth of books on the market dedicated to product scope management and the art of gathering requirements. This includes for all types of projects and converting them to practical *and desired* reality.

Hence, Jamal's latest book is designed to tackle this essential area of managing a project. "Hot" topics include such items as

- How to find stakeholders, customers, and users who can provide you with requirements in the first place
- How to draw forth high-level scope requirements on multidisciplinary, engineering, product development, and IT projects
- How to define detailed requirements on such multidisciplinary projects
- Best practices of documenting requirements on software development and IT projects
- Similarly, on engineering and product development projects and multidisciplinary projects

- How to write project charters and what their role is in the scope management process
- How to control project scope, especially in the end game, and how to troubleshoot scope problems

In this book, author Jamal Moustafaev illustrates his thoughts and experiences with a large number of high-profile, well-documented projects, citing a multitude of fascinating historical facts and examples analyzed from the point of view of project scope management. The book unites the best practices of scope management from the fields of traditional project management, information technology, software development, engineering, product development, architecture, construction, and multidisciplinary projects. It is based on the most advanced and popular works by prominent authors and contains the latest advances in project scope management. It also concentrates on the hands-on practicality of tools and techniques rather than focusing on their academic prominence.

Best of all, Jamal's book is easy to read and uses an informal, non-academic language to explain all the key points.

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Preface

Why a Book on Scope Management?

The readers of my previous book, *Delivering Exceptional Project Results: A Practical Guide to Project Selection, Scoping, Estimation and Management*, know that I have already tried to highlight and, it is hoped, managed to shed some light on some of the problems of scope definition and management. I am referring to the fact that business requirements elicitation (i.e., the initial phase of product scope definition) is underdeveloped in today's project management science with the exception of the IT and software development sectors, where scope definition (aka business analysis) is relatively advanced but excluded from the project manager's domain of responsibilities.

As a result, most industries have a very prominent knowledge gap in project scope planning, a gap that starts sometime after the Project Charter has been completed and approved and ends somewhere around the point when the work commences based on the detailed blueprints, technical drawings, and bills of materials.

And yet, scope definition remains the key ingredient in the success of any project. After all, as one of my clients used to say, "If one does not understand completely what he or she is going to build, what is the point of engaging in scheduling or budgeting?" Later in this book, we show that a big portion of our project failures are rooted in our inability to elicit, analyze, and properly document project requirements.

Key Features of This Book

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We have decided not to reinvent the wheel and attempt the creation of a brand-new scope management process, especially considering the fact that all of the said processes have already been defined by the traditional school of project management. Having said that, if any readers prefer to adhere to some other methodology, I am still convinced that the book will be of significant value to them, but they will probably have to read the chapters in some other sequence, different from the one presented in this book.

In this book, we start by discussing how to collect project requirements and then move to defining scope, followed by the creation of the work breakdown structures. Finally, we examine the verification and control of the scope. However, most of the book—approximately 70%—is dedicated to collecting requirements and defining product and project scope inasmuch as they represent the bulk of the project scope management work undertaken on any project regardless of the industry or nature of the work involved. Furthermore, the focus is exclusively on practical and sensible tools and techniques rather than academic theories that work great on paper but unfortunately cannot be applied in real life.

Real-Life Project Case Studies

What is attempted in this book is taking five completely different projects, including

- "CRM System Implementation" at a financial institution (multidisciplinary)
- "Mobile Number Portability" at a wireless provider (multidisciplinary)
- "Port Upgrade" container terminal upgrade by a port authority (engineering/construction/multidisciplinary)
- "Energy Efficient House" design and construction (engineering/product/construction) by a product company
- "Airport Check-In Kiosk Software" design and development (software development) by a software product company

and tracing their development from a project scope management perspective from the very initiation of the project to the end of the execution and control phases. In the course of this book, we create project charters, high-level scope, detailed requirements specifications, requirements management plans, traceability matrices, and a work breakdown structure for the projects selected.

Why These Case Studies Specifically?

One of the major reasons for this particular selection is the inherent differences between the ways the requirements are captured in different industries; even the process itself has different names in different domains. In IT and software development it is called "business analysis," whereas in engineering and product development we refer to it as "conceptual design." But most important, with the increase in the size and complexity of the projects in modern organizations, especially the functional siloed ones, we are now encountering a completely new breed of ventures: projects that cannot be classified as purely technical or purely engineering. These are the ventures that involve multiple departments of the company and include marketing, sales, product, engineering, training, IT, customer relations, public relations, and many other groups of requirements.

Let us consider several examples. Into what category of projects does the deployment of an ERP system fall? Is it just an information technology initiative that should be handled exclusively by IT department employees? Many companies made that mistake only to discover later that because this project involves pretty much every division in the organization, all the requirements of each department need to be captured and properly implemented for the project to succeed.

Here is another example that we discuss in detail later in the book: the "Port Upgrade," the construction of a container terminal for a port authority. Is it "just" a construction project that can be outsourced to a construction vendor? And what is the value of a fully built container terminal without proper marketing, without roads and railroads leading to it, and without proper security systems and procedures, just to name a few scope components?

This group of projects presents the most experienced project managers with a multitude of questions that are impossible to answer quickly and easily. Here are some of them:

- How should the requirements be captured?
- What methodology should be used in capturing, analyzing, and documenting these requirements?
- As a project manager, am I responsible just for my part of the scope (e.g., install the ERP system or build the terminal) or for the success of the overall project?
- Should the project manager employ the engineering or architectural standards of scope definition?
- How should the inappropriateness of the above-mentioned approaches be addressed for documenting IT or marketing requirements and vice versa?
- Should each department write its own separate scope document, or is the project manager responsible for capturing all the requirements in one place?
- In that case, is there a chance of dependencies between different scope elements that will most likely be overlooked if the requirements are captured in different documents written in different technical "languages"?

Answers to these difficult questions are discussed in depth in this book. And to reflect the real-world project diversity properly, the selection of the project case studies for this book is supposed to reflect the variety of project categories that we encounter in the world today.

Please note that all these case studies are based on real-life projects, albeit somewhat altered either to protect the identities of the clients or to eliminate unnecessary complexity or detail, where I acted either as a hands-on project manager or a process improvement consultant. Thus, please keep in mind that none of the documents included in this book is completely perfect from the project management point of view. And although some of them have undergone technical team inspections, customer walk-throughs, and peer reviews, it is very likely that experienced project managers, especially the ones who worked on similar projects in the past, will discover certain discrepancies, irregularities, mistakes, and missing requirements.

The purpose behind this book is not to demonstrate perfect and completely faultless artifacts of scope documentation but to fill that apparent void in the tools, techniques, and methodologies in the field of project scope management and to try to come up with a universal approach to scope definition by attempting to pick the best practices of software development, engineering, construction, and several other fields by blending them and making them available to all industries.

Also, as it became quite popular with the readers of my previous book, each chapter starts with a fascinating historical case study where we analyze either interesting historical facts or very famous inventions, such as the Viking ship, the katana sword, the composite bow, the Burj Al Arab, and so on, from the project scope management perspective.

Who Is This Book For?

This book is designed for several groups of people. First, this book is for the project managers, either officially designated or just those who have been tapped on the shoulder by management and told to "handle this little project" in addition to their day-to-day duties, working at large multidepartmental organizations who need to handle complex projects involving marketing, IT, product development, human resources, training, and other divisions, to name just a few.

The second group that I had in mind is the engineers, architects, and product managers who all had scope definition expertise for at least several centuries but may benefit from (1) familiarizing themselves with the project management perspective on scope management and (2) learning some fresh new ideas from other fields, especially from software development.

It is hoped that functional managers and technical specialists from all areas—marketing, human resources, information technology, engineering, finance, accounting, and so on—will also find this book useful inasmuch as they are getting more and more involved in larger multidisciplinary interdepartmental projects.

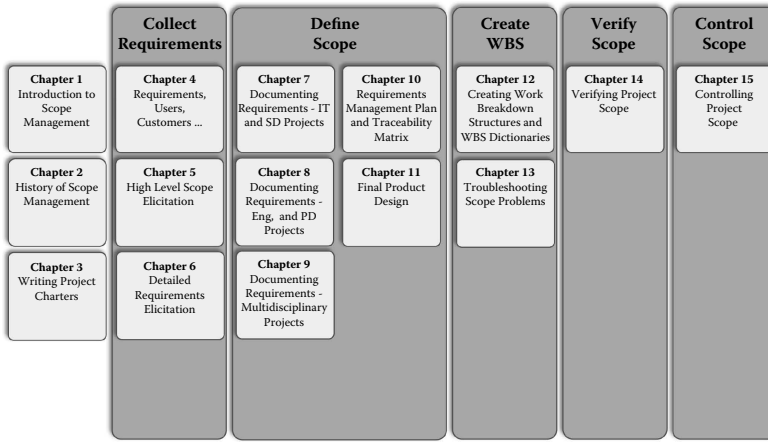
Last but definitely not least, it is for the people in the IT sector. Despite the fact that they already have the luxury of having access to the business and systems analysis domains, they are encountering the issue of managing what is being perceived as an IT project but in reality has multiple impacts on several or even all departments

of the organization. If one thinks about this topic a bit, one may realize that there is no such thing as a pure information technology project anymore. Even a replacement of a server may and probably will affect several groups of users outside the information technology division whose needs will have to be considered during the project implementation.

Book Overview

The book keeps to the traditional approach to project management with the following phases:

- Collect requirements
- Define scope
- Create work breakdown structures
- Verify scope
- Control scope



Chapter 1 describes the current challenges faced by project managers in various industries with respect to the scope definition. It also provides the reader with the assessment of the current state of the projects, the root causes of our failures, and the significant impact of the requirements on overall project success.

Before we delve into the detailed analysis of project scope management, in Chapter 2 we talk about the history of design throughout the ages by examining the Egyptian pyramids, the Colosseum, composite

bow, Viking longship, and several other key milestones in the course of human history.

Later, in Chapter 3 we examine the creation of the project charters, as they are the main input into the first stages of the project scope management process. It should be noted, however, that the first high-level scope of the project should be outlined in the business case document that is supposed to justify the project idea to the executives of the company. But because writing the business cases belongs to the project portfolio management domain, it is omitted from the scope of this book.

Moreover, the chapter is supported by five complete project charter samples, including the "CRM System Implementation" at a financial company, "Mobile Number Portability" at a wireless provider, "Port Upgrade" at port authority terminal, "Energy Efficient House" design and construction, and the "Airport Check-In Kiosk Software" design and development.

Chapter 4 discusses different requirements types and taxonomies as well as various categories of users, customers, and ways of identifying them. Chapter 5 delves into high-level requirements elicitation by discussing various requirements gathering techniques, including interviews, problem reports, and brainstorming, to name a few.

Chapter 6 continues the scope elicitation theme by going deeper into detailed scope definition. Chapters 7 through 9 discuss the best practices of requirements documentation in IT and software development, engineering, and multidisciplinary projects, respectively. Chapters 7 to 9 also have requirements specifications documents for each of the five projects mentioned earlier (see Taylor & Francis Group/CRC Press website http://www.crcpress.com/product/isbn/9781482259483 for all the supplementary documents for the book).

Chapter 10 focuses on writing the requirements management plan (RMP) and traceability matrix (RTM); once more, this chapter includes five sample documents for each of the projects mentioned earlier (see Taylor & Francis Group/CRC Press website http://www.crcpress.com/product/isbn/9781482259483 for all the supplementary documents for the book).

Chapter 11 discusses several final product design techniques that are borrowed mainly from the engineering and product design domains. Chapter 12 analyzes the art and science of creating the work breakdown structures and ventures into the estimation domain

of project management by demonstrating several useful and practical techniques of assessing project resource requirements and schedules. Chapter 12 has one sample WBS developed for the "Mobile Number Portability" project (see Taylor & Francis Group/CRC Press website http://www.crcpress.com/product/isbn/9781482259483 for all the supplementary documents for the book).

Chapter 13 is dedicated to the topic of troubleshooting scope-related problems and how to deal with them in an efficient and practical way. Chapter 14 discusses various scope verification topics, including customer walk-through, technical team inspections, and peer reviews. Finally, Chapter 15 deals with scope control and management in the Execution stage of the project.

Good luck on your projects and enjoy the book!

Jamal Moustafaev
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About the Author

Jamal Moustafaev, MBA, PMP, president and founder of Thinktank Consulting, is an internationally acclaimed expert in the areas of project/portfolio management, project scoping, process improvement, and corporate training. He has completed projects for private sector companies and government organizations in the United States, Canada, Europe, Asia, and the Middle East, including the US Department of Defense (USA), Siemens (Germany), Petronas Oil (Malaysia), and TeliaSonera (Sweden), to name a few.

Moustafaev is a certified Project Management Professional (PMP®). He holds an MBA in finance and a BBA (finance and management science) from Simon Fraser University. In addition to teaching a highly acclaimed Project Management Essentials course at the British Columbia Institute of Technology (Vancouver, Canada), Moustafaev also offers several project and portfolio management corporate seminars through his company:

- Practical Portfolio Management—Selecting and Managing the Right Projects
- Successful Hands-On Management of IT and Software Projects

- Successful Hands-On Management of Modern-Day Projects
- Project Scope Management

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Introduction to Scope Management

Who? What? Why?

Historical Perspective: The Rusted Staple Story

Abwehr, the German military intelligence organization was created in 1921 as a part of the Ministry of Defense. It remained a small and consequently not very important part of the Wehrmacht until January 1, 1935 when it was taken over by the soon-to-be Admiral Wilhelm Canaris (see Figure 1.1).

In a fairly short period of time Canaris was able to reorganize his agency into one of the most efficient intelligence-gathering organizations in the world. Abwehr's activities spanned the entire world including the United States, Canada, Africa, and Europe as well as England and Russia.

With the opening of the Eastern Front, Abwehr was tasked with establishing Abwehr schools in the occupied territories of Poland, the Baltic states, and the western parts of the Soviet Union. These organizations were responsible for recruitment, training, and deployment of commando-style agents whose primary purpose was reconnaissance and sabotage behind enemy lines.

The aforementioned recruits were typically handpicked by the Abwehr officers from among millions of Soviet POWs who were captured in the first several months of the invasion. Some of them were convinced to enlist in the intelligence schools because they could no longer bear the horrible living conditions in the German POW camps, whereas others did this for ideological reasons, not the least of which was hatred of Stalin's tyrannical regime in Russia.

Figure 1.1 Admiral Wilhelm Canaris.

All the "students" went through an extensive training that included hand-to-hand combat, target practice, interrogation and intelligence-gathering techniques, as well as radio operations, to name a few. Afterward, the graduates were supplied with absolutely the best documentation provided by Abwehr's Department 1-G responsible for false documents, photos, inks, passports, and chemicals. It is important to note that German technology in producing counterfeit documents was probably the best in the world at the time. After all, they mastered the production of British pounds and US dollars that perplexed the most experienced experts on either side of the Atlantic.

Yet, despite the first several months of successful infiltrations, the agents dropped behind the enemy lines started failing one after another; some were shot while resisting arrest, some were jailed, and a certain percentage of them were recruited to work as double agents, thus supplying the Abwehr headquarters with false information.

It took the Germans several years to discover the root cause of their problem. It turned out that the documentation itself, as far as

images, stamps, and fonts, was perfect. The problem lay in a couple of simple staples that were used to fasten the pages of the document together! German industry was producing these staples from stainless steel. Thus, they were very resistant to the rusting process, whereas the Soviets manufactured their staples from the cheapest iron wires available, thus causing them to be covered in rust in a matter of weeks if not days!

Therefore, even the most uneducated Soviet recruits, who sometimes couldn't even read, were able to determine whether the man standing in front of them was a spy or a genuine soldier of the Red Army. The algorithm was pretty simple: If you can see rust stains on the pages of the document, it is the real deal, and if the staples are clean and shiny, you have an enemy agent standing in front of you.

Examined through a project management lens, this story highlights one of the most interesting and enigmatic areas of project delivery: project scope management, or to be even more accurate, the scope definition domain. The product scope for the counterfeit documentation produced by the technical experts at Abwehr consisted of several features, including, but not limited to, proper paper with correct watermarks, appropriate photos, and correct fonts and inks; however, it failed to incorporate a feature requiring the staples to be made from low-grade steel that would rust in a matter of days.

Just as in many other software development, IT, architecture, or engineering endeavors, a simple omission of just one of these scope components led to the failure of the entire project.

Why Write a Book about Project Scope Management?

Current State of Project Scope Management

The field of project scope management seems to be one of the most neglected domains in project management. Until recently, most of the project management textbooks stated something to the effect of, "Once the project manager gets the product scope definition from the technical experts, she can embark on the creation of the project work breakdown structure (WBS) with the assistance of her team."

How exactly this product scope definition is arrived at and what steps should be undertaken to get from the point when the customer walks into the room and states that she needs a custom desk for her office to the point in time where both the blueprints and the bill of materials for said desk are finalized remained unclear.

Interestingly enough, the information technology and software development industries do have a framework called business analysis, or systems analysis, or requirements engineering that was specifically designed to fill this void in the field of project management. In the IT field, the tasks of gathering business requirements and breaking them down into high-level features and functional and nonfunctional requirements typically fall under the responsibility of the business analysts.

In architecture, engineering, and product development, the tasks of eliciting product scope fell into the laps of engineers, architects, and designers who later supplied the project manager with the product scope so that he could build a work breakdown structure, network diagram, and the like.

Key Problems with Scope

An observation of project management practices in various industries confirms that in many instances scope management in general and scope definition in particular tend to be viewed as exclusive technical areas, which leads to several very legitimate questions frequently asked by many of my colleagues:

- If the project manager is to lead the project, should he also lead the product definition stage?
- If scope size and complexity have a direct impact on project timing and budget, shouldn't the project manager be aware—at least at a high level—of how the technical team arrived at the current scope in order to be able to make trade-off decisions?
- Our engineers (designers, developers, architects, etc.) are very good at design but not very skilled at interacting with customers and extracting the requirements from them. What should we do in this scenario?

Finally, and most importantly, what about enterprise or multidisciplinary projects? With the size and complexity of projects growing,

it is not unusual now that the project scope encompasses the entire organization. Let us look at a couple of examples from different industries.

Note: These are the two of the five projects we analyze in detail and create project scope management documentation for throughout this book.

Port Upgrade: Container Terminal Construction Project The first one is, as it was initially labeled by the senior executives, the "construction of the new container terminal" project. The logic at the top of the port authority literally was, "Because this is a construction project, there is no need to worry on our end; we will just outsource the construction part to the contractor."

But a very quick analysis discovered the following situation (see Figure 1.2). The organization consisted of multiple departments, including real estate, public relations, legal, marketing, planning, engineering, IT, logistics, and security divisions, to name just a few. It turned out that each one of these departments had its own portion to contribute to the overall larger scope of the project. In other words, the real estate department had to purchase the land required for construction. They had to perform this task in close collaboration with the legal department that made sure no local laws or bylaws were broken. The PR department was responsible for working with federal, state, and municipal governments to communicate the plans and the progress of the project and to ensure that their interests were considered in the project.

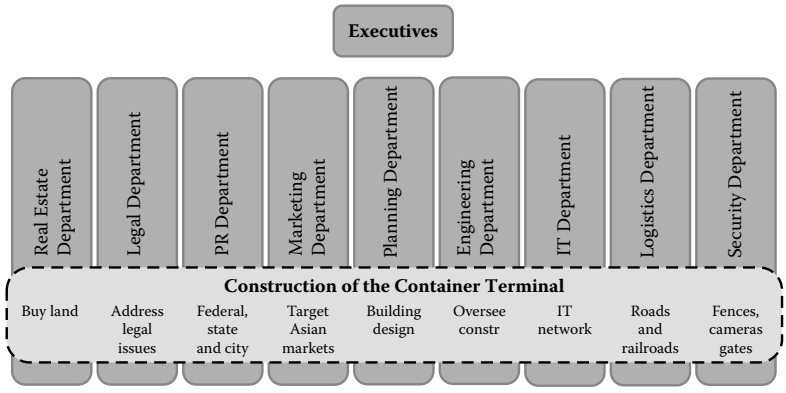

Figure 1.2 Port upgrade project.

Furthermore, the marketing department representatives had to start their "cheerleading" dances for their Asian partners in order to promote the yet-to-be-built port facility. In the meantime, the planning division had to oversee the design of the new facility and pass it over to the engineering department, which would be responsible for finding the contractor and monitoring him during the execution stage. At some later point, the IT specialists were supposed to set up the entire network in the new building including hardware and software. And finally, the security people had to ensure that the new facility conformed to the federal government's security standards.

So, here is the key question: Is this really just a construction project? And inasmuch as it obviously is not, what techniques, standards, and methodologies should be used in capturing the scope? Should the project manager utilize the engineering or architectural standards? But they are not very suitable for documenting the IT or marketing requirements. Or should each department write its own separate scope document? But in that case is there a chance of dependencies between different scope elements that will most likely be overlooked if the requirements are captured in different documents and are written in different "languages"? For example, is it possible (let us consider the most primitive example for simplicity's sake) that the server room designed by the architects will be of inadequate size or design for the needs of the information technology people?

Wireless Company: Mobile Number Portability Project This story involves a wireless company in Europe that enjoyed a very dominant position on the local market (more than 53%) with three major players in the country. At one point the country's ministry of communications decided to enact legislation similar to that already implemented in many Western countries, namely the Mobile Number Portability Act. This law would enable wireless customers to switch their cellular providers freely while keeping both their phone numbers and the prefixes.

Initially the senior management of the mobile company viewed this project as a small endeavor to be undertaken by their IT department and a group of network engineers. It was assumed that there may be a need for an additional server or two and some tinkering with the