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Managing Virtual Networks on Large Scale Projects

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Abstract

The complexity of Boeing's 787 Program is too great for the formal planned information and communication network structure to fully meet the needs of companies, managers, and employees located throughout the world. By observing the 787 program it became apparent that identification, creation and nurturing of networks are an important new skill set for managers. In this large scale systems integration environment Process Integration Teams and the Partner Working Group were networks designed by managers to fill communication gaps. Employees also responded by forming learning networks to help them acquire knowledge they need to be successful. This is compounded by the evolving nature of the program which can make today's networks obsolete and require new networks to be created in the future. Managers must continue to ensure that current networks add value and identify potential new communication and information gaps that will need networks to fill them.

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Environment

The 787 Program is a large scale systems integration project, where the whole product lifecycle from concept to design and assembling the airframe is performed by Boeing divisions, subsidiaries and partner companies located throughout the world. This creates huge logistical, technical, and cultural challenges in the development of the airplane. These challenges include; moving stuffed assemblies thousands of miles for just in time delivery, coordinating and maintaining configuration control on computer design platforms used by design partners located in multiple time zones, and maintaining clear communication among diverse cultures.

In order to integrate the airplane the proper tools are needed to help bring together the right people at the right time so they can work together no matter where in the world they are located. This is the network centric organization model in action. Work groups are fluid depending on the specific task, tools used, or part of the airplane. People who work for different companies under separate reporting "chains of command" must work together in a coordinated fashion to develop a functional airplane on time that meets stringent cost, performance targets and Federal Aviation Agency (FAA) regulations.

Additional complexity has been added to the 787 Program due to the computing systems and business processes being designed "just-in-time" to support the required level of integration with the latest technological advances in design tools. Therefore the program has two major organizations, one to design and build the airplane, and the other called Systems Integration Processes and Technology (SIP&T) to develop and deploy the systems and processes. Program participants are required to install new systems (which may or may not easily fit into their existing computing infrastructure), learn how to use them properly, and meet aggressive airplane design schedule and technical requirements.

Keys to Success

Successful integration of a large scale project like 787 requires a new approach. In the past managers were technical experts who understood the whole system and told people what to do. That approach has limits because as complexity increases no one person or group has all the answers to a specific problem. Also, the planned network structure to support a complex program will not cover all of the communication and information needs of the program. This creates gaps that need to be filled by organic networks, that is networks that grow naturally independent of the formal program structure. In this new environment I believe there are three keys to success, a compelling shared vision, the right technology, and collaboration.

Vision

The vision needs to clearly define the systems, processes, and people principles that the program is based on. All parties should know what tools they are using, what processes they must follow, and what the key behaviors need to be. The original intention of the 787 program reflects the following vision.

- Systems – One System – Product Life Cycle Management Tools
- Processes – One Way – No workarounds, no exceptions
- People – One Team – One Plan – Everyone working together for a common purpose and cause

The goal is for everyone to work together using the same tools and processes. The vision needs to be clear and shared so it can guide decision making at all levels. Management needs to move from trying to know what is going on everywhere to more of a “vision police” role. Decisions need to be pushed down to lower levels of the organization and executives should step in when decisions are being made that are contrary to the vision. This requires clear communication of the vision and education of managers and employees regarding what vision supporting decision making looks like.

Technology

There are two different categories of technology on the 787 program. First is the technology used to design, build, and maintain the airplane. This is a complex web of systems that must interface with each other and ensure that airplane configuration is controlled, proprietary information is protected, as well as prevent violations of national and international import/export laws.

Second is the technology required for communication between program participants. The tools used on the 787 Program are WebEx, video and teleconferencing, web portals and server based data management tools (ForumPass). Successful use of the tools is more than just mastery of the technology; success is based on the expertise of the meeting facilitator and participants in ensuring that clear communication has occurred. Basic listening and communication skills such as paraphrasing, repetition, and asking for feedback, need to be emphasized in order to make sure that there is agreement about what was said. The biggest challenge in virtual meetings is the rush to present the information superseding the need to make sure that everyone in the room and on-line understands what is said. Meetings need to have less on the agenda and the facilitator has to solicit feedback from the participants.

Collaboration

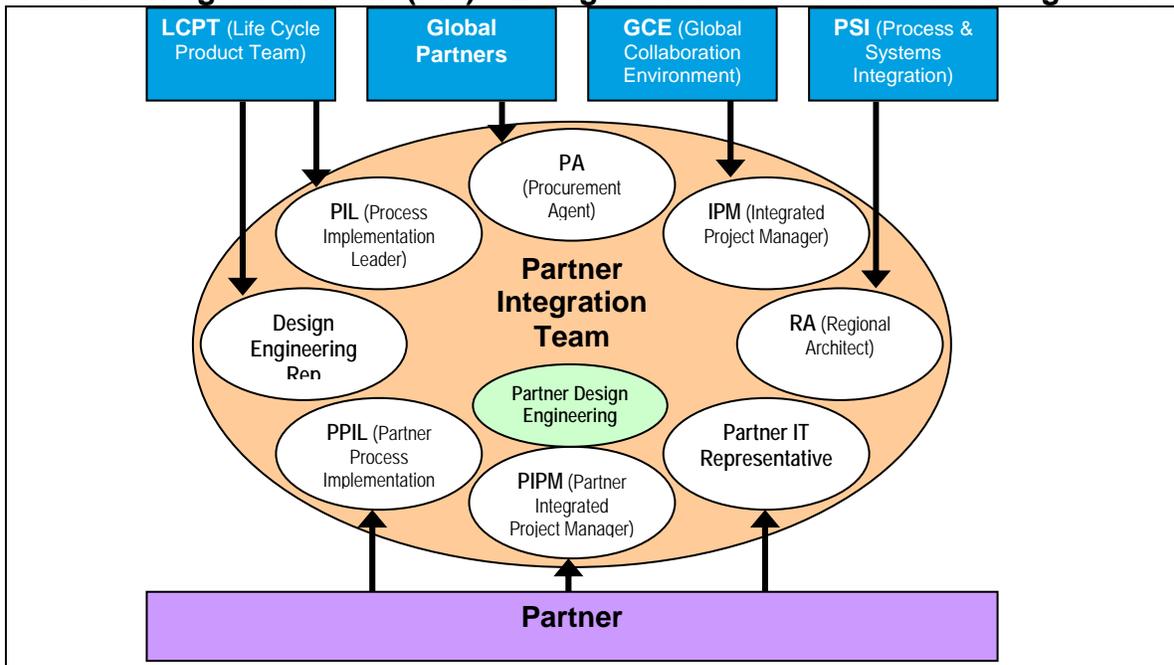
Collaboration is defined by Webster as “to work jointly with others.” In a large scale systems integration environment this requires the integration and knowledge management of unique business and worldwide cultures. On the 787 program, knowledge and ideas are shared between organizations that may not typically interact with each other, and in some cases may not historically trust each other. In order for collaboration to occur, the 787 program set up a formal structure with Life Cycle Product Teams (LCPTs) for different sections of the airplane to organize and coordinate the overall design and build process. This formal network of teams and sub-teams was designed to facilitate planning and collaboration for developing and building the airplane. But true collaboration is more than structure it requires a willingness to cooperate and the commitment to take the time to ensure that everyone truly understands each other.

Organic Networks

The interesting phenomenon for me on the 787 Program is the emergence of “organic” networks that have risen to fill the collaboration gaps that the formal structure does not cover. One category of organic network are “**management driven**” additions to the original program plan. This is when managers see gaps and create formal networks to fill them. Two examples of management driven networks on 787 are the Partner Integration Teams (PIT) and the Partner Working Group (PWG). The PITs were created to fill the gap between the organization developing and deploying the new processes and systems and the program design and build group.

The gap in the original program structure that needed to be filled was how to introduce new business partners to the system, processes, tools, Boeing culture, and bureaucracy quickly so they could get up to speed and contribute the 787 program. Boeing managers Dennis Broughton, Brad Elmenhurst, with help from Jeanne Heggem and myself designed the PITs to be the central integrator of new partners into the program. The PITs’ role is to introduce the partners into the system, develop the plan for the Partner to acquire and deploy the hardware and software necessary to design and build the airplane and support partners’ development of a training plan so they could use the tools and follow the processes.

Partner Integration Team (PIT) – Designed for Cross Functional Integration



Partner Integration Team has representatives from Boeing Organizations and the Partner to ensure rapid deployment of common systems and processes.

The Partner Integration Team was made up of representatives from the following organizations performing specific roles:

Organization	Roles
787 Systems Integration Processes and Technology (SIP&T)	- Computing Architecture Expert (Technology) - Relationship Managers and Planning
787 Design and Build Program	- Process Implementation Leader (Business Process)
Boeing Global Partners	- Procurement Agent (Business Expectations)
Partner Company	- Process Implementation Leader - Information Technology Representative - Integrated Project Management
Boeing Training and Development	- Business Process and Systems Alignment

The critical role is the integrated project manager assigned to each partner. They facilitate the PIT meetings, and are the primary contact to help the partner navigate the bureaucracy, understand the culture, and find what they need. After a while they even changed their name from integrated project managers to “relationship managers” since their key role is not to do work but help the partners develop the relationships needed so they could design and build the airplane. This simple network accelerates the partner’s introduction and integration into the program so they become more efficient more quickly.

Another management driven network was the Partner Working Group (PWG) which is the brainchild of Systems Integration Processes and Technology (SIP&T) leader Dennis Broughton and which I helped to implement. The Partner Working Group is made up of all the partners on the 787 Program, the 787 LCPT process implementation leaders, and the leaders of the Systems and Process Development organization. The goal of the PWG is to provide a forum for learning about the new process and tools, communicate status of the process and tool deployment plans, and to be a place where partners provide feedback to Boeing about how things are going. The PWG consisted of two types of meetings, monthly virtual meetings using audio-conferencing and WebEx and twice yearly face-to-face meetings five weeks prior to the major block point software releases.

Monthly virtual meetings focus on providing information to partners about the program systems and processes. A major lesson learned was that partners are reluctant to share information in a public forum. We have found that partners from some cultures often do not want to admit in a public forum that something is not clear to them. The relationship manager checks in with them after the meeting and helps them with any questions they may have.

The relationship managers are also used to help create agendas for the virtual meetings since they are in tune with what the partners are interested in hearing. I also worked with the 787 Process and System leaders to make sure that they would communicate important information to the partners. Originally the virtual meetings were alternated from early mornings one month (for U.S. and Europe) and late afternoons the second month (for U.S. and Asia). After receiving input from the partners we started running two identical meetings each month (one early and the other late.) Average monthly attendance was around 70 people with around 20 partners represented.

Twice last year we conducted large scale face-to-face meetings attended by over 120 people with representatives from over 35 partners. The goal of the large meetings was to prepare for major block point software releases and to encourage sharing and learning between Boeing and partners. I worked with 787 Process Development and Deployment managers to design meetings that were a balance of information sharing and small group interaction to encourage partner involvement and sharing that did not typically occur in the virtual meetings. The feedback from the partners and 787 managers was that these meetings were very helpful in ensuring smoother implementation of block point releases. One other feedback was from new partners who found it extremely useful to learn from Boeing and other partners and implement lessons learned from other's mistakes to help them hit the ground running as they joined the program.

The second category of "organic networks" was the creation of many small user groups. These "**employee driven**" networks sprung up around specific information technology systems, where the users formed virtual teams to learn about that system. These teams are run by subject matter experts who share their knowledge and create forums so that people from different Life Cycle Product Teams (LCPTs) as well as partners can learn, share, and solve problems. At this time there are 16 user groups with attendance in their meetings ranging from 15-115 people. Attendees of these groups are often subject matter experts from different LCPTs and partner companies allowing for technical knowledge sharing across organizational boundaries.

A new role for leaders supporting unplanned user groups is one of acknowledgement and nurturing. Managers need to support employees by valuing their participation as long as the meetings are constructive and not impose their agenda's upon them. This requires managers to check-in with the user group leaders to see how things are going and offer help if required. Otherwise managers need to trust that the team members are using the time productively (unless they hear otherwise) and leave them alone.

Conclusion

The complexity of the large scale network centric organization is too great for the formal "planned" program structure to handle alone. Additional networks are needed to fill the gaps and add to the overall effectiveness of the program. One type of network is management driven where managers intentionally design networks to fill gaps in the formal organization structure. The second type of network are employee driven that evolve to fill specific technical gaps. New management skills are required in today's complex environment, the ability to foresee the gaps and design appropriate networks to fill them and support and nurture of the unplanned networks that spring up is fundamental.

I believe another skill for managers as the 787 program reaches maturity will be the ability to recognize when to shut down old network structures and create new ones to fill the needs of that phase of the program. Every network should support the vision and goals of the program. Management must know when a network structure has outlived its usefulness and needs to be shut down to save time, energy, and money. And they need to know when to create new network structures to further the vision and goals of the program.