

## Critical Chain Project Management: A Third Generation Paradigm Shift for Shorter Projects

Richard E. Zultner

Due to the high interest in Critical Chain Project Management that developed from the November Roundtable, the Alliance sponsored a two-day workshop on this subject. Our last Newsletter introduced the concept to readers. This issue features an article, by our workshop leader, that elaborates on this radical approach.

Larry Gastwirt  
Director

### Why would we want a new approach for managing projects?

The primary reason organizations are implementing Critical Chain project management is that (1) the elapsed time of projects is substantially reduced, *without*: additional resources (or overtime), reduced scope, increased risk, or cutting quality. And (2) late projects are virtually eliminated.

Since substantial schedule reduction without trade-offs is considered not possible (it breaks the "triple constraint" paradigm of traditional project management), and eliminating late projects has been an objective of many organizations for many years (with little success), is it possible that finally there is a new paradigm for project management? One that is superior to traditional approaches?

### Brief History of Project Management

In the beginning, there was no "discipline" of project management. No one "taught" project management. People learned how to manage projects through apprenticeship, and their own mistakes. (Some organizations still use this approach today.)

### Three Generations of Project Management.

*First Generation:* Stevens graduate Henry L. Gantt formalized many of the basic principles of project management, such as the concept of task dependencies, and developed a way to formally depict those dependencies. Today, the Gantt chart is still the most widely used diagram for representing projects. (Some organizations still use just these basic tools for project management, even today.)

*Second Generation:* In 1959, The Rand Corporation introduced PERT (Program Evaluation and Review Technique), and in 1961 Du-

Pont introduced CPM (Critical Path Method). These approaches represented a paradigm shift in project management: focus on the project's critical path. PERT/CPM represented a major advance in planning and controlling projects, and over the next four decades came to be seen as fundamental to professional project management. Although PERT/CPM did not supplant all previous project management methods, they did revolutionize the field of project management.

*Third Generation:* In 1997, with the publication of his book *Critical Chain* (North River Press, ISBN 0-88427-153-6), Eliyahu M. Goldratt introduced Critical Chain project management. Although Critical Chain (CC) project management builds on many of the elements of previous generations of project management, it has several distinctive aspects: (1) CC applies a true systems perspective to project management, and the management of multiple projects, (2) CC explicitly deals with variation, thereby providing a better foundation for real risk management, (3) CC integrates technical and social aspects of projects.

Although these concepts are present in traditional (first and second generation) project management, with Critical Chain they are advanced to a new level, using new methods, producing benefits that were not possible in previous generations. This is the classic definition of a paradigm shift.

### A Paradigm Shift

Some of the Critical Chain case studies show improvements so great that they are hard to believe. What could account for such huge gains, when no trade-offs are necessary, and no changes made to the engineering methods?

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## Critical Chain Project Management (Continued)

What price did those organizations pay for such results?

To achieve breakthrough results, Critical Chain calls for a paradigm shift in project management. What does a paradigm shift look like?

One characteristic of a paradigm shift is that it introduces new practices, some of which are the exact opposite of existing "best practice" methods. Looked at in isolation, they seem to be irrational. But once you understand the new "worldview" for managing projects, they seem to be common-sense.

For example, in Critical Chain project management, you do not track projects against dates on a project schedule. There is a Critical Chain project schedule, but it is not used for project tracking. There is very serious tracking of the project against the deadline, but that is not done with the project schedule. Not the way you do things today? Absolutely.

Another characteristic of a paradigm shift is that some old practices, some of them "best practices," become obsolete, and are discarded. For example, traditionally you work hard to make sure everyone has work to do, all the time. You measure resource utilization, and take action whenever it declines. In Critical Chain project management, you don't utilize all resources fully. In fact, re-source productivity is not a major concern. Counter-intuitive? Definitely.

Another "radical" change is that you don't start projects as soon as possible in Critical Chain project management. And you don't multitask resources either. Isn't that the opposite of what you do now? Exactly. That's why it's a paradigm shift.

Of course, not everything in project management is overturned by Critical Chain. There are many common practices that are unchanged by Critical Chain. And there are other existing practices that are further strengthened.

For example, traditional project management has known about "slack," and used "contingency reserves" for years. In Critical Chain project management, these concepts are elevated to "buffers" that are precisely positioned, sized, and protected (with a rock-solid justification: they make the project shorter).

Another extension to existing practice is the increased attention paid to the resource-constrained critical path. (The critical path determines the duration of a project.) In second-generation professional project management, after the critical path is determined, it is then constrained

by available resources to produce a realistic project plan. In Critical Chain, the resource-constrained critical path is further protected with buffers so it is unlikely to change during the project. This "resource-constrained critical path protected by buffers" is the "critical chain" of the project. And because it doesn't change, it is simpler and easier to manage.

If Critical Chain made only small changes to existing project management methods, it would be hard to believe that huge gains could follow. (And that we could have overlooked such changes for so long.) But because Critical Chain changes some fundamental ideas, it is at least reasonable that large improvements could be the result. As you learn about Critical Chain piece by piece, please keep in mind that it is a *system* of project management. Individual elements that seem counter-intuitive when examined one by one, or impossible to implement in isolation, are inter-connected, and are actually easier to implement as a whole system.

Changing fundamental ideas is non-trivial. But the benefits of doing so are large, and the most recent development in Critical Chain is a method for shifting paradigms efficiently.

### Where did Critical Chain come from?

Dr. Eliyahu M. Goldratt developed Critical Chain in the mid-1990s by applying his Theory of Constraints to project management. The Theory of Constraints (ToC) is a systematic method for achieving breakthrough solutions on purpose. Those who are trained in Theory of Constraints by the Goldratt Institute are called "Jonahs" after a character in his first book, *The Goal* (1984). This business novel has sold over 1.2 million copies, and has been translated into 13 languages. It is one of the best selling business books of all time. As the back cover states:

"The Theory of Constraints, used by thousands of companies worldwide, defines the thinking processes that enable people to invent new fundamental solutions for complex situations. And it shows ways to penetrate the culture of an organization so that these solutions can be implemented in the mode of an ongoing process. This theory provides an overall framework for helping businesses determine: what to change (not everything is broken); what to change it to (simple, practical solutions); how to bring about the change (overcoming the inherent resistance to change)."

### Critical Chain Project Management, in Two Parts

Critical Chain Project Management has two parts. One for managing the entire set of projects in an organization

## Critical Chain Project Management (Continued)

6. Can we trim the solution's negative outcomes (for our environment)?

The second three layers are about deciding *what to change to*.

7. Can we remove the implementation obstacles (for our environment)?  
 8. Do we have a clear implementation plan (for our environment)?  
 9. Shall we start the first project(s)?

The last three layers are about deciding *how to change*.

### Critical Chain Implementation Process

Critical Chain Implementation, especially the de-implementation of multi-tasking, requires learning how to plan projects with the Critical Chain single-project solution, and how to manage an entire set of such projects with the Critical Chain multi-project solution. But most of the time and attention must be focused on changing the minds and attitudes of key people, so the required behavior changes take place in the organization. Without the behavior changes, you do not get schedule reduction! Having Critical Chain plans is not enough. You need the behavior changes by business management, project managers, and project team members to make those dreams come true. The most critical aspect of implementation is to assure the behavior changes required to eliminate multitasking across projects, and start relay runner behavior on all active projects.

### Training

There are a number of groups providing assistance to organizations wanting to implement Critical Chain, each with their own particular approach. There are, however, some common elements.

A half-day Overview is needed to introduce Critical Chain to key members of the organization, show what problems result from multi-tasking, and explain the benefits of Critical Chain project management. A two-day Workshop then is required to master the "how to" of Critical Chain with hands-on exercises. Participants gain not only an intellectual understanding of the method, but also a "gut-level" understanding. This is the prerequisite to behavior change. The

quality of the exercises in this session is critical to getting behavior change.

To shift the paradigm of those who manage the project pipeline requires working through the layers of resistance in a Management Implementation Session with all key managers. Senior management must understand the "how to" details and decide how to change the measurement and reporting system to support and maintain the new behaviors of the Critical Chain multi-project solution. This can take from five to ten days depending on the size of the management team and the degree to which multi-tasking is entrenched in the existing policies and measurements. Some follow-up sessions to assure the new paradigm is firmly rooted and flourishing are generally needed.

To actually shift the paradigm on projects requires working through the layers of resistance in a Project Implementation Session. Each project team, and all key project players, must work through the issues and obstacles of re-planning their project with the Critical Chain single-project solution. This can take from one to ten days depending on the size of the project and the quality of the existing project plan. Follow-up sessions to deal with any difficulties that arise may be required.

### Software Support

There are several project management software packages available that support both single and multi-project Critical Chain, including add-ons to Microsoft Project. (And more and more project management vendors are adding Critical Chain to their software.) If you have existing project management software, it is not absolutely necessary to purchase Critical Chain-specific software — but most of the implementations to date did so. Training on the software for project managers and resource managers will be needed. Also, many organizations find that printing out their project plans with a large-scale printer is convenient.

So the total investment in training and software to implement Critical Chain is quite modest relative to the benefits. For those organizations that already have plans to train their project managers in formal project management, the implementation described above fits in nicely. To date, Critical Chain has an excellent implementation record. That's due to the careful planning and execution of the hundreds of pioneering organizations that implemented Critical Chain in the 1990s.

Critical Chain accomplishes the "magic" of substantial schedule reduction in eminently common-sense ways — that are nonetheless decidedly non-traditional. Critical

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## Critical Chain Project Management (Continued)

the original commitments are realistic). If they weren't realistic, why bother?

In order to do whatever it takes during the project to address a threatened commitment, we must (D) take corrective action when a "surprise" threatens a commitment (because not enough safety was planned for the "surprise"). This is one side of the conflict. When "Murphy" strikes, we must deal with an unplanned problem that threatens the schedule, the budget, or the scope of our project. Therefore, we must act. The traditional compromise here is to add more safety when planning the project so we can handle more surprises, or work more unpaid overtime.

**Another objective:** In order to meet the original project commitments, we must (C) protect all project commitments when any single commitment is threatened (because all the original commitments are important).

In order to protect all project commitments when any single commitment is threatened, we must (D', read as "D prime") not take corrective action when a "surprise" threatens a commitment (because there are no "free" actions; all unplanned actions "cost" us in terms of some commitment). This is the other side of the conflict. When Murphy strikes, we must not take action to deal with it because any action we take will "cost" us something in terms of at least one of our original commitments. Therefore, we must not act. The traditional compromise here is to invoke change control to force some room in the original commitments, or postpone the issue to the next release.

**The conflict:** We cannot (D) take corrective action when a "surprise" threatens a commitment and (D') protect all project commitments when any single commitment is threatened, at the same time (because action and non-action are mutually exclusive). So typically we oscillate between the "rock" of (D) and the "hard place" of (D') as projects progress. Often projects favor action (D) in the early stages, and inaction (D') in the later stages. Such attempts to

compromise are eventually doomed in the long run as one objective or the other is impacted.

### Breaking the conflict

Most project managers want to try to break this conflict by challenging the assumption on the A-B arrow, that the original commitments are realistic. But this takes us right back into the vicious cycle of project management.

Are we stuck? In Critical Chain project management, we break the conflict by challenging the assumption on the B-D arrow, that not enough safety has been included in the project plan. Business managers have no problem with this direction for a solution, but project managers certainly do! "My people are burnt out from too much overtime, and we were still late. How can you possibly say the plan had enough safety for the "surprises" when Murphy hit? Clearly if it did, we wouldn't be late!"

Critical Chain single-project management deals with this issue, and breaks the conflict, by applying a centuries-old concept from outside the field of project management. Critical Chain Multi-Project management goes even further, breaking an even bigger business conflict, by applying the basic process principle of Just-in-Time to managing projects. The actual mechanics of these breakthrough methods are beyond the scope of this article, and are best understood through hands-on exercises in a Critical Chain Workshop.

Transferring this knowledge involves shifting people's paradigm — a non-trivial event for any organization. Fortunately the Critical Chain community has a systematic way to shift paradigms, rapidly.

### Nine Steps to Change a Culture

When people resist change, they do so in a systematic way. That is, we can predict the nature, and sequence, of their questions and objections. So, rather than fight resistance to change head-on, why not *use* the resistance to *accelerate* the change process? With such an approach, we can leverage the systematic nature of resistance to bring participants to accept change (by making it *their* change), successfully and rapidly. The basic method involves developing answers to a series of questions:

#### The Nine Layers of Resistance

1. Do we have this problem?
2. Or a related problem?
3. Can we impact the problem?

The first three layers are about deciding *what to change*.

4. Which way to a Solution?
5. Is the solution complete (for our environment)?

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## Critical Chain Project Management (Continued)

project manager, try to include even more safety in their estimates ("because on our last project we didn't have realistic estimates — look how late we were"). They determine the project will take 10 months.

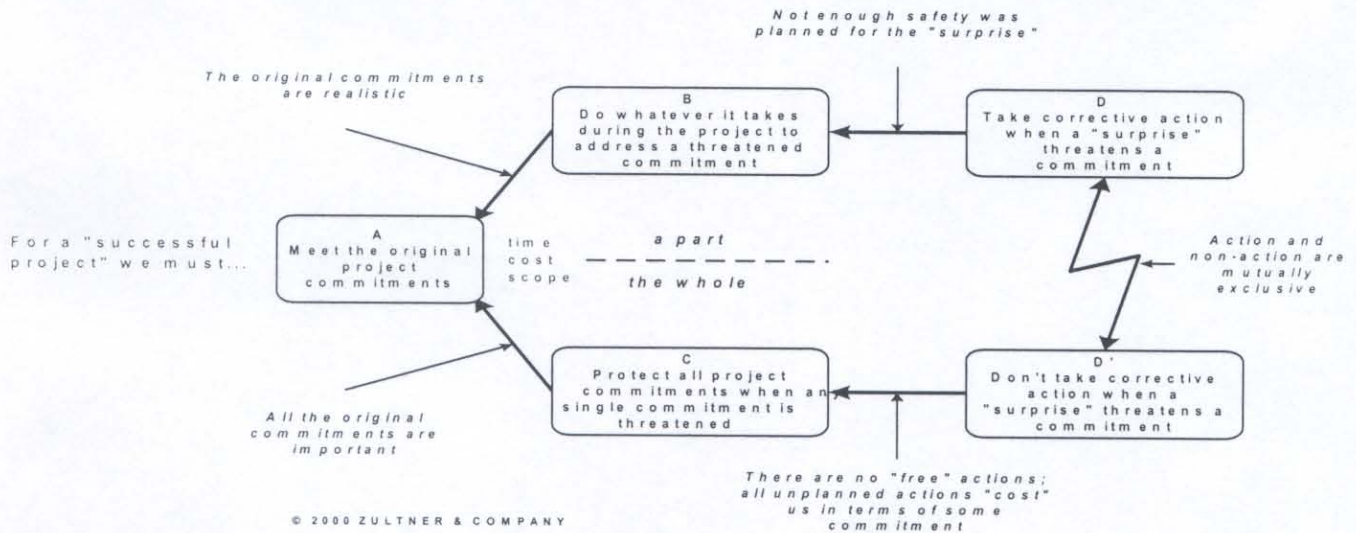
Management, being presented with a project plan with more safety (and therefore a longer schedule for a comparably sized project), reach for the ax, and chop the project schedule ("because that is just too long"). They cut it to 8 months.

they could do it in less than 10 months, and we were right."

So we have a conflict. Both sides are convinced they are right. Both sides are convinced the other side is the problem, and they are frustrated in their inability to reach an acceptable solution. What can be done?

### The Core Conflict of Project Management

A "core conflict" in the Theory of Constraints is a fundamental conflict that causes most of the [in this case,



So the project team starts the project with a chopped schedule, which they suspect is unrealistic, but they struggle valiantly anyway to try to meet it. They finish in 9 months despite their best efforts.

Then the cycle begins anew. Teams and project managers attempt to add more and more time into their project plans (becoming increasingly resourceful at sneaking safety into their schedules), and management responds by wielding their ax with a heavier and heavier hand, chopping more and more from every project. Everyone loses.

### How to break the vicious cycle?

Project managers say, "Teach our managers to respect the professionalism of our project schedules. To deliver on time, we need the time we ask for. Make them put the ax away! We told them you couldn't do the project in 8 months, and we were right."

Business managers say, "Teach our project managers how to do realistic schedules. If these projects will actually take that long, we can't do the project. We told them

schedule-related] problems in your organization. And what makes a core conflict so difficult is that you are trying to satisfy two objectives that you *must* do to accomplish your goal. But the actions to satisfy those objectives impale you on the horns of a dilemma. No "solution" exists, and no compromise is truly acceptable. So until the conflict is broken, it continues to cause a variety of problems year after year after year.

The annotated Evaporating Cloud diagram (a Theory of Constraints tool) shown above, graphically shows the core conflict for project management. This classic conflict is between *the whole* (the entire set of project commitments) and *a part* (one of the commitments). In traditional project management terms, this is the "iron triangle" or the "triple constraint": to get more of one (time, cost, or scope) you *must* trade off the others. In Critical Chain project management, we break this conflict.

**Our goal:** For a "successful project", we must (A) meet the original project commitments (time, cost, scope, etc.).  
**One objective:** In order to meet the original project commitments, we must (B) do whatever it takes during the project to address a threatened commitment (because

## Critical Chain Project Management (Continued)

*Lord Corporation Case Study:* IT department (UK)  
The IT department did support, implementation of packages, and custom development. Before 1998, they were able to deliver good software, but rarely on time. In the preceding 5 years, they were either always late — or cut scope to finally deliver. And they only took on 50% of the projects their users requested.

The CIO attended a two-day Critical Chain Workshop, and they began in 1998 with detailed implementation plans for 9 projects. Their very first project finished early. Today they work on fewer projects at once, but get them done *much* faster, and have no backlog — so they are very responsive to the user departments. No additional resources were added to clear the backlog. It went away solely as a result of their increased project throughput.

They used to hold monthly status meetings, but now do short, weekly reviews of all active projects. Users now believe project end dates. In November of 1998, they had already finished all requested projects for the year early, so they had to solicit additional projects from their users.

The number of software organizations implementing Critical Chain for software development is growing rapidly, and on every continent. Some recent cases are:

- Elbit Systems (Israel) — contract software development
- Lucent Technologies (US) — embedded software
- Siemens (Germany) — telecommunications software

There are now enough companies—software and non-software with success from Critical Chain that it is clear the method works, and can work VERY well in almost any organization — if properly implemented.

### Why Change? (Do your projects “take too long”?)

Do your customers, or your management; think your projects are too long? I'm not asking if you think your projects could, or should, be shortened, I'm asking, “would those who judge your performance appreciate shorter projects?” For most project managers, the answer is clearly, “yes, there is a problem with how long our projects take. Our customers, and our management, want shorter projects.”

What have you done to reduce project schedules so far? As this is not a new problem, you have probably tried a number of methods, with mixed success. If the problem still exists, then you are looking for further improvements. So what are you considering now?

Most schedule reduction methods for projects operate in the development domain. Critical Chain operates solely in the project management domain, so your engineering methods or development methodology are unaffected.

That means Critical Chain generally complements any other schedule reduction initiatives you may have started.

### Our projects are not too long, but...

Perhaps the problem is not the length of your projects *per se*, but with a schedule-related problem:

- Too many late projects
- Too many people leaving because of too much overtime to make our deadlines
- Too many projects where scope was reduced in order to make the deadline
- Too many projects where the quality of the product was sacrificed to meet the schedule

Some of these problems, such as projects being late, are addressed as a by-product of Critical Chain. For the rest, the savings of “shorter projects” can be reinvested into any of these areas. For example, if the project can be reduced by 15%, and a 10% reduction is passed on to the customer, you still have 5% of the entire project to invest in additional quality methods. (The ones you know you should do, but never have the time to do on your projects.) You can do a lot of quality when you invest 5% of the entire project on *additional* quality activities.

But is the problem in our power to solve?

### The problem is management

In some organizations, there is no hope that schedule reduction is possible because the problem is seen as result of someone else's decision. Which we can't change!

“Yes, our projects take too long, but the problem is management.” (Not me!)

“Sure, we have too many late projects, but my requests for more resources were turned down.”

“I told them how long it would take, and they reduced my estimate! No wonder we're late.”

The problem is THEM.

So there is no way we can impact the problem of late projects? Many project managers are firmly convinced that the cause of this problem is out of their hands.

Why is this?

### The Vicious Cycle of Project Management

At many organizations, good project management is applied, and despite careful planning, projects are late, with little chance of making their business case. When projects are late, blame is assessed, and often some is placed on the team, and the project manager. So next time, the team members, and especially the

## Critical Chain Project Management (Continued)

(Multi-Project Critical Chain), and one for planning and managing an individual project (Single-Project Critical Chain).

With Single-Project Critical Chain, we consider all the tasks in a given project as a *system*. A project isn't finished until all its tasks are completed. So what is the goal of a project with respect to its schedule? Isn't it to finish all project tasks by the deadline? To accomplish this, Critical Chain starts with some familiar facts, but reaches a new and exciting conclusion.

With Multi-Project Critical Chain, we consider the entire set of projects in your organization as a *system*. Specifically, all the projects that you do this year will come out of the *system* that is your development organization. Projects don't deliver all their benefits to customers until they are finished. So, what is the goal of your organization this year? Isn't it to maximize your throughput of projects? To deliver as many projects, as fast as possible, to your customers? To do so would maximize the value you deliver.

Traditionally, project management has not offered much guidance for those charged with managing a large set of projects — beyond treating them as "sub-projects" to an organization-wide "super-project." This approach assumes that there is no difference between managing multiple projects and sub-projects. Most organizations don't attempt to implement this notion, even if they have the elaborate software required.

### Does Critical Chain work? SINGLE PROJECT

*Harris Corporation Case Study:* Harris Semiconductor, Project Raptor was an investment of \$250M —the largest capital investment in Harris Corporation history—in a state-of-the-art 8" wafer fabrication plant in Mountaintop, PA. Management wanted the plant completed in 27 months. (The world record for completion of a wafer fabrication plant at the time was 29 months, and the world record for production ramp-up after completion was 16 months—at a different plant from the one holding the completion record.) The industry norm was 46-54 months total for this type of project.

The project team decided to apply Critical Chain, and came up with a Critical Chain schedule of 18 months. Management instructed the team to "adjust" their schedule to 23 months, as 18 months was just "too ambitious." (This was the first time the team had ever seen their management request a project be made longer.)

The plant was complete in 13 months, with a 4% budget overrun.

Ramp-up to full production took 21 additional days. Usually 46-54 months is required to go from groundbreaking to full production. Harris did it in 14 months.

With the plant up and running, Critical Chain was then applied to custom chip development: the time was reduced from 8 months to 6 weeks. Harris is now deploying the critical chain approach company-wide.

Now there are only two possible conclusions: either the entire semiconductor industry is inept in constructing multi-million dollar semiconductor plants, or Critical Chain is a significant advance in the field of project management.

### Does Critical Chain work? MULTI-PROJECT

*Israeli Aircraft Division Case Study:* Israeli Aircraft (IAI), Maintenance Division. In November of 1995, the Maintenance Division of Israeli Aircraft was in deep trouble. In 1995 they attracted only 14 aircraft to maintain, had only \$12M of orders for 1996. They needed an additional \$80M in revenue to break-even—or face massive layoffs. But as a government-owned entity, and 1996 being an election year, no layoffs were possible. So they had to try something else. Something radical. They tried Critical Chain project management. It worked.

By 1997 they attracted 38 planes, with the same people and facilities as in 1995. Continental Airlines, one of the biggest in North America, started sending all their wide-body jets to IAI for maintenance, even though they didn't fly to Israel as a destination. (They do now.) Continental willingly paid 30% above the going rate for maintenance, because they got their planes back in half the usual time. One-day earlier turn-around saves \$60K a day (the daily cost of renting a replacement aircraft).

The Maintenance Division is now the biggest profit center in the company. In 1998, business was so good, with a large backlog of work booked, that they broke-even for the year in April. (Do you know what the profitability of a company is, that breaks even in April, and has a full order book?)

Now there are only two possible conclusions: either the entire aircraft maintenance industry is inept at managing their core business, or Critical Chain is a significant advance in the field of project management.

### Does Critical Chain work? ON SOFTWARE?

Yes, a growing number of examples clearly show it does.

## Critical Chain Project Management

Chain is, in many ways, less complicated than many of the old project management practices it replaces. But it is a paradigm shift, so the implementation must be tailored to the specifics of your environment. All the local problems, possible negative outcomes, and the specific implementation obstacles in your organization must be surfaced and carefully addressed before implementation begins.

**SINGLE-PROJECT Critical Chain** project management can reduce the elapsed time of most individual projects by roughly 15-25% through the efficiencies of pooled safety — which requires relay runner behavior in project teams.

**MULTI-PROJECT Critical Chain** project management can reduce the elapsed time of most sets of projects in your organization by roughly 15-25% through the elimination of bad multitasking — which requires staggering project starts according to a drum schedule.

The gains from each method are independent, and therefore additive. You should do both, in one implementation effort, and reduce the elapsed time of your projects by amounts that will be difficult for people in other organizations to believe.

### The Future of Project Management

Is Critical Chain an *evolutionary* advance of best practices in project management? Is it a *revolution* in project management with radical new practices? However you wish to characterize it, Critical Chain project management offers the opportunity to have significantly shorter projects.

Today, some organizations are already managing their projects this way. Someday, all serious projects will be managed this way. Other companies have done it. They faced similar questions, doubt, and difficulties. But they did manage to overcome them, implement the new paradigm, and get the benefits. You could too.

*Richard E. Zultner did projects the traditional way in high-tech software intensive organizations for a decade. After receiving his training in critical chain from the Goldratt Institute in 1997 he shifted to the new paradigm. As an Adjunct Professor in Project Management at Stevens Institute of Technology, Richard teaches advanced project management courses. He also does consulting and training in Critical Chain and QFD with high-tech companies all over the world.*

## Howe School Expanding Executive Education

The Howe School of Technology Management is expanding its Executive Education program with a new series of off-campus offerings.

Spring offerings include the following courses in the Morristown, NJ area: "Project Management Leadership," taught by Professor Aaron Shenhar, April 4-5; "Front-End of Innovation: How to Get and Manage Breakthrough Concepts," taught by Professor Peter Koen, May 17; "Leading the Technical Enterprise," taught by Professor Richard Reilly, May 21-22; and "Driving Innovation to Results," taught by Professor Gary Lynn, June 5-6.

Alliance Sponsors will be familiar with this outstanding group of faculty from their participation in Alliances Conferences and Roundtable meetings over the years.

These courses are among the first nine in the executive Education program. The others are "Marketing Fundamentals," "Innovation Management", "Strategic Planning", "Corporate Venturing", "Change Management", "Leading Managing Teams", and "Business Plan Fundamentals". Additional Topics in telecommunications and information technology will be added to the program in the future.

For more information, call Sharen Glennon, associate director of marketing for the Howe School, at (201) 216-5381.

## Upcoming Events

**The next Roundtable Meeting, on the topic of Portfolio Management, will take place April 30th.**

**The 2002 Alliance Conference will also be devoted to Portfolio Management and will feature Robert Cooper, one of the world's leading authorities on new product development, as keynote speaker. Please mark the date, June 20th.**

**For further information on these and other Alliance activities, contact Dr. Larry Gastwirt: [lgastwirt@aol.com](mailto:lgastwirt@aol.com)**