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Getting the Most Out of Integrated Product Teams (IPTs)

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An Integrated Product Team (IPT) is a multi-functional team formed for the specific purpose of delivering a product or developing a process or policy. IPTs are set up to foster parallel rather than sequential decisions and to guarantee that all aspects of the product, process, or policy are considered throughout the development process. To most organizations, IPTs represent a fundamental departure from past practice, one that requires changes to structures, policies, processes, and even philosophy. Consequently, IPTs need strong high-level and middle-management support and continual reinforcement to succeed. In 1995, secretary of Defense Perry directed the use of IPTs for defense acquisition. In this paper, we examine government, industry, and academia's experience with IPTs. Based on our research, we recommend ways to better implement this new management approach.

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Summary

In 1995, Secretary of Defense Perry directed the use of Integrated Product Teams (IPTs) for defense acquisition. In this paper, we examine government, industry, and academia's experience with IPTs. Based on our research, we recommend ways to better implement this new management approach.

We prepared this paper at the request of the Acquisition Reform Executive in the Office of the Assistant Secretary of the Navy (Research, Development, and Acquisition).

Findings

Organizational change

An IPT is a multi-functional team formed for the specific purpose of delivering a product or developing a process or policy. IPTs are set up to foster parallel rather than sequential decisions and to guarantee that all aspects of the product, process, or policy are considered throughout the development process.

To most organizations, IPTs represent a fundamental departure from past practice, one that requires changes to structures, policies, processes, and even philosophy. Consequently, IPTs need strong high-level and middle-management support and continual reinforcement to succeed. If such support exists and is reinforced by new managers, teaming will become a way of life for an organization and in 3 to 5 years it will be the norm. But if there is no such support, or if management's enthusiasm for teaming declines, teams will lose their effectiveness.

It is easiest to bring about the kind of organizational change required by IPTs in organizations that have suffered major setbacks such as the loss of contract or a decrease in profits. Convincing people that

change is needed is more difficult in organizations that have been delivering good products on time. Absent a seminal event, management support becomes even more important.

It is not necessary to convert an entire organization to IPTs in order to make IPTs work. And organizations need not form IPTs in every instance. IPTs are not appropriate for urgent, minor, or routine matters, but can be effective for larger or complex projects and for developing processes or policies.

Key features of successful IPTs

The teams we studied had a number of distinct characteristics, or features. Some are more significant than others, but they are all important. Successful teams had most if not all of the following features:

- One leader (or at most co-leaders)
- Small working-level teams with no more than 15 people
- Responsibility and limits to authority embodied in charters
- Members with authority to act on behalf of their functional organization (read "empowered")
- Training in team concepts and rewards for team performance
- Collocation
- Access to media aides such as e-mail, video-teleconferencing, and data/information management software, among others.

Key features of IPT organizations

In addition to these team-specific features, organizations that have transitioned most fully to IPTs have changed their policies and procedures to better foster a team environment, including:

- Creating company-wide functional standards
- Instituting team-oriented compensation structures
- Reducing the number of required briefings to the management hierarchy

- Changing internal administrative processes, such as those for subcontracting and source selection.

What we can expect from IPTs

If organizations and their IPTs have all (or most) of these features, we can expect:

- Higher up-front costs primarily due to the need for training, collocating IPTs, and more frequent meetings
- Better communication
- A higher quality workforce as individuals become exposed to the broad program picture
- More informed decisions and less time overall because of faster high level review and approval (but slower decision-making at the working level).

Risks

There are a number of potential risks managers must consider when setting-up teams.

- IPTs have high "up-front" costs. If off-setting cost and time savings do not materialize, there are few remedies and little time for recovery.
- Teams can start behaving like committees if individuals put the interests of their functional specialty above the interests of the teams.
- IPT structures, with overarching, integrating, and working-level IPTs, can become over-bureaucratized and top heavy, slowing down or hindering progress rather than facilitating it.
- Over time, the continued reassignment of functional specialists to integrated teams can dilute core functional skills resulting in the loss of "corporate memory."

Differences between government and industry

We found that in DOD, large "meetings-only" IPTs were common, whereas in industry more IPTs tended to be smaller, permanent, and with more collocation. There are other significant differences between industry and government IPTs that will make it more difficult to effectively implement IPTs in the Department of the Navy. These include:

- Chain-of-command considerations that hamper free and open discussion
- An inability to fully empower government comptrollers.

Recommendations

For maximum effectiveness, creation of IPTs should be accompanied by:

- Concise IPT charters to define expectations, boundaries, and authority
- Organization changes to accommodate collocation and shifts of functional personnel to IPTs
- Process changes to eliminate serial review/approvals made superfluous by IPTs
- Personnel policy changes to provide training, evaluation, and a reward framework tailored for IPTs.

Introduction and background

> There is nothing more difficult and dangerous, or more doubtful of success, than an attempt to introduce a new order of things in any state. For the innovator has for enemies all those who derived advantages from the old order of things, while those who expect to be benefited by the new institutions will be but lukewarm defenders. This indifference arises in part from fear of their adversaries who were favored by the existing laws, and partly from the incredulity of men who have no faith in anything new that is not the results of well-established experience.
>
> Machiavelli, *The Prince* [1]

On 10 May 1995, Secretary of Defense William Perry issued a memorandum [2] to the Service Secretaries requiring the use of Integrated Product Teams (IPTs) "throughout the acquisition process to the maximum extent practicable." This memorandum describes the use of IPTs as "a management technique that simultaneously integrates all essential acquisition activities through the use of multidisciplinary teams to optimize the design, manufacturing, and supportability processes," and notes that IPTs "are currently being used successfully by many industry and government program managers."

The requirement has prompted the Department of the Navy (DON) to form numerous IPTs for program management and oversight of major programs, yet many questions remain regarding the best way to form and implement IPTs.

Recognizing that there are many ways to implement the DOD guidance, the Department of the Navy Acquisition Reform Executive asked CNA to "evaluate the IPT experience in industry and at other government agencies...to obtain a comprehensive picture of the current state of IPT use and the best way for DON to implement this important management technique."

Approach

Our approach was to evaluate the full range of lessons and guidance in existing literature and to select key portions applicable to the requirements of the Department of the Navy; to survey and assess the various IPT techniques used by other government agencies and industry; and to determine their lessons learned.

We selected 11 contractors and 13 government projects that were known to have used IPTs; provided questionnaires (see appendix A); and interviewed more than 80 program managers, senior government and industry officials, functional leaders, IPT members, and experts from academia (see listing, appendix B).

The industry participants were all large, established corporations. Three (Boeing, Ford, and GM) deal primarily with commercial buyers; three (GE, Pratt & Whitney, and Texas Instruments) provide large amounts of products to both government/DOD and commercial buyers; and five (Hughes,[1] Lockheed-Martin, Loral-Vought, McDonnell-Douglas, and Northrop Grumman) deal primarily with the DOD.

All but three of the government projects we reviewed were ACAT I high dollar, high visibility programs.

We assured all respondents in industry and government that their replies would be on a nonattribution basis; and we told our industry contacts that their replies would be handled as business sensitive.

Finally, we developed findings and recommendations based on our experience and the combined wisdom of the many officials contacted.

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1. Although GM owns Hughes, we limited our GM review to North American Operations, which includes cars and trucks only, and addressed Hughes as a separate company.

Integrated Product Teams in DOD and industry

Evolution of DOD acquisition management approach

To ensure a focus of management attention and resources on key programs in the mid to late 1960s and early 1970s, the military departments began establishing program management offices (PMOs), with program managers responsible and accountable for cost, schedule, and performance. These program management offices were largely self-contained,[2] and were not as dependent on functional organizations for support in areas such as logistics support planning, design management, and contract planning as previous programs had been.

As these new PMOs first developed, the functional organizations continued work on established programs that had not been "projectized," but as more and more new programs started and additional PMOs were formed, the functional offices lost many of their people to new programs. Through the late 1970s and early 1980s, the functional offices gradually lost influence over new programs.[3] The result was generally faster and more focused performance from each individual program, because programs could proceed independently and key functional experts were not spread thin among many new projects. However, because each program operated independently, there was a growing perception by the late 1980s that new programs were not benefiting from the lessons learned by other program offices; that the Services were repeating the same mistakes; and that,

2. For example, the Air Force's C-5A, and the Navy's LHA and DD-963.

3. The changes in the relative influence of functional organizations are exemplified by the rise and fall of the functionally-organized Naval Material Command (NAVMAT). Established in 1966, NAVMAT peaked in size in 1980 (730 civilians, military unknown), and then diminished to 440 civilians and 109 military in 1985 when it was disestablished.

by reducing the role of functional organizations, the Services were "losing their corporate memory."

This led to the resurgence and expansion of many functional organizations to ensure that new programs were developed in accordance with accepted standards and did not repeat the mistakes of the past. Unlike the functional organizations that had participated in program planning and execution before the advent of program offices, the functional organizations of the 1980s evolved primarily into policy "oversight" activities, emphasizing:

- Checking Program Management Offices to ensure that standards were met and mistakes of the past were not repeated
- Critiquing programs to prepare senior-level decision-makers for their decision-making responsibilities at major milestones
- Approving program management plans.

To obtain high-level approval at program milestones, program managers first needed to persuade the Service and OSD functional organizations that program plans were acceptable. However, as described by the President's 1986 Blue Ribbon Commission on Defense Management [3], persuading the functional organizations was a problem for many projects:

> An army of advocates for special interests descends on the program to ensure that it complies with various standards for military specifications, reliability, maintainability, operability, small and minority business utilization, and competition, to name a few. Each of these advocates can demand that the program manager take or refrain from taking some action, but none of them has any responsibility for the ultimate cost, schedule, or performance of the program.

Program reforms initiated as a result of the Blue Ribbon Report streamlined acquisition organization and procedures by establishing DOD and Service Acquisition Executives and Program Executive Officers [4]; however, the role of the functional organizations was not appreciably altered. In fact, by 1995, the "DOD acquisition hierarchy" (the functional staff) was described as having "an unquenchable appetite for data and paperwork, was quick to second guess decisions, and worse yet, revisited decisions endlessly [5]."

Origin of IPTs in DOD

As a result of the widespread criticism of OSD's lengthening review and decision process, and the perceived disproportionate influence of functional (special interest) groups, OSD developed a new acquisition management process. The new process continues the use of functional specialists for retention of the corporate memory; however, to avoid placing too much emphasis on functional staff review and approval, specialists from the functional organizations are to be fully involved on special *teams* with the PMOs, throughout all phases of acquisition.

This new relationship between the functional and program management organizations, and the emphasis on *parallel* rather than *sequential* efforts, has been referred to as "Integrated Product/Process Development" (IPPD) to reflect the greater degree of coordination among disciplines. The new teams, essential to making IPPD work, are known as "Integrated Product Teams (IPTs)."

The most recent proposal to use IPTs in the Department of Defense originated with the OSD Acquisition Reform Process Action Team (PAT) [6], a team chartered by the Secretary of Defense to develop "a comprehensive plan to reengineer the oversight and review process for systems acquisition, in both the Components and OSD, to make it more effective and efficient, while maintaining an appropriate level of oversight."

Drawing on the growing popularity of the use of teams in industry, the PAT recommended that DOD institutionalize the use of Integrated Product Teams in the Department of Defense to accelerate the DOD milestone review and approval process and to reduce the delays attributable to OSD functional staff review. The PAT team envisioned:

- "A multidisciplinary, integrated staff that will facilitate a product-oriented focus, rather than a functional issues focus."
- "The IPT would act collaboratively and decide what issues need to be raised to the decision-makers."

- "The IPT concept is intended to be used horizontally (i.e., a program manager IPT, a Component staff IPT, and an OSD staff IPT) and vertically (i.e., expanded program manager IPTs that include Component and OSD staff) when necessary for early or continuous involvement."

DOD IPT guidance

Direction to form and implement IPTs was provided initially by OSD memoranda [7], which outlined the principles of the concept. This was followed by a "DOD offsite" [8] for program managers, program executive officers, and key OSD personnel.

Since July 1995, OSD has provided additional insight and guidance. Answers to questions raised at the offsite were provided in August 1995; the *"Rules of the Road" Guide* was published in November 1995; and the *DOD Guide to Integrated Product and Process Development* was published in February 1996.

These guides state:

> The objective of the IPT process is to eliminate sequential and redundant program reviews—by the Program Executive Officer (PEO), the Service staff, the Service Acquisition Executive (SAE), the OSD staff, and finally by the Defense Acquisition Executive (DAE) [9].
>
> IPTs shall function in a spirit of teamwork with participants empowered and authorized, to the maximum extent possible, to make commitments for the organization or functional area they represent. IPTs are composed of representatives from all appropriate functional disciplines working together to build successful programs and enabling decision-makers to make the right decisions at the right time [10].
>
> IPPD is a management process that integrates all activities from product concept through production/field support, using a multifunctional team, to simultaneously optimize the product and its manufacturing and sustainment processes to meet cost and performance objectives. IPTs, cross-functional teams that are formed for the specific purpose of delivering a product...are the means through which IPPD is implemented. Members of an IPT represent technical, manufacturing, business, and support

functions and organizations which are critical to developing, procuring, and supporting the product. Having these functions represented concurrently permits teams to consider more and broader alternatives quickly, and in a broader context, enables faster decisions. Once on a team, the role of an IPT member changes from that of a member of a particular functional organization, who focuses on a given discipline, to that of a team member, who focuses on a product and its associated processes [11].

Evolution of IPTs in industry

In industry, there has been an evolution of organizational structure and management philosophy not unlike the evolution of the DOD acquisition management structure described earlier. Most companies originated as single product companies, and their processes at the outset were inherently team-like in that functional specialists and product managers worked together to optimize their product. As companies grew and additional products were developed, many tended to form departments and divisions that organized work by activity/function (i.e., marketing, engineering, manufacturing, etc.) [12], becoming primarily function-oriented. Others simply added additional single-product divisions, each with its own self-contained marketing, engineering, and production capabilities focused on a single product.

As companies became either strongly functional or strongly product-oriented, they learned that each approach had its shortcomings. The product-oriented organizations, although relatively fast at decision-making and getting a product to market, suffered from duplication of staff, inconsistency in application of company policy, and a tendency not to learn from prior mistakes. Functionally organized companies were generally more consistent from product to product and were often known to be better technologically, but they were slower to respond to change and apply their well-developed technology, and tended to be less responsive to customer needs [13]. Many companies shifted emphasis from one type to the other (most notably, in the 1970s, from the functionally oriented organization to the product oriented organization), and different techniques have been employed (use of project leaders in functional groups, or the use of

matrixed structures to coordinate products across functions) to overcome the shortcoming of each organizational type. What evolved was essentially four different approaches to integrating product and functional interests (see figure 1) [14]:

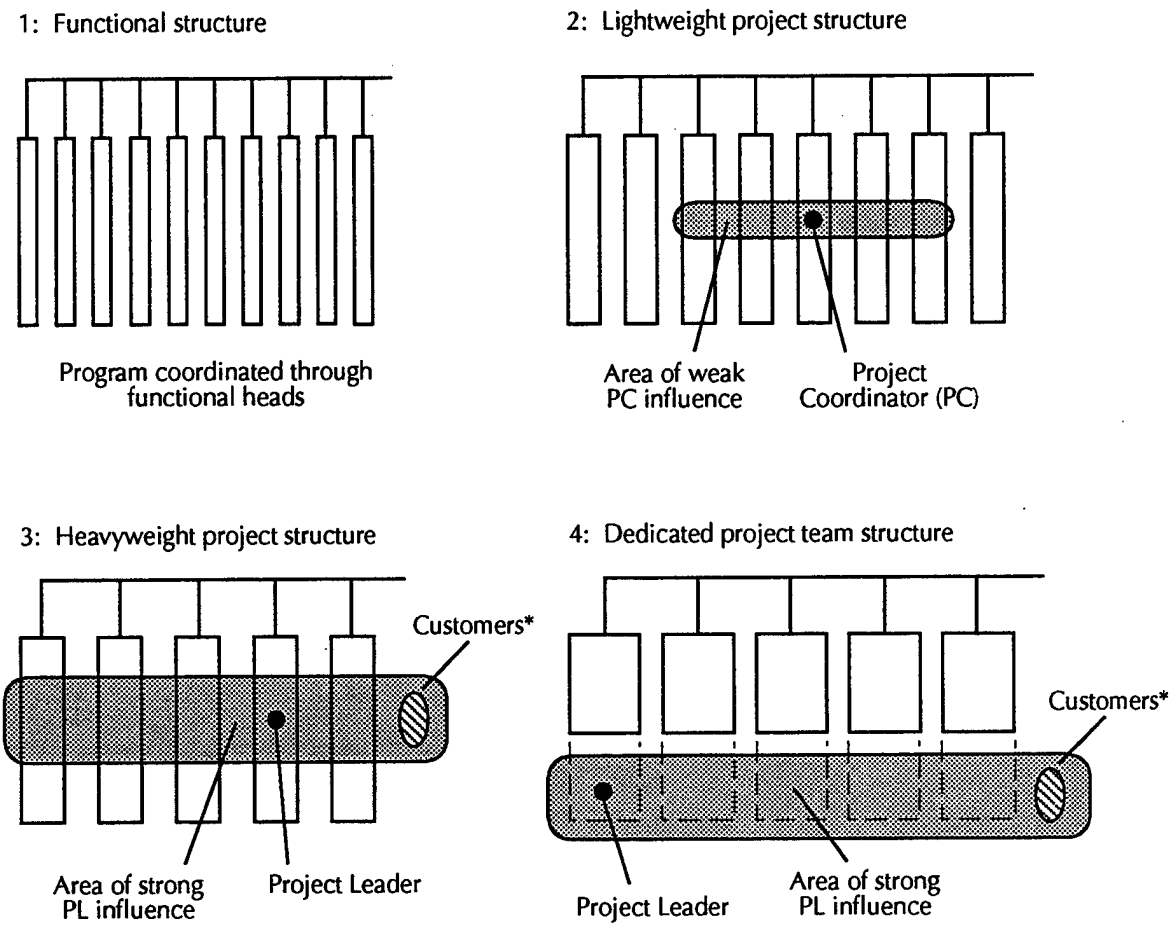
A functional system, where the basic work gets done within, and leadership occurs through, the functional organizations; in this structure, there is no project leader; no one person has overall responsibility for the total project.

A "lightweight" project team system, where a project manager coordinates and schedules activities through liaison representatives, but the basic work and much of the substantive leadership occur through the functions; the lightweight mode is similar to the functional system, but there is a project coordinator who keeps the functional groups informed, organizes meetings, and facilitates decisions.

A "heavyweight" project team system, where the work is done in the functions, but a project leader and a core team of functional leaders take responsibility for all aspects of the project; in the heavyweight system, the project leader has broad responsibility and clout over working-level people within functions.

A dedicated project system, where the people working on the project are pulled out of their functional organizations and dedicated to a team (or project management office) led by a strong and empowered project leader; in this approach, functional people are dedicated to the project full time. They report directly to the project leader and do the detailed work.

Figure 1. Different approaches to integrating product and functional interests[a]



* Strong tie to customers

a. Source: [14].

Most companies that we spoke to have concluded that neither a strongly functional nor a dedicated project system is desirable in today's environment (one company referred derisively to its previous dedicated project structure as its "hero mode"), even with various "lightweight" or "heavyweight" variations.[4] Therefore, they had moved or were moving toward total integration of their functional and product line people through teaming arrangements. They saw this as a means to not only overcome barriers inherent in "silo" or "stovepipe" organizational structures, but also as a technique to shorten lead times and reduce rework, by "pulling involvement forward" (using the right people earlier in the process to enhance communication at every phase).

Different IPT types

We observed two types of IPTs in industry and government:

Meetings-only teams

- One type of team exists solely in meeting form. Its members are attached to different functional and product line organizations; generally report to different supervisors; and are located in different offices, buildings, or even cities. When a major problem or decision point emerges, the members are called together to meet and jointly resolve issues. In its best form,
  - — Each team member brings to the table the expertise of his or her particular functional specialty, and is empowered to speak on behalf of his/her organization. However, unlike a

4. What "new" environment has prompted this latest wave of organizational changes? First, product complexity requires greater coordination and integration among functions and components than ever before (aircraft engine and airframe controls, for example, or automobile engine, transmission, and braking systems). Second, rapidly changing technologies and global competition mandate that the length of development ("dream-to-gleam," "deal-to-steel") be substantially reduced. Therefore, functional specialists must not only work together, they must do more work *concurrently*, which demands improved coordination among many disciplines.

committee, the team emphasis is on arriving at decisions that are in the best interest of the product overall, rather than a decision that is optimized for one particular functional area at the expense of the product.

— Members stay current with the program and its product because the team meets often during the life of the program. Between meetings, a program management office manages the program but ensures that IPT members remain informed through continued and prompt communications (faxes, e-mail, etc.)

— Because the IPT members are not involved full time with any one program, they are free to work on other IPTs, thus ensuring cross-fertilization, consistency among programs, and maintenance of the "corporate memory."

Dedicated teams

- A second type of team is the team that operates together continuously. Its members may be attached to different organizations and may all be evaluated by different supervisors, but they are collocated in the same building or near-by buildings, and their time is dedicated nearly 100 percent to one product throughout the life of the program.

  — The team members do not meet only when a major problem or decision point emerges; rather they work together continuously and meet on an informal or periodic basis as necessary to resolve day-to-day problems.

  — Because of its product focus and the continuous involvement of team members, this type of IPT is very much like a division within a program office, or (depending on the IPT scope) like a complete program management office. However, unlike employees of a conventional program management office, most of the members responsible for functional areas have been drawn into the IPT from functional organizations outside the PMO, and may still be attached to those organizations and depend upon them for

performance evaluations, bonuses, training, etc. In its best form:

- This type of IPT optimizes coordination and communication among most team participants because of their nearly constant participation.
- This type of IPT brings the expertise of all functional specialists to bear on program problems (both large and small) *in real time,* without later delays or decision reversals. At the same time, because of the continued affiliation of the IPT functional specialists with their functional "home offices," their functional expertise is enhanced, and consistency among programs and functional corporate memory can be maintained.
- Like the "meetings-only" IPT, this type retains the corporate functional "home offices," but a key concern is maintaining expertise in these core functional organizations while functional specialists are dispersed among different IPTs:
  * Some functional heads we spoke to handled this "keeping up to date" problem by having weekly meetings with the people they had assigned to product teams. One acknowledged that this may be a cause of the "too many meetings" complaint of many IPT members, but felt it was the only way he could keep abreast of what was going on in the IPTs, and the only way for his IPT people to stay current with functional developments in other areas.
  * Another company solved the problem with "technology clubs," a club being a group of specialists in one function, each of which is assigned to a different product team, that meets periodically to share ideas from their product teams.
  * Some companies required the functional experts who had been moved to IPTs to document "lessons learned" for their functional organizations when their projects completed. One company required *quarterly* "lessons learned" reports to be sent to the functional organizations ("too much is missed if you wait until project completion"), and

the reports became required reading for other functional specialists preparing for new IPT assignments.

We found the "meetings only" type of team is most common in DOD at the PMO and higher level as a supplement to the many conventional PMOs already established in the Services. For example, DOD requires "overarching" IPTs (OIPTs), "working-level" IPTs (WIPTs), and "integrating IPTs" (IIPTs), all of which are "meetings-only" IPTs. At the highest levels of corporate management, where executives usually cannot participate full time on any one team, "meetings-only" IPTs are also commonplace.

Permanent teams, normally fully collocated, are more common in industry and at the execution level of some DOD programs.

Successful IPTs

As in real estate, where it is often said that the three most important factors in selling a home are location, location, and location, our review has confirmed that the three most important factors in creating an IPT are communication, communication, and communication.

We asked those we interviewed to list the attributes of a successful IPT, and we have summarized their replies in this section. But in every case, the list of attributes is mainly a list of ways to improve communication among a large group of people with diverse backgrounds. Collocation, e-mail, videoteleconferencing, management information systems, common databases, defined charters, standardized processes, and team training are all tools to keep people who otherwise might not communicate *early enough in a program,* to do so. The key is to foster and maintain exceptional communication, starting at the very early stages of a program, among all the right people.

Regarding communication, note this word of caution. If, as a manager, you have opened all the necessary communication links on your teams, there will be immediate communication between your people and your suppliers, and between your people, your customers, and the hierarchy above you. This means that your boss or customer may hear of a problem before you do, and possibly before the responsible team has developed alternative solutions. For many organizational cultures, especially in the military and large corporations, this is a major departure from what many had thought were the inviolable rules of good management: Never let your boss or your customer hear the bad news before you do, and never present your boss or customer with a problem that you haven't first thought through and for which you have some alternative solutions.

The good news is that, although your boss or customer may hear of a problem before you do, their people will be working to solve it along with your other team members by the time it comes to your attention. With trust and confidence up and down the supplier/customer/leadership chain, this new mode of communication outside of "normal" channels is not an undesirable by-product of IPTs, but rather is the basic reason why IPTs are created, and the reason for their success.

Organization dynamics

The makeup of a team is heavily dependent upon what is possible in an organization and what the recent history of the organization has been. Change is easier to implement if there is a "shared perception of crises [15]," a common understanding among most personnel that improvements are necessary. Nearly all organizations that were successful in changing their culture to accept teams had been required by their customer to do so, or had been subject to some major, seminal event that made it clear that changes and improvements were necessary. One large military Command said its conversion to IPTs wouldn't have been as successful without "the forcing function" of downsizing. It had to organize into teams simply "for survival."

One company said that it found a lot of acceptance for the teaming concept at one division because it was just getting over cancellation of a large contract that had not gone well, and many felt changes were necessary. Other companies said they had just lost a major competition, or were trying to reverse years of reduced market share and declining profits. But companies or divisions that had been recently successful were less enthusiastic about "fixing something that's not broken." One company noted that many in their organization are questioning why they are changing to a team-oriented structure (as required by their contract) when their product—used extensively during Desert Storm—is "the best in the world," and the company is profitable. This company has not yet decided to convert entirely to IPTs, because they aren't certain that teams will work as advertised and are awaiting hard evidence from their one IPT program.

All organizations will encounter some resistance to change, whatever the circumstances. One spokesman for a government activity that has been a strong advocate of teams indicated that they had converted to a teaming organization 3 years ago, but were still "only 70 percent there;" they expected it would take "1 or 2 more years" before teaming became the accepted way of doing business. This coincides with the experience of others, [16], who describe the growth "from teams to teamwork" as a 3- to 5-year process, heavily dependent on high-level management support. With continued management support, teamwork can be expected to become the norm ("mainstream") in 3 to 5 years. Where management support is lacking, however, "teams go into gradual decline and become forever an exception to the way work gets done [17]."

There is no recipe for the perfect team or even the perfect team concept, and in fact organizations need not use IPTs for all of their products and processes. We found evidence at some of the large organizations we visited that it was quite possible to maintain a conventional hierarchical structure at one location while at the same time converting to a series of IPTs at another. Indeed, most companies don't use IPTs for everything—they're impractical for urgent, minor, or routine matters—and many companies only introduced IPTs company-wide after first trying them on one or two projects; during these trial periods, both conventional and IPPD/IPT processes proceeded simultaneously.

Team dynamics

There is a constancy about teams and their conduct that emerged again and again in our review. One Air Force officer expressed this best by describing the four phases in the life of a team as "forming, storming, norming, and performing."

While the "forming" phase is self explanatory, the "storming" phase typically involves getting acquainted and, for some, setting boundaries within which they'd prefer to work and defining turf for which they expect to be considered the expert. "Norming" follows when other team members assert their interests, overlaps of expertise are recognized, and accommodations (sometimes implicit, sometimes explicit) are reached that enable the team members to proceed constructively, and to "perform" over the life of the program.

Because this pattern is so typical, it is important to recognize that it exists and to expect some early nonproductive time from a new team as its members become familiar with the program, adjust to one another, and start scoping their order of business. Two companies said it was 6 months before some of their early teams really started working well together. Others were unable to quantify how long the problems lasted, but all agreed that start-up problems should be expected.

Several companies addressed desirable/undesirable behavior of team members and leaders in their team training, in order to improve team productivity. Examples of team member behavior to be reinforced or "challenged" are listed in attachment 1.[5]

Leadership

Selection of leaders

We found no examples of leaders being selected or designated by their own team members or by other IPTs. Leaders were usually selected or requested from other parts of the organization by the program manager, or were members of the program manager's office. Some leaders were nominated by their functional supervisors, and approved by the program manager. We found no leaderless teams,[6] nor did anyone we spoke to advocate having a team leader who was not also ultimately responsible for the team's products.[7]

5. Courtesy of Loral Vought Systems PAC-3 Missile Program, Dallas, TX.

6. This is consistent with most readings on the subject. For example, see [18] or [19].

7. This does not mean that leaders shouldn't strive for consensus. Not only do the best leaders strive for consensus, they are able to achieve it without their teams being aware that the selected approach coincides with the leader's preferred approach.

One leader versus co-leaders

Most industry and government teams used single leaders. Although all agreed that one person should always be in charge, there were some variations:

- **Co-leaders, sometimes with one clearly in charge in the event of nonagreement, and the other acting as a "deputy."** Use of co-leaders was felt by many to improve cooperation among two otherwise separate groups; and it also was viewed as a way to smooth leadership transitions (the deputy normally takes over when the leader leaves). Various combinations include:
  - — Military and civilian
  - — Engineering and manufacturing
  - — Engineering and program management office
  - — Program management office and manufacturing
  - — Program management office and user
  - — Buyer and supplier.
- **Leadership of the IPT meetings rotates among team members.** Under this system, the permanent leader acts as a "referee," and retains ultimate responsibility for the product, but is relieved of some of the administrative burdens of team leadership while still ensuring team focus. We observed this technique in only one program, but it was reported to work well and to have the added advantage of contributing to team-building and team-member development.
- **Leaders assisted by facilitators.** Several of those interviewed favored using a facilitator to help the team leader, rather than changing the team leader. ("Some engineers are great engineers and decision-makers but can't run a meeting.") Many companies had permanent facilitators and "champions"—IPT experts—that helped new projects set up their IPTs, created training programs, and participated in early meetings to ensure a good start.

- **Leaders assisted by "guardians."** To guard against "backsliding" to previous practices and to ensure that IPPD/IPTs continue to work as intended, one company uses a "guardian"—a respected, former senior officer of the company—who reports directly to the president and operates as a sort of ombudsman and ambassador for IPPD/IPTs. IPT leaders and functional leaders purportedly can go to him for help in sorting out and solving organizational difficulties whenever the new process runs into trouble.

Leadership changes with program phase

In most cases, IPT leaders stayed for the duration of the programs. However, some officials in both industry and government told us that, for long programs of many phases (design, manufacture, test) changing leaders when program phases change would not be a bad alternative. For example, in one program in industry all the IPTs were led by "engineering," with a "manufacturing" representative as co-leader. Although the program is now transitioning from development to production and there are no plans to change leaders, the program manager could foresee a time when the engineers should have little influence ("sooner or later you have to shoot the engineers"), and a manufacturing rep, or even a logistics manager, should lead.

However, opinions differed as to whether or not leaders should be changed when programs transitioned to new phases. One company was convinced that the concept of changing leaders when program phases change "is flawed" because of the inevitable problems associated with "passing the baton." Moreover, if a leader knows he is to be relieved at a certain point in the program, he might postpone difficult decisions, or take a short-term approach to some problems.

Creating the team

An IPT leader is typically charged with creating his or her team. Some companies' functional leaders provide names of nominees for the IPT leader to select from, and in other cases IPT leaders would initially pro-

pose individuals for the team and the functional leader would then agree or negotiate an alternative. The key considerations in creating a team are:

- Objectives/responsibilities of the team
  - — Product cost/schedule/performance requirements
- Authority of the team and team members
- Functional expertise that must be on the team
- Resources of the team
  - — Budget, office space, conference facilities, computers/fax/VTC/e-mail, etc.
- Personnel arrangements
  - — Who does the team report to?
  - — Who is responsible for team members' pay and performance evaluations (IPT leader or member's functional supervisor?)
- What training is necessary?

Training

The replies from industry with respect to training for IPTs were surprisingly consistent. Nearly all those that did not institute special training for team members or team leaders wished they had; those that did conduct some training beforehand were glad they did.

Of those favoring team training, almost all felt team members should be trained together, rather than individually before joining the IPT. Because communication and trust among team members are very important, training of team members together was most useful because members learn not only what is expected of them, but also the capabilities and foibles of other members and how each can be expected to contribute.

Many believed that team training based on real problems facing the team was the best type, as opposed to other types of training that might foster bonding and trust but would be harder to translate to the workplace.

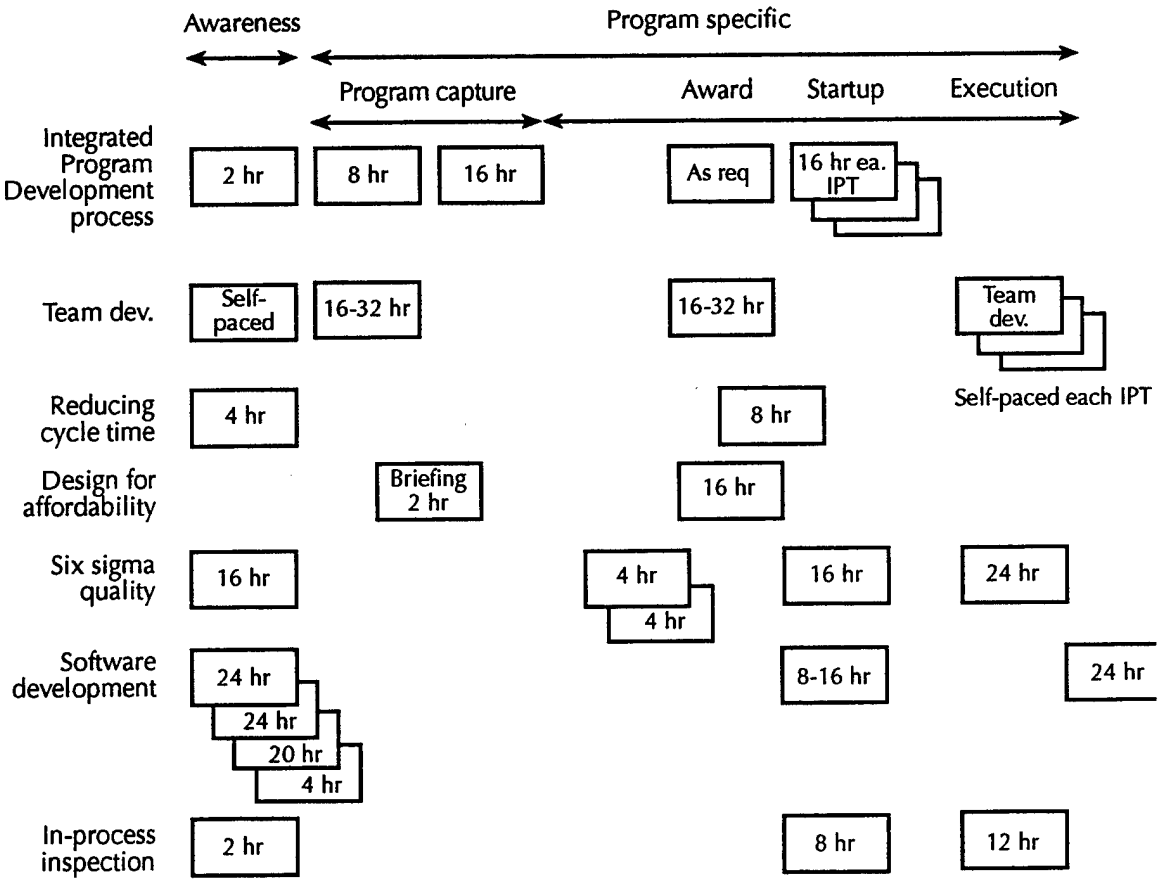
Views on the type and duration of training varied, depending on the respondent: Although many in the government felt no training was necessary, others believed 3 to 5 days was appropriate, with leadership training and "how-to-run a meeting" training warranting about 1 to 2 days, and team training for the entire team warranting about 2 to 3 days. In industry, particularly at the large companies that were trying to completely change a culture as well as an organizational structure and company process, we found advocates for much more training (generally, no less than 40 hours, with as much as 3 to 4 weeks at some locations). The types of training included:

- **Awareness training:** The need for cultural change. Why IPTs are being introduced, and how they will benefit the organization and the workforce.
- **Orientation training:** Exposure to the overall program. Contract information, overall program requirements, and how each IPT contributes to the whole.
- **Team-building:** How the team members should work together, and what is expected of the teams and team members. Team-building training is frequently built around real problems that the team is charged with solving, to ensure training has relevance to the workplace. Some also included "diversity training" as part of their team-building because the potential for conflict is high when teams bring together people of different race, gender, and ethnic backgrounds, as well as varying age groups and educational levels.
- **Conflict resolution/negotiation:** How to gain team agreement and acceptance on controversial issues.
- **Special skills training:** Tailored training to provide or enhance a skill needed by an individual team member or leader. This training might be sponsored or endorsed by a functional head rather than an IPT leader, to ensure that functional expertise is maintained and to enable greater empowerment.

Many in industry would like to have had more training (they feel it would have helped team productivity during early program stages), but were unable to do so because "there wasn't time for everyone to go off and be trained," or funding wasn't available. Two companies solved this

problem by using what one called "just-in-time training"; they supplemented existing company-wide training by providing a nominal amount of "awareness" training (1 to 2 days) at the outset, covering organizational cultural change, IPT fundamentals, and team-building, and then developed special courses for members' individual training plans for later training over the remainder of the program. This allowed rapid start-up, permitted work to be done by the team as others were trained over time, ensured more focused training tailored to individual needs, and spread out the funding requirements. (See figure 2

Figure 2. Program training and workshops



as an example of "just-in-time" training made available to IPT members at one company on an as-required basis.)

Another approach used by two large organizations to ensure that training was accomplished promptly and that it reached as many people as possible, was to have training conducted by chain-of-command supervisors. At the top of the organization, senior executives, assisted by professional facilitators, trained those who reported immediately to them, and they in turn trained their subordinates who trained their subordinates, etc. Known as a "training cascade [20]," this approach has several advantages:

- It shows those at the working level that top management considers this subject important. ("People watch what the boss spends his time on. If the boss spends a lot of time on this training, it must be important.")
- With the supervisors training their subordinates, it ensures more attentive trainees, especially those who know that they later will have to train their own people.
- It's possible to train nearly everyone in the company (many thousands) in a few short weeks.
- It's less expensive than contracting for hundreds of trainers. (However, they did use some facilitators /assistants to aid supervisors who lacked training skills.)
- After training is complete, all instructional material and expertise remain in the organization.

To ensure that the essential message of the training was not distorted or diluted as it was relayed down through the tiers of management, one organization provided course summaries to each individual after each training session.

Charters

Each industry IPT examined had specific requirements and responsibilities in terms of product budget, product specifications, and product delivery schedules. Almost all the companies had also written IPT charters that included general authorities and responsibilities (one company

called them their "RAAs"—Responsibilities, Authorities, and Accountabilities), and a "decision escalation path" to be used if the team could not reach a decision on its own.

All the companies felt that it was very important to have some type of definition ("boundaries") to clarify what is expected of teams, and what authorities are given to them and what authorities are not. Most said that problems were likely to surface without clear boundaries. For example, one company indicated that it had oversold "empowerment" to such an extent (without also explaining limitations of authority) that some IPT leaders felt it was their opportunity to be "king for a year." Naturally, inter-team as well as intra-team cooperation is required, and training alone can't make that point as well as training plus some written specifics in a charter.

Although all the companies defined boundaries for their IPTs, or had the IPTs develop their own boundaries for approval, one company cautioned that over-defining boundaries could "limit solutions," and others warned that one shouldn't let charter preparation become an end in itself, or involve a lengthy bureaucratic effort.

Empowerment

Empowerment is nothing new, and the term "empowerment" is overused. The key is that (1) employees must have functional skills that qualify them to speak for their functional organizations in most situations, and (2) they must have *prompt* access to their organizations/supervisors for those situations requiring policy changes or deviations.

In all cases, functional team members said that they were "empowered" to act on their bosses' behalf, and supervisors said they empowered their representatives "within reason." The most common exception were some financial representatives, who, like their counterparts in government, could not speak on behalf of their organization's comptroller.

But the need for boundaries surfaced frequently during our empowerment discussions. Yes, functional representatives were empowered,

but they needed to know their limits: They could and should act promptly on team matters for which they have experience and authority, but major departures from preestablished policy (i.e., agreeing to a radical new maintenance policy, or an untested material, or an unproven supplier) nearly always requires checking back with functional supervisors. In this regard, many said that IPTs can only work if an organization already has preestablished functional standards to be used as a basis for team-member empowerment. If such standards do not exist, then team members either have "to wing it" when supporting their team (with no corporate experience base for individual team members' contributions), or they would have to constantly check their functional supervisors before making any significant decision (thereby losing any advantage of a teaming arrangement).

Team size and composition

Teams should be comprised of "whatever it takes." Larger, more complex products tend to require many disciplines and specialists, and thus tend to have larger teams. Some product teams have many hundreds of members, typically broken down into module teams and subordinate component teams that mirror the product work breakdown structure. Most industry teams have full-time "core" members from each major functional area, supplemented by some part-time specialists that are on more than one team. Many teams change in size and composition as program phases change, with more participation by user groups in the early stages when most requirements are being defined, and less users and designers during the manufacturing and support phases.

Although it is important to include all the right people on the team, team leaders must be careful because meetings typically are inefficient as decision-making bodies when they become too large. Most of those we spoke to thought that to be effective, a team should not be too large. (One company said its experience indicated that 8 to 12 people was optimum, others said 6 to 10, and many said "less than 15.") Teams that usually meet with 50 to 60 people in attendance (not uncommon for some government IPTs we examined) cannot involve all members in the decision-making process, so the meetings degenerate into briefings or most members becoming observers rather than participants. When a problem occurs, a subgroup or mini-team must be created on an ad hoc basis to

resolve it and report back to the main team. However, this minimizes "buy-in" of the decision by the many team members that were not directly involved in developing it.

Collocation

All those we contacted indicated that collocation of all full-time members of an IPT was probably the single most effective way to improve communication, break down organizational barriers, and streamline and accelerate the decision process. Recognizing that large programs with geographically dispersed industry and government organizations cannot collocate everyone, both industry and government managers stressed that every effort should be made to collocate as many team members as possible, and to facilitate meetings and communication among those that are not collocated by other means, such as video-teleconferencing (VTCs) and increased use of fax and e-mail.

Although most companies thought that collocation was beneficial categorically, one company said that the need for collocation depends on program phase and information flow:

- Collocation has the most benefit during the early stages of design and development, where there are more interfaces, and communications are more complex and more frequent.
- Collocation is less important during the later stages of a program, such as during production and support, when there are fewer interfaces and communications become less frequent and complex.

Using technology

The effectiveness of IPTs can be improved by:

- Using video-teleconferencing when face-to-face meetings are impractical.
- Expanding the use of e-mail to keep all members informed in real time. (Some projects use the Internet to distribute

unclassified information, not unsuitable for public disclosure, to team members.)

- Using common office systems and computer software (word processing, CAD/CAM, graphics, spreadsheet, etc.)
- Making common databases and management information systems readily available to all members.

It is not surprising that many noted that shared databases helped their productivity. MIT has shown [21] that a strong correlation exists between the availability of an integrated database and design team interaction (figure 3), and improved cost and schedule performance (figure 4).

Figure 3. Common databases correlated with interaction between teams

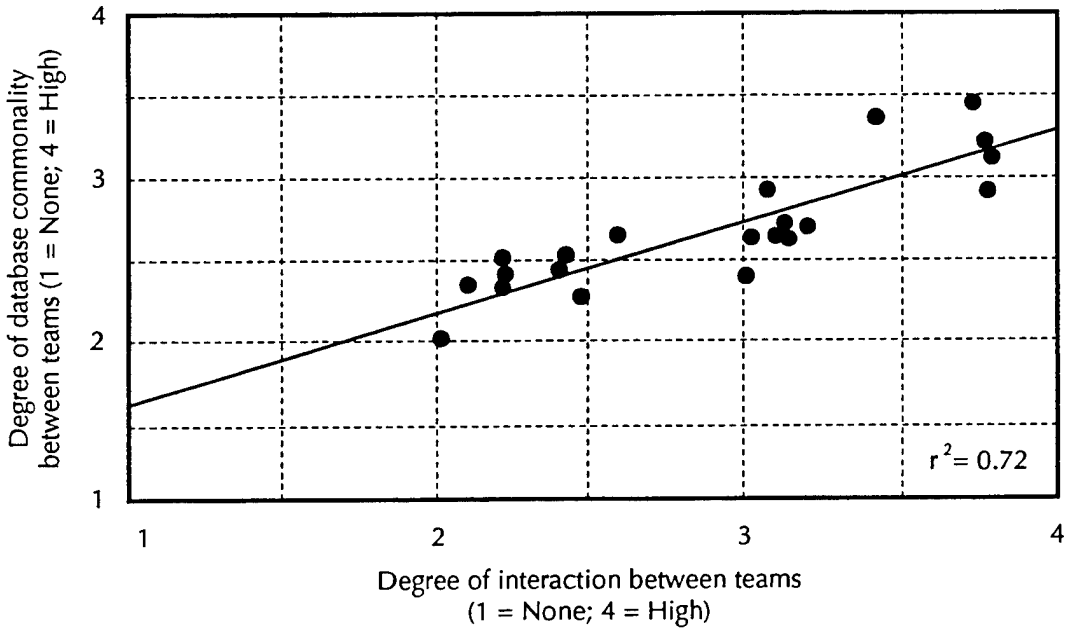
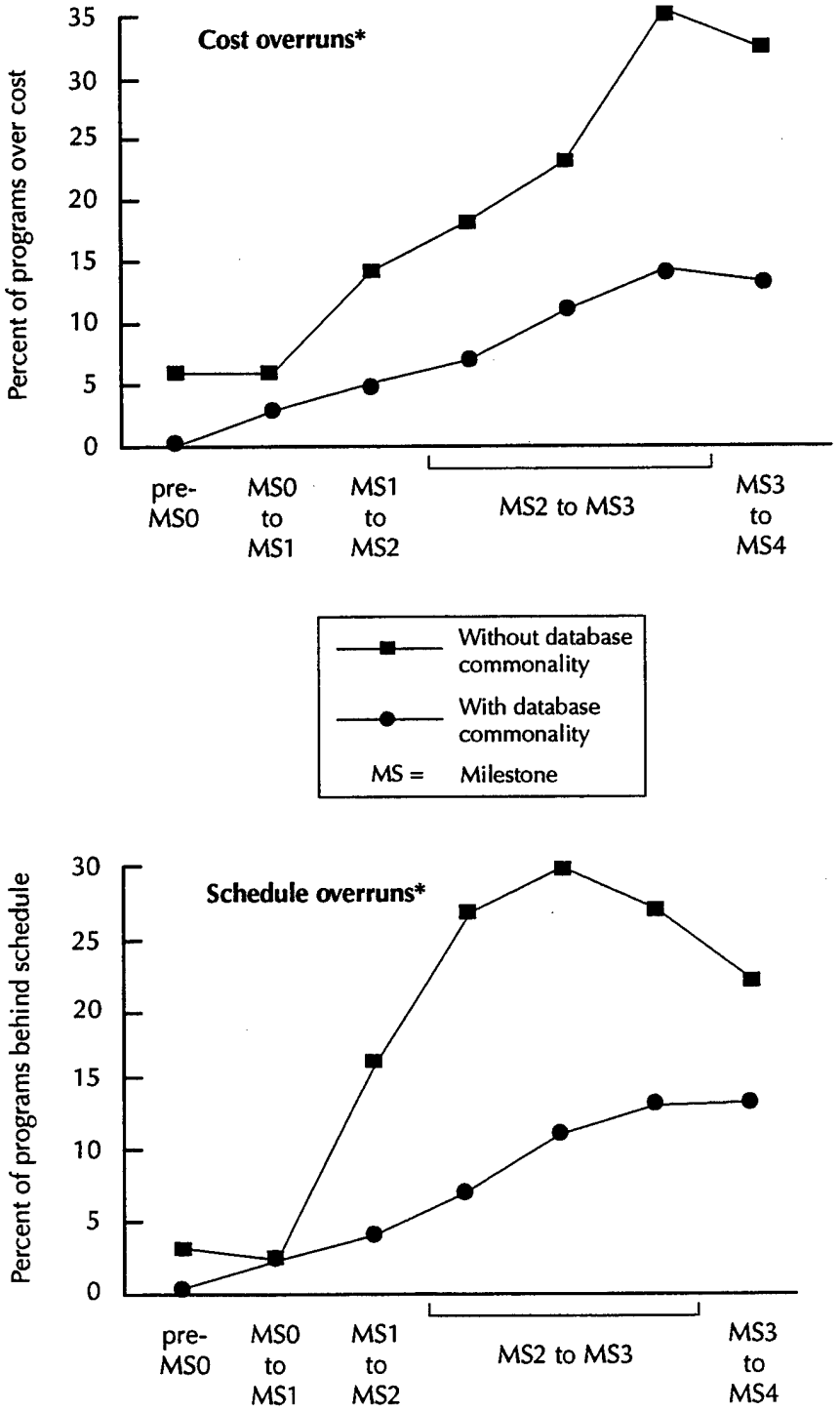


Figure 4. Common databases correlated with program cost and schedule



Many told us that VTCs were a poor substitute for face-to-face meetings (especially if there had been no previous face-to-face meetings), but they were generally better than conventional "conference calls." The biggest disadvantages were the transmission delay times and the inability to see everyone at the meeting to observe body language, attentiveness, and interest. Quite a few mentioned that one should never try to negotiate or try to persuade via VTC.

IPT performance

Metrics

In industry, all teams used performance, cost, and schedule as the primary measures of success. (See figure 5 and table 1 for examples of improvements reported by some of the companies we visited.)

Figure 5. Design errors reaching the factory

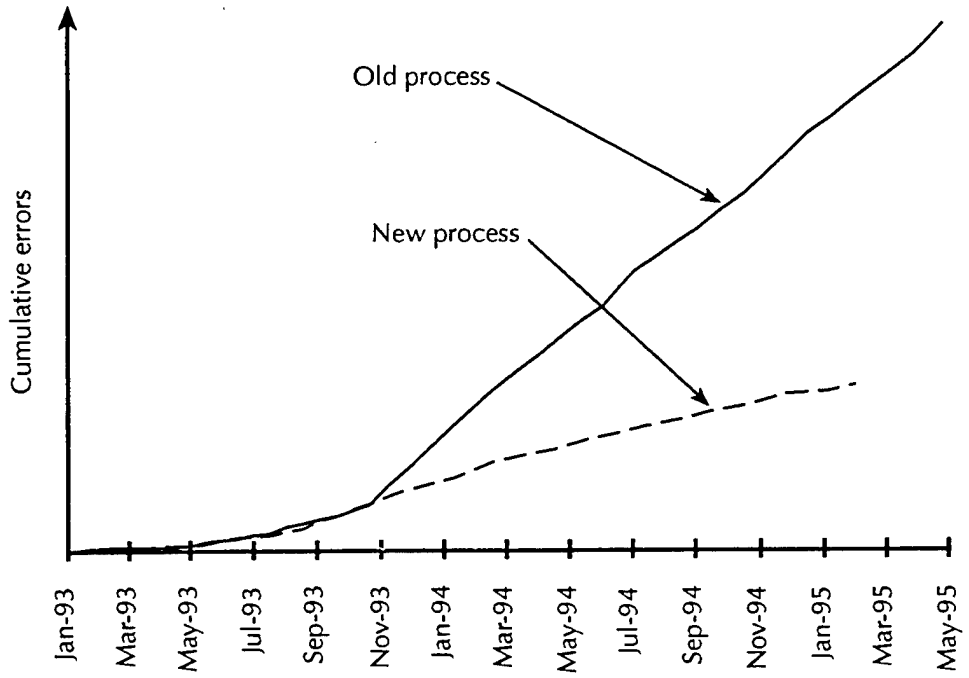


Table 1. Impact of IPTs/IPPD

	Metric	Before	After
Company A	Component manufacturing		
	Delinquent jobs	165	34
	Defects per unit	.032	.012
	System cost	100%	60%
	Printed wiring—board assembly		
	Cycle time	100%	33%
	Quality (scrap)	5%	1%
	Customer returns	4.6%	.3%
	Subassembly production		
	Cycle time	100%	62%
	Quality (sigma level)	4.1	5.0
	Support staff	100%	21%
	Operations		
	Cycle time	100%	67%
	Hours per unit	100%	80%
	System-level manufacturing		
	Support labor	100%	14%
Company B	Component yield	30-40%	80-84%
	Component development times, design to availability of first item		
	Example 1	44 wks	20 wks
	Example 2	31 wks	14 wks
	Example 3	21.5 wks	13 wks
	End-product costs		
	First 12 units	100%	95%
	Next 33 units	100%	88%t
Company C	Product time-to-market	100%	77%
	Facility tooling cost	100% (6-8 yrs ago)	50% (now)
	Program approval time	67 working days	20 working days
Company D	Product time-to-market	100%	75%
	Product development cycle	7.6 yrs	5.7 yrs

IPT performance measures varied with the product. Some common metrics were:

- Design errors reaching factory
- Defects per unit
- Hours spent on rework
- Amount of scrap
- Percent yield of usable components
- Days for program approval
- Number of months from design inception to first hardware delivery.

If a team was making good progress toward meeting its requirements in these areas, the team was succeeding. One manager said that the simpler the goals, the easier it is to empower the team members to make decisions to meet those goals. ("Everyone can understand the goals, and, with current information available to all through a real-time management information system, nearly everyone can figure out what the boss would do if they elevated the decision to him. So they make the decisions themselves.")

We found little enthusiasm for team measures of effectiveness that were based *solely* on team process rather than cost, schedule, or performance measures. Although all the companies and government programs we examined use cost, schedule, and performance measures as the primary metric to determine how well their teams are working, two government projects and three companies we spoke to were using team self-assessment techniques in addition to these metrics to assess how well the group was working *as a team*, and how well the *process* was working. Samples of some of the better self-assessment forms we found for team leaders and team members [22], and total team effectiveness [23], are in attachments 2 and 3.

Evaluating IPT team performance

An IPT's performance is typically evaluated by the program manager or a higher-level IPT, and we found that most program managers were authorized to reward each team based on how it cooperated with other teams as well as on its individual performance. Many company officials mentioned cooperation with other teams as a very important factor and one that needs to be constantly assessed and monitored to avoid the "silo effect" of IPTs that do not coordinate well with other IPTs. Interestingly, IPTs formed to overcome the silo effect of very independent functional groups or very independent program offices apparently themselves can become insular and overly independent.

Evaluating IPT personnel performance

Evaluation of individual members of IPTs was usually a joint effort of the IPT leader and the functional supervisor of the member:

- In some organizations, IPT leaders "wrote up" evaluations and functional heads concurred. (Most IPT leaders thought this made most sense when the functional member was collocated with the team rather than with his/her home office, but it does add an administrative burden that can conflict with time demands on the leader.)
- In other organizations, the functional head proposed a final evaluation subject to the IPT leaders' concurrence.
- In still another variation, one organization left team-member evaluations strictly up to the IPT leader, but asked the functional leaders to "rank" their people from first to last, for the purpose of determining bonuses and setting retention priorities during downsizing.
- In a few cases, team members rated each other. One of the more interesting approaches, still on a trial basis, calls for members to indicate by secret ballot the percent of the total effort that they thought each member contributed to the success of the team. (They could not vote for themselves.) Team rewards were then apportioned based on the averages of the peer assessments.

In nearly all organizations, functional heads set base salaries, but IPT leaders determined or at least influenced annual bonuses.

Other policy and procedural changes

All the companies we visited thought it important to make other changes to company policy and procedures when IPTs were instituted, and 9 of the 11 companies we visited have made or are making fundamental organization and procedural changes to facilitate their IPTs. These changes include:

- Establishing company functional standards to be used by IPTs
- Changing compensation and performance evaluation programs
- Collocating functional and project team members
- Increasing video-teleconferencing facilities
- Reducing the number of required briefings to the hierarchy
- Changing internal administrative processes, such as those for subcontracting and source selection.

Differences between government and industry

There are differences between government and industry that will make it difficult for IPTs in government to be as successful as they are in industry:

- **Measures of effectiveness**
  - — In the government, where success is not easily measured, there will always be those who don't recognize that improvements are necessary, and who argue that the status quo is preferable to the risks of the unknown.
  - — Industry, with well-defined hardware deliverables and profit levels, is better able to quantify the need for improvement than are government activities. Industry is also better able to quantify favorable results. These factors make it easier to motivate the workforce to change the culture, to meet new goals, and to reward results.
- **Open, candid communication**
  - — Government comptrollers must often cut funding from successful programs to cover unexpected shortfalls in other programs. Because of this, they are constantly searching for programs with a potential excess of funds, and project managers, knowing this, are reluctant to be candid in IPT meetings if it means revealing a potential fund surplus. Thus the nature of the comptroller's duties in the government are in conflict with one of the objectives of a good IPT—free and open communication, and mutual trust among team members.[8]

8. Good program managers do not object to losing program funds where they clearly will not be needed, but comptrollers are sometimes inclined to cut funds at the first sign that there *may* be an excess.

- **Empowerment**

  "Without the proper authority, teams become nothing more than committees who recommend action but have no means by which to implement those actions [24]."

  — All IPT literature that we have examined, and all industry personnel that we spoke with, uniformly emphasize the need to empower IPT members. Without empowerment, decisions made during time-consuming IPT meetings will be revisited, negating much of the time saved initially by resolving the issue at the team level. Unfortunately, representatives of the comptroller in both DON and OSD cannot commit irrevocably because their resources are not fixed and are subject to reduction by the Congress.

- **Cooperation versus independence**

  — The law [25] requires that

  Operational testing of a major defense acquisition program may not be conducted until the director of Operational Test and Evaluation of the DOD approves in writing the adequacy of the plans (including the projected level of funding), and

  OSD's Director, Test Systems Engineering & Evaluation "analyze the results and report as to whether the test and evaluation performed were adequate; and...confirm that the items or components actually tested are effective and suitable for combat.

  — Some OSD team members see these requirements as justification for acting independently and emphasizing the importance of the test and evaluation function over other project requirements, thereby subordinating overall project success to the requirements of a single functional area—the antithesis of the IPT concept.

- **Training**

  — Although there were some exceptions, higher level government managers thought training was less important than did industry officials. This lack of high-level recognition that training is necessary increases the risk that IPTs will not be as successful in government as they are in industry:

- Industry officials, including those at the levels of vice president and above, all favored training for team leaders and members. In government, higher level officials were less likely to feel that training was necessary, with most noting that "we've all had team training and have been trained on how to run a meeting before."

- In industry, team training of all members of a team *together*, even if some had received earlier team training, was thought to increase chances for team success, whereas in the government, many thought team training was not important for individuals who had previously received some type of team training.

IPT risks

Until now, we have focused on government and industry's experiences with IPTs and applying the concept in the Department of the Navy. In this section, we review some of the potential pitfalls, or risks, associated with IPTs. Our research suggests that even teams set up "by the book" are vulnerable, and managers must be mindful of problems encountered by others. We do not include every potential problem, rather we have highlighted some of the more common ones.

Teams behave like committees

There is the risk that "teams" will start behaving like "committees," and that individual specialists will put the interests of their functional specialty above the interest of the product team; or, conversely, decisions will start reflecting "lowest common denominator" solutions to achieve consensus.

Whereas teams may be characterized as a group of people working toward a goal ("I'm here to make the product better"), committees are characteristically made up of individuals whose chief aim is to protect the interests of those they represent ("I'm here to make sure you don't violate our process"). The latter occurs when individuals place the interests of their functional office above the interests of the product. In other cases, to avoid confrontation, teams reach compromise decisions that are not optimized for the product but are least objectionable to all members. Either way, team decisions are not optimized for the product, and cost, schedule, or performance/quality can suffer.

Teams stray from contract requirements

There is the risk that teams with a "can-do" attitude, in well-meaning attempts to solve problems jointly and promptly, will stray from contract requirements such that:

- The contractor or other supplying activity gradually takes on more than is required by contract or charter, leading to potential cost overruns, delays, and/or claims.
- The government or other acquiring activity gradually waives charter or contract requirements to resolve problems, without appropriate coordination or compensation.

IPT process becomes bureaucratized

There is the risk that the IPPD/IPT process, as it becomes institutionalized with its overarching IPTs, integrating IPTs, and working-level IPTs, will become bureaucratized and top heavy—actually slowing down and hindering progress rather than facilitating it.

Too many teams

There can be a temptation to form teams for every task, but some tasks are better performed in a functional organization, or simply by one responsible individual. You don't need to team for urgent, minor, or routine matters.

Too many meetings

This is a by-product of the notion that teams are the only way to air and solve issues. Although frequent, short, efficiently run meetings can markedly improve communication and cooperation among all team members, many we met complained that IPTs cause more meetings among more people on more programs than ever before, spreading personnel resources thin with no measurable improvement of the product.

The problem can be particularly acute for individuals who are on more than one IPT. And it can increase the functional office's resistance to IPTs.

Too much documentation

Most we talked with felt it was important to formalize roles, authorities, and targets in a charter or like document at the start of a program. But charters take time and resources to write. This adds to start-up costs and the impression that teams take time to get moving.

Moreover, by setting roles and boundaries, charters can create the conditions under which stovepipes (or "silos") re-emerge. As one observer noted, "by creating boundaries, you limit solutions." If the document is too rigid, it can impede interaction within and between teams and filter out voices that would otherwise be heard. If it is too long, its creation can become an end in itself, causing problems rather than contributing to solutions.

Other documentation requirements can also limit productivity. IPPD/IPT instructions, guides, handbooks, plans, and reports may all be of some value to inform and provide guidance to the workforce, but are onerous if overdone.

Organization core skills are diluted

Bringing people from different functions together on a team exposes members to other skill types and to the product-development process in general. Successful teams we spoke with spent time early on indoctrinating one another into their respective specialties. Many referred to this experience as "training future program managers." Such "cross-training" was so successful in some organizations that individuals could fill in for one another during absences. And there are expected longer term benefits as individuals move up in an organization. But cross-training can create problems. First, hours spent learning about or doing someone else's job is time away from one's own discipline. Second, time away from the functional home office decreases exposure to new developments in one's field. If unchecked, this could lead to a watering down of core functional skills and loss of the "corporate memory." One company's IPT guide had this to say on the need for keeping functional organizations strong:

> **Special caution to functional organizations supporting execution IPTs-** The functional organizations must be vigilant, that, over a period of time, they do not atrophy as a result of inadequate resources for improving processes, tools, and training. They must be vigilant to ensure that adequate rotation of managers and team leaders occurs so that lessons learned and new ideas flow seamlessly across all boundaries...Always remember, that without healthy functional organizations, IPTs cannot succeed in the long term.

Almost without exception, the functional home offices in the organizations we visited retained responsibility for their individuals' career paths and for professional development. This makes sense because the team leader is focused on delivering the product. However, it also means that organizations need to ensure that being on a team doesn't compromise an individual's opportunities once he or she has left the team ("if the design team meets in isolation... members will be in a very different place in their development than their peers [26]"). This is particularly important given that not all individuals in an organization will be members of teams.

Inadequate training

Training is important. If there is too little training, members will not be prepared for the dynamics of the process. This can increase stress and create bad first impressions with lasting consequences. In one case reported to us, new team members were left in a room to sort out a problem without any prior guidance or training. The experience was so stressful for some members that the team leader got negative feedback for days.

Too much training, on the other hand, is time spent away from reaching team goals. One team leader from a larger company said he had been in some form of training for almost three months.

We encountered others who felt they were given the wrong kind of training. Some said they were trained individually rather than as a team, or were given instruction on how to follow rules (or get around rules) rather than how to improve processes. Organizations must find the right balance in terms of time and curriculum.

Conclusions

What to expect from IPTs

Program cost and schedule

- IPTs have higher "up-front" costs than do conventionally run programs. These costs are due to the need for:
  - — Increased training
  - — Collocating IPTs
  - — More frequent meetings at the early stages of a program
  - — The greater number of hours charged early in the program by functional personnel who normally are not involved until later.
- The early stages of programs managed with IPTs generally take longer than under prior systems.

For programs we examined that were nearing completion, these early cost and schedule increases appear to have been offset by later savings. For programs in the early stages of development, it was too early to tell, but all but one company was confident that later offsetting savings would result.

Communication

- IPTs improve communication across organizational boundaries.
- IPTs that work well promote near instantaneous communication among personnel at all levels of an organization without regard to the chain-of-command. But we found industry program managers learning of problems after their customers did, and government program managers learning of problems after

their superiors. Although rapid communication is a major benefit of IPTs, this can conflict with traditional thinking in the military that discourages information flow and decision-making outside the chain-of-command.

Quality of the workforce

- IPTs tend to improve the workforce by creating a broader understanding among individuals of the total picture. Because IPTs expose many specialists to team-related problems that are broader than the types of problems they have had to deal with previously, one company described IPTs as a training ground for future CEOs. (Nearly all its previous CEOs had come from the finance community.) Many others in both industry and government said that future programs are likely to benefit because IPTs are helping to "grow project managers."
- IPTs can weaken functional organizations by diluting their staffs through reassignments to numerous IPTs, unless actions are taken to ensure:
  - Functional organizations maintain close communication with their specialists that have been collocated with IPT.
  - IPT lessons learned are continuously fed back to functional organizations.

Quality of decisions

- IPTs generate better decisions because they tend to be better-informed decisions, made with the right participants:
  - Because working-level IPT decisions tend to involve more people, they generally take longer than decisions made conventionally, but they have wider organizational acceptance and "buy-in."
  - Because IPTs tend to leave fewer unresolved issues for high-level decision-makers, the ability to gain high-level approvals rapidly has improved at organizations that have changed to IPTs.

Recommendations

Provide guidance and boundaries

The Department of the Navy should ensure that team requirements and authorities are clear. Where IPTs have been formed without guidance, clear, *concise* charters should be prepared to identify team expectations and leader/team responsibilities and authorities.

Train

The Department should develop training for IPT leaders and team members, to include as a minimum:

- Initial awareness/orientation training
- "Just-in-time" team-building and special skills training, tailored to the needs of individual team leaders and members.

Collocate when possible

The Department should consider wider use of full-time and collocated IPTs, preferably linked to organizational change that institutionalizes teams rather than having them operate in a "meetings only" mode.

Protect expertise

Recognizing that IPTs can dilute functional expertise unless certain safeguards are employed, the Department should apply IPTs as a part of a broader plan that considers:

- The impact on functional organizations
- The need to retain core capabilities

- The need to continually develop the workforce and retain critical skills
- The need to maintain a "corporate memory" of lessons learned.

Reward good team work

The Department should take steps to continually reinforce the need for teaming and teamwork by recognizing, rewarding, and publicizing good examples and good results.

Consider reducing size of large IPTs

The Department should consider restructuring selected IPTs if their size limits their effectiveness. It can do this by:

- Breaking the large IPTs into smaller IPTs
- Limiting attendance to one representative from each functional organization represented on the team
- Using one representative empowered to represent more than one functional organization
- Reassessing the need for representatives from organizations whose possible contributions during some program phases may be minimal.

Appendix A: Integrated Product Team (IPT) Survey

1. When did you start using IPTs?

2. Why did you start using IPTs? Generally, what is your current approach and how does it differ from past practice?

3. Are you using IPTs for all programs/products, or just selected ones? Do you ever use IPTs for developing a policy, or for oversight, rather than for a product?

4. If not all programs/products use IPTs, what criteria do you use to determine when IPTs (vs. other approaches) are appropriate?

- Dollar level
- Program complexity
- Product type
- New programs/products only
- Other (explain)

5. Do you:

- typically use a number of different IPTs per program/product (how many)?
- or limit the quantity of IPTs per program/product to just one? Why?

6. If you use more than one IPT per program/product, do any team members participate on more than one team? Do you have some people on IPTs for more than one program/product?

7. What benefits did you expect from using IPTs?

8. So far, have IPTs met expectations? If you can, please quantify the benefits (or disadvantages) that you have experienced:

- Cost
- Schedule
- Quality
- Other

9. If you cannot quantify the benefits/disadvantages, what method/measure do you use to satisfy yourself that the IPT process is, or is not, an improvement over past practice?

10. Have you changed your organization's structure or processes (budgeting, reporting, program oversight, etc.) to accommodate the IPT process? How?

11. What problems/costs/limitations have you experienced with IPTs so far?

- During their creation
- During their use

12. Do your IPTs use IPT leaders, or are your IPTs self-directed? Do they use:

- a consensus decision-making process?
- a voting process?
- or is the team leader solely responsible for the decision after considering all comments from team members?

13. Do you find that the IPT decision-making process:

- provides decisions [better than/the same as/not as good as] your previous process?
- provides decisions [faster/no faster/slower] than your previous process?
- provides decisions having [better acceptance/no better acceptance/less acceptance] than your previous process?
- contributes to the development of your workforce [better than/about the same as/not as good as] your previous process?

14. Do your IPT members:

- have authority to act on behalf of the functional organization they represent?
- or act solely as "eyes and ears" of their functional organizations, facilitating better-informed and/or faster decision-making by their functional organization?

15. How do you select your IPT leader?

- Program manager is team leader
- Team leader is senior member on team
- Team leader is designated by program manager
- Team leader is designated by senior company officials
- Team leader is designated by other IPT teams
- Team leader changes depending on program phase
- Other (explain)

16. How are other IPT members selected, and what criteria are used?:

- Selected by IPT leader
- Selected by consensus of IPT members
- Selected by each functional group
- Selected by Program Manager
- Selected by Other company officials

17. Do your IPTs meet:

- periodically (weekly, monthly, etc.)?
- or only when prompted by a particular need?
- if meetings are infrequent, is there greater between-meeting communication among team members than under your previous process?

18. Do you:

- collocate team members?
- alternate among different sights for meetings?
- or always meet at the same place?

19. Do you try to limit IPT size, or do you emphasize instead the need for wide participation?

20. What is the approximate size of your IPTs and IPT meetings?

21. What disciplines/functions do you try to represent on your IPTs?

22. How do you evaluate and incentivize/reward IPT members? Who evaluates IPT members?

23. Is your organization's IPPD/IPT process documented?

24. Do your IPT leaders/members receive any special training? Explain training type and duration.

25. Have you introduced any special technology to facilitate your IPTs?

- Teleconferencing
- E-Mail
- Other

26. Based on your experience, what are the attributes of an ideal IPT and IPT environment? (where applicable, contrast an ideal IPT with other popular approaches of the past, such as Process Action Teams, quality circles, etc.).

- Composition and size
- Role of the leader and leadership style
- The role of IPT members
  - — Authority/empowerment
  - — Extent and duration of participation
- Role of top management
- Meeting frequency, location/collocation
- Supporting technology
- Training
- Member performance evaluations and rewards/incentives
- Measures of Effectiveness
- Other

Appendix B: IPT contacts in government and industry

This appendix lists all of the people who discussed with us and/or briefed us on their IPT experiences. We have divided them into four categories: (1) industry, (2) academia, (3) DOD (OSD and the Services), and (4) government (non-DOD).

Table 2. Contacts in industry

Company	Program/Division	Individual(s)	Title
Boeing	F-22	Frank Statkus	Program Manager
	737 Upgrade	Jag Hajari	Body IPT Manager
	V-22[a]	Stu Dodge	Vice President
Ford	Powertrain Ops	John Huston	Vice President, Powertrain Ops
		Susan Wrobel	Manufacturing Business Office, Powertrain Ops
		John Lombardi	PM, Car Powertrain Systems
		Scott Gegesky	PM, Truck Powertrain Systems
		John Bicanich	Engineering Manager, Mustang Powertrain System
		Elio Lori	Powertrain Ops
		John Kirsch	Manager, Process Benchmarking/Leadership, Product Development
		Brian Geraghty	Manager, Process Leadership, Product Development
General Electric	Military Engines Department	Richard Ruegg	General Manager—F414 Programs Department
General Motors	Luxury Car Lines	Jim Taylor	Vehicle Line Executive

Table 2. Contacts in industry (continued)

Company	Program/Division	Individual(s)	Title
Hughes	Naval & Maritime Systems (NAMS)	Dan Jenkins	Vice President, NAMS
		James Kingsbury	IPD Specialist
		Donald Hopp	IPD Specialist
		Kelly Poor	IPD Champion
		Gary Panattoni	Team Leader, Display Systems Transition Program
Lockheed-Martin	Tactical Aircraft Systems	Charla Wise	Vice President and Program Director, F-22 Program
		W. J. Moran	Product Director, F-22 Weapon System Analysis/Integration
Loral-Vought	PAC-3 Missile	Michael Trotsky[a]	Deputy Program Manager
		Sue Morris	IPT Facilitator
McDonnell Douglas	C-17	Max Loften	IPD Implementation and Planning
		Will Snodgrass	Senior Manager, Product Definition Systems & Processes
		Mark DeVoss	Senior Manager, C-17 Supplier Management
		Lee Andrinja	Air Vehicle Integration
Northrop Grumman	B-2	Bill Lawler	Vice President, B-2 Program
		Michael Rumbaugh	Director of Product Quality (Military Aircraft Systems Division)
		Chris Hernandez	Director, Integrated Product Development
		Gregory Manuel	Integrator, Program Integration (B-2 Program)
Pratt & Whitney	Government Engine Business	Walt Bylciw	Sr. Vice President, F119 Engine Program
		Robert Cea	F119 FSD Program Manager
		William Richey	F119 Business Development

Table 2. Contacts in industry (continued)

Company	Program/Division	Individual(s)	Title
Texas Instruments	Defense Systems and Electronics Group (DS&EG)	Alan Lashbrook	Member, Group Technical Staff (DS&EG)
		Dick Shaw	Champion, IPDP Deployment (DS&EG)
		Diane J. Allen	Organizational Effectiveness Consultant, High Performing Organizations Development
		Troyce D. Barton	Member, Group Technical Staff, IPD Systems Group

a. Briefing at DSMC.

Table 3. Contacts in academia

School	Department	Individual	Title
School of Aerospace Engineering (Georgia Tech)	Aerospace Systems Design Laboratory	Daniel Schrage	Professor
Harvard Business School	Technology and Operations Management	Dorothy Leonard-Barton	William J. Abernathy Professor of Business Administration
Sloan School of Management (MIT)	Organization Studies	Deborah Ancona	Associate Professor
University of Michigan School of Business Administration	Operations Management	John E. Ettlie	Associate Professor

Table 4. Contacts in DOD

Organization	Directorate/Program	Individual	Title
Office of the Undersecretary of Defense, Acquisition & Technology	Defense Procurement	Eleanor R. Spector	Director
	Test Systems Engineering & Evaluation	John A. Burt	Director
	Acquisition Program Integration	Joe Ferrara	Office of the Deputy Director, Acquisition Systems Management
	Strategic & Tactical Systems	George Leineweber	Office of the Deputy Director, Naval Warfare
	Comptroller/Chief Financial Officer	Ron Garant	Director, Investment (Office of the Deputy Comptroller, Programs/Budgets)
Air Force	Secretary of the Air Force (AQXR)	COL Jeanne Sutton	Chief, Acquisition Management Policy Division (DAS for Management Policy and Program Integration)
	B-2	COL Steve Harman	Deputy Program Director
		George Walter	Contracts Division
		Stan Ritchey	Financial Management Division
		Tom Kelley	Senior Systems Integrator
		John Gala	Air Vehicle Development Team
	C-17	Kenneth Payne	Deputy Program Director
	F-22	Tom Graves	Deputy Program Director

Table 4. Contacts in DOD (continued)

Organization	Directorate/Program	Individual	Title
	Joint Direct Attack Munition (JDAM)	Terry Little[a]	Program Manager
Army	Army Staff	Ken Oscar	Deputy for Procurement
	Army Material Command	Gilbert Langford	Concurrent Engineering Branch
		Bob Whiteley	Reliability (Engineering Division)
	Longbow Apache	Gary Nenninger[b]	Deputy Program Manager
	Century Land Warrior	Carol Fitzgerald[b]	Program Manager
	Composite Armored Vehicle (CAV)	Gilbert Piesczak[b]	ATD Program Manager
Navy	NAVAIR	VADM Lockard	Commander
	NAVSEA	Paul Schneider	Deputy Director
	SPAWAR	RADM Wagner	Commander
	LPD-17	CAPT Maurice A. Gauthier	Program Manager
		Gary Pickens	
	New Attack Submarine (NSSN)	CAPT Dave Burgess[b]	Program Manager
	PMS-312 (Aircraft Carriers)	CAPT K. P. Perkins	Program Manager
	PMS-325 (Support Ships, Boats, and Craft)	Colmer Thornley	Program Manager (ADCX)
	Joint Advanced Strike Technology (JAST)	Jon A. Schreiber	Manufacturing IPT Lead

Table 4. Contacts in DOD (continued)

Organization	Directorate/Program	Individual	Title
		Larry Niedling[b]	Director, Integrated Product Development
Other	Defense Services Management College (DSMC)	Paul McMahon	
		Norm McDaniel	
		Don Fuji	

a. Briefing at DSMC.
b. Briefing at Integrated Process & Product Development Seminar, Washington, D.C. February 21-22, 1996.

Table 5. Contacts in government (non-DOD)

Organization	Office/Program	Individual	Title
FAA	Associate Administrator for Research & Acquisitions	Lindsey Smith	Chief of Staff
		Dennis C. Smith	Vice President, Arthur D. Little
	Oceanic and Offshore IPT	Joe Fee	IPT Leader
		Nancy Graham	Deputy

Attachment 1: Examples of team and team leader behavior

The material in this attachment is provided courtesy of Loral Vought Systems PAC-3 Missile Program, Dallas, Texas.

EXAMPLES OF DESIRED IPPD TEAM BEHAVIOR TO REINFORCE

Takes active role in team decision making
Gives everybody an equal opportunity to give input
Understands and communicates the importance of maximizing time spent doing value added work.
Recognized what's value added and what's not.
Comes to meetings prepared
Works for team consensus
Contributes positive suggestions
Is open, constructive, and positive in response to new ideas and work procedures.
Recognizes that change is necessary.
Willing to commit to making changes that improve teamwork.
Encourages the elimination of unnecessary work.
Provides quality output
Self directed for meeting deadlines without supervision
Looks ahead
Is proactive
Understands requirements for timely delivery.
Exhibits self-motivation in accomplishing tasks.
In a change agent.
Listens attentively to suggestions
Talks up the process
Encourages others to get involved
Participates in process
Works with team members to investigate new ways of doing business.
Has a positive "can do" attitude and encourages a strong team spirit.
Complimentary of work of others
Encourages participation within the team
Helps set team goals
Accepts team's responsibilities
Backs members' ideas
Encourages new ideas from team members
Is a good listener
Demonstrates communication as a two way process
Considers other points of view
Recognizes that continuous improvement is the key to meeting customer needs.
Willingly shares information
Contributes to a work environment such that team members openly share problems
Is cooperative
Actively listens
Focuses on the process and on the needs of the customer
Tries to define "what" not "who" is wrong
Gathers facts
Appropriately blends the use of data with experience to made decisions
Embraces all opportunities for improvement
Participates in process improvement activities
Helps others develop their ideas
Is a positive change agent
Is willing to try something new

EXAMPLES OF UNDESIRED IPPD TEAM BEHAVIOR TO CHALLENGE

Does not help to improve team process
Does not participate in making meetings meaningful and productive.
Tries to dominate team meetings
Puts up barriers to change
Doesn't want to commit to change
Always has an excuse for why things can't be changed.
Looks only near term
Doesn't plan
Is reactive
Doesn't formulate solutions to overcome obstacles
Resistant to change
Defensive and feels threatened by ideas for improvement
Does not participate in improvement and portrays IPPD as a waste of time
Is not interested in IPPD
Satisfied with status quo
Afraid of new ideas and technology
Is competitive
Protects territory
Is not interested in promoting an environment where the team shares responsibility.
Undermines team decisions
Dominates team activity
Does not go to bat for team members' ideas.
Is passive
Does what they want, ignoring team consensus.
Jumps to conclusions
Is not a good listener
Doesn't communicate the message clearly.
Critical of work and/or ideas of others
Helps create barriers to effective communication
Unwilling to consider other opinions.
Defensive about new approaches to problems
Cannot distinguish situations where assistance should be sought
Believes most problems are caused by the people
Does not use accurate data in decision making or discussions.
Shoots from the hip
Makes decisions based on opinions even when data is available
Ignores or overlooks facts in making decisions.
Does not understand what a process is
Has no involvement in process improvement
Resists change
Blocks improvement efforts made by others
Finds reasons not to try something new.

EXAMPLES OF UNDESIRED IPPD TEAM LEADER BEHAVIOR TO CHALLENGE

Does not go to bat for team members' ideas
Does what they want, ignoring team consensus
Does not provide any guidance in helping team understand the new system
Doesn't recognize opportunities when guidance is needed
Does not recognize when team members are having trouble.
Is not a good listener
Talks down to team
Makes members feel unimportant
Plays one against the other
Plays favorites
Calls all the shots
Undermines or arbitrarily overturns team decisions
Provides feedback that doesn't help members improve
Too nice to confront someone who is not performing
Delays handling problems and hopes they will go away
Shows anger if anyone disagrees
Gives awards arbitrarily
Rewards individual behavior in a way that discourages team effort
Lets the dominant personality control the team
Does not improve the process
Implements solutions before problem is known
Satisfied with the status quo
Constantly challenges new ideas and techniques
Thinks in terms of the past
Puts up barriers to change
Doesn't want to commit to change
Shoots the messenger
Becomes upset with everyone when things go wrong
Puts a Band-Aid on the problem
Has taboo subjects
Makes no effort to remove barriers
Creates barriers between teams
Provides no reinforcement for working with IPPD
Believes IPPD and continuous improvement are fads
Is satisfied with current performance
Is satisfied with the current level of skill and training
Does not support employee self improvement attempts

EXAMPLES OF DESIRED IPPD TEAM LEADER BEHAVIOR TO REINFORCE

Clearly communicates that commitment to IPPD is a key requirement for everyone's job
Helps achieve team goals
Backs members' ideas
Actively participates within the team
Encourages new ideas from team members
Enthusiastically supports ideas of team and assists in developing improvements to ideas.
Works as an enabler to help members understand the IPPD system concepts.
Helps guide team to first time quality
Willingly shares information
Is a good listener and makes people feel comfortable during the communication process
Is approachable
Encourages participation within the team
Shares decision making
Provides equitable treatment to team members
Appropriately provides positive and negative performance feedback
Is as constructive as possible when correcting behavior problems
Expresses disagreement tactfully and encourages others to express their views, even contrary ones.
Is willing to improve
Can give individual recognition without hurting team harmony.
Is aware of and sensitive to interpersonal conflicts
Values the time of each team member
Knowledgeable of the IPPD mission and vision
Willing to commit to a solution
Asks the right questions to understand the problem
Encourages team members to investigate new ways of doing business
Constantly challenges established ideas and techniques.
Is open, constructive, and positive in response to new ideas and work procedures
Continuously works to simplify the process
Exchanges ideas
Challenges current thinking and policies
Does everything within their power to remove all barriers to improvements.
Continually recognizes employee potential
Actively assists employee in career development

Attachment 2: Team leader and team member self-assessment tools

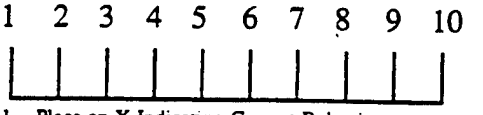
This material in this attachment is provided courtesy of the Northrop Grumman B-2 program.

TEAM LEADER AND TEAM MEMBER SELF-ASSESSMENT TOOLS

TEAM LEADER SELF-ASSESSMENT

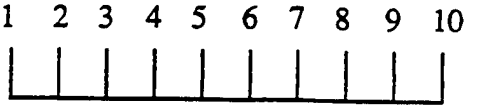
Organizing and Planning

1. Clearly Articulates Team's Purpose in Meaningful Terms to Team Members, Customers and Suppliers.

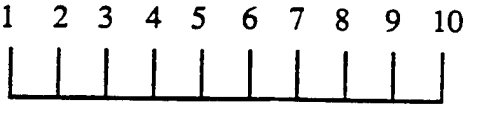


1. Place an X Indicating Current Behavior
2. Circle the Number Indicating Highest Performance Level Expected Within 6 Months

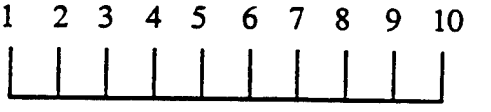
2. Optimizes Use of Team Members' Diverse Knowledge, Skills and Abilities in Recommending Task Assignments.



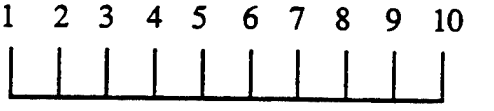
3. Shares Valid, Pertinent Organizational Information with Team Members.



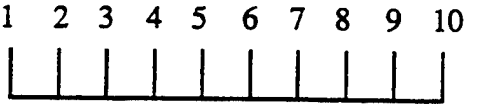
4. Questions/Tests Team Member Understanding to Clarify Specific Roles and Responsibilities Within the Team.



5. Encourages Continual Examination of Team Roles to Ensure Effective Alignment with Changing Needs.

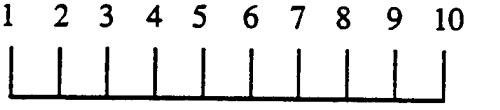


6. Explains the Rationale and Impact of Organizational Change to Team Members and How the Team's Work May Be Affected.

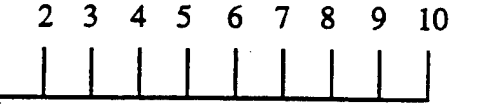


Process Management Skills

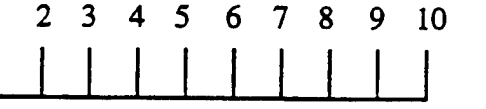
7. Helps the Team Define Relevant Performance Measures.



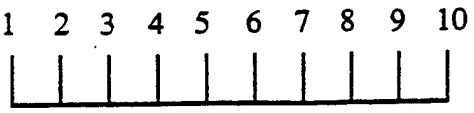
8. Provides Assistance in Removing Obstacles that Impede Effective Team Performance.



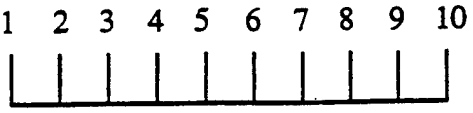
9. Develops Team Meeting Agenda with Input from All Team Members.



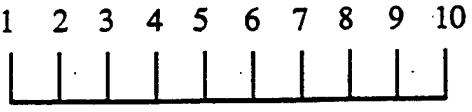
10. Helps Establish Realistic Time Table for Covering Meeting Objectives. Monitors and Suggests Adjustments as Needed.



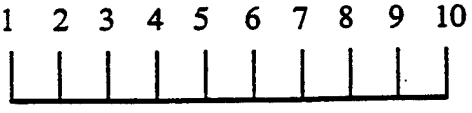
11. Facilitates Team Discussion to Determine Most Appropriate Decision Making Methodology and Level of Influence to Be Assumed.



12. Encourages Team Members to Run Risk Analysis Before Committing to Final Decision.

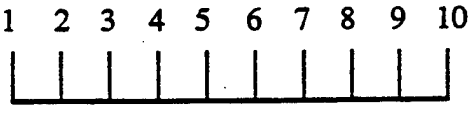


13. Facilitates Team Members in Defining and Selecting Relevant Metrics for On-Going Performance Evaluation Related to Establishing Team Goals.

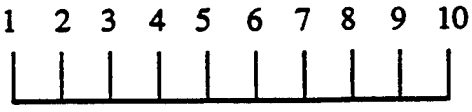


People Skills

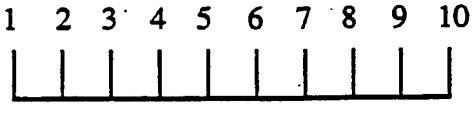
14. Appropriately Identifies Need for Intervention During Team Meetings and Makes Procedural Suggestions.



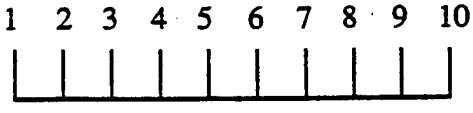
15. Involves Team in Orientation of New Members and Takes Action to Ensure All Team Members Receive Appropriate Added Support During Transition Periods.



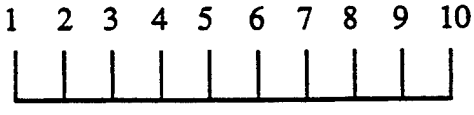
16. Accurately Identifies Sources of Potential Conflict and Takes Necessary Action to Prevent Escalation.



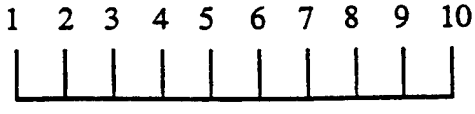
17. Periodically Facilitates Review of Team Conduct Guidelines to Validate Current Relevance.



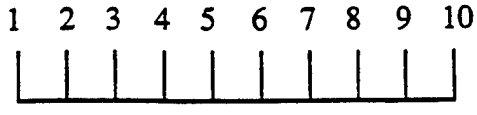
18. Facilitates Team in Determining Strategies for Meeting Its Performance Goals.



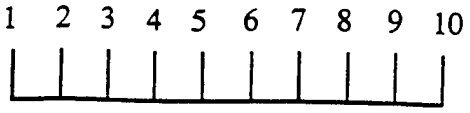
19. Clarifies Expectations for Individual Contribution During Team Meetings.



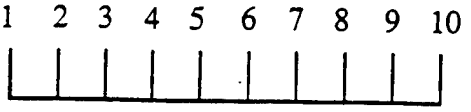
20. Encourages Team Members to Work Directly with Each Other When Differences of Opinion Cause Concern.



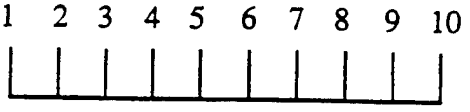
21. Create Safe Environment in Which Team Members Are Willing to Risk Asking Questions and Suggesting Innovative Ideas.



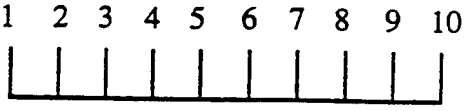
22. Consistently Encourages Team Members to Confront Conflict Situations and Helps Identify How Unresolved Issues Impact Team Performance.



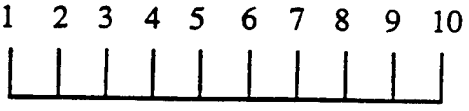
23. Works with Team Members One-on-One to Identify Areas of Interest as Well as Areas Needing Improvement. Recommends Appropriate Training and Development Strategies to Address Interests and Performance Gaps. (Note: For IPTs, Coordinate with Functional Manager.)



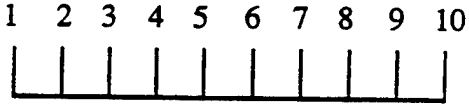
24. Encourages Team Members to Share Collective Wisdom and Expertise with One Another.



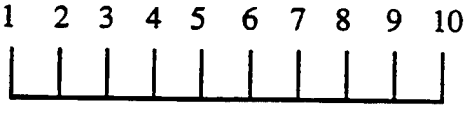
25. Provides Guidance to Team Members in Exploring Possible Approaches to Challenges that Stretch Existing Knowledge, Skills and Experience.



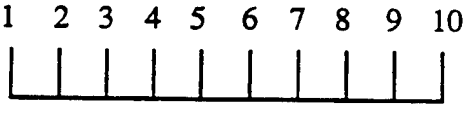
26. Effectively Collaborates with Others in Determining Best Ways to Achieve More Effective Team Performance.



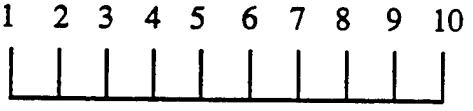
27. Consistently Checks Out Assumptions by Questioning, to Explore Context and Validate Facts Before Recommending Action.



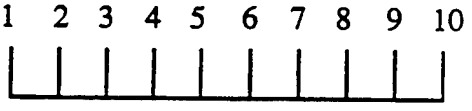
28. Identifies Behavior Inconsistent with Team Conduct Guidelines Developed and Agreed to by Team Members.



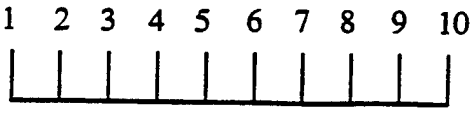
29. Positively Reinforces Team Member Creativity in Generating and Evaluating Alternative Approaches.



30. Demonstrates Ability to Draw Out Team Member Concerns Regarding Changes and Responds Empathetically While Maintaining Focus on the Facts.

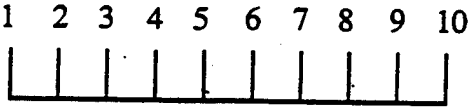


31. Demonstrates Variety of Effective Coaching Techniques and Flexes Approach to Match Individual Team Member Learning Style Preferences.

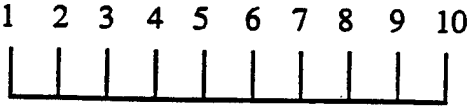


Personal Leadership Effectiveness

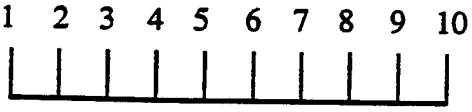
32. Actively Listens to Customers to Fully Comprehend How the Team Can Best Respond to Requirements.



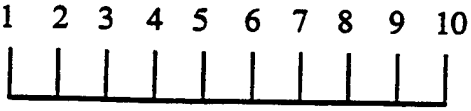
33. Effectively Articulates Specific Team Needs to Suppliers.



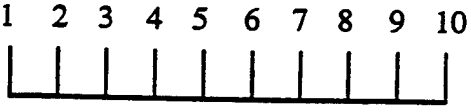
34. Asks Questions to Clarify and Obtain Mutual Understanding When Working with Others.



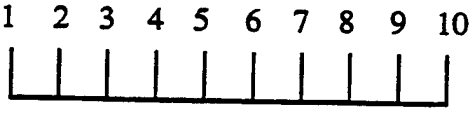
35. Models Constructive Feedback and Provides Appropriate Coaching Aimed at Improving Team Communication.



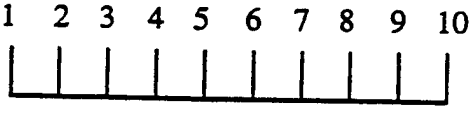
36. Models Consensus Building Techniques and Provides Appropriate Guidance/Intervention in Facilitating Team Interactions.



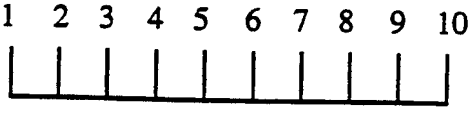
37. Avoids Soliciting or Offering "Second Hand" Information and Related Assumptions.



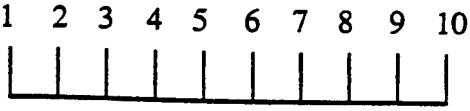
38. Effectively Uses Appropriate Intervention Techniques When Conflicts Arise to Quickly Re-Focus the Team's Energy on Improving Its Performance.



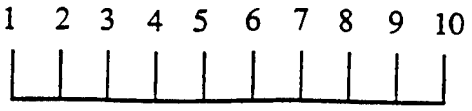
39. Identifies Resistance to Change and Works to Remove Any Barriers Impeding Team Performance. Discourages Speculation and Rumors.



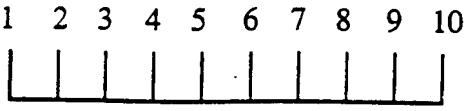
40. Models Flexibility, Innovative Thinking and Creativity. Accepts Learning Errors as Inherent Risks During Transition Activities.



41. Recognizes When to Transition from a Coaching Role to a Directive Role.

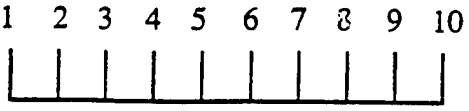


42. Continually Seeks Opportunities for Self-Improvement.

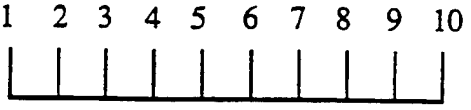


Job Skills

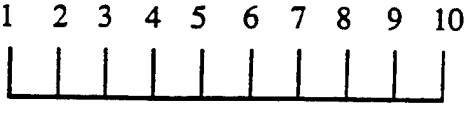
43. Demonstrates Knowledge of Product Design Through Team's Work Accomplishments.



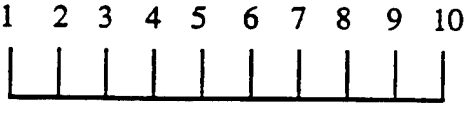
44. Demonstrates Technical Expertise for Problem Solving.



45. Able to Use and Access the Company Information Systems.

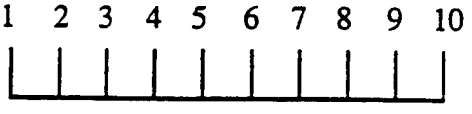


46. Utilizes Project Management Skills to Link Resources, Critical Path, Earned Value, Planning and Schedules.

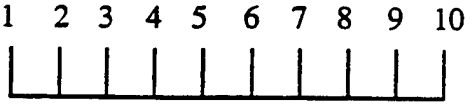


Business Management Skills

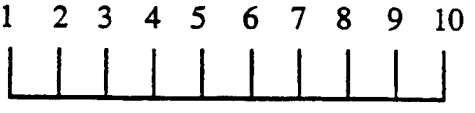
47. Knows How to Think and Act Like an Owner.



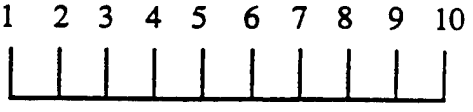
48. Is Able to Develop Realistic Budgets.



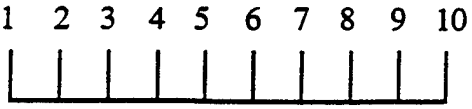
49. Understands the Relevance of Cash Flow, Asset Utilization, and Performance to Budget and Schedule Objectives.



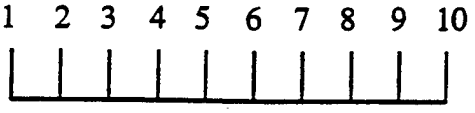
50. Knows the Value of Timely and Accurate Progress Reporting.



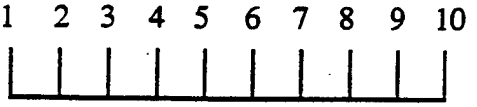
51. Understands the Importance of Performing Within the Boundaries of the SOW.



52. Comprehends the Value of Identifying and Reporting to the Business Management Function, Opportunities for Cash Flow Enhancement.



53. Adheres to Contract Requirements and Influences the Contract Acquisition Process.

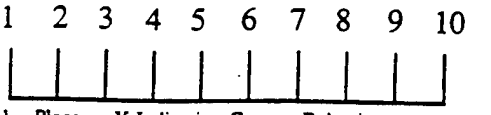


NORTHROP GRUMMAN

TEAM MEMBER SELF-ASSESSMENT

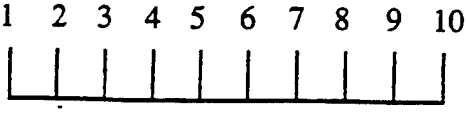
Organizing and Planning

1. Participates in Defining Relevant Team Performance Measures.



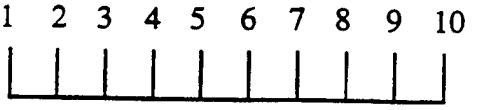
1. Place an X Indicating Current Behavior
2. Circle the Number Indicating Highest Performance Level Expected Within 6 Months

2. Clearly Understands Each Member's Personal Role, Accountability and How Their Work Fits into the Overall Team Purpose.

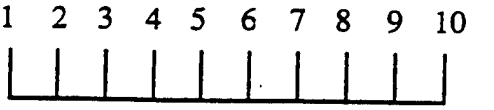


Process Management Skills

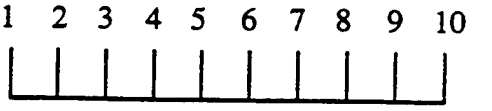
3. Self Monitors Progress According to Agreed-Upon Performance Measures.



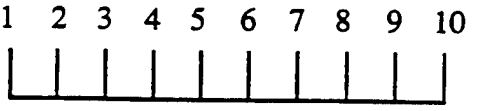
4. Provides Input into Development of Team Meeting Agenda.



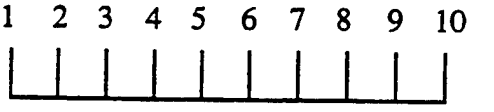
5. Offers Personal Perspective During Team Meeting Discussions.



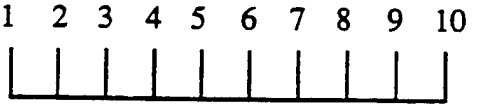
6. Contributes to Accomplishment of Meeting's Purpose.



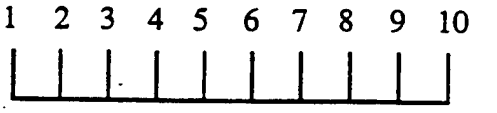
7. Provides Constructive Feedback Aimed at Improving Team Performance.



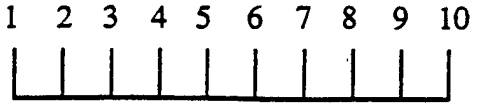
8. Influences Others in Working Toward Consensus.



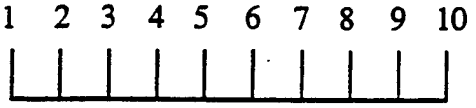
9. Questions Context and Validates Facts Rather than Acting on Assumptions.



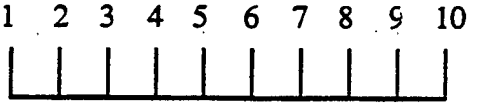
10. Seeks to Achieve Mutual Understanding by Listening to Other's Concerns and Acts Collaboratively with Focus on Finding Workable Solutions.



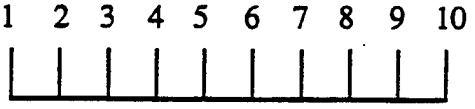
11. Concentrates Effort on Expressing What's Missing that, if It Were Present, Would Reduce or Alleviate a Conflict.



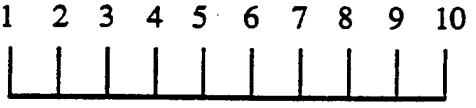
12. Abides by Agreed-Upon Decision Making Methodology and Level of Influence.



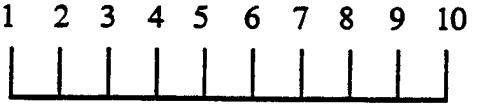
13. Participates in Periodic Team Self-Assessment Activities Designed to Identify Potential Needs/Gaps Between Actual Performance and Team Performance Goals.



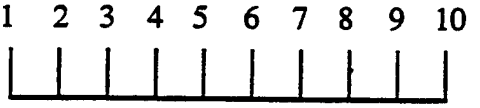
14. Participates in Determining and Implementing Action Plans for Planned Team Improvements.



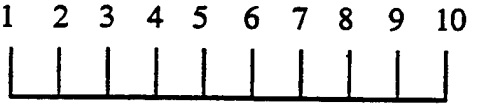
15. Completes Risk Analysis Before Committing to a Final Decision.



16. Recognizes That The Team Can Best Respond to Requirements (Rather Than An Individual).

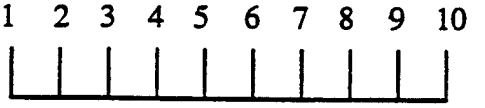


17. Effectively Articulates Specific Team Needs to Suppliers.

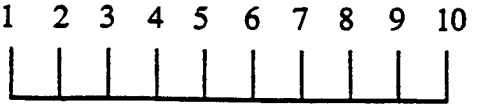


People Skills

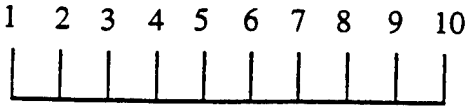
18. Makes Decisions by Sharing Personal Perspectives and Providing Relevant Fact-Based Information.



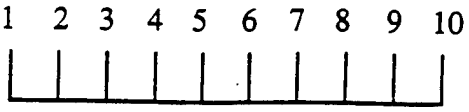
19. Maintains Other's Self-Esteem by Acknowledging Individual Contributions to the Team's Work.



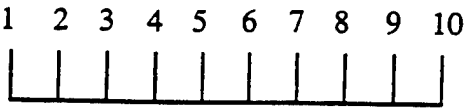
20. Responds Empathetically to Other's Feelings Without Taking Sides or Passing Judgment.



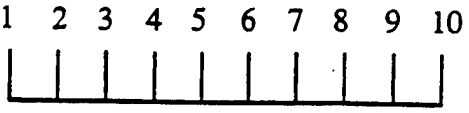
21. Shows Respect for Individual Differences by Seeking Other Perspectives and Viewpoints.



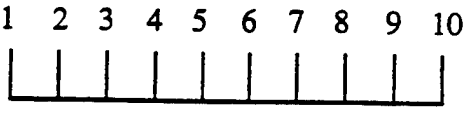
22. Asks Questions to Clarify and Obtain Mutual Understanding When Working with Others.



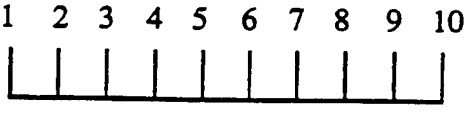
23. Displays Skill in Working Collaboratively with Others to Achieve Team Performance Goals.



24. Actively Participates in Orienting New Team Members to Routine Team Practices. Identifies Opportunities for New Members to Contribute Individual Strengths in Accomplishing the Team's Work.

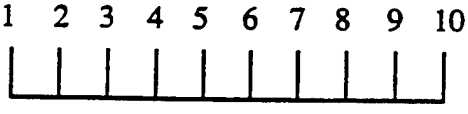


25. When Disagreements Occur, Demonstrates Willingness to Focus on Facts (Not Personalities) and the Impact on Team Performance. Avoids Destructive Behavior (Placing Blame, Withdrawing, etc.) Balances Advocacy with Inquiry in Efforts to Move the Team Forward.

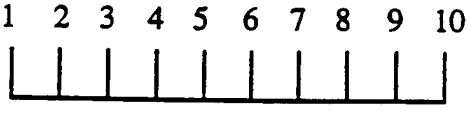


Personal Leadership Effectiveness

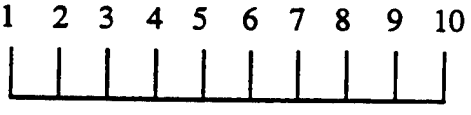
26. Provides Feedback to Other Team Members in Identifying Strengths and Encourages Opportunities for Development that Could Enhance Team Performance.



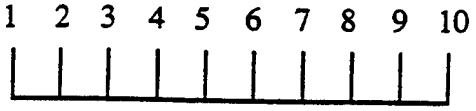
27. Supports Team Decisions.



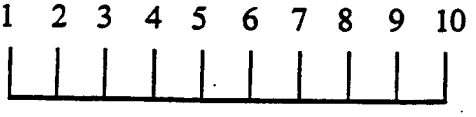
28. Responds Positively to Feedback Offered by Others and Requests Specific Suggestions for Performance Improvement.



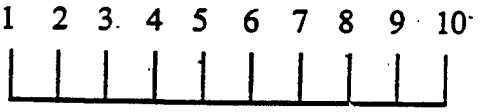
29. Shares Valid, Pertinent Team-Related Information with Team Members.



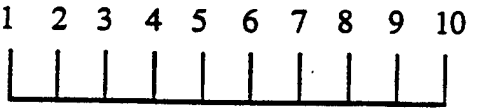
30. Demonstrates Ability to Maintain Primary Focus on Team Purpose. (Individual Agendas Come Second.)



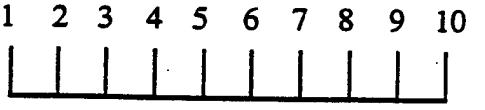
31. Asks for Assistance when Achievement of Performance Goals Is Threatened by Elements Beyond Individual Span of Control.



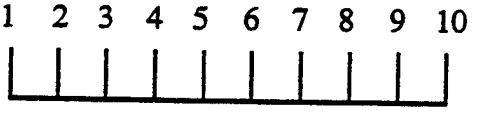
32. Consistently Addresses Questions/Concerns/ Suggestions Directly with Other Individuals to Maintain Open and Honest Communication.



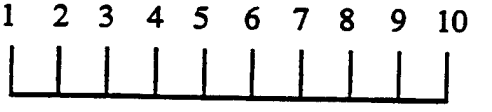
33. Asks for Help and Additional Perspectives When Faced with Challenges that Exceed Skill, Knowledge or Routine Experience Level.



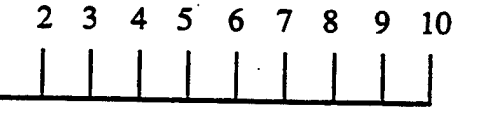
34. Demonstrates Self-Discipline in Abiding by Agreed-Upon Guidelines for Team Conduct. Speaks Up When Behavior Is Incongruent with Guidelines.



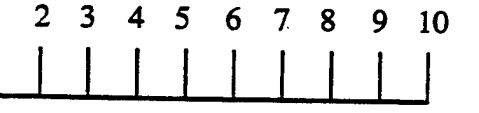
35. Maintains Open Mind Regarding Change. Asks Questions to Clarify Rationale for Change and Its Anticipated Impact on the Team's Work.



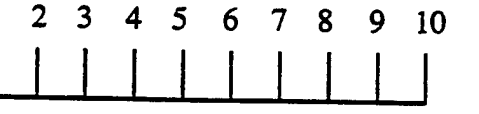
36. Recognizes Personal Resistance to Change and Seeks Help in Identifying Cause(s) and Possible Solutions.



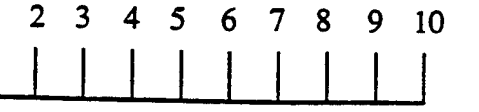
37. Demonstrates Personal Initiative in Seeking Continual Opportunities for Self-Improvement. Follows Through on Personal Commitment to Training and Development Activities.



38. Requests Feedback from Other Team Members in Identifying Strengths and Opportunities for Development.

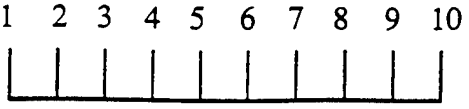


39. Actively Seeks and Responds Positively to Coaching.

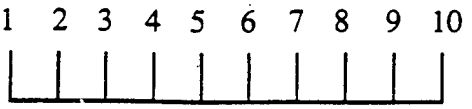


Job Skills

40. Exhibits Problem Solving Skills.

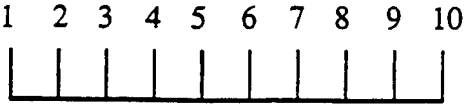


41. Able to Use and Access the Company Information System Technologies.

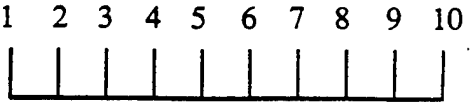


Business Management Skills

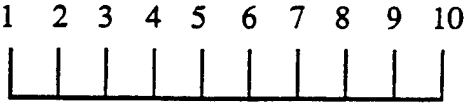
42. Knows How to Think and Act Like an Owner.



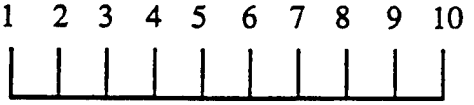
43. Understands the Relevance of Cash Flow, Asset Utilization, and Performance to Budget and Schedule Objectives.



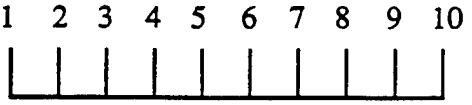
44. Knows the Value of Timely and Accurate Progress Reporting.



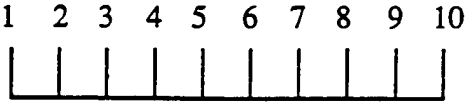
45. Understands the Importance of Performing Within the Boundaries of the SOW.



46. Comprehends the Value of Identifying and Reporting to the Business Management Function, Opportunities for Cash Flow Enhancement.



47. Adheres to Contract Requirements and Influences the Contract Acquisition Process.



Attachment 3: Team effectiveness rating tool

The material in this attachment is provided courtesy of Loral Vought Systems PAC-3 Missile Program in Dallas, Texas.

RATING TEAM EFFECTIVENESS

Instructions: Indicate on the scales that follow your assessment of your team and the way it functions by circling the number and/or word on each scale that you feel is most descriptive of your team.

1. Team Goals

Confusing, diverse, conflicting; members indifferent; little interest shown.	Discussed but not agreed upon.	Clear and shared by all members; all care about group goals; everyone feels involved and committed to goals.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

2. Roles and Responsibilities

Unclear; not discussed; participants' expertise not utilized.	Discussed but some confusion still exists.	Members discussed and understood their individual roles; participants' expertise fully realized.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

3. Team Building

Group unaware of members' strengths and weaknesses; low rapport.	Some effort to build rapport among members but with limited results.	Individual differences well-integrated; high rapport.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

4. Meeting Mechanics

Agenda not presented; no discussion on how decisions would be made; operating ground rules not discussed.	Decision-making process and operating ground rules discussed but not agreed upon.	Agenda followed; during first meetings, decision-making process agreed upon and operating ground rules set.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

5. Participation

Leader exhibits narrow focus on ideas; does not listen to others; members' contributions stifled; one or two members dominate, other members do not participate; some members disruptive.	At times, leader encourages participation, exerts some control over disruptions; members' participation varies.	Leader open to ideas presented; ensures participation by all members shared openly.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

6. Problem Solving

Root causes not analyzed; symptoms acted upon with snap proposals; no agreed upon problem-solving steps.	Problem-solving steps utilized at times; brainstorming and/or main methods used.	Structured problem solving steps utilized; problems diagnosed; causes defined before alternatives proposed, problem-solving tools (i.e. nominal group technique, cause/effect diagramming, force filed analysis, etc.) used effectively.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

7. Leadership

Leader either too controlling or fails to guide group; productivity leadership responsibilities not shared among members; overall direction of team not maintained.	Leader exhibits both directive and supportive behavior; Sharing of leadership role among few members; focus of group fluctuated.	Leader helped team achieve high productivity while maintaining high morale; informal leadership shared by all members; established and maintains overall direction of team effort.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

8. Empowerment

Members' contributions stifled by others; members lacked authority to accomplish/implement their tasks; members have no power to influence decisions.	Responsibilities shared among some members; some authority exists to achieve project goal.	Members take responsibility for tasks; members have authority to accomplish tasks; members have power to influence decisions.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

9. Time Management

Either too little or too much time spent on project; meeting time wasted.	At time, project either seems sluggish or hastened; sometimes, meetings efficient, some time wasted.	Total amount of time spent on project and in meetings used efficiently.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

10. Project Management

Progress of project not monitored; lack of resources delays project; low and erratic attendance at meetings.	Milestones established but not monitored; at times, lack of resources limited groups' progress.	Milestones used to monitor team's progress; necessary resources available for tasks; high and consistent attendance at meetings.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

11. Management Support

Little visible evidence of management support for team project.	Evidence of some management support, but not consistent.	Consistent, visible management support and interest for team's progress.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

12. Decision-Making

Little discussion; decisions made by leader or one or two members.	No predetermined process used to make decisions.	ideas evaluated using determined criteria; decisions made by group consensus after discussion.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

13. Creativity

People afraid to offer ideas; risk-taking is non-existent; tradition and status quo is maintained.	Some members hesitate to offer ideas; sometimes, ideas evaluated before explained.	People are positive, explore alternatives and look for good in ideas; people feel free to offer ideas and seek ideas from others.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

14. Trust

Distrust exists within the group; people are guarded; sharing of information limited; separate agendas evident.	At times, members are guarded and withhold information.	Trust exists within the group; people are open and candid with each other, information is shared freely.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

15. Recognition

No appreciation for individual contributions expressed; teams' contributions not valued or recognized by affected organizations.	Some appreciation for individual contribution; little recognition for team's efforts.	Appreciation for individual's efforts and contributions expressed; team contributions valued and recognized by organization(s) affected by team's project.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

16. Conflict Resolution

Conflict never resolved in group - members left meetings frustrated; members were afraid to express their alternatives.	Some frustration caused by lack of conflict resolution; some members expressed disagreements openly.	Conflict resolved effectively; members not afraid to disagree with each other.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

17. Morale

No team spirit existed; members unwilling to help others; little hope for positive outcome existed.	Some team spirit; members' opinions were respected; some members optimistic as to outcome.	A strong sense of cohesion and team spirit; mutual respect and willingness to help each other evident; members confident of success.

Poor								Excellent
1	2	3	4	5	6	7	8	9

Over the last three months gotten worse stayed the same improved

Comments:

Team Leader _____

Team Name _____

Date _____

References

[1] Niccolo Machiavelli, *The Prince*, Chapter 6, 1527; translated by Christian E. Detmold, Airmont Publishing Co., Inc., 1965

[2] Secretary of Defense, *Memorandum for Secretaries of the Military Departments, et al. Subject: Use of Integrated Product and Process Development Teams in DOD Acquisition*, 10 May 1995

[3] The President's Blue Ribbon Commission on Defense Management, *A Formula for Action, Report to the President on Defense Acquisition*, Apr 1986

[4] *Implementation of the Secretary of Defense's Defense Management Report to the President*, Progress Report, Mar 1991

[5] *Final Report of the Contract Administration Reform Process Action Team to the Under Secretary of Defense for Acquisition and Technology*, Feb 1995

[6] The Acquisition Reform Process Action Team Final Report to the Secretary of Defense, *Reengineering the Acquisition Oversight and Review Process*, Vols. I and II, 9 Dec 1994

[7] Under Secretary of Defense, *Memo for Secretaries of the Military Departments, et al. Subject: Reengineering the Acquisition Oversight and Review Process*, 28 Apr 1995; and Secretary of Defense, *Memo for Secretaries of the Military Departments, et al. Subject: Use of Integrated Product and Process Development Teams in DOD Acquisition*, 10 May 1995

[8] Defense Management College, *DOD IPT Offsite*, 20 Jul 1995

[9] Under Secretary of Defense, *Memo for Secretaries of the Military Departments, et al. Subject: Questions and Answers from the DOD Offsite Conference: "Institutionalizing IPTs: DOD's Commitment to Change,"* 14 Aug 1995

[10] Office of the Under Secretary of Defense (Acquisition and Technology)/ASDC3I, *Rules of the Road, A Guide for Leading Successful INTEGRATED PRODUCT TEAMS*, Nov 1995

[11] Office of the Under Secretary of Defense (Acquisition and Technology)/DTSE&E, *DOD Guide to Integrated Product and Process Development*, Feb 1996

[12] McDonnell Douglas Aerospace-West *Training and Education Publication*, Vol. II No. 6, Aug 1994

[13] Harold Kerzner, Ph.D., *Project Management: A Systems Approach to Planning, Scheduling, and Controlling,* Van Nostrand Reinhold Company, 1979

[14] H. Kent Bowen, Kim B. Clark, Charles A. Holloway, Steven C. Wheelwright, *The Perpetual Enterprise Machine,* Oxford University Press, 1994

[15] Allan L.Wilkins, *Developing Corporate Character—How to Successfully Change an Organization Without Destroying It,* Jossey-Bass Publishers, 1989

[16] Organizational Dynamics, Inc., *Making Teams Work—A Guide to Creating and Managing Teams,* 1993

[17] ibid, p. 127

[18] Jon R. Katzenbach and Douglas K. Smith, *The Wisdom of Teams–Creating the High Performance Organization,* Harvard Business School Press, 1993

[19] Organizational Dynamics, Inc., *Making Teams Work—A Guide to Creating and Managing Teams,* 1993

[20] ibid, p.62

[21] MIT data, *Lean Aircraft Initiative* Research

[22] Northrop Grumman, *Human Resources Guide for IPT Implementation,* Jan 1996

[23] Loral Vought PAC-3 Missile Program, Dallas, Texas

[24] Sammy G. Shina, University of Massachusetts, Lowell, *Successful Implementation of Concurrent Engineering Products and Processes,* Van Nostrand Reinhold, New York, 1994

[25] Title 10, U. S. Code Sect. 2399

[26] Darcy Hitchcock and Marsha Willard, *Why Teams Can Fail and What To Do About It,* Times Mirror Higher Education Group, Inc. 1995, p. 73

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