Multi-project Management: Executing the Details of the Project Portfolio (Part 1 of 2)

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"When I use a word," Humpty Dumpty said in a rather scornful tone, "it means what I choose it to mean—neither more nor less."

Lewis Carroll
Through the Looking Glass

Introduction

In the world of white-collar work, "multi-project management" often means "what you must do to successfully execute the chosen portfolio of projects for your department." To the chief executive officer, it means six-sigma process improvement efforts, accelerating cycle time, competitive products in a strong strategic portfolio, and increased profits. To the engineering vice president in charge of new product development, "multi-project management" has overtones of strategic portfolios, production ramp-ups, market projections colliding with manufacturing costs, and "break-even time" analysis. To the chief information officer, it means internal customers quarrelling about whose need is the most urgent. To the head of the marketing department, it means a staff being asked to split time between the corporate-sponsored process improvement efforts and their regular work demands. To the project manager, it's a noisy, contentious environment where other projects steal your key people.

To the individual white-collar, professional who is dividing time between two projects, "multi-project management" means juggling appearances to keep two bosses happy at the same time. The closer you get to "multi-project management," the more difficult it looks. Balancing a portfolio of demands is not an easy challenge to meet—and those actually splitting their time between several projects have the biggest challenge.

The most common form of divided time management for the individual professional is not even "multi-project," it is "multi-assignment" management—dividing time between a regular, functional job and a special, temporary project. [1] A work assignment can be either a regular job activity or a project task. The project work usually extends beyond the boundaries of the regularly defined job.

In order to respond to the challenge of "executing the project portfolio" we will dedicate the first half of this article to solving this most common problem, "multi-assignment" management. We will begin with the *knowledge worker assigned to both a regular job and a temporary project*. The solution to the simple form of this common problem should point the way to the solution of the more complex cases of multi-project management. If we can solve the problem for the knowledge worker, we can specify the minimum requirements for what the white-collar organization must do to support the worker's needs. In the second half of the article we will explore how these minimum

requirements for managing a portfolio of projects may be turned into "just enough process" for the organization to successfully execute its portfolio. So just how does the individual knowledge worker successfully balance a regular job and a temporary project?

The Challenge to the Individual

We ought to give the whole of our attention to the most insignificant and most easily mastered facts and remain a long time in contemplation of them until we are accustomed to behold the truth clearly and distinctly.

Rene Descartes
Rules for the Direction of the Mind

From "Interruption" to Work Assignment

For this discussion, we will adopt a simplifying rule of thumb and say that a small project, one that requires less than 20% of your time, can be handled as an "interruption" in the normal give and take of a regular job.[2] (If you find 20% too large, supply your own boundary for when assignments become "interruptions.") Our knowledge worker's balancing problem begins when the project's work grows larger than four days a month. (If several small fragments of projects are being worked on, then they can be bundled together under the heading of "small projects" and treated like a single project of some size.)

If a month contains twenty workdays, a large project might, in an extreme case, claim as many as sixteen days. If the project's demands grow even larger, then the balancing problem disappears and the month transforms itself into a "project month" with a few "interruptions" from the regular job. By using the "20% rule of thumb" we can focus the problem of "balancing two assignments" on a month where each work assignment takes between four and sixteen days.

So, for the moment, our knowledge worker begins with a pile of work that totals no more than twenty days of work for the month. The work is split between days of project tasks and days of regular job activities.

Pick-Up-Sticks Planning

If you are a knowledge worker, planning your work can be like playing a grown up game of pick up sticks. You circle the pile of work, sizing up the pieces, looking for a good piece to start with. After the first piece, you may choose to pick up other, similar pieces to achieve some efficiencies with what you learned from the first piece. You also consider the size of each piece and compare how long it will take to finish with what remains of the day or of the week. You will try to pick up pieces that make your work schedule efficient.

You also consider what must be done first, what piece precedes what other piece, so that you progress in a natural order through the work. So you circle the pile of sticks, grouping pieces where they give you efficiencies, being careful not to pick up a piece out of order.

The pieces in this pile may be either regular activities for the office or special tasks for the project. The interplay between the two is hard to predict and depends heavily on the nature of the actual work itself. In general, the regular work is more familiar and more predictable (because you have done it before). The project work is less familiar and less predicable (because, by definition, the result is unique, so some of the work must be new). As you walk around the pile you can clearly see the outlines of the regular work while the outlines of the project work remain somewhat obscured.

The Whole Week
What guidelines for balance does the "pick-up-sticks" approach suggest if you are a white-collar professional? Let's begin with smallest details and begin by *scheduling the whole week*. The seven-day week is large enough to provide a degree of flexibility, yet small enough to be clearly understood. Many time-management methods recommend weekly planning.[3] A week allows for balancing professional and personal commitments, as well as for balancing long-term and short-term professional activities. And most important, a week allows you to balance office activities and project tasks.

Imagine a table with columns headed "Monday," "Tuesday," and so on, through "Sunday." The rows are the hours of the day labeled in thirty-minute increments from 6:00 a.m. to 9:00 p.m. Enter pieces of work on this table. Begin with personal activities, then turn to the project-office mix of work lying in a pile. (See Figure 1.)

Figure 1. Mornings a Week at a Time

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
7						
8						
9						
10						
11						

We are assuming you do not need to schedule time to learn how to do your assignment. Even on projects, the evidence is that people "often" have adequate technical talent to perform the task.[4]

First Things First
What's next? A skilled worker seeks to achieve a good balance by *doing the most important work first*. When the departmental schedule is most important, you pick up any regular activities that must be completed before a deadline. When the project's schedule is in jeopardy, you pick up project tasks that lie on the critical path. When two assignments both need your immediate attention, you get help or push out the least important deadline.

When the schedules have been attended to, you do the next most important work. As you arrange the work in declining order of importance, wherever you can, you bundle the pieces of work in the most efficient manner. This may mean bundling project work together, then bundling office work together, or it may mean bundling similar work (both office and project) together.

The way you "pick up" work here is by placing it on your weekly personal calendar. You begin by placing the "big bundles" on the calendar before the "smaller bundles" and finally the individual pieces. You try to arrange your work so that if the big bundles shift you can gracefully rearrange the smaller bundles and individual pieces. You allow for the variation inherent in the estimates of the work, especially the project work.

Reduce Risks Early
A second rule of thumb says *do "risky" assignments early*. When you have a choice, and one assignment has a higher risk factor than another (either in terms of likelihood of problems, impact if there is a problem, or uncertainty about the estimate of how big it is), you should do the risky assignment first. This lets you find out early whether you have a problem or not, when you still have the maximum flexibility to respond to the problem. Do the well-known and "safe" work later to avoid having "last-minute" crises.

"Schedule Driven" Work
A third rule of thumb says *limit "schedule driven" work*. Avoid filling more than 85% of your workweek with "schedule driven" work.[5] That's 34 hours of "schedule driven" work in a 40-hour week. Scheduling 34 hours of "schedule-driven" work does not mean you will work less than 40 hours, it means you will at least *plan* for six hours of "work that can be delayed." The six hours may actually be spent on a variety of options: on slips in the "schedule driven" work, on helping others with their work, on unexpected risk events, or on the originally planned "work that can be delayed" itself.

If you plan 40 "schedule-driven" hours, allow yourself 47 hours, following the 85% rule, to complete them. Also, remember that when working more than 50 hours, you will lose efficiency and you should allow for that loss in your planning.[6]

How Big are the Pieces?
While work that comes from the regular job may be familiar, work from the project is probably less so. It's wise to keep the less familiar project tasks under control by keeping them relatively small. A well-formed project task should take the worker *no more than two weeks* to finish. The upper boundary when you are full-time on the project is ten workdays, or 80 hours. Office activities may be allowed slightly larger boundaries because they can be more reliably predicted.

A work assignment has two opposing sets of forces pushing on its size and duration. Pushing to make it larger and longer is the worker's desire for autonomy and the manager's desire to lessen the overhead of reporting. Pushing to make it smaller and shorter is the worker's need to see progress and the manager's need to minimize the impact of a missed deadline. (If the deadline were eight days, you could take corrective action sooner than if the deadline had been fifteen days.) An old rule in software development says never let a task exceed two weeks.[7]

From Hours Per Week to Days Per Month
Our knowledge worker needs to balance work over days of the month as well as the hours of the week. At any one time, a project task can range in size from four to ten days, with complementary job activities filling the schedule. If you are a skilled knowledge worker, how many project tasks can you complete in a month?

In the best case, by skillfully balancing your time between the regular job and the temporary project, you can finish several small project tasks ahead of schedule and manage to log *four* completed milestones during the month. (Remember, at least four days were reserved for your regular job.)

In the worst case, you could fail to complete a single milestone. For example, you have only four days available for project work and a task planned for nine days. If the project work was limited to four staff-days during the month, the project task should have been split into two smaller pieces.

There are a number of ways to break up a task into sub-tasks. When faced with the worst case schedule, you should take the initiative to break up the work in such a fashion that the project manager can expect *a deliverable within two calendar weeks.*

So in the worst case, after you split the task into pieces, you get one completed milestone in a month. If you started just before the beginning of the month, completed the first task in a little longer than the expected two weeks, you could still be working on the second task when the month runs out.

The result? Our individual worker, by skillfully balancing the regular job and the temporary project, can, in one month, accomplish some regular job activities and *one to four project tasks.*

The Ongoing Work
The new work assignments come to our knowledge worker from the job supervisor or the project manager, from the regular needs of the job or from the posted plan for the project. The assignments often arrive with embedded challenges and attached urgency.

On the regular job, you handle work activities in the routine way. You report your work according to the defined operations of the office. Communications are governed by office policy.

On the project, new work can arrive when a predecessor task is completed, when a co-worker needs a hand, when a change of plan intervenes, or when a risk event occurs. You deliver completed tasks as soon as they are finished and report their delivery in the weekly or biweekly project progress meetings. Communications are governed by the project communications plan.

As a skilled knowledge worker you constantly juggle your plans for the week and for the month. Business value drives each assignment's priority. As special needs arise, you fluidly rearrange the activities of the job and the tasks of the project to optimize your delivered business value for the week and for the month. You use the "work that can be delayed" to safeguard the "schedule driven" work and keep things moving according to plan. In short, you successfully balance your regular job and your temporary project.

Balancing Skills
Our knowledge worker can successfully meet the challenge of balancing a regular job and a temporary project by exercising skills that include:

- Obtaining a good estimate of both the size and the schedule of every job's activities and of every project's tasks.
- Intelligently grouping small pieces of work (parts of both regular job activities and project tasks).
- Managing personal and professional hours on a seven-day week.
- Doing the most important work first.
- Doing the risky assignment before the safe assignment.
- Committing to no more than the total real calendar days available in the month.
- Limiting "schedule driven" work to 85% of the calendar and scheduling "work than can be delayed" to the remaining 15%.
- Defining, or re-defining, a project task to finish within a two-week duration.
- Understanding the business goals of both the regular job and the temporary project, and being able to chose between them.

From Multi-Assignment to Multi-Project
Now that we understand how a knowledge worker can balance the demands of a regular job and a temporary project (the problem of multi-assignments), how does our knowledge worker apply these skills to more than one project (the problem of multi-projects)? The answer, it turns out, is simple.

Our white-collar professional can handle at most five assignments, activities or tasks, a month. If each task comes from a different project, our knowledge worker can balance up to five "multi-project" obligations across the four weeks of the month. With reasonably sized tasks, the number will usually be between two and four.

Remember that the month's assignments should include three days of "work that can be delayed." Such work can be either job activities or project tasks not on the critical path (and with sufficient slack to avoid affecting the critical path).

So by applying "multi-assignment" balancing skills an individual knowledge worker can solve the "multi-project" problem. The next pressing question is what must the white-collar organization do to allow the individual knowledge worker to exercise these balancing skills with a full portfolio of projects?

The Challenge to the Organization

> *A man is rich in proportion to the number of things*
> *which he can afford to let alone.*
>
> Henry David Thoreau
> *Walden*

Just Enough Process
We will begin with the minimum requirements needed to help our knowledge worker and expand our list only under duress. Our goal is to understand what are the few,

critical, organizational actions necessary to meet the "managing the project portfolio" challenge. Looking at the knowledge worker's list of skills on the previous page we see that, at a minimum, the organization must:

- Provide good estimates of both the size and the schedule of every job's activities and of every project's tasks.
- Avoid committing any person to more than the month's total calendar days.
- Be sure that work plans limit "schedule driven" work to 85% of the calendar and allow "work that can be delayed" to fill the remaining 15%.
- Encourage skillful individual time management.
- Be sure every assigned project task has a two-week (or less) duration.
- Be sure that everyone understands the business goals of both the regular job and the temporary project(s) in a way that enables them to chose among them.

While the list is obvious, these minimal requirements may provide a real challenge to many organizations. For starters, how does an organization provide good estimates for both job activities and project tasks?

Good Estimates
Regular job activities may not always be easy to estimate, but they should be easier than the unfamiliar tasks of the average project. Project estimating has received a lot of attention over the years and experienced-based ranges of values will do the trick in most circumstances.[8] Range estimates can capture what total-quality experts call "common cause variation" and will reliably estimate both the individual tasks and the project's overall size and schedule.[9]

An organization with elementary project planning skills should have no trouble providing our knowledge worker with estimates for the work assignments he or she is being asked to undertake. The functional departments can do the same. Our knowledge worker can use the estimates to fit the work into the days of the month. If the total plan exceeds the days available, the knowledge worker must renegotiate the work.

The Monthly Fit
Organizations that fail to understand their role in supporting good project management usually fail the "monthly fit" test of adequacy. The leading symptom of this failure is that the responsible senior line manager cannot say how many staff-days of project work are budgeted for the up-coming month.[10] A related symptom is that the project and department managers do not know the total work the people on their projects have been asked to do. Another symptom of this problem is that the project managers complain that their projects are understaffed. Such symptoms are all too common.[11]

Sometimes department managers assert that their staff is 100% dedicated to the department work, but cannot supply any supporting details. Sometimes the list of department work totals well over 100% to show that no member of the staff can possibly do any additional work. In both cases, the senior line manager must insist on better tracking of time spent. Only when the departmental work is held to the same standards as the project work can rational tradeoffs be made.

When even the heads of the individual departments and the managers of the active projects have no idea what their group's total staff-day budget for the up-coming month is, the first thing the organization must do is:

- Have each department manager submit their budget in staff-days for everyone in the department.
- Have each project manager submit a budget in staff-days for everyone on the project.
- Have both (or all) the parties agree on the number of staff-days for each staff person involved, so that *everyone's budget is within the calendar month's available staff-days*.
- Have everyone adjust the plans' schedules to reflect the monthly agreement.

This *agreement among the projects and the departments is the responsibility of the senior line manager* overseeing both. The agreement must be reviewed monthly and probably should look ahead two or three months. "Best practice" companies have this meeting at least monthly and sometimes more frequently. [12] Software tools exist to track these agreements in a practical way with a minimum of overhead to either the department heads or the project managers.[13]

At a strategic level, "best practice" organizations practice quarterly (or semi-annual), long-term resource planning, to be sure the multi-year goals of the organization can be factored into the monthly decisions. Successful project managers know they must be prepared for both the monthly and the quarterly meetings.

Project Managers of Part-time Resources
In order to be effective during the monthly meeting, a project manager needs to have reviewed the project's planned budget for each part-time staff member. The project manger must first know *how much* time will be required of each individual. Only after that question is answered should the project manager explore what the detailed *schedule* will be.

An emerging "best practice" in many companies is to leave working out the details of the schedule to the individual knowledge worker in consultation with the project managers, cooperating fellow workers, and department heads. This can work if everyone's monthly total fits within the month and no one is grossly overworked. Software that supports the individualized scheduling has proven quite successful in practice.[14]

The watchword for successful managers of part-time project resources is "don't level your resources, *budget* your resources." Part-time, white-collar resources frequently have such volatile schedules that traditional resource leveling is a waste of time. It's a waste of time because the resource's constantly shifting schedule requires constant re-leveling. And the new answers are no more lasting than the old answers. A skillful manager will recognize when over-planning is a waste of time and back off.

What can the skillful project manager do to ensure his or her project will get completed in this multi-project environment with part-time resources?

1. Be sure to fight for monthly allocations of the appropriate resources.
2. Adjust the plan's schedule to reflect the result of these resource fights.
3. Be sure everyone knows the business value (priority) of the project (and each assigned task).
4. Be sure that a "schedule driven" task is highlighted to the individual who will be working on it.

5. As you negotiate the work plan with each individual, make sure that the no task exceeds the two-week boundary. (Redefine the work if necessary.)
6. Make sure each of your resources has scheduled at least three days of "work that can be delayed" during the month.

Deciding Who Gets the Critical Resource
Multi-project management grows more complex when a person with a unique skill is needed for two different assignments at the same time. The decision rules are well known, (but difficult to apply):

1. Do the assignment with the bigger business value first.
2. If the assignments are close in business value and one is "schedule-driven," do the "schedule-driven" one first.
3. If both are "schedule-driven," translate the schedule effects into business value and do the one with the bigger business value first.
4. If both are "schedule-driven" and have the same business value, do the one that has the earliest project deadline (higher risk) first.

When a critical resource becomes a constraint across several projects, the projects should be arranged to provide the most overall business value. When value is synonymous with schedule, well-known methods can be applied to scheduling the critical resource.[15]

The first and third rules are often violated because the organization has failed to make, or to make widely known, an assessment of the business value of the work. But how, exactly, does the organization arrive at the business value of the work?

Business Value
A project's initial business value is usually developed during the strategic portfolio analysis of the organization's many projects (especially new-product projects). Senior management adjusts the project portfolio to reflect the strategic objectives of the corporation.[16]

The overall business value is strongly tied to the output of the project. If a particular project is undertaken to provide a unique service, the business value is the expected net profit that the project earns by completing the effort. When a project is undertaken to produce a product, the business value of the project is entwined in the fortunes of the product.

A basic understanding of the business value of the products produced by the projects is critical to the organization constructing a strategic portfolio of projects. Business value determines whether the project should be done at all, and whether, after it has been started, it should be continued. Business value determines who gets the organization's scarce resources first. Business value affects the value of a day of schedule, the value of a product feature, the value of a dollar of cost. Finally, business value allows everyone on the project to make intelligent tradeoffs in their day-to-day work decisions.

The business value of a project is best expressed in two dimensions, profit over time. Not only *how much* profit, but *when it will occur*. Two of the many ways to view such business value are shown here.[17] Figure 2 is a six-year business model of the product

that includes the investment (mostly the project cost) and the return (the product's cumulative profit). Figure 3 graphs the monthly cash flow for the same six-year model.

Every project should have such a business model. (In fact, every project does have a model, but many remain *implicit* because no one has written the model down and made it *explicit*.) If the organization fails to provide an explicit business model to the project, the project team should construct its own and publish it to the organization.

Figure 2

A Business Model of the Value of a Project's Product

| | Year | | | | | |
	-1	0	1	2	3	4
Gross Economic Benefit (Sales)		143	257	463	625	375
Economic Cost (Expenses)		105	194	369	530	335
Project Cost	130					
Net Benefit (Profit)	(130)	**38**	63	94	95	40
Cumulative Benefit	(130)	**(92)**	(29)	65	160	200

Figure 3.
Business Model Cash Flow
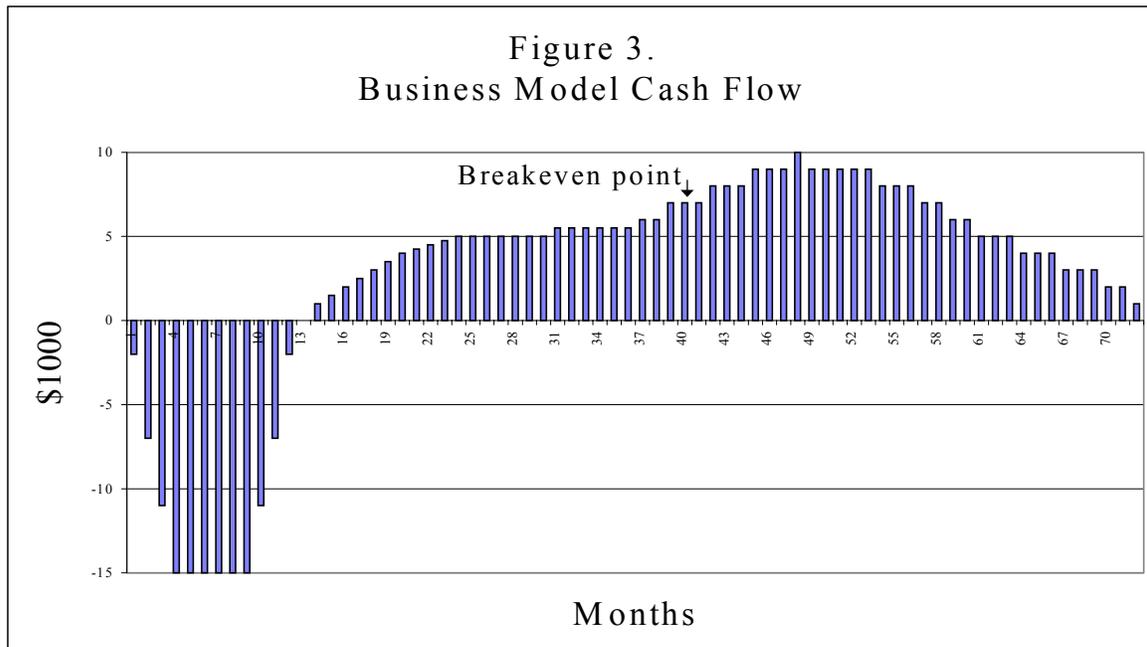
Exploring Figures 2 and 3

Figures 2 and 3 have several features. First, they insist that the product of the project, the project's deliverable, be considered in terms of economic costs and benefits. The economic gross benefits are often sales, the economic costs are often business expenses plus the one-time project costs, and the economic net benefits are often profits. Second, they show how these forces are expected to play out over time. We can see the full life of the idea (or at least its future for the next six years).

Note that this "economic" cost-benefit analysis can work even in "not for profit" organizations. Coming into compliance with a new regulation, trying to reach a new audience, upgrading to meet a competitive challenge, instituting a new departmental process, or capitalizing on a new discovery, are all projects whose results have economic gross benefits, costs, and net benefits over time.

A third feature of Figures 2 and 3 is that they require advice from the relevant experts in the organization. Relevant experts might include marketing, sales, manufacturing, legal counsel, R&D, development engineering, support engineering, or representatives from a particular user community.

A fourth feature of the two figures is that they allow the project team to illustrate how a marginal change (say, plus or minus 10%) might affect the overall business value. By comparing marginal changes in project schedule, product features, and project cost, the organization can make critical tradeoffs both during the planning and during the execution of the project. [18] These discussions of marginal value necessarily require seeking advice from the relevant experts.

With the business value derived from a business model, our project team can allocate business value down through its work breakdown structure to the individual tasks.[19] After completing its detailed planning, our project team is prepared to manage its resources flexibly, and to defend itself against the onslaughts of other projects.

With a clear concept of each project's business value, the project managers have a mechanism for resolving their monthly negotiations over constrained resources. Schedules must yield to business value.

If the individual project teams heavily revise their business models, they should report them back to the strategic planning group where they can be reintegrated into the strategic portfolio analysis.

With the individual knowledge worker balancing the day-to-day work and with the organization engaged in "just enough process" to coordinate multiple projects, the "multi-project management" challenge has been substantially met. What remain are a few considerations about "full-time" work—when the individual is completely dedicated to one project, but the organization is still doing many projects.

The Challenges of Full-time

> *What of architectural beauty I now see, I know has gradually grown from within outward.*
>
> Henry David Thoreau
> *Walden*

Full-time project work has disadvantages as well as advantages. The stability and efficiency of the assignments of a "regular job" are transformed into the higher-risk, volatile tasks of the project. Safeguarding long-term functional expertise is subordinated to supporting the short-term, ad hoc needs of the project. However, organizations often decide, after carefully weighing the alternatives, to launch a full-time project.

Full-time Work for the Individual
By focusing on the needs of the individual knowledge worker, we see clearly that our multi-project solutions for part-time work also apply to full-time work on projects. Full-time project work is simply the management of a series of one to five tasks in a given month. The same intelligent grouping of work details that occurs in the multi-project world occurs when our worker is engaged in a variety of tasks on a single project. The level of contention for an individual's services may be less, time may be more focused on the work at hand and less on switching contexts between projects. So in general, a skilled worker with a supportive organization will find the full-time environment easier to manage than the multi-project environment.

Full-time Work for the Project
A project manager with a full-time staff is much happier than a manager with a part-time staff. With the competition for staff removed, the project's schedule and cost become much easier to manage. Dates can be met, costs can be contained, and the product appears as planned.

Full-time Work for the Organization
At the organizational level, the full-time environment usually results in an increased emphasis on project organizations and decreased emphasis on functional departments. The alternative organizational structures are well understood and documented in the literature as "functional, weak matrix, strong matrix, and project." [20]

Organizational structures strongly influence the role of a "project office," (or even whether one exists.) Traditionally "project" and "strong matrix" organizations have sponsored project offices to select computer tools, define processes, audit practices, and manage the career development of project managers. Today some "functional" and "weak matrix" organizations have project offices that provide part-time project managers with basic administrative support, such as scheduling or financial reporting. In almost all cases, a project office can offer critical coordination and support for the monthly resource meeting.

Conclusion

By focusing on the individual knowledge worker in a white-collar organization, we have arrived at the individual skills necessary to execute the details of an organization's portfolio of projects. From these individual skills, we have derived a minimum set of business imperatives for an organization that wishes to enable its members to be successful in this environment. In particular, we have derived effective practices for project managers and for line managers. One critical element of these practices is an explicit model of the business value of each project.

As an organization gets better at managing its project portfolio it will achieve more business value with less difficulty. "Multi-project management" will mean the same thing to all parties. Everyone will understand that as they balance the execution of projects in the portfolio, they can expect to see job satisfaction increase, business productivity rise, strategic focus sharpen, and bottom-line profits increase.

(Portions of this article will appear in Project Management for the Business Professional: A Comprehensive Guide*, Joan Knutson, ed., John Wiley & Sons. Used with permission.)*

About the Author

John M. Nevison is a founding partner of Oak Associates, Inc. He is the author of six books and numerous articles on computing and management. During the course of his business career, Nevison has built and sold a business, managed projects, managed project managers, and served as both an internal and external consultant to Fortune 100 companies. He is past president of the Mass Bay Chapter of the Project Management Institute. He is a certified Project Management Professional (PMP). He may be reached at info@oakinc.com.

Notes

1. Of 226 respondents doing project work in eight companies, over 75% spent significant amounts of time on regularly assigned, (non-project) work. Specifically, only 7 (3%) worked exclusively on project work and only 66 (25%) spent more than 80% of their time on project work. Overall, 64.5% of their time was spent on project work and 34.5% on office work. (The numeric averages don't necessarily add to exactly 100%) (See Nevison, February, 2000).
2. The figure 20% is a handy place to begin a discussion of splitting time between two assignments that both demand attention. It was suggested by Heinz Scheuring, a veteran of eighteen years of project management consulting. (See Scheuring, 1999).
3. Time management is about balancing the many goals of an individual. It is especially relevant to the particular problem of balancing different work assignments. The most ardent proponents of the week-at-a-time management are Covey, 1989, and Covey, Merrill and Merrill, 1992. Oncken, 1984, and Webber, 1972, have additional valuable insights.
4. In a recent Oak Associates study, 280 respondents doing project work in eight companies answered that "In our organization, people who work on our current projects have adequate technical skills," a heartening "often." (See Nevison, February, 2000).
5. The 85% figure is a rule of thumb that comes from skilled senior project managers. One of my most experienced partners, Carl Belack, uses 85%. (See Belack, 1999). A current client uses 6.5 hours per 8-hour day for scheduled activity. Another client's senior project manager reported in confidence that he scheduled all his projects using a four (not five) day workweek. The 85% figure is cited as an upper bound on the "value added work" of development engineers on projects at several clients. (See Smith and Reinertsen, 1998, and Wheelwright and Clark, 1992).
6. A personal study of 30 white-collar professionals suggested the "Rule of Fifty" which says that "On the average, no matter how many hours a person is at work they only return fifty productive hours." Blue-collar productivity studies of the last 50 years confirm this statistic. (See Nevison, March, 1992, and December, 1997, and *Winning Project Management*, 1998).
7. An early reference to the "two week rule" is in Metzger.1973. Since then, numerous software clients have confirmed its critical utility.
8. An easy to read introduction to the mechanics of estimating can be found in Durrenberger, March, 1999. See also, *Winning Project Management*,1998.
9. Simple explanations of how add up estimates are in the PMBOK Guide, p. 116. (See Duncan, 1996) and Durrenberger, March, 1999. For additional details on advanced scheduling, see Nevison. September, 1999.
10. Marvin Patterson, the former Vice President for New Product Development at Hewlett-Packard, says, "Even though it is counterintuitive, booking every resource to the limit usually results in a huge waste of effort. If everyone is always busy on urgent tasks, people are not available when they are needed to resolve a bottleneck, and critical cross-functional talent is not at hand to get the next project started in the right direction." (See Patterson, 1992).
11. When 300 managers across the country were asked for factors causing problems on their projects, the most common answer was "inadequate resources." These managers are not just whining, they are genuinely and chronically understaffed. (See Taylor, 1998.) In a recent Oak Associates study 278 respondents doing project work in ten companies said that only

"seldom" was it true that "In our organization we have an adequate number of people to work on our current projects." (See Nevison, February, 2000).

12. When asked if his firm allocated resources monthly, a recent client laughed and said, "right now, we are doing it weekly." This may be a little too frequently, but it can occur in a crunch.

13. Over one hundred companies use ResSolution successfully to perform this monthly budgeting. These companies combine the computer tool with monthly resource management meetings among the managers of active projects. (See *Scheuring ResSolution ® 3.1: Multi-project Management Resource Tool for Line and Resource Managers*, *User's Guide*, 1999). For an excellent introduction to the whole subject of computer aided project management see my colleague's summary. (See Belack, 2000).

14. *Scheuring Project 98 Plus®* allows an individual to collect a "to do" list and assignments from one or more Microsoft Project 98 files, to sort the all the tasks in order of their due date, and to print out the list for the month. The individual has the responsibility to contact any project managers whose work may require rescheduling and negotiate an acceptable solution. The individual can practice the pick-up-sticks, qualitative arrangement, of the work, because his or her quantitative boundaries were set by the organization. (See *Scheuring Project 98 Plus ®, User's Guide,* 1999).

15. Methods to develop a resource-constrained critical path for the whole portfolio of projects are well known. The methods are all "trial and error" heuristics because no analytical method exists to arrive at the one true answer to this "resource leveling" problem. Some recent approximations have been labeled a "critical chain" and discussed in Newbold, 1998. The helpful concept of DRAG on the critical path is defined and explained in Devaux, 1999. For a simple discussion of the traditional view, see Nevison,1981.

16. Portfolio management is a familiar idea to those engaged in strategic planning. A sound approach to portfolio fundamentals includes a preliminary allocation of project resources for the next business year. (See Gill, Nelson, and Spring, 1996, and *Scheuring ResSolution © 3.1: Multi-project Management Resource Tool for Line and Resource Managers*, *User's Guide*, 1999).

17. Many models exist in the literature. Figures 2 and 3 trace their origins to Smith and Reinertsen,1998, to Patterson,1993, and to the "return map" of House and Price,1991.

18. Recently the author has developed a new diagram to help project teams make the tradeoffs between scope, schedule and cost, called "The 10% Chart." (See Barker and Nevison, 2000).

19. Assigning value to the branches and sub-branches of a work breakdown structure all the way down to the level of the work assignments is a useful skill for all project managers. (See Devaux, 1999).

20. Traditional discussions on the organizational implications of projects are well known. (See Kerzner, 1998, Kezsbom, 1989, and Frame, 1987).

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