



The Iron Triangle is Obsolete – Long Live the ECPM Framework Scope Triangle

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The "Iron Triangle" has been a mainstay in project management for many years but its value in the complex project landscape is limited. This is not an article about the "Iron Triangle." Rather it is an article about the its contemporary replacement - the "ECPM Framework Scope Triangle." This Scope Triangle offers a systems view of complex projects and their effective management. As such it provides the ECPM Framework with a tool to support problem solving, change management and business decision making. That same tool can be applied to the PRINCE2 Framework with equal impact.

To begin our discussion know that there is a significant difference between the project variables defined in PRINCE2 (Costs, Timescales, Quality, Scope, Risk and Benefits) and those defined in the ECPM Framework (Cost, Schedule, Resource Availability, Quality, Scope and Risk).

Note that PRINCE2 includes Benefits and the ECPM Framework does not. Benefits are defined within the business value that is generated from the project deliverables and in the Business Case that justified the project.

The biggest and perhaps most important variable is Resource Availability. It is clearly identified as a project, program and portfolio constraint in the ECPM Framework but is absent from the PRINCE2 Framework at the project level. The program and portfolio level are out of scope here.

There are just a few graphics used in the ECPM Framework that should be burned into your project management brain. They are intuitive and powerful decision making tools. The ECPM Framework Scope Triangle is one of those graphics.

THE ECPM FRAMEWORK SCOPE TRIANGLE - DEFINING VARIABLES

The ECPM Framework includes the Iron Triangle (Cost, Schedule, Scope define the three sides of the Iron Triangle) but it is much more than that. It is a system defined by the 6 variables shown in Figure 5.1.



Figure 5.1: ECPM Framework Scope Triangle

Risk

Risk overshadows the other 5 variables in the ECPM Framework Scope Triangle. It can impact any of the other 5 variables. In the complex project landscape, risk is so impactful and potentially damaging that one of the team members should be given responsibility for risk management. Assigning that responsibility is essential to effective complex project management. The responsibility spans the entire project life cycle and therefore the risk management life cycle from Identification to Assessment to Mitigation to Monitoring. A risk management plan is developed with the collaboration of the project team. Recall that the project team includes decision making responsibilities of the client and so risk management decisions are also client decisions. Risk is continuously monitored and reported upon at each project status meeting.

Quality

The project deliverables and the process that produced them will have been defined as part of project requirements elicitation. There is also an implied "fitness for use" against which the process and the product are measured.

The following two types of quality are part of every project:

- **Product quality:** As used here "product" includes tangible artifacts like hardware and software solutions as well as business processes. The traditional tools of quality assurance and quality control are used to ensure product quality. In a complex project situation product quality is an evolving quality. Incremental solution development must include a continuous review of the convergence of product quality as measured against product performance requirements.
- **Process quality:** Process quality is the enabler of product quality and for that reason it should continuously reflect a best effort. The focus is on how well the project management process works for this project; how it can be improved for this project, and how it can be improved for future projects. A continuous process improvement program for complex project management must be in place.

A sound quality management program with processes in place that monitor the work in a project is a good investment. Not only does it contribute to client satisfaction, but it helps organizations use their resources more effectively and efficiently by reducing waste and revisions. Quality

management is one area that should not be compromised. The payoff is a higher probability of successfully completing the project and satisfying the client.

Scope

Simply put, scope defines what is in the project and what is not in the project. Much of this can be described through a necessary and sufficient set of project requirements (see Article 3: Elicitation of High-level Requirements).

Scope is a statement that defines the boundaries of the project. It tells not only what will be done, but also what will not be done. In the information systems industry, scope is often referred to as a functional specification. In the engineering profession, it is generally called a Statement of Work (SOW). More generally it has been called Project Overview Statement (POS), Project Initiation Document (PID), Document of Understanding (DOU), Scoping Statement, Project Charter, or Project Request are also in common use. PRINCE2 projects begin with a Project Mandate. Project Mandate precedes the PID which is also part of the PRINCE2 Framework. The POS is part of the ECPM Framework Ideation Phase. It is quite similar to the PID but there are some distinct differences too. See Article 4: Comparison of the PRINCE2 PID and the ECPM Framework POS.

Whatever its name, this document is the foundation for all project work to follow. It should be the primary input for all project performance reviews, status meetings, change request approvals and problem resolution. For that reason, it is critical that the scope be correct and be up to date. Beginning a project on the right foot is important, and so is staying on the right foot. It is no secret that a project's scope can change. In the complex project world, you do not know how or when, but scope will change. Detecting that change and deciding how to accommodate it in the project plan are major challenges for the complex project manager.

Cost

The dollar cost of doing the project is another variable that defines and constrains the project. This includes not only the development costs but also the ongoing maintenance costs of the deliverables. Total cost is a variable often used in project prioritization processes. Cost is best thought of as the budget that has been established for the project. This is particularly important for projects that create deliverables that are sold either commercially or to an external customer.

Cost is a major consideration throughout the project management life cycle. The first consideration occurs at an early and informal stage in the life of a project. The client can simply offer a figure about equal to what he or she had in mind for the project. Depending on how much thought the client put into it, the number could be fairly close to or wide of the actual cost for the project. Consultants often encounter situations in which the client is willing to spend only a certain amount for the work. In these situations, you do what you can with what you have. In more formal situations, the project manager prepares a proposal for the projected work. That proposal includes an estimate (perhaps even a quote) of the total cost of the project. Even if a preliminary figure has been supplied by the project manager, the proposal allows the client to base his or her go/no-go decision on better estimates.

Schedule

The client specifies a time frame or deadline date within which the project must be completed. To a certain extent, cost and time are inversely related to one another. The time a project takes to be completed can be reduced, but costs will increase as a result. The schedule reflects not only the timeframe within which the project is executed but also the labor hours needed to produce the deliverables within that timeframe. That extends the reach of the schedule into the commitments made of resource utilization across that schedule. That is the root cause of most resource contention problems that arise during the ECPM Framework Project Execution Phase.

Time is an interesting resource. It can't be inventoried. It is consumed whether you use it or not. The objective for the project manager is to use the future time allotted to the project in the most effective and productive ways possible. Future time (time that has not yet occurred) can be a resource to be traded within a project or across projects. Once a project has begun, the prime resource available to the project manager to keep the project on schedule or get it back on schedule is time. A good project manager realizes this and protects the future time resource jealously.

Resource Availability

The resources are any finite consumables (people, rooms, computer time, equipment, etc.). In the short run there is only limited capacity of each resource. Some of it has already been allocated to other in-process projects as well as committed to future projects. Resource Availability deserves considerable discussion as it is a constraining variable that impacts all the other variables as well as active and to be approved projects. At the enterprise level, Resource Availability is the link to portfolio management in that the resources are finite, at least in the short run and are allocated across all approved projects by virtue of the strategic plan. So while there are constraints that operate on a single project (time, for example), Resource Availability is a constraint that is binding across the entire project portfolio. It is the ultimate enabler of the strategic plan! It is the binding constraint across all projects in the portfolio.

In many organizations Resource Availability is not taken into account when projects are approved for execution. Resource Availability encompasses both skill availability and schedule availability.

- **Skill availability** means that the project portfolio should be balanced with respect to skill and competency requirements. If every project required only senior project managers, what do you do with the junior project managers? That further begs the question about proposed resource requirements for the project. Trade-offs and between project manager negotiations for skills and competencies of the team members are common.
- **Schedule availability** is a bit more forgiving in that schedules can be adjusted to remove resource conflicts. That requires attention to the critical path and slack management. Another tool that has helped is "Management Reserve." It will be discussed in a future article.

Not taking these two availabilities into account as part of project approval becomes a major obstacle to project completion because it leads to resource contention problems and scheduling conflicts during project execution. In other words it throws the project system out of balance. Project Portfolio Management is out of scope for PRINCE2 at the project level and resource contention is not even considered as a factor in project approval. Even though the Project Board may have knowledge of available resources, these considerations do not appear explicitly in the PRINCE2 Framework. The situation is different at the Program and Portfolio levels. It is clear from the above discussion that a sound human resource management process is critical to project plan achievement. Unfortunately not too many organizations can boast of having such a process in place. Commercial products fall short of meeting the complex project management requirements.

Including resource management during ECPM project planning as a constraining variable is straightforward as long as the appropriate Resource Managers are invited to participate in the planning activities. They have command of the resource schedule and intimate knowledge of the availabilities and capacities of their resource inventory and can make informed decisions for

resource availability for both current and future projects. It is not obvious that the PRINCE2 project team has those resource managers in attendance.

THE ECPM FRAMEWORK SCOPE TRIANGLE - A SYSTEM IN BALANCE

On the first day of a project the project system is in balance. No work has been done yet. Due to the dynamics of the situation this balance may be short-lived. Something changes that was either expected or not expected even though its timing may be unknown. Literally every change has a domino effect on the other variables and causes a change in one or more of the 6 variables. In order to restore balance to the project, a change in one or more of the other variables will have to be made. In that sense the ECPM Framework Scope Triangle is a management tool for problem resolution, schedule repair and change management. This systems view of project management is a useful problem solving tool and change management tool and is explored in detail in the ECPM Framework book (Wysocki, Robert K., 2014, *Effective Complex Project Management: An Adaptive Agile Framework for Delivering Business Value*, J. Ross Publishing). Its adaptation to PRINCE2 is discussed in this article. The Iron Triangle, which is not discussed in PRINCE2 or the ECPM Framework, does not offer such a rich interpretation.

The 6 variables that define the ECPM Framework Scope Triangle form an interdependent set of variables that define the project as a system in balance. To understand this interpretation, visualize the triangle as a geometric figure that encompasses an area (the area occupied by the scope and quality) that is bounded by the three sides of the triangle. Those sides are just long enough to encompass that area. If one of the sides should shrink (budget is reduced, schedule shortened or a previously scheduled resource is no longer available), then the reduced length of the corresponding lines are no longer sufficient to encompass the area defined by the scope and quality. The interpretation and its explanatory figure is conceptual. Don't try to draw the triangle. It can't be done. A very common situation arises from scope change request that increase scope. Decreases are rare. In these cases the area occupied by scope expands and the sides of the triangle are no longer sufficient to enclose the larger area. Something has to change. The length of one or more lines must be increased (increased time or cost and/or more staff assigned to the project), so that the larger scope can be bounded by the larger triangle.

I have had over 25 years of client experiences using the ECPM Framework Scope Triangle. It has been a valuable addition to my project management tool kit and I can recommend it to you especially if you are a PRINCE2 Practitioner or Professional.

PRIORITIZING THE ECPM FRAMEWORK SCOPE TRIANGLE VARIABLES

Except for risk, the other 5 variables can be prioritized as an assist to problem solving, change management and other management decision making. Figure 5.2 is an example of one such prioritization schema. It applies to only one project. Every project is different. The matrix shows that the time constraint is the least flexible and the cost constraint is the most flexible. Also note that scope is quite flexible as should be the case for any complex project.

Variable \ Priority	Critical (1)	(2)	(3)	(4)	Flexible (5)
Scope				X	
Quality			X		
Time	X				
Cost					X
Resource Availability		X			

Figure 5.2: Prioritized ECPM Framework Scope Triangle Variables

When alternatives solutions to a problem or change management approval arise, this matrix is easily applied to help prioritize and then make the best choice. For example in Figure 5.2, since cost is the most flexible, choices that impact cost would receive a higher likelihood of being implemented than those that involve time or resources. Variables prioritization should be done during project planning to remove any bias that might arise during the problem solving or change management events. That prioritization exercise must involve the client too.

Problem Solving & the ECPM Framework Scope Triangle

There are a variety of problem solving models that are in common use. The one that I am recommending is simple and can be used in a variety of contexts within the ECPM Framework. It was developed by J. Daniel Couger (1995, *Creative Problem Solving and Opportunity Finding*, Boyd & Fraser Publishing Company) aligns quite well to the divergent/emergent/convergent process used in the Ideation Phase of the ECPM Framework and is the recommended model. The Couger model follows the linear process:

- Step 1: Delineate opportunity and define problem
- Step 2: Compile relevant information
- Step 3: Generate ideas
- Step 4: Evaluate and prioritize ideas
- Step 5: Develop implementation plan

Something has happened that put the project plan at risk. Late shipments from suppliers, equipment malfunctions, sickness, random acts of nature, resignations, priority changes, errors, and a host of other factors can lead to problems that affect deliverables, deliverable schedules, and resource schedules. The project team owns the problem and must find a solution.

This situation is very different for the project manager than the case of a change request. When a change request has been made, the project manager has some leverage with the client. The client wants something and might be willing to negotiate to an acceptable resolution. That is not the case when a problem arises on the project team. The project manager does not have any leverage and is in a much more difficult position.

When the unplanned happens, the project manager needs to determine who owns the problem and the extent of the problem, and then take the appropriate corrective measures. Those measures often include helping the owner of the problem find an acceptable solution following the escalation hierarchy discussed later in this chapter. Minor variations from the plan will occur and may not require corrective measures. There are degrees of corrective measures available to the project manager: In trying to resolve a problem, the project manager begins at the top of the escalation hierarchy and works down the hierarchy, examining each option until one is found that solves the problem.

The ECPM Framework Scope Triangle enables you to ask the question, "Who owns what?" The answer will give you an escalation pathway from project team to resource manager to client to sponsor. The client and senior management own time, budget, and resources. The project team owns how time, budget, and resources are used. Within the policies and practices of the enterprise, any of these may be moved within the project to resolve problems that have arisen. In solving a problem, the project manager should try to find a solution within the constraints of how the time, budget, and resources are used. For these solutions the project manager does not need to go outside of their sphere of control.

The next step in the escalation strategy would be for the project manager to appeal to the resource managers for problem resolution. The resource manager owns who gets assigned to a project as well as any changes to that assignment that may arise.

The final step in the problem escalation strategy is to appeal to the client and perhaps to the sponsor for additional resources. They control the amount of time and money that has been allocated to the project. Finally, they control the scope of the project. Whenever the project manager appeals to the client, it will be to get an increase in time or budget and some relief from the scope by way of scope reduction or scope release.

There are three levels of escalation strategy: project team-based, resource manager-based, and client-based.

Project Manager–Based Strategies

If the problem occurs within a non-critical-path activity, it can be resolved by using available slack (Wysocki, Robert K., 2014, *Effective Project Management: Traditional, Agile, Extreme, 7th Edition*, John Wiley & Sons). One example is to reschedule the activity later in its ES-LF window or extend the duration to use some of the available slack. Note that this strategy does not affect any other activities in the project. By using slack, you affect the resource schedule for all activities that have this activity as a predecessor. Another approach is to continue the schedule compression techniques employed in defining the original project plan. This strategy can affect resource schedules just as in the prior case. The last option open to you is to consider the resource pool under your control as the project manager. Can some resources be reassigned from non-critical-path activities to assist with the problem activity?

Resource Manager–Based Strategies

After you have exhausted all the options under your control as the project manager, it is time to turn to the resource managers for additional help. This help may take the form of additional resources or rescheduling of already committed resources. Expect to make a trade-off here. For example, you might be accommodated now, but at the sacrifice of later activities in the project. At least you have bought some time to resolve the downstream problem that will be created by solving this upstream problem. If you have other projects that you are currently managing, some trades across projects may solve the problem.

Client-Based Strategies

When all else fails, you will have to approach the client. The first option would be to consider any multiple-release strategies. Delivering some functionality ahead of schedule and the balance later than planned may be a good starting point. The last resort is to ask for an extension of time. This may not be as unpleasant as it seems because the client's schedule may have also slipped and the client may be relieved to have a delay in your deliverable schedule, too.

The Escalation Strategy Hierarchy

The problem escalation strategy presented here is based on the premise that you, as the project manager, will try to solve the problem with the resources that you control. Failing to do that, you can appeal to your resource managers. As a last resort, you can appeal to the client.

One thing to note here that is very different from the change request situation discussed previously is the leverage to negotiate. As mentioned, you, as the project manager, have leverage when the client has requested a change, but no leverage when you have a project problem to solve. The client has nothing to gain and is therefore less likely to be cooperative. In most cases, the problem can be reduced to how to recover lost time. The following six outcomes are possible to this problem situation:

- **No action required (schedule slack will correct the problem)**—In this case, the slippage involved a non-critical-path activity and it will self-correct.
- **Examine FS dependencies for schedule compression opportunities**—Recall that you originally compressed the schedule to accommodate the requested project completion date by changing FS dependencies to SS dependencies. You should use that same strategy again. The project schedule will have changed several times since work began, and there may be several new opportunities to accomplish further compression and solve the current problem.
- **Reassign resources from non-critical-path activities to correct the slippage**—Up to a point, you control the resources assigned to this project and others that you manage. You may be able to reassign resources from non-critical-path activities to the activities that have slipped. These non-critical-path activities may be in the same project in which the slippage occurred or they may be in another project that you manage.
- **Negotiate additional resources**—Having exhausted all of the resources that you control, you need to turn to the resource managers as the next strategy. To recoup the lost time, you need additional resources. These resources may come in the form of added staff or dollars to acquire contract help.
- **Negotiate multiple release strategies**—This strategy involves the client. Just as in the case of a change request, you can use a multiple-release strategy to your advantage. An example will illustrate the strategy: The project manager shares the problem with the client and then asks for the client to prioritize the features requested in the project plan. The project manager then offers to provide the highest-priority features ahead of their scheduled delivery date and the remaining priorities later than the scheduled delivery date. In other words, the project manager gains an extended delivery schedule, but gives the client something better than the original bargain offered—namely, something ahead of schedule.
- **Request a schedule extension from the client**—This is the final alternative. Although it's similar to the multiple-release strategy, it offers the client nothing in trade. The slippage is such that the only resolution is to ask for a time extension.

You, as the project manager, should try to solve the problem by starting at the top of this list of six outcomes and working down until a solution is found. By using this approach, you will first try to solve the problem with resources that you control, then with resources that the resource managers control, and finally with resources and constraints that the client controls.

Change Management & the ECPM Framework Scope Triangle

The ECPM Framework recommends a Bundled Change Management Process. Simply put, all decisions regarding proposed scope changes are held until the Client Checkpoint Step. This is different than the traditional approach. To handle change requests as they arise, as is done in the PRINCE2 Framework, is not a lean practice. During the Client Checkpoint Step all proposed scope changes that have not yet been acted upon are considered together. These will include past requests that have not yet been processed as well as requests that arose during the just completed cycle. From among those change requests some will be approved and available for scheduling, others will be rejected and others will be held for later decisions.

What is the Bundled Change Request Process?

It is difficult for anyone, regardless of his or her skills at prediction and forecasting, to completely and accurately define the needs for a product or service that will be implemented 6, 12, or 18 months in the future. Competition, client reactions, technology changes, a host of supplier-related situations, and many other factors could render a killer application obsolete before it can be implemented. The most frequent situation starts with a statement that goes something like this: "Oh, I forgot to tell you that we will also need ..." or "I just found out that we have to go to market no later than the third quarter instead of the fourth quarter." Face it: Change is a way of life in complex project management. You might as well confront it and be prepared to act accordingly.

Because change is constant, a good project management methodology must have a clear and effective change management process in place. In effect, the change management process has you plan the project again so it now incorporates the approved changes. If your PMLC Model requires a complete plan at the outset of the project, much of the time spent doing the planning will turn out to be nonvalue-added work due to the time spent replanning to accommodate approved changes. Perhaps the use of a PMLC Model based on just-in-time planning is a better approach at least from a "lean" perspective. Even if you have to use a plan-driven PMLC Model, incorporating the Bundled Change Request Process will be a good insurance policy.

An integral part of the Bundled Change Request Process is documentation. I strongly suggest that every change be treated as a major change until proven otherwise. To not do so is to court disaster. That means every change request follows the same procedure. Figure 5.3 is an example of the steps in a typical Bundled Change Request Process.

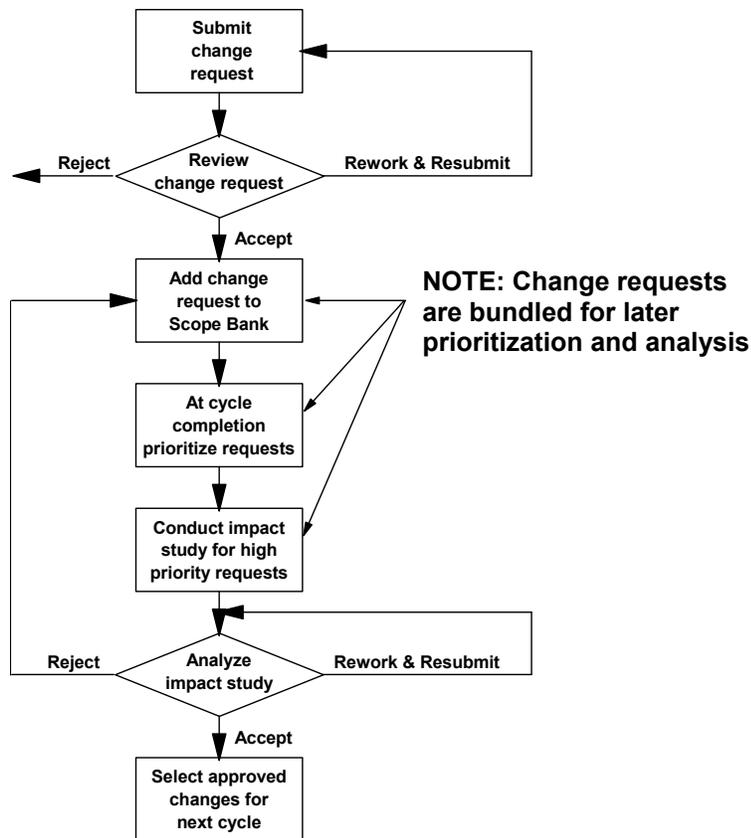


Figure 5.3: Bundled Change Management Process

So What's Different?

In the ECPM Framework the scope change process does not exist in the traditional forms you are probably familiar with already. That should come as good news to the traditional project manager for whom change is not welcome after spending the effort to build the plan. That may sound strange given what we have already said about ECPM thriving on change. Scope change in an ECPM project occurs but not like it does in a traditional project. Learning and discovery are the hallmarks of an ECPM Cycle so that any thought or idea that the client team or the development team has as to something different to do in the solution is captured and stored in the Scope Bank. The major difference between the traditional project and ECPM scope change is that in the traditional project the scope change requests are considered one at a time on a first come first serve basis. That is not the case with the ECPM Framework. Furthermore in ECPM Projects scope changes become part of the project plan going forward whereas in traditional and PRINCE2 projects they are an add on to a project plan that already exists. It is easy to see that in these approaches there is a lot of wasted time revising a plan to accommodate scope changes. That doesn't happen in the ECPM Framework because the plan going forward has not yet been prepared and so there is no wasted time processing scope changes. In the ECPM Framework planning is a just-in-time event. In the ECPM Framework resources are used to best business advantage on value added work whereas in traditional projects there is no assurance that that is the case.

Project Impact Statement

A common application of the prioritized scope triangle variables occurs whenever a scope change request is made. The analysis of the change request is documented in a Project Impact Statement (PIS). If the change is to be approved, there will be several alternatives as to how

that change can be accommodated. These alternatives can be prioritized using the prioritized scope triangle and forwarded to the Client Checkpoint Step for consideration.

If the project is subject to frequent change requests and these are processed on an as received basis, significant resources can be wasted. Bundling change requests and processing them in bulk (say at the end of a cycle or at milestone events) can avoid wasting resources and protect the project plan as well. That is the process followed in the ECPM Framework.

Regardless of the PMLC Model you choose, you will have to deal with scope change requests coming from the client and from the project team. In some cases, you'll be expecting these change requests, but not when you will get them but you'll be ready to process them. In other cases, you will not be expecting them (or at least won't want them), but that doesn't absolve you from having a way to process them. During project planning I introduce the client to the Bundled Change Request Process and its benefits and get their agreement to its use. So the Bundled Change Request Process can be in place from the start the project.

PRINCE2 and the Change Process

There are four obvious benefits that the ECPM Framework Scope Triangle and specifically the change process can bring to the PRINCE2 Framework:

- It is lean - groups the requests into a single decision package
- It is lean - allows for prioritization of requests
- It is lean - schedules change implementation for maximum business value
- It is lean - minimizes nonvalue-added time

The major benefit is that the process will reduce the time wasted to process change requests. All meaningful analysis of the change requests is done at the completion of the current cycle. The analysis includes a prioritization and scheduling of the approved change requests. So only one plan revision is done at these deadline dates rather than one plan revision for every change request in the bundle - an obvious saving of time, cost and resource utilization.

Prince2 devotes a chapter to change control and issues management (*Managing Successful Projects with PRINCE2, 2009 edition, AXELOS*) with the emphasis on issue management. Issue management is not unlike problem solving and I have discussed how the ECPM Framework Scope Triangle is an excellent structure for managing problem solving and analysis of the alternatives. In the complex project world change is to be expected, unlike the traditional project world where change is less frequent and disruptive of established plans and schedules. PRINCE2 change control is not lean! The ECPM Framework approach to problem solving and bundled change management is an excellent lean process that can be adapted and integrated into the PRINCE2 Framework with minimal disruption of the management process.

PUTTING IT ALL TOGETHER

The change process has been the bane of the traditional project landscape but is essential for the success of the complex project landscape. The less that is known about the goal and or solution the more frequent are the change requests. It is not uncommon for a change request that was made earlier is reversed by a more recent change request. that is the nature of the search for an acceptable solution to a complex situation. Learning and discovery are not linear processes. For that reason alone, the bundled change process first defined in the ECPM Framework as part of its lean practice has application to the PRINCE2 Framework as well.