An Early Warning System for Programs Utilizing the Rolling Wave Lifecycle[1]

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This article intends to build upon the "novel approach to determining which tasks are on track, falling behind, or ahead of schedule in a project characterized, at least in part, by Rolling Wave planning cycles," as presented by the authors in Ford et al. (2023). In that article, we presented a new key performance indicator (KPI) we named the "Early Warning System," consisting of a series of formulas to compare a task's estimated duration, estimated end date, and percent complete to present a manager with a snapshot of whether the project task(s) was on track. This article extends that process to propose a similar methodology for program managers administering multiple projects, all utilizing the Rolling Wave lifecycle, to meaningfully monitor and control scope, schedule, and cost in an environment often characterized by ambiguity.

Rolling Wave

There are two broad categories of project management: predictive and adaptive (PMI, 2021; Kerzner, 2022; Kloppenborg et al., 2019; PMI, 2017). The predictive (or Waterfall) lifecycle is typically characterized by intense and detailed planning efforts (sometimes called Front End Loading [FEL] or Front End Engineering Design [FEED]) followed by the disciplined execution of the plan, with as few deviations as possible. The planning effort often takes months, if not years. In a traditional Waterfall lifecycle, organizations often use metrics and KPIs such as earned value management (EVM), including cost, schedule, scope, quality, and risk variance as measured against the baseline, which the project manager sets before execution begins (PMI, 2021; Kerzner, 2022; Kloppenborg et al., 2019, PMI, 2017).

The adaptive lifecycle approach is best utilized when elements of ambiguity exists in the project's scope, schedule, or cost. Two approaches in an adaptive project environment are Rolling Wave and Progressive Elaboration. A Rolling Wave lifecycle utilizes an iterative planning process (Progressive Elaboration) to capture increasingly detailed information regarding scope, schedule,

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cost, risk, and quality as the project progresses. The Project Management Institute (2021) describes Rolling Wave planning as "an iterative planning method in which the work to be accomplished in the near term is planned in detail, while the work in the future is planned at a higher level," as seen in Figure 1.

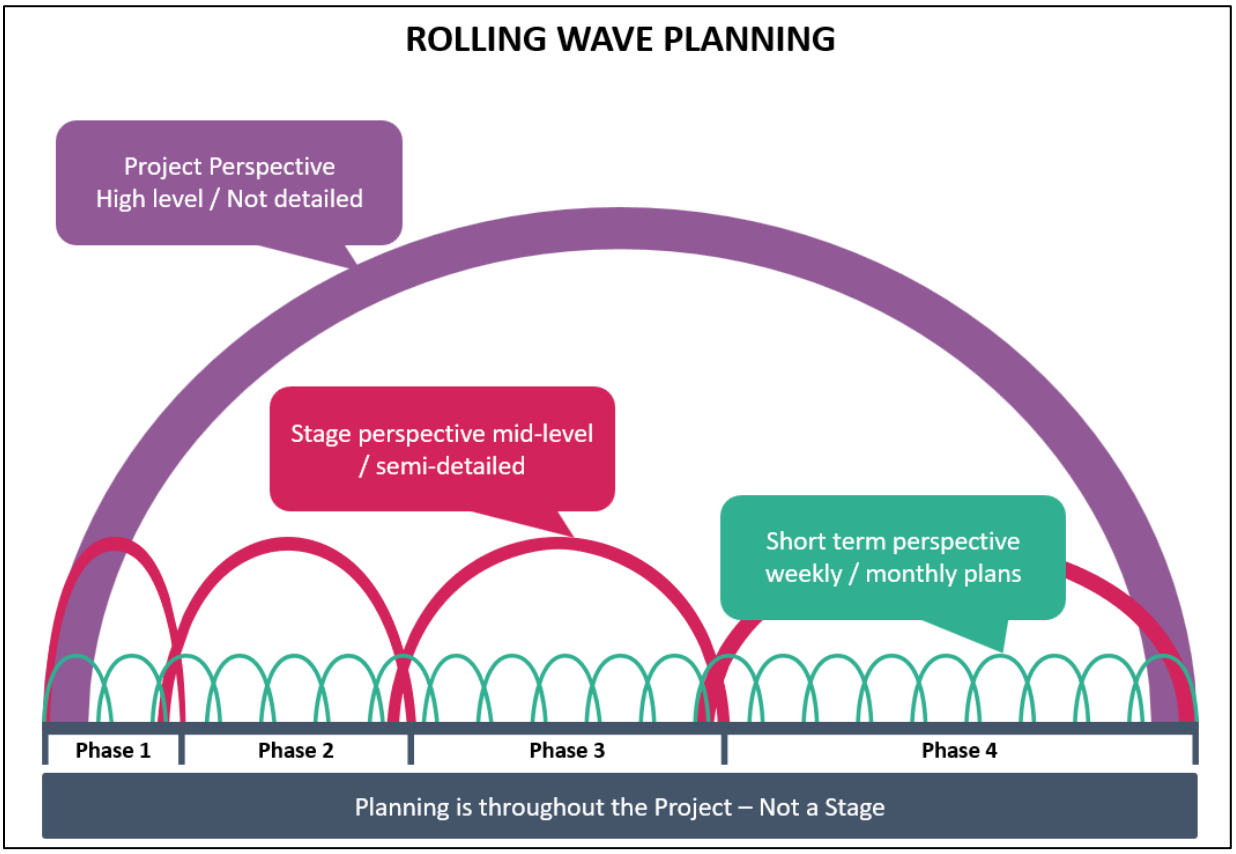

Figure 1: The Rolling Wave planning philosophy

The Rolling Wave lifecycle also differs from some Agile methodologies, which are best suited for (and initially conceived for) software development (PMI, 2021; PMI, 2017; Beck, et al., 2001). In a Scrum construct, for example, one would anticipate utilizing shorter iterations known as "sprints," which are often 2-4 weeks long and geared towards delivering testable iterations of a software package. The philosophy of this framework regarding testable iterations centers around building on what the team already knows works, i.e., testing and integrating with a deliberate process and building on what has been previously validated, with the intent of a relatively bug-fee final product. The traditional Agile metrics include "burndown charts, velocity diagrams, epic and release burndown graphs, statistical control charts, cumulative flow, defect analysis, throughput,

etc." (Ford et al., 2023). These metrics are proven in an Agile lifecycle but do not always directly translate into a Rolling Wave environment.

However, in practical management applications, we often see aspects of both Waterfall and Agile lifecycles in use at any given time. They are not mutually exclusive. These projects are known as Hybrid projects. A typical example is a large, complex construction project or, in the aerospace community, a new satellite constellation. Depending on the project's parameters, the planning process (FEL or FEED) for such endeavors is generally measured in months, if not years. After the plans are approved, the key stakeholders set the baseline, execution begins, and work is monitored/controlled per traditional Waterfall methodologies (PMI, 2021). However, there are typically scopes within the Waterfall project executed under a Rolling Wave or other Agile philosophy. These scopes, generally riskier due to ambiguity, innovation, or another characteristic that resists pre-planning, often carry budget allowances, schedule uncertainty, and scope ambiguity, translating into risks that can be quantified into contingency funding. These scopes are managed via Agile methodologies within the Waterfall project approach.

Building on this project management philosophy, we built and utilized a practical methodology to monitor and control necessarily ambiguous projects, as outlined in our previous article. However, when one project evolves into four or more projects, one faces the additional challenge of scaling up into program management instead of project management. In our case, the multiple emerging projects were branded by innovation, technology development, and product development. The challenge, therefore, was scaling up the Rolling Wave methodology, as well as the Early Warning System, into an effective and efficient framework by which we could administer not just a single project but an entire program of interrelated projects populated with tasks characterized by cross-predecessor and cross-successor relationships. We present a structural solution to this challenge.

Rolling Wave Program Management

In this example, we assume a program manager faces the challenge of facilitating the build-out of four distinct but interrelated project plans, each with a project manager. Each project will utilize the Rolling Wave construct, and the organization expects a program-level plan within a month. The program managers's first orders of business will be to set a meeting structure and program calendar for the project managers to facilitate the planning process and set clear expectations for the initial planning timeline. A typical program calendar in this environment would include two fifteen-minute weekly team meetings, usually Tuesday and Thursday, due to Monday and Friday

tending to be project meeting-heavy. Additionally, the program manager will typically have a more in-depth meeting of an hour or so with the project managers on Wednesdays.

In this scenario, one of the key issues facing the program manager is the reality that the four projects have interrelated dependencies. These predecessor and successor relationships are challenging to quantify and even more difficult to track promptly, as each project has inherent uncertainty (risk) throughout the plan. The solution we found is to have a comprehensive program dashboard, a section of which is seen in Figure 2.

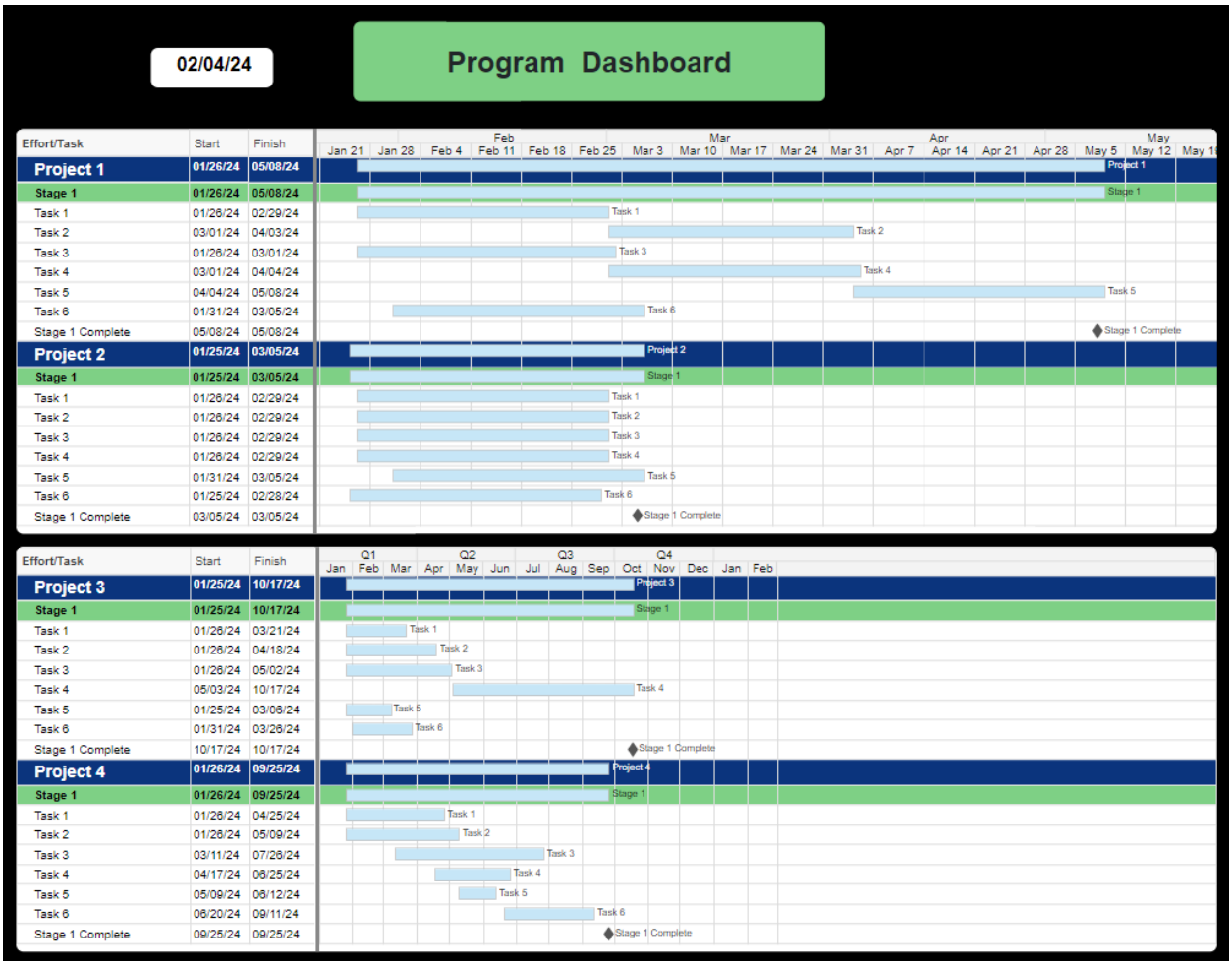

Figure 2: Example of a Gantt chart view of four project plans

The Gantt section of the dashboard automatically pulls critical data (some user-identified and some auto-filtered) from each of the four project plans. The four project managers will need to establish

project calendars to facilitate building out their respective plans using the organizational template, which is predesigned to enable a robust stage-gate process. The project managers will ensure that the planning exercises incorporate vital stakeholders across the organization's functional areas (procurement, logistics, finance, quality, risk, marketing, sales, etc.). Once the project managers build out the project plans with their teams, the program manager will ensure that the dashboard displays the correct data in the Gantt view and use it during the weekly meetings to coordinate among the project managers regarding which tasks impact (or could impact) tasks in the other projects. This process is essential when tasks are often added, changed, and deleted as the project proceeds.

The next section of the dashboard (Figure 3) includes the Early Warning System, as described in Ford et al. (2023), and a change order report for the program. Similar to the project-level version, we leveraged a Smartsheet report to pull data from the four project plans, filter it, and sort it into a tabular format that provides insight into which tasks are lagging behind the planned schedule, what project plan they are associated with, the schedule ratio value, the latest associated comments from the team, who is responsible for the task, and whether the task is on the critical path. The change order log is vital for program-level team meetings to prevent unintentional negative impacts on other projects due to ignorance on the part of a project manager. Ensuring that project managers are fully aware of pending change orders from the other project managers helps prevent these unintentional cross-project impacts.

Early Warning System

Row	Sheet Name	Efficiency	Schedule Ratio	Percent Complete	Task Description	Latest Comment	Assigned To	Critical Path?
3	Project 1 Plan	🔴	8%	2%	Task 1		Person 1	☑
6	Project 2 Plan	🔴	8%	2%	Task 4		Person 4	☐
7	Project 2 Plan	🔴	8%	1%	Task 5		Person 5	☑
5	Project 2 Plan	🔴	14%	4%	Task 3		Person 3	☐
4	Project 2 Plan	🔴	16%	4%	Task 2		Person 2	☐
3	Project 2 Plan	🔴	20%	5%	Task 1		Person 1	☐
3	Project 4 Plan	🔴	33%	5%	Task 1		Person 1	☐
4	Project 4 Plan	🔴	40%	4%	Task 2		Person 2	☐
4	Project 3 Plan	🔴	50%	4%	Task 2		Person 2	☐
3	Project 3 Plan	🔴	54%	5%	Task 1		Person 1	☐

Change Orders

Change Order Number	Task Description (include plan / row number)	Request Date	Requester	Summary of Change Requested	Impact to Scope, Schedule, and/or Cost	Approval Authority	Decision	Closed?	Documents Updated?
4	Change to task 3, project 1	02/05/24	Person 2	Delete task due to redundancy	No impact	Project Manager	Approved	Yes	Yes
3	Change to task 14, project 4	02/02/24	Person 3	License purchase for new software	Increase cost $15k	Sponsor	In Work	No	No
2	Change to task 10, project 3	01/29/24	Person 2	Extend duration 2 weeks	Extend task duration 2 weeks	Sponsor	In Work	No	No
1	Change to task 1, project 2	01/26/24	Person 1	Extend duration, purchase equipment	Pushes schedule out 1 week, adds $5k	Project Manager	Approved	Yes	Yes

Figure 3: Example of an Early Warning System and change order reports

It is also crucial that the program manager actively facilitate the conversations regarding the Early Warning System and change management process to prevent negative project impacts across the program. Reviewing the program-level Gantt charts, Early Warning System, and change orders should naturally segway into discussions about impacts on the program's schedule, scope, cost, risk, and quality plans.

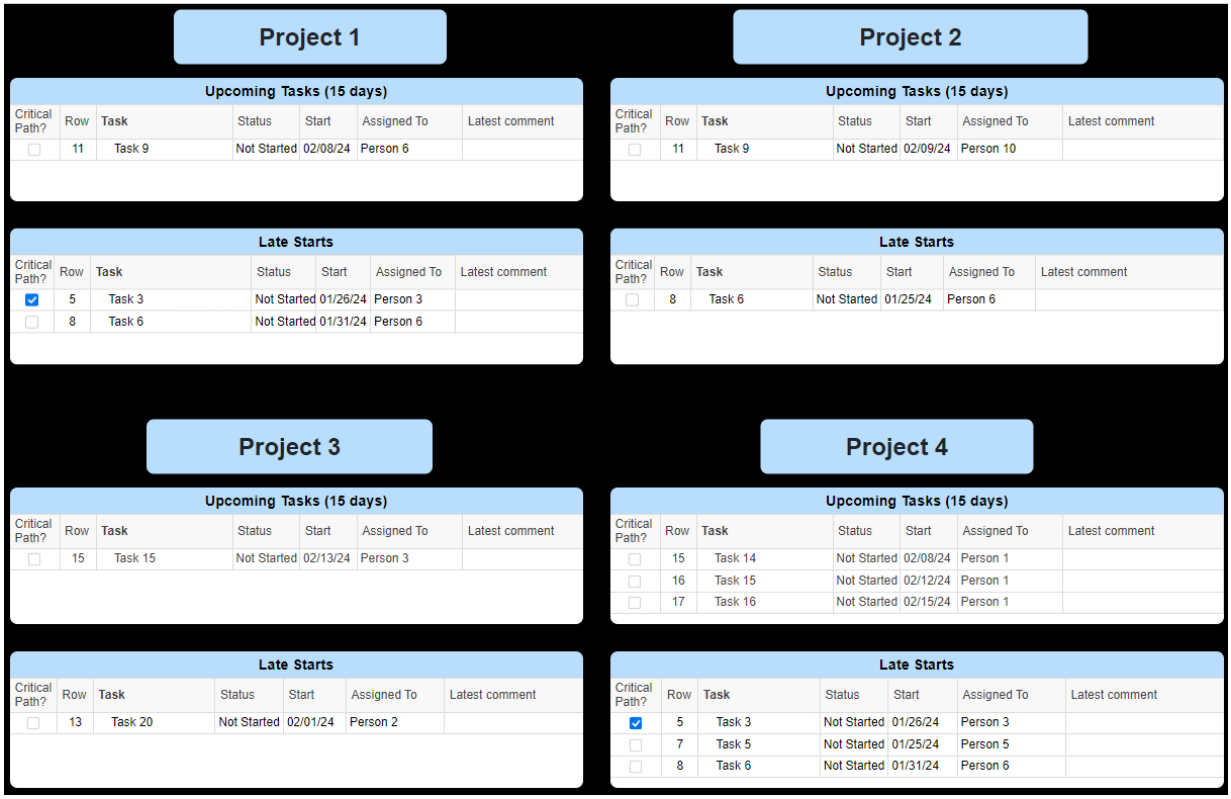

Figure 4: Example of upcoming tasks and late starts

The last section of the program-level dashboard, as shown in Figure 4, displays the upcoming tasks (tasks that should start in the next 15 workdays) and any tasks currently showing as late starts (tasks that should be in progress but are not). This view lets the program manager see at a glance which tasks are starting in the next three weeks, who will be working on them, and whether they are on the critical path. Additionally, the program manager can see which tasks have not started but should have and their status on the critical path. The conversations around this information typically lead to further discussion regarding resource management, cross-dependencies, and program synergy across projects.

Conclusion

There are numerous challenges to scaling up a reporting process, such as information overload, loss of data, lack of analysis, and insufficient context. To actively resist these potential pitfalls, we instituted a program-level dashboard that presents high-level Gantt charts from each project and a consolidated Early Warning System and change order log. Additionally, each project in the program has a snapshot of upcoming tasks and late starts. The program manager can utilize these tools in periodic stand-ups and program-level meetings to actively administer the program with their project managers. By encouraging active communication among the project managers and accurate and timely project plan updates, the program manager can ensure that the program proceeds with as little ambiguity and unanticipated disruptions as possible and actively manage risk and quality issues.

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Steve Ford holds a BS from the US Air Force Academy (2004), an MS in Space Studies from the University of North Dakota (2009), and a Doctorate of Management – Project Management from Colorado Technical University (2021). Steve is currently the President and CEO of Advanced Applied Project Management Solutions, Inc, a project management, change management, and risk consulting firm. He holds numerous project management-related qualifications, including Project Management Professional (PMP), Risk Management Professional (PMI-RMP), Agile Certified Practitioner (PMI-ACP), Lean Six Sigma Black Belt Professional, Project Management- Lean Process Certified, Lean Supply Chain Management Certified, and Lean Culture Certified. He has over 20 years of aerospace and construction experience in project and risk management. He can be contacted at Steve@aapms.net.