

# Using “Core Teams” for Rapid Product Development - A Long-Term View

## Introduction

Although no longer the latest business fad, teams remain popular. Teams are being used in a wide range of businesses for a growing variety of purposes. Numerous books and articles have been written on the subject. An ever-increasing range of training programs and self-study materials are being marketed. Some writers have even suggest that in these times of downsizing, globalization and Internet chat rooms teams powerfully tap into our psycho-social needs for connectedness.

While all of this may be true, at Analog Devices a team approach to new product development (NPD) has been deployed for very specific business reasons. High performance teams are a means to an end, not an end in and of themselves.

This paper will follow the evolution of “core teams” within one business unit of Analog Devices. The journey begins with the Transportation and Industrial Products Division (T&IPD). In 1998 a company-wide re-organization resulted in T&IPD being re-cast as Test & Micromachined Integrated Components (TMIC) a key player in an even larger division. Throughout the entire time period our goal has been market dominance as IC supplier for the Automatic Test Equipment market.

## Defining the Problem (FY’94)

The decision to convert to a core team strategy dates back to a senior management off-site in the Spring of 1994. As part of preparing the fiscal plan, the managers used an Affinity Diagram to explore the following question: “What are the weakness preventing a time-to-market (TTM) of 12 months by FY’96?”

ADI as a company is heavily dependent upon the release of new products to meet our revenue objectives. A critical financial metric is TTM. Product life cycles have decreased 22 – 49% in the past ten years. To be financially successful products must release on time or early. Products released late may never re-coup their initial R&D investment. In addition, late products are not designed into the intended customer’s application, as well as the next two to three generations of their products.

Although this was a room full of engineers, at a leading edge technology company, the conclusions from the Affinity Diagram weren’t technical. The main obstacles identified were:

- Our traditional resourcing strategy is inadequate for the demands of rapid new product development (NPD)
- Our products are too complex for the silo approach of passing a product in a linear fashion from one function to the next

Underneath these conclusions was a very rich analysis. A key problem was that to “maximize efficiency” we started new products as soon as key resources became free, even when other new

products were already backed up in functional queues elsewhere within the organization. Expanding the queue further aggravated existing capacity constraints.

A second issue reflected the complexity of our products. Increasingly our products required the contributions of multiple technical disciplines, often working in parallel. Our resourcing strategy did not sufficiently account for the iterative, inter-dependent nature of NPD. In striving to maximize efficiency design engineers would perform critical development work at the start of a project, hand off the product and then be assigned to a new project. As a result:

- Designers were not available to perform necessary tasks later in the development cycle
- Project managers searching for alternative design resources were not always able to secure the level of expertise needed in a timely fashion
- “Incomplete hand-off” as well as incorrect assumptions about the replacement resource’s level of understanding caused mistakes and delays

With some high profile products the original designers were pulled off their new project to support the product they had worked on previously. Typically they were multi-plexed between the two projects. In either case, one or both of the development efforts was adversely impacted.

Ironically, our resourcing strategy undermined our efforts to plan future projects. No matter how well we planned, new project starts were delayed when anticipated resources were unexpectedly unavailable. There was a trickle down effect whereby other functional disciplines were unavailable for the delayed start of the planning phase. Lack of full cross-functional representation in planning hindered attainment of Design for Manufacturability and Design for Testability goals.

A final concern was that the lack of continuity was inhibiting organizational learning. Rapid product development requires the ability to leverage and apply lessons learned from earlier development efforts. Frequently this wasn’t the case.

## **Solution Planning**

Following this rather somber discussion the division management agreed that a new resourcing strategy was needed, one that acknowledged inter-dependencies as well as limited, shared resources. For this strategy to work, we had to stop taking on more projects than we had resources. Although this seems like a rather obvious statement, it required abandonment of cherished beliefs. A successful new strategy required:

- Acceptance that having design engineers with "idle time" was less costly than bottlenecks
- Willingness to take a long-term financial perspective - accepting that the increased development expenses associated with using a contractor to stay on schedule, was significantly less costly than one month of lost sales revenues due to a late release

The Director of Engineering and the HR director were assigned the task of examining alternative resourcing strategies and preparing recommendations. Consistent with our company's culture they utilized TQM tools to analyze the issue. They actively elicited input from a wide range of employees. Over the next several months they benchmarked best practices, contacted

local universities, consultants, colleagues, customers and suppliers, and extensively reviewed the literature. Sharing their learnings on improving the NPD process became a regular item on the senior management's bi-weekly meeting agenda.

### Rejected Organizational Structures

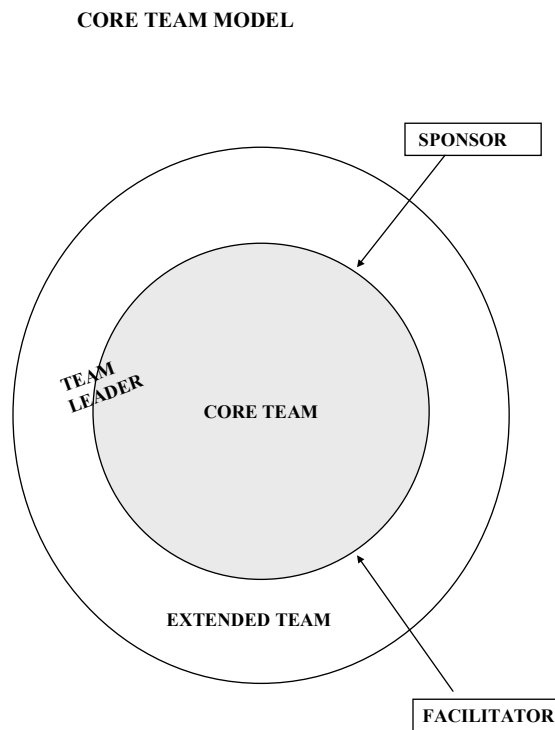
McGrath, Anthony and Shapiro (1992) introduced a framework that was found to be particularly appropriate for evaluating competing organizational structures. "The secret to successful product development teams lies in organizing them to achieve effective coordination, communication, and decision-making." (p. 62.) Using this typology a variety of organizational structures were explored and subsequently rejected.

MODEL	WEAKNESSES
Functional Organizations	<ul style="list-style-type: none"> <li>• Maintains “silo” orientation (e.g., vertical approach to problem resolution)</li> <li>• Serial handoffs approach is inconsistent with the iterative, concurrent nature of NPD</li> <li>• Lacks horizontal framework for effective communication and coordination</li> </ul>
Internal Customer/Vendor	<ul style="list-style-type: none"> <li>• Time-consuming, bureaucratic decision-making and sign-off processes</li> <li>• Formal hand-offs encourage segmentation vs. collaboration</li> <li>• Does not account for multiple customers competing for limited resources</li> </ul>
Matrix Management	<ul style="list-style-type: none"> <li>• Not conducive to development of shared ownership and accountability (e.g., functional resources are “loaned out” to projects)</li> <li>• Schedules and project plans are developed with input from only some team members/disciplines</li> <li>• Confronted by competing priorities, decisions often reflect organizational politics not company goals and/or customer needs</li> </ul>
Autonomous Teams	<ul style="list-style-type: none"> <li>• Lack of checks and balances may result in products designed which can not be efficiently tested and/or manufactured</li> <li>• Operating in isolation, team actions may not be aligned with changing priorities and/or customer needs</li> <li>• Requires very experienced, fully resourced teams</li> </ul>

### Core Teams

We selected the "core team" model, as it appeared to offer fast time-to-market in an environment of shared resources. The core teams approach was multi-functional, focused,

designed to minimize bureaucracy and accommodate parallel activities. In contrast to traditional organizational structures a continuous circle represented the core team model. McGrath, Anthony and Shapiro (1992) wrote:



As the circle implies all team members are equals. All product development responsibilities are divided among the team members and individual team members' responsibilities are usually associated with their skills. The circle also suggests that everyone faces the same challenge: to do what it takes to get the right product out to the customer quickly. This implies completing tasks that may be outside team members' strict functional areas or below what would normally be considered their stature (p. 82).

One of the most attractive aspects of this model was identification of two types of team members – core and extended.

#### Core Team Members

- The team's goal is their #1 priority
- They work on team tasks full-time as necessary
- They work with the project from start to finish

- They are accountable for the team’s overall success, (releasing the new product on time) not “just their own piece”

### Extended Team Members

- Their goals involve providing service/support to one or more core teams simultaneously
- They are either:
  - ♦ Involved with the project from start to finish on a part-time basis **OR**
  - ♦ Intensely involved with the project, but only for a limited time (e.g., to complete a given set of tasks)
- They do not share accountability for overall team success
- They are actively involved from the beginning in developing the schedule and project plans
- They are regularly up-dated on team progress, recognizing the impact of schedule changes on their ability to meet commitments

While an individual can be a core team member on only one team at a time, someone can be an extended team member on several teams simultaneously

### **Securing Extended Team Member Commitment**

In planning to implement the core team process, concern was expressed that extended team members would resist, feeling that they were being treated as “second class citizens”. In point of fact, extended team members in some of the support groups were among the most enthusiastic supporters.

The support groups often felt that the traditional approach resulted in schedules that underestimated the complexity and duration of their tasks. In addition these schedules did not adequately take into account the competing demands experienced by these groups. By being officially recognized as extended team members, the support functions felt they had gained the opportunity to provide input early in the process, when it would be most useful.

From the perspective of the support groups an additional weakness in the traditional approach to NPD was insufficient visibility into the true state of a program. The core team model offered them greater opportunity to monitor, coordinate and prioritize among projects. While they were not expected to attend all of the meetings of the various teams, they were copied on the minutes. They gained real-time appreciation of a team’s actual progress. If a team appeared likely to slip a milestone extended team members could proactively re-prioritize their workflow. They were able to take advantage of these open periods to double up resources and thereby accelerate completion of development work on a different project. This increased the likelihood of their availability when the original team was ready for their services without jeopardizing other projects.

As shall be discussed below, most of these benefits have been realized. The process has worked best with extended team member resources within the support groups within our division. We have experienced greater difficulty working with our manufacturing organization, which prefers to operate in a customer/vendor mode. We have also had to re-examine our

assumptions re: individuals who performed tasks typically associated with core team members, but who held extended team member roles.

## **Core Team Deployment**

Having already implemented many TQM efforts, the division decided to use a Plan-Do-Check-Act (PDCA) deployment strategy. We utilized an external consultant and ADI's Corporate Training & Development staff to surface implementation issues and to conduct introductory teamwork skills training. Nervously aware of open issues, but cognizant of the urgency to accelerate the pace at which new products were introduced to the market, the remaining teams launched in FY94 used the core team model. T&IPD senior management made a commitment to monitor the process and make improvements where necessary.

## **First "Check" - Mixed Results**

At the end of the first year, core teams' results were compared to traditional NPD activities. By all financial measures the core team development approach was a success:

- Time-to-market was reduced by 25%
- New product releases increased by 30%
- New product revenues doubled

Although the core team model was seen as an effective approach to NPD, overall employee commitment was low. Team members described the core team process as confusing and at times frustrating. In the rush to correct the problems associated with a functional, hierarchical organization, the benefits that structure provided had not been sufficiently taken into account. Employees felt the pendulum had swung too far in the other direction. Consistent with the notion of PDCA, our "check" identified areas where improvement "actions" were needed.

## **Improvement Activities**

In FY'95 four cross-functional "Hoshin" (improvement) teams were chartered to address individual, team and organizational structure issues related to core team deployment. Each team had the twin tasks of further identifying the weaknesses in our process and then developing detailed solutions.

The *planning* team reported:

- Teams lacked the data, tools and skills to accurately assess resource needs and generate plans
- Teams lacked mechanisms to efficiently communicate with *all* of the resources required to develop a new product
- Teams lacked processes to secure extended team members' commitments
- Teams were unable to establish goals and set metrics
- Sponsors and teams lacked the skills to successfully launch a new team (e.g., developing ground rules, project scheduling)

The *execution* team pointed out:

- Teams did not have sufficient authority and decision making capabilities
- Teams lacked an adequate system for dealing with changing commitments and priorities
- Teams were still initiated with insufficient resources
- Employee roles and allegiances to both the team and the formal reporting structures were not clear
- Sponsors and teams lacked basic day-to-day teamwork skills (e.g., meeting management, conflict resolution)

The *team completion* team surfaced the following issues:

- The organization did not know how to recognize and reward teams upon completion
- Our performance management process still focused on individual contributions vs. attainment of team goals
- We lacked processes for collecting and meaningfully using team member inputs in the performance review process
- There was confusion regarding the roles of the team leader and the manager in the performance review process
- Teams were untrained in delivering feedback

The *data collection and analysis* team reported:

- Teams lacked data collection mechanisms to track progress to schedule, as well as to assess and improve team performance during the life of the project
- Data on the key issues of multi-plexing and delays was of uneven quality
- Data was insufficient to determine root causes and improve the core team process
- We lacked mechanisms to identify, document, communicate and standardize division best team practices

## **Process Improvements**

The four teams immersed themselves in the issues. They developed detailed recommendation that were presented at a division off-site, and subsequently ratified. Among their contributions:

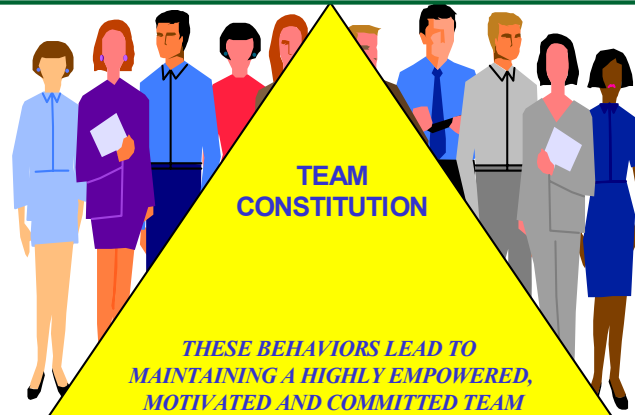
- Creation of the “T&IPD Team Constitution” which defined the roles and responsibilities of the team leader, members and sponsor
- Development of a project planning flow chart and supporting documentation to help start new teams
- Introduction of team surveys to be used during the life of the team, and peer evaluation forms to be used as part of the performance review process
- Establishment of a reward and recognition process, which teams negotiated with their sponsor at the beginning of the project.

## Project Team Reference Card

T&IPD

### TEAM MEMBERS

- ALL TEAM MEMBERS ARE CONSIDERED EQUAL AND SHALL BE TREATED AS SUCH
- MEMBERS HAVE THE RESPONSIBILITY TO DISCUSS WITH THE TEAM ANY ISSUE WHICH MAY IMPEDE THE #1 PRIORITY
- TEAM MEMBERS MAY RECONTRACT THROUGH THE TEAM WITH THE SPONSOR WHEN AN AGREED-UPON CHANGE FORCES A PERMANENT CHANGE IN SCHEDULE
- IT IS THE TEAM MEMBERS RESPONSIBILITY TO REMAIN UP-TO-DATE ON ALL TEAM ISSUES
- TEAM MEMBERS SEEK APPROPRIATE TRAINING
- TEAM MEMBERS ARE WILLING TO WORK IN AREAS OUTSIDE OF THEIR EXPERTISE IN ORDER TO GET THE JOB DONE



#### Team Leader

- ASSUMES RESPONSIBILITY FOR TEAM-DEVELOPED OPERATING PRINCIPLES
- ENSURES THAT COMMUNICATION AMONG MEMBERS IS OPEN & EFFECTIVE
- SUPPORTS ALL MEMBERS IN PLANNING AND IMPLEMENTING THEIR TASKS
- SHARES EMPOWERMENT AND RESPONSIBILITIES AS TEAM ABILITY GROWS
- ESTABLISHES AND MAINTAINS A COLLECTIVE DECISION-MAKING PROCESS
- MAINTAINS A CLARITY OF PROJECT-SPECIFIC BUSINESS GOALS
- MAINTAINS A FIRM ALLIANCE WITH THE TEAM'S SPONSOR
- UTILIZES FACILITATION SERVICES WHEN NECESSARY
- SEEKS FEEDBACK FROM MEMBERS AND PEERS TO IMPROVE LEADERSHIP SKILLS
- CONTINUALLY WORKS TO TEST AND EXPAND TIPD TEAM PHILOSOPHIES

#### Team Sponsor

- RECRUITS THE TEAM LEADER
- RESPONSIBLE FOR SUCCESSFUL NEGOTIATION WITH THE TEAM OF CLEARLY DEFINED GOALS, RESOURCES AND SCHEDULE
- RESPONSIBLE FOR ALIGNMENT OF TEAM GOALS WITH THOSE OF THE PL, DIVISION AND CORP.
- CLEARS OBSTACLES
- ALLOWS THE TEAM TO DETERMINE ITS PATH TO SUCCESS
- ADJUSTS THE AMOUNT OF DIRECTION BASED ON TEAM AND TEAM LEADER EXPERIENCE; SERVES AS COACH, PROVIDES MOTIVATION, INSPIRATION AND EXPERTISE
- IMPLEMENTS TEAM DECISIONS WHEN SPONSOR SUPPORT IS REQUIRED
- STAYS AWARE OF TEAM PROGRESS
- RECOGNIZES TEAM ACCOMPLISHMENTS
- HAS THE RESPONSIBILITY TO CANCEL THE TEAM WHEN THE TEAM TEAM GOALS ARE NO LONGER ACHIEVABLE NOR ALIGNED WITH BUSINESS OR PRODUCT LINE GOALS

In discussions surrounding the improvement teams' recommendations, division management identified the need for additional resources to support team development and learning. Based on their research a team facilitator position was established.

## **Second “Check” and Actions**

The following year a second assessment of our core team process was performed. The good news was that the formal NPD metrics continued to improve (e.g., TTM continued to decrease and new product revenues continued to increase). Core team excitement was growing. By and large the Hoshin team improvements seemed to be working. The notable exception was our reward and recognition process.

Teams reported that negotiating up-front for recognition was a de-motivating experience. Rather than receive a financial reward at the project’s conclusion, teams preferred timely, but sincere acknowledgment of hard work from their Sponsor. The formal reward and recognition program was discontinued. Team leaders were encouraged and empowered to use a wide range of more spontaneous recognition tools, ranging from spot awards to T -shirts, bringing in donuts, as well as taking the team out to dinner.

Overall commitment to the use of core teams seemed to be growing. As one engineer reported "it looks like this core team stuff has passed the pet rock stage." At the same time, individuals were raising new, more personal, concerns regarding such issues as career advancement in a flattened organization and assimilation of new employees. In response to these concerns, a second round of Hoshin teams were launched. Among the recommendations from the new Hoshin teams were:

- Further revisions to our performance review system to recognize individual and team goals
- Improving the process for collecting peer inputs
- Expanding senior engineer job descriptions to include mentorship responsibilities
- Establishment of functional learning forums in support of organizational learning
- Development of a new technical career planning matrix focusing on skills and competencies better suited for a horizontally growing organization

## **Year Three - The Challenge of Success**

Utilization of core teams significantly contributed to the division's success. We became the dominant supplier in key markets and developed strategic partnerships with several key customers. Success at times resulted in customer demands coming quicker than our ability to respond. A further complication was a dramatic shortage of manufacturing capacity experienced by the entire semi- conductor industry. This combination resulted in diverting the focus of in-place teams from new product development activities to enhancing the yields on already released products. This combination of pressures resulted in the division slipping back into old habits, and both financial results and employee morale suffered.

## **Year Four -"Getting Back on Track"**

The previous year had been a painful one for the division, but it motivated us to return to behaviors that had contributed to past successes. Senior management publicly acknowledged

mistakes had been made and re-committed to adhering to core team guidelines. The focus of the up-coming year was getting back on track. Towards this end the Division Vice President introduced the *T&IPD NPD Operating Guidelines*. Among the key ideas expressed in the guidelines were:

- We will forecast product line resource demand vs. capacity quarterly
- We will take innovation out of the critical path
- Core teams will remain assigned to the project until production release
- We will average 3 core team members per project.
- Individual extended team members will be limited to a maximum of 3 teams (Exceptions – New Product Planners and team facilitators)
- Core team members can only be an extended team member on one team at a time
- No new projects will be started without a fully staffed team (which assumes proper skills sets)

### **Current State – Year Seven**

Over the past three years we have wrestled with the principles contained in the Operating Guidelines. We have had the enviable position of more business opportunities than resources. Rather than turn business away, we frequently manipulated the system (e.g., individuals who were currently core team members on one project were unofficially assigned to work on another project which had not formally started). At these times our initial inclination was to feel frustrated and guilty about our inability to adhere to the core team ideal. Belatedly we realized that we were attaching a degree of religious orthodoxy to the core team model that was in conflict with our original impetus for adopting this approach.

Returning to our TQM roots we have analyzed our difficulties using core teams. As shall be discussed below based on our learnings we have revised our process of using teams for New Product Development.

### **Lessons Learned - Conclusions**

A major challenge we experienced is that the core team model for all of its benefits is very resource intensive. Adherence to the core team model ensures that projects will be staffed with the correct level of dedicated resources focused on accomplishment of the goal. This model successfully addresses the iterative nature of NPD, and functional inter-dependencies. From our experience a weakness is that the core team model does not adequately take into account the demands of a portfolio with a variety of projects, at various stages of development and of varying levels of complexity.

We have come to realize that a one size fits all model is not appropriate for our business. For certain projects, (e.g., those that have a very aggressive schedule or a high degree of innovation) a core team approach is the most appropriate vehicle. When we are engaged in parallel development efforts, which are very similar, assigning a core team to each project is not the best way to operate. In support of parallel development efforts we have successfully formed mini-teams, which are supported by a large functional team. This new model results in higher engineering efficiency and encourages technology re-use.

Even in those situations where a core team model is appropriate we have come to recognize that a full core team for the length of the project may not be necessary. We have re-defined our guidelines whereby some individuals remain core team members for the life of the project, whereas others can successfully re-negotiate their status from core to extended.

In summary, we adopted a core team approach for New Product Development for very specific business needs. This model has been very effective in responding some of our challenges. Long-term success has been due to our willingness to critique and revise our process based on our learnings. We have revised our use of the core team approach, and recognized that it is not the correct approach for all of our development activities.