

The TMPM Framework: Tailored Project Execution for Test and Measurements

Filipe Altoe, PMP

Principal at TSXperts (www.tsxperts.com)

Introduction

Another articles named “Why Test and Measurements Projects Fail” presented the main issues that drive test and measurements project failure. It was presented on those articles that the two main root causes for project failure were lack of well established project requirements and poor planning. A deeper analysis was performed in the context of the test and measurements stakeholder landscape and the conclusion was the poor communication with the project stakeholders and missing stakeholders were at the heart of the problem, and were the true root causes, driving lack of well established requirements and poor planning. Finally, it was mentioned at that article that the typical frameworks that are utilized for the execution of the test and measurements projects were not addressing these issues and that a modified framework, better tailored for test and measurements projects was needed. This article presents such framework, named TMPM.

Organization Structure

Let’s kick off the discussion of the people aspect of the framework by focusing on poor communication with stakeholders and missing stakeholders; the too root causes identified in the aforementioned article.

To recap, T&M projects usually involve a multitude of stakeholders with different backgrounds. Typically, they include stakeholders with multiple engineering backgrounds, others with finance, accounting, manufacturing, business, marketing, and others with no college background, but who should definitely be included as part of requirements elicitation, risk identification and risk analysis exercises.

Typically, organizations that execute T&M projects assign a Project Manager to direct the project team members, collect requirements from stakeholders, perform risk identification and analysis and to be the main point of contact to all project stakeholders.

Optimal communication between two parties happen when, either they have similar backgrounds, or at least one of the two understands enough about the subject of the other's background in a way there is no translation mistakes in the communication. Test and measurements projects have an interested landscape for both project teams and project stakeholders.

It is not uncommon to see the following project team members on a test and measurements project:

- Test Engineering
- Software Engineering
- Firmware Engineering
- Embedded Engineering
- Mechanical Engineering
- Electrical Engineering
- Validation Engineering
- RF Engineering

The list below shows examples of background and skills for possible stakeholders involved in test and measurements projects:

- Various Engineering skills
- Quality Engineering
- Manufacturing Engineering
- Finance
- Accounting
- Business
- Marketing
- Various backgrounds but not necessarily college education (operators)

One aspect that is extremely important in the achievement of a great level of cooperation by the project stakeholders with the project is the overall credibility the Project Manager brings. The perception of competency of the Project Manager by the stakeholders is one of the keys to getting them involved in the project plan. If a stakeholder doesn't professionally respect the Project Manager, that person will most likely avoid involvement with the project at the level that we would like, as an extension of the project team. This person will probably perceive herself as not part of the team, but as a client of the project deliverables.

A second aspect that is a direct driver of the level of involvement from the stakeholders that we are shooting for is the Project Manager's personality. A person who is able to connect, on a human level, with a stakeholder will, most likely, if not get full involvement from the stakeholder in the buying-in of the project plan, will, at a minimum, turn that stakeholder into an advocate of the project.

In summary, the ideal Project Manager for test and measurements project should have, not only skills in the technical subjects listed above, but also a personality that allows her to connect both with operators in their multiple backgrounds, all the way up to the C-level person involved in the project, passing through all the mid level stakeholders in between.

This is an extremely tall order, borderline impossible. Nobody is this super person alone; which is one of the reasons why a great deal of T&M projects fail, especially the larger ones. It is intuitive to see why the larger projects are the ones that tend to fail. It is not necessarily a matter of technical complexity on those projects alone, but the human aspect of it that is most of the times ignored. Larger projects, obviously involve a higher number of stakeholders, as they tend to have a higher impact in the organization. Also, a higher number of departments are usually touched by the larger projects, which raises the number of project stakeholder's backgrounds involved.

However, an organization can potentially get a little closer to the ideal Project Manager if a project management body composed of two people is formed, as opposed to a single person. Let's think through this for a second. One can potentially break down the list of skills described above into two major categories: Technical skills and personality skills. This sort of suggests that if we had a two-people combo, where would be the technical brain and the other bringing the personality, this structure would have a much better chance of success than if we spend our life time trying to find that one person who combine all of these traits.

It would be extremely difficult to find a highly skilled Engineer in several engineering subjects who would also have deep business skills. Usually, the type of personality that goes deep into one of the areas doesn't have the same level of interest for the other. It is important to keep in mind here that, what we are looking for is not someone who is an expert in one and dabbles on the other. Remember that what we are striving for is credibility across the board, from all project stakeholders. We need superstars on the two areas; engineering and business.

To summarize the high level skills that we are looking for on those two people. The first one would:

- Not necessarily be the best communicator, but can get the point across
- System level engineering expert
- Not necessarily business savvy
- Bring credibility from the engineering background stakeholders

The second person would:

- Be a great communicator
- Be comfortable with engineering subjects, but not necessarily a deep expert on them
- Extremely business savvy
- Be a people person. Have a personality that would allow her to connect in a human level with all project stakeholders, from operators to C-level

The list above suggests that we are looking for an extremely well rounded Systems Engineer and for an Engineer with project management experience who decided to go into the business world (maybe a MBA type) with the people-person personality.

This structure is much more reasonable from the human resources perspective. There are people out there who meet the specifications above. Whereas, it would be a semi-impossible task to find an individual who would bring all of those traits at the level of expertise that we are looking for.

With this structure, these two people would share the project management accountability. In fact, there is a line that can be drawn as far as the responsibility that each one would take in the management of the project.

The Systems Engineer would:

- Be the one responsible for the technical leadership of the project team
- Responsible for the technical aspects of the project plan
- Be accountable to validate the estimates for the technical tasks to be executed by the project team
- Make sure the technical project team members stay on task and not fall into the traps of gold plating (engineers tend to pursue the shiny object of making things perfect. The perfect is definitely the enemy of the great in T&M projects.)
- Utilize engineering expertise to earn project credibility from the engineering background stakeholders
- Lead risk analysis focused on the technical risks

The Project Manager would:

- Be the one responsible for the administrative aspects of the project
- Responsible for the non-technical aspects of the project plan
- Make sure the technical project team members stay on task and not fall into the traps of gold plating (engineers tend to pursue the shiny object of making things perfect. The perfect is definitely the enemy of the great in T&M projects.)

- Utilize business savvy to earn project credibility from the non-engineering background stakeholders
- Utilize personality to connect with all project stakeholders
- Lead risk analysis focused on the non-technical risks

The Client Integrator Liaison

Another article named “Challenges in Working with a Consultant or System Integrator” presented the five main challenges faced by organizations that engage System Integration companies to execute test and measurements projects. Since the engagement of integrators is becoming more and more common in the execution of test and measurements projects, the framework also addresses this scenario. The previous section presented a slightly different project management structure by splitting the management of the test and measurements projects into two roles. This section presents the need for an extra role that will address the challenges of engagement between client and Integrator.

The main goal for the person executing this role is to address the following scenarios of engagement with Integrators:

1. Client trust initial requirements definition to Integrators
2. Client does back of napkin requirements definition
3. Over the fence mentality
4. T&M system implemented in parallel to DUT design
5. Project budget defined before feature set complete

1. Client trust initial requirements definition to Integrators

The two main drivers for all the problems that surface on this type of engagement are due to lack of time by the Integrator’s part in executing a proper requirements gathering activity and the potential lack of full picture on the Integrator’s part in regards to the client’s target business value for the T&M system to be built.

Also, project requirements are a deeper abstraction layer that stems from the project objectives. The project objective is where the high level care-about from the project stakeholders should be captured. This higher level of abstraction can be seen as the value proposition statement for the T&M project. This is basically the source of alignment between the system to be built and the organization business value for it.

As it can be inferred by the discussion on the organization structure of the project management body, there is a person in the two-people management team that is better

equipped to connect with the project stakeholders to collect these project objectives; the person called the Project Manager in this new framework.

This is an activity that rarely is paid attention to when a member of the System Integrator staff is responsible for executing the requirements gathering activity. The requirements gathering activity performed by the Integrator, as it was seen, is abbreviated and usually focuses on the test system specifications per say. But, remember, garbage in, garbage out. Bad project objectives will lead to bad project requirements, which will lead to bad system specifications.

What is being proposed by the framework is that a person needs to perform a thorough project objective gathering, prior to the engagement of a System Integrator to build the test system, even if the Integrator will be given the tasks of collect requirements.

Furthermore, there is a difference between the project requirements and test system specification. The project requirements are directly related to what the test system will do, whereas the system specification is related to how the system will do that.

What this article proposes is that Integrators are to be involved once the “what” has been thoroughly defined. They are experts in the how anyways.

The liaison role that is being defined here would be the person responsible to collection the “what”, which, again, will stem from the project objectives, which is the business value for the test system that would have also been collected by the same person.

2. Client does back of napkin requirements definition

The facts listed below are usually present in this type of engagement with Integrators:

- The client may not be as well versed in performing a thorough requirements analysis for T&M system as an expert from the field would be
- Common for internal resources not to have in depth knowledge of the type of information an Integrator usually needs from clients in order to keep headed in the right direction
- Internal resources rarely can dedicate themselves full time to the requirements definition exercise
- It is usually extremely difficult to find resources who can execute a well balanced business and technical requirements gathering activity

The list above is practically a desired list of qualifications for the person occupying the liaison role. The end results, much like the case number one above is that, at a minimum, the client should have ready for the Integrator the comprehensive list of project objectives and the “whats”

or project requirements for the test system. Some clients may want even to go one step further and define the test system specification, which is the third level of abstraction for requirements.

3. Over the fence mentality

This situation happens when the client believes that since an expert company is being hired to execute the T&M system, the Systems Integrator will take care of everything with absolute no or very minimum interaction with client internal resources until it is time to deploy the system. On this described scenario, not only the requirements' gathering is given to the Integrator, but there is usually very minimum interaction throughout the project lifecycle.

This type of engagement usually happens when the client doesn't have the needed technical resources in house to manage the work performed by the Integrator. This is actually a bad situation for both client and Integrator.

As it was seen by a previous chapter, the main issues that this type of engagement brings are:

- Lack of alignment of the final delivered system with the client's business value
- Information flow from client to Integrator suffers, which may lead Integrator to be headed in the wrong direction
- Unreasonable expectations on the client's part, mainly due to ignorance of what can and what can't be accomplished within the project schedule and budget

This case also can benefit from the suggested liaison role. This person would need to understand the Integration business enough to make sure the needed information from the client to the Integrator is flowing at opportune times. The liaison would also need to be technically competent on the T&M subjects in order to follow the technical implementation that is being proposed by the Integrator. Ultimately, this person would make sure the business value collected as part of the project objectives are always kept in line with the project implementation as well as would keep the client's expectations in touch with reality.

4. T&M system implemented in parallel to DUT design

This issue calls for a deeper solution than just simply assigning a liaison to coordinate the interface between client and Integrator. This situation can't really be properly addressed if the project is being executed in a waterfall format, due to the nature of the fluid requirements.

On this situation, the client is better off by setting up a semi-Agile structure, and to have the liaison functioning as a Product Owner for the Agile project. Details on how this can be achieved is beyond the scope of this article, but can be found in an article entitled “Maximizing the business value of a Test and Measurements system in support of a NPI process”.

5. Project budget defined before feature set complete

The same comment that was made for issue number 4 above is valid for this issue.

Tools

A separate article entitled “Test and Measurements System Modeling: Addressing the Root of the Problem” presented a detailed account on how to utilize UML (Universal Markup Language) in the execution of modeling activities for the test and measurements project. This article refers the interested reader to the one mentioned above for details on how to perform modeling for test and measurements projects. This article provides high level information on how the topic of the aforementioned article is the basis for the tools utilized in the TMPM framework.

It is important to keep in mind that the framework’s objective is to address the two main drivers of test and measurements project failure, poor communication with stakeholders and missing stakeholders. Therefore, it is natural to intuit that the framework tools will facilitate that task by the framework.

Modeling Project Objectives and Requirements

The typical methodology used for collection of project objectives and requirements have been interviews with the project stakeholders and the collection of the information in some sort of text document. The verbiage presented in this document should capture the nature of the objectives and requirements. Moreover, the text should be written in a way that it represents accurately what the stakeholders intended as well as what the requirements gatherer person interpreted and the two aspects need to match in order for the requirements to be valid.

The practice usually consists of the requirement gatherer asking questions to the stakeholders; which than provide answers to those questions that get captured in the project objective/requirements document straight up. If the process is thorough, as it needs to be, several

stakeholders from all areas the project will touch are interviewed, and their answers captured in the document.

There are several problems with this approach. The first one that can be seen is the fact that the information gathering in this format will have a questions-and-answers format. The person being interviewed will basically answer whatever question is being asked and wait for the next question. The onus of describing what the system is expected to do will fall solely in the shoulder of the person asking the questions. The questions better cover the entire spectrum of scope the system ought to implement; otherwise, there will be objectives/requirements that won't be gathered. It is not to say that the person being interviewed is sandbagging the process; it is flat out human nature. Once a questions-and-answers interviewed format is established, the interviewee will most likely just answer questions, as opposed to help the interviewer to paint the whole picture of the project objectives/requirements.

A better approach to the interviews would be a conversation where some sort of picture is being painted, literally, while the conversation takes place. This is where UML modeling comes in handy. By utilizing modeling to gather objectives and requirements, the task now, from the interviewee perspective is not just to answer questions, but to complete the diagrams that are being drawn. This is much more conducive to unsolicited information being volunteered by the stakeholder, even if there isn't a specific question being asked about that information.

It becomes much easier to the stakeholder to get the ideas flowing out of her head, materializing onto the diagram. That is exactly what we want. We want to make sure a literal brain dump is captured from the stakeholder mind. This process is much closer to that than the usual questions-and-answers-write answers down in a text document methodology.

Modeling System Specification and Preliminary Design

The next step down in the project lifecycle is the determination of the T&M system specification and the overall system design. These two are obviously separate aspects of a T&M project, however, in reality; they usually navigate very close to each other.

The system specification is the detailed function and technical description of a system. Though they are still related to the system "whats" they actually usually start taking in consideration the "hows". The system specification can be seen as a bridge between the project requirements and the high level system design. It further details key performance parameters that are dictated by the project requirements as well as defines the key system attributes, which is usually the first touch point to the high level system design. Or, in other words, it derives the system requirements to a preliminary design level of details.

Usually, the system specification on a T&M project is the document that allows refining of cost and schedule as well as the establishment of project baselines for its metrics. It also ensures traceability of the project objectives and requirements to a system design, making sure the selected design approach is taking into account all system requirements. It is the link between the “how” back to the “what”.

As the other article presented, the UML structure diagrams emphasize the things that must be present in the system being modeled; or, “How” the system will implement “What” the system needs to do. One can also intuit that these types of diagrams would be great candidates to model the system the system design, the “Hows” of the system being built. That is indeed the case.

Stakeholder Management

The modeling tools mentioned above certainly address the communication with stakeholder issue. They also indirectly address the missing stakeholders issue, since, as it was seen, the requirements elicitation process is an iterative process. And, as the stakeholders get more and more familiar with the system requirements, they may identify other stakeholders that should have input on the modeling process as well, one that may have not initially identified as project stakeholders.

To stitch this together, we need a mechanism to manage these stakeholders. The first task is to create what is called the stakeholders register, which is basically a list showing all project stakeholders that were identified through the modeling activities.

The stakeholder register is expected to be a living document. While the project unfolds, it is important to always be vigilant to stakeholders that might not have been identified. After all, missing stakeholders is one of the root causes that we are trying to address with the TPM framework. Any new stakeholder identified along the course of the project needs to be captured into the stakeholder register and the proper high level analysis needs to be performed in order for the information on the register to be filled out.

Good project management is all about thinking ahead and anticipating problems as opposed to taking mitigating action. Having a documented management strategy in place for all stakeholders will help the Project Manager to make decisions along the course of the project that goes in line with the identified management strategy, as opposed to not consider the human aspect of managing the project. Usually, decisions that are made taking in consideration the stakeholder management plan are the ones that can keep the project moving in calm waters as opposed to potentially drive it through conflicting interests of the multiple stakeholders.

Conclusion

This article presented the TPM framework, a framework that is tailored for the execution of test and measurements projects. The framework proposes a two-person management body to be responsible for the test and measurements project management. It presented the high level skills for the two roles, the Systems Engineer and Project Manager. It showed how this structured is much better tailored to address the poor communication with stakeholders and missing stakeholders issues that were identified as the root causes that drive test and measurements projects to failure.

The article also proposed the creation of a client-integrator liaison role. This role would address the five issues identified in the engagement of System Integration companies. It showed how the liaison role would fill the gap on each of the five issues presented.

The tools used by the TPM framework were also presented. That section showed how modeling can help with the two root causes of test and measurements project failure. It also presented a stakeholder management strategy to make sure the information captured by the modeling activities are properly acted upon by the project management body.