Mastering Prioritizing Academic Projects: Leveraging the Triple Priority Triangles

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Effective project management is as crucial in academia as in any other professional field. Whether you are just starting out on the academic career track or running your own lab with international partners, you will be juggling multiple responsibilities, from conducting research to mentoring students and managing administrative tasks.

Project management is not a foundation of the training a PhD student receives, but it should be. The reality is that managing research projects – from a thesis to an international consortium - requires a keen understanding of project management principles to be successful. Balancing project constraints such as scope, budget and timeline are important to ensure successful outcomes. Just as a conductor harmonizes an orchestra, academics must orchestrate various project elements to achieve their research goals. This is the case whether we are planning or executing a project.

The Imperative of Constraint Management in Academia

We can treat the vast majority of these tasks as projects and utilize project management techniques adapted to the unique context of academia to successfully complete them. The **Triple Project Priority Triangles** is one such tool, specifically aimed to help of consider how different constraints operate on academic projects and help us decide which to prioritize during planning or project execution.

We can utilize this tool whether we are working on a grant application, or if we are in the post-award stage where we transform our initial project outline into a detailed execution plan. The prioritizations that we define during project planning also help us decide how to respond to changes in conditions during project runtime. For example, if an element of the project turns out to be more costly than estimated, do we then compromise on scope? And if so, do we sacrifice academic impact or real-world impact? Can we accept lower-quality results or higher risk?

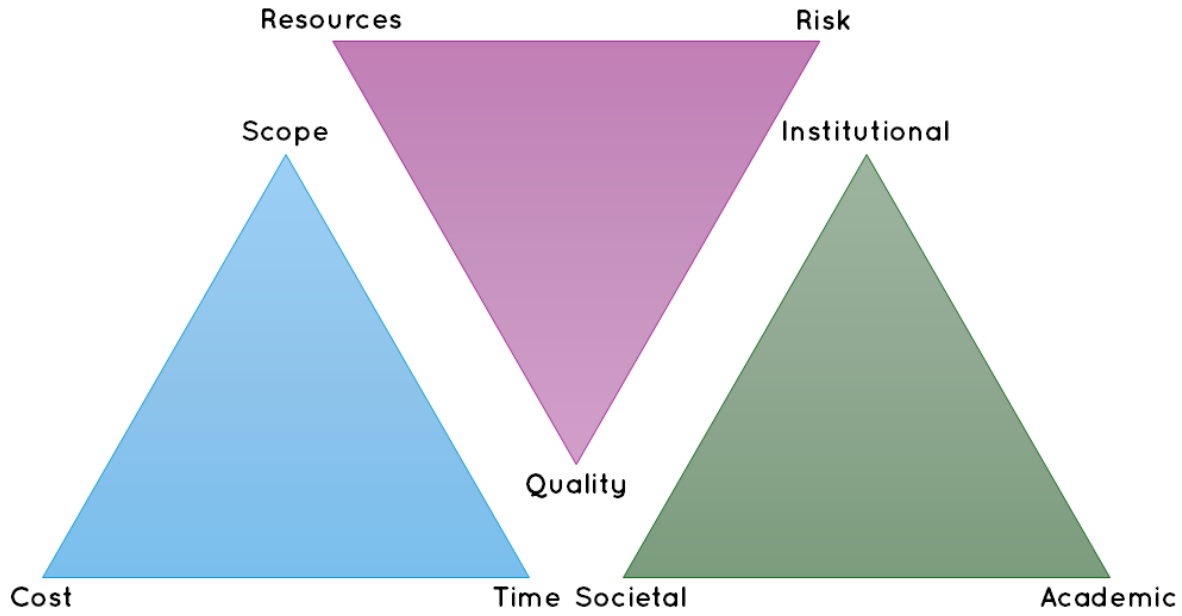
Having carefully considered these questions in advance of project execution helps us navigate changing circumstances.

Introducing the Triple Project Priority Triangles

To make clear, understand and choose between the constraints placed on research projects (and other academic projects) the Triple Project Priority Triangles provide a valuable starting point. When we are planning projects, the triangles help us consider what a change in one constraint will mean for the others. During project execution, the triangles help us understand how a change in one constraint, for example, increased costs, will affect other factors in the project.

Two of these triangles are well-known in the broader project management literature, but the third one is unique to academic research:

The Triple Constraint Triangles in Academic Project Management



The Iron Triangle: Scope, Cost, Time

Covers the fundamental conflicting constraints of project **scope**, the **cost** of the project and the **time** it takes to complete it.

Scope: Scope refers to the specific objectives and deliverables of a project. In academia, this could mean the aims of a research study or the content to be covered in a new course. Clearly defining the scope helps in setting realistic expectations and provides a roadmap for the project's progression.

Cost: Cost encompasses all financial resources required for a project. This includes funding for materials, personnel, and other expenses. Academic projects generally operate within tight budget constraints, making it essential to plan and allocate funds judiciously to ensure project sustainability.

Time: Time management is pivotal in academia, where multiple projects and responsibilities compete for attention. Establishing clear timelines and adhering to deadlines ensures that projects progress smoothly and are completed as planned.

The iron triangle shows that you cannot increase scope without also increasing time and/or cost. All projects find themselves somewhere inside this triangle, which represents how these three constraints are interconnected. When a change is made to one constraint, adjustments are required to one or both other constraints. The For example, increase the scope, and you must also increase cost and/or time. Decrease project time and/or cost, and you must also decrease the scope. You cannot have everything.

The iron triangle contains two types of relationships: A) The relationship between scope and time/cost is directly proportional. When scope increases, time and/or money must also increase to tackle a larger project. B) The relationship between time and cost is *inversely proportional*. These two factors move in opposite directions. If costs need to be cut, then deadlines will have to be extended. On the other hand, if you encounter shortened deadlines, you will need to increase cost to compensate for the shorter timeline.

The two relationships cannot be changed. Nothing a project manager does will make it possible to change one variable without causing a corresponding change, either proportional or inverse, to the other two points in the triangle. This is why the scope triangle is referred to as the iron triangle or tripe constraints, as it cannot bend to the will of a project manager.

We must choose how we prioritize each of these during project planning, and similarly during project execution if a change in circumstances occur.

The Quality Triangle: Resources, Risk and Quality

Covers the conflicting constraints of the **resources** the project will cost, the **risks** it will face and the **quality** of the project results.

Resources: Resources pertain to the human, physical and informational assets necessary for project execution (note that financial resources are covered under the *cost* factor). This includes research assistants, laboratory equipment, communities and access to scholarly databases. Effective resource management ensures that all aspects of the project are adequately supported.

Risk: Every project carries inherent risks, from potential funding cuts to unforeseen challenges in data collection. We can have different *risk requirements* for a given project. Identifying these risks early and developing mitigation strategies can in some cases prevent minor issues from escalating into major obstacles, but it does not change the underlying fact that some research is riskier than others in terms of the odds of producing the desired result.

Quality: Quality assurance involves considering what quality the project should have, in terms of its processes and the outcomes. For example, to what degree a project documents its method and troubleshoots it, and the degree to which validity and generalizability of results are integrated. In academia, quality often translate to producing rigorous research, delivering insightful lectures, and publishing in reputable journals. It could also be a high-performing piece of software or hardware in a project seeing collaboration with industry. Upholding quality ensures that the project's outcomes are respected and valued within the communities it falls within, whether academic, industry or another sector.

Similarly to the iron triangle, these three constraints are interconnected in the same relationships. For example, if we prioritize keeping risk low, it means we need to increase the resources available for the project, and/or lower the quality of the results we expect. Balancing these factors ensures that the project not only meets its objectives but does so efficiently and effectively.

The Impact Triangle: Academic, Real-World and Institutional Impact

Covers the conflicting constraints of three different types of impact a research project can generate: **academic**, **societal** (or **real-world** or policy impact in some versions) and **institutional**.

Academic Impact: Creating research that will see wide recognition and uptake in our academic domain of choice, be cited and drive recognition of the involved researchers, is the traditional focus of many academic research projects. It is, however, just one form of impact.

Real-World Impact: All kinds of research can impact the world, irrespective of its domain or epistemology. Basic (foundational) research – also called low-technology readiness level research – may be temporally far removed from establishing real-world impact, but much such research has ultimately had massive impact on society and economy. Other research is closer to real-world impact, e.g. engineering research conducted in partnership between academia and industry. Other research informs public policy, seeking to provide policymakers with the best possible evidence, or helps organisations or charities create a positive societal impact.

Institutional Impact: This is impact for the institution or institutions hosting the research project. Perhaps surprisingly, institutional impact is *not* academic impact. While universities are certainly appreciative hosting renown researchers or supporting research that changes the world in meaningful ways, universities are fundamentally reliant on other types of impact, notably: a) attraction of funding, either directly or through student fees; b) research that helps the institution position itself locally, nationally and internationally, and c) research that helps the institution further its strategic agenda. From the perspective of an individual academic, we might be happy when we get the grant the project relies on, but from the perspective of a strategically thinking university, a more interesting question is how will this lead to further grants? Is a whole chain of grants and lucrative licensing agreements on the horizon? Does the active project help the institution position itself with major funders? Can the work be leveraged to garner the attention of policymakers? Donors? And so forth.

Again, we find the same relationships at play. If we want to increase the academic impact, we need to reduce the focus on real-world and institutional impact. While some project can deliver all three, each type of impact will be less than if the project is focused on one of them.

It is probably not a surprise that these tree types of impact are at odds. For example, research to inform public policy, might also provide academic impact, but the requirements of the policymakers are very different than research aimed directly at generating citations and recognition in a field. This makes sense when we consider that the "end users" of the research in the three situations have very different requirements in terms of what they need from the research. Furthermore, that they have different languages and that providing results to them in a format where it can drive the kind of action we seek, takes time and resources.

The topic of how these three forms of impact operate hotly debated, and we will avoid further detail here beyond establishing that the impact of research comes in three different ways, but any one project will struggle to deliver on all fronts and will be more efficient if aimed at one type of impact.

Application of the Triple Triangles in Research Projects

The relevance of the Triple Project Priority Triangles becomes particularly evident at three critical stages of a research project's lifecycle:

1) Pre-Award Stage: Guiding Proposal Development

When applying for funding, the Triple Triangles serve as a strategic guide for considering how different constraints impact each other, as described above. Secondarily, the model provides guidance as to what elements we need to consider in developing the project at the proposal stage, for example:

- **Scope Definition**: Clearly articulate your research objectives and questions. A well-defined scope demonstrates feasibility and focus to funding bodies.
- **Budget Planning (Cost)**: Develop a detailed budget that aligns with your project's needs. Consider all potential expenses to avoid underestimation.
- **Timeline Establishment (Time)**: Propose a realistic timeline with milestones. This shows reviewers that you have a structured plan for project execution.
- **Resource Identification**: Specify the team, facilities, and materials required. Highlighting available resources can strengthen your proposal.
- **Risk Assessment**: Identify potential challenges and propose mitigation strategies. A proactive approach to risk management reflects thorough planning.
- **Quality Assurance**: Outline how you will ensure high-quality outcomes. This could include peer reviews, pilot studies, or adherence to established methodologies.
- **Impact Focus:** Consider the goal of the project in terms of its intended impact and integrate the constraints this poses on the resourcing and execution of the project.

By addressing these elements in a proposal, we can convey a comprehensive understanding of the project's demands and demonstrate preparedness to manage them.

2) Post-Award Stage: Refining Project Plans

Upon securing funding, it is time to translate your proposal into actionable plans. At this stage, we convert what is a well-considered project, but which is typically only described at a reasonably high level, into a detailed project plan. Traditional project management has a plethora of useful tools to guide this process. Our triple triangle framework not only provides constraint dimensions to consider in a similar capacity as we did during the initial project planning at the proposal stage; it also provides a high-level view of key factors to consider:

- **Scope Confirmation**: Revisit and refine your research questions. Ensure they are still relevant and achievable within the project's parameters. Define work packages and estimations for each.
- **Budget Management (Cost)**: Allocate funds to specific activities based on the estimates. Consider if the necessary resources, such as person-power or equipment, are available the planned time.
- **Detailed Scheduling (Time)**: Develop a detailed project schedule. Assign tasks, set deadlines, and establish a system for tracking progress. Tools such as network diagrams are highly useful for this purpose, flowing into Gantt charts and cost/schedule budgets.
- **Role Allocation**: Assign roles and responsibilities. Ensure team members to be recruited have the necessary tools and support to perform their tasks effectively.
- **Risk Management Implementation**: Reassess your risk mitigation plans into action given the more detailed planning at this stage. Set up a system for continuously monitoring for new risks and adjust strategies as needed.
- **Quality Control Measures**: Implement procedures to maintain high standards. Regular evaluations and feedback loops can help maintain quality throughout the project.
- **Impact Focus:** Consider in more detail the intended impact and troubleshoot the pathways to achieve them. Consider carefully the stakeholders involved that can either aid or hinder the desired impact generation. Create a communication plan covering each stakeholder.

At this stage, while some flexibility remains, certain aspects like cost and time are often fixed. Therefore, careful planning and adherence to the established parameters are crucial for project success, notably to ensure we do not lose scope. There will usually be more flexibility in the Quality and Impact triangles at this stage.

3) Project Execution: Deciding how to adapt to changing conditions

No project plan survives meeting with reality. Such is also the faith of research project – especially empirical, low-technology readiness level and risky projects. A lot of factors can change within or around a project. Whether it is a sudden shortage of resources, unexpected data results, or shifts in team dynamics, the ability to adapt is crucial. When situations on the ground invariably deviate from the plan, the Triple Triangles provide a first step in figuring out how we respond to those changes.

Step 1: *Identify Key Project Constraints and Flexibilities*

Begin by pinpointing which elements of the Triple Triangle are fixed and which are flexible. For example, a grant-funded project may have a fixed budget (cost) but adjustable timelines (time). This gives you an initial understanding of how the project can move within each of the three triangles, and how that movement will affect other parameters in each triangle.

Step 2: *Make Informed Trade-offs to Achieve Project Goals*

Consider how to make a trade-off to account for the changed condition. For example, unexpected sampling issues might negatively impact the quality of results. If quality is a hard constraint in the project, it means increasing resource allocation or accepting additional risk.

Other examples include:

- **Scope Adjustments**: Imagine we are in the midst of executing a study, and preliminary findings suggest a need to explore an additional variable. Expanding the scope at this stage requires careful consideration. How will this impact our timeline and budget? It is essential to assess whether the potential benefits of broadening the research outweigh the constraints of time and cost.
- **Budget Reallocations (Cost)**: Suppose a key piece of equipment breaks down, necessitating an unplanned expenditure. To accommodate this within a fixed budget, we might need to reallocate funds, perhaps by reducing costs in other areas or seeking additional funding. This balancing act ensures that the project remains financially viable without compromising essential components.
- **Timeline Revisions (Time)**: Unexpected delays, such as difficulties in data collection or analysis, can threaten project deadlines. In such cases, revisiting the project schedule to identify tasks that can be expedited or rescheduled becomes imperative. Alternatively, negotiating deadline extensions with stakeholders may provide the necessary leeway to maintain project integrity.

Step 3: Monitor Whether Trade-offs Worked

Once a mitigation plan has been put into place, it is important to monitor whether it works. In small project, e.g. a PhD project, this is readily apparent. In a larger, multi-institutional consortium project, this kind of project monitoring is essential to make sure that each site or person involved is reacting to the changed conditions in the manner intended. Communication across consortia sites is notably crucial in times where a project is changed.

Additional Constraints in University-Based Research

The Triple Triangles are certainly not a comprehensive list of all the constraints academic researchers must navigate in proposing, planning and executing a research project. While they form a strong baseline, we should not be blinded by the model but rather use it as a springboard for considering what other factors to consider. For example:

- **Ethical Considerations**: Ensuring ethical standards are upheld in research design and execution is paramount. This includes obtaining necessary approvals and informed consent. Ethical considerations can, for example, increase cost and time, but also lead to higher impact and stakeholder satisfaction.
- **Institutional Policies**: Adherence to university regulations and guidelines can influence project planning and implementation. This can improve institutional impact. Not doing so can cause trouble with the administrative staff or management and cause no end of trouble.
- **Stakeholder Expectations**: Balancing the interests and expectations of various stakeholders, including funding bodies, participants, and the academic community, adds complexity to project management. Every project will have stakeholders that are crucial to the success and impact of a project.
- **Interdisciplinary Collaboration**: Coordinating across different disciplines requires effective communication and integration of diverse perspectives. Building mutual respect for different disciplines within a project team (or consortium) is vital to ensure a well-functioning partnership. Working across epistemologies can be incredibly challenging and is a topic in its own right.
- **Nature**: While mainly relevant for fieldwork-based research, nature has a way of imposing its own will on our work. Handling this constraint requires careful risk planning and risk management, and sometimes very innovative thinking when a component breaks down in the field, or the expected behaviours of animals we study do not appear. While this constraint is usually dealt with in terms of risk planning, any experienced fieldwork scientist will tell you that nature has a way of surprising us in unexpected ways.

Recognizing and addressing these constraints is essential for the holistic management of academic research projects.

Conclusion: Ensuring Research Success Through Structured Prioritization

Effective project management is one of the best ways of ensuring the success of academic projects, whether aimed at research, development, education or administration. The Triple Triangles show how important holistic project planning and execution is, and how various constraints interact. The Triple Project Priority Triangles provide a structured framework to guide prioritization and decision-making, from proposal development to project execution. By thoughtfully balancing scope, cost, time, resources, risk, quality and the three types of impact, and considering additional academic constraints as relevant, researchers gain a high-level framework for understanding what restrictions exist in research projects, how they impact each other and how we relate to them across the proposal, planning and execution phases of research projects.

Thanks for reading.

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