Introduction

Large-scale information technology projects are different from smaller-scale projects in many ways. Consider some key differences:

- Large-scale information technology (IT) projects typically implement information technology of strategic business importance.

- Large-scale IT projects demand the orchestration of hundreds of team members, communication with hundreds or thousands of users, and development and configuration of a vast array of technical components.

- Large-scale IT projects usually occur over a period of years.

- Large-scale IT projects require the management of relationships with multiple user groups. These users may be in different geographic locations and reporting up through different business organizations.

- Large-scale IT projects require extensive logistics and administration. Acquisition of software, preparation of work sites, preparation for various meetings, and work plan administration are among the many challenging and time-critical administrative tasks that must be coordinated.

Given these distinguishing characteristics, large-scale information technology projects are inherently very risky. Prudent risk management and the coordinated communications of the importance or risk identification, mitigation, and control are essential for the success of the large-scale information technology project.

The Larger, The Riskier

Unlike smaller projects, large-scale projects allow little room to recover from fundamental mistakes. Consider how a delay of a month or two on a five person project may be recoverable through increased staffing or overtime. A delay of a month or two on a three hundred person project has many more disastrous consequences. Similarly, developing alienation and distrust among six users is much easier to overcome than a similar situation with six hundred or six thousand users.

There is a non-linear increase in project communications complexity when moving from a small project to a large one. A small project of 5 team members has 5! or 120 possible communications combinations. A larger project of 100 team members has 100! or $9.33 \times 10^{37}$ communications combinations! The larger project is 50 times bigger in terms of team members, but has communications that are astronomically more complex.

Similar non-linear comparisons may be made between a smaller project with 5 integrated computer programs compared to a larger project with 100 or 500 integrated computer programs. The risk of flaws in the technical integration increases exponentially as the number of integration points increases.

Ten Risk Areas

Proactive risk planning is necessary to avoid fundamental mistakes. The risk planning must be reflected in the work plans and approaches, as well as in the overall communications plan, in order to be effective. The following is a discussion of the top ten risk areas faced by project managers of large-scale IT projects, as well as potential solutions specifically tailored to larger-scale IT projects.

1. Project Communications

The PMBOK Exposure Draft states project communications management “provides the critical links among people, ideas and information that are necessary for success.” When these critical links break down, teams, sponsors, and users become isolated from each other, resulting in disjointed solutions that are rejected by users and sponsors.
alike. Business sponsors may reject the best systems solutions if the business and IT are alienated from each other as a result of poor communications.

Fundamental aspects of communications management still hold for the large-scale project. However, large-scale projects present special communications risk management challenges. Typical communications techniques such as regular staff and user group meetings can prove ineffective for projects with hundreds of team members and hundreds or thousands of users.

Here are some communications techniques that are tailored for the management of communications risk on the large-scale IT project:

1. Project Kick-Off Meetings in Large Auditoriums: It is not impossible to hold a project kick-off meeting just because all relevant constituencies (the team, the users, executive sponsors, key vendors, etc.) number in the hundreds or more. Hold the meeting in an auditorium. If you do not have such a facility at your work site — rent one. One large-scale project (for which this author served as the project manager) rented the auditorium at a nearby museum to hold its kick-off meeting.

   Video Project Headline News (or, “Around the Project in 10 Minutes, This is Headline Project News”): Consider preparing a weekly video tape that operates the same way as CNN Headline News™. If CNN can update the world in 30 minutes, surely you can update the project in 10 minutes. (This author is indebted to colleagues Joe DiVanna and Jim Ettwein for identifying this technique.)

2. Executive Commitment

   Executive involvement and support are critical to ensuring that the evolving systems achieve the business vision. Without adequate executive commitment large-scale IT projects risk numerous failures, including lack of business ownership, systems solutions failure to meet strategic objectives, inability to resolve resource bottlenecks, and inability to resolve business priorities.

   However, on the large-scale project, executive constituencies can be difficult to communicate with since they are multitudinous and widely dispersed geographically and organizationally. Large-scale projects are more likely to be challenged by strong conflicts between executive constituencies. For example the cadre of Regional Vice Presidents may have their own political battles at work with the Headquarters Vice Presidents. The Program and Project Managers charged with developing and implementing integrated order entry, inventory and replenishment systems will find themselves right in the middle of these preexisting squabbles.

   Here are some techniques for managing executive commitment that are tailored for risk management on the large-scale IT project:

   Assign a Senior Executive to Full-Time Project Oversight: Large-scale projects are often of greater importance to meeting strategic business goals than entire divisions or business lines. As such they merit the full-time attention of a Division President level executive. This technique immediately elevates a large-scale project’s importance in the organization to its actual level of importance to the business. Without assigning such a high profile executive, the project’s ability to obtain resources, resolve issues, and gain understanding and acceptance at the executive level are crippled to the point of assured project failure.

   Attach Project Topics to Regular Executive Meeting Agenda: Since large-scale IT projects implement strategic change they often deserve attention at regular senior management meetings. The Project Executive should present the project status at such meetings.

3. Business Result Focus
Delivering real business results as quickly as possible should be a guiding principle of every IT project. Without a focus on real business results other goals eclipse the project team’s focus. When project managers succumb to this risk they supplant project or system goals for business goals. For example, systems goals such as implementing a (really cool) three-tiered client/server architecture or project goals such as meeting the deadline to complete integration testing may be viewed as of paramount importance. Compared to meeting the real business need, these goals are clearly of lesser importance.

Enormity of scope should not be an excuse for delaying the implementation of working systems that deliver real business results. Large-scale projects actually have more of a need to deliver results quickly because they must satisfy any business sponsor doubts about the great financial and human investments required to keep the project going. Like it or not, business sponsors tend to think that any multi-million dollar investment does not show tangible results within a 6 month or 12 month period is suspect.

Here are some techniques for managing business results focus that are tailored for risk management on the large-scale IT project:

1. Dedicate Teams to Short-Term Prototypes: Entire teams may be dedicated to achieving short-term business goals. Short-term systems may be technically "disposable" because final decisions have not been made on the technical and application architectures. This should not be an important consideration. Demonstrating the business concepts of the evolving systems should be the more important factor than staying pure to the technical vision in the short-term. For example, if your end-state architecture is UNIX, but your team is already skilled and equipped to develop in Windows, build the initial prototypes in Windows. The underlying technology is immaterial to the business.

2. Business Polling: A large-scale project is at risk of losing its business focus and not knowing it. Some large-scale projects become insular societies unto themselves. The views of the business people on the project team may be counted to the exclusion of the views of the end-users. One risk detection technique that is well suited to the large-scale project is opinion polling. With polling you may efficiently discover the views of your, for example, one thousand business users. Design the questions to reveal whether the business thinks the project has lost its focus and, if so, why.

4. User Involvement

The assignment and commitment of key users to the project is critical to success. Users must view the IT project as their project. Without direct day-to-day user involvement, IT projects tend to drift toward providing technically operational systems that risk being unworkable in a real business context. The unwritten nuances and detailed requirements are more easily skipped without direct user involvement. The risk is nothing short of complete project failure.

Large-scale IT projects are very susceptible to the risk of poor or inadequate user involvement. Sometimes the importance of adequately addressing user involvement gets lost in the "big numbers" of large-scale projects. For example, consider a large-scale project that has planned for the assignment of 50 users to various project teams and roles. Business executives may misjudge the situation if only 35 users have been provided instead. They may reason, "well 35 is a big number, they have got to be able to do it with that army of users."

Unlike more modest projects, large-scale projects introduce broadly based change and new operating paradigms. Users who are involved in the development may resist this change and instead feel that their role is to protect and defend the old ways. Similarly, they may reject the holistic perspective large-scale projects take to business change and champion the perspectives’ of their home organizations.

Following are some techniques for managing user involvement risk on the large-scale IT project:

1. Special User Orientation: At the time of project commencement consider having a special off-site orientation only for users assigned to the project. The agenda should be focused on topics of particular interest to the users. These topics may include: "the user team member role", "expect change", "senior management’s expectations of users assigned to the project", "how to communicate within the project", "how to communicate outside the project", and "personal career considerations.” To be effective, this orientation needs to be led by business user executive management with the assistance of the project executive and manager.
The Buddy System: A key goal for the large-scale project is to focus on maintaining the goodwill of business user team members throughout the life of the project. For the multi-year large-scale project, one effective technique is to establish a buddy system where new users to the project buddy-up with users that have worked on the project for a while. This will help the new users accept change and understand their roles. Users new to a project are more likely to mind the advice of their business colleagues than, for example, their project team leaders who are from the MIS organization.

5. Project Management

Quality project management requires experience, thoroughness, a reality-based attitude, and a pro-active posture. It is unfortunately true that even in today’s times there are still those who believe that IT projects are largely technical endeavors. Project sponsors may lack a balanced attitude about the process and functions of project management vis-à-vis issues purely of people assignment. “We have a great team!” is often the rallying cry for projects headed for failure. Even the best teams require proactive coordination and management.

Many project sponsors make project manager staffing decisions based on criteria that do not relate to typical success factors such as project management knowledge, training and hands-on experience. Instead, rules-of-thumb such as seniority in operations management roles or simple availability are used to select the project manager. Even on projects of a more modest size, lacking appreciation and attention to project management or appointing an inappropriately skilled project manager are very risky undertakings. On large-scale projects these failings are most assuredly fatal. With regards to project management risk, it is best not to even begin a large-scale IT project when project management is inadequately addressed. Project sponsors should therefore make it a “hurdle criteria” to identify a qualified project manager who is available full-time for the project before beginning the project.

Another common failing of large-scale projects is not the project manager’s lack of qualifications but lack of empowerment to do the job. They may even be blocked from collecting information to enhance their understanding of whether project related work is getting done. Some areas may be designated as off-limits to their review, counsel or intervention. Frequently these areas are "sacred-cows" within the organization. These can run the gamut from the Legal Department to Database Administration. In effect this creates a situation where the project management role is accountable and responsible for the overall success of the project but is limited in its ability to manage, coordinate or influence critical project functions.

Note that the point here is not that the project manager should have direct-line authority over all organizational areas that affect the project. This would be tantamount to saying the project manager needs to be the CEO. The issue is one of having the authority to review, monitor and coordinate all of the relevant resources. For example, the project manager should not control or directly manage the Quality Assurance team. However, the project manager should have the ability to ensure that this function is performed. If it is not being performed, the project manager should have the ability to communicate these concerns to the appropriate management levels and expect constructive and remedial actions.

6. Scope Management and Control

Modern projects manage scope and achieve business results by delivering system functionality in a “series of small successes” and resist the temptation to constantly change scope. “Scope creep” results
when scope is not managed but instead allowed to grow out of control. A structured process must be in place to manage scope. Otherwise, all project constituencies get overwhelmed with what's possible -- with what's technologically possible.

In scope creep someone volunteers that if a change is made or scope expanded a good business or technical result will be achieved. If the project leadership agrees, they may reach the erroneous conclusion that such changes should be put into the scope. If that were true, we would all be driving Ferraris because when you sit down to buy a car you have a discussion with your spouse about how it would be good to get a very fast car and that it would be good to get the best car. This discussion proceeds to the point where you are well beyond what your family can afford. Priorities and constraints are not recognized.

In large-scale projects scope is extremely difficult to control. Business process owners and project sponsors may feel that the hundreds of team members that are consuming vast amounts of corporate resources should, at the very least, do whatever the business wants, whenever the business wants it. Large-scale projects also provide a sense of the single opportunity of a life-time. Many feel “If we don’t get it now, we’ll never get it.”

Here are a couple of techniques for managing scope that are tailored for risk management on the large-scale IT project:

- **Small successes**: The technique of delivering results in a series of small successes is also beneficial to managing scope creep risk. Scope is managed one system release at a time. The IT teams partner with the business to specify release contents; or, to say it a little differently, the project team and the business work together to prioritize requirements.

- **Formal contracts**: Given the diverse constituencies served by large-scale projects, it is important to consider going beyond typical scope management techniques like a formal change control process. The teams may want to draft formal signed by the key business and project decision makers. These contracts will specify the scope of the next release, the priority of functionality in case the project needs to cut release scope, and an agreement on how scope may be changed and who may initiate scope change. While this approach lacks flexibility, it is better than runaway scope.

7. Quality

The entire management team must demonstrate an un cynical commitment to quality. This commitment must be included in project plans and felt by the individual team members. There is a risk that day-to-day pressures create an atmosphere where quality becomes secondary. Projects also risk the management of quality in a perfunctory manner only. In this case quality programs are ineffective or weakly administered. Projects that succumb to this risk have quality programs that are viewed as intrusions or as signs of management mistrust in the team’s commitment or capabilities.

Inattention to quality is a potentially fatal disease for large-scale projects. The achievement of project milestones can eclipse the need to ensure quality, completeness and integration of project deliverables. Such projects can become out-of-control very quickly. Complex systems components that are labeled as “done” may in fact require serious rework. When such a situation is allowed to occur with the deliverables of scores of teams, the project simply becomes a runaway.

One way to describe this problem is with the analogy of automobile manufacture. Would you want to drive in a car that had random, undocumented flaws in 10% of its parts? Of course not -- it would be suicide. Would you want to use a large, complex computer systems with flaws in 10% of its programs and databases? If you think rigorous testing will catch these flaws, think again. Edward Yourdon notes in his text The Decline & Fall of the American Programmer that testing can, at best, be counted on to catch only 30% of the bugs in a system.

Without a reliable quality process the large-scale project is a sure runaway. Its integrated end product would be unusable and unfixable. Such runaway projects take significant investments in terms of time and money, and produce much product in terms of deliverables, but produce outputs that are not usable.

Here are a couple of techniques for managing quality that are tailored for risk management on the large-scale IT project:
8. Technology

Client/server open technologies are very risky to implement. Planning for the project's technology critical path must be careful and thorough. The critical path itself is not readily evident to those inexperienced in developing major systems using new client/server architectures. For example, tools selection is an ongoing activity. What's the best tool to play back test cases? What are the best tools for configuration management using your specific operating system and hardware? What do you do mid-project when it is apparent that the best-of-class tool you have selected is no longer best?) Developer training is a critical path activity requiring careful planning and scheduling. Timing and management of software upgrades are important. For example, if you have a full toolset designed to support programming using Powerbuilder version 3, what do you need to do to upgrade to version 4.0? Hint: the answer is not as simple as ordering and installing the version 4.0 software.

Another common risk presented by new client/server technologies results from the fact that client/server environments require the custom development or acquisition of unproven tools to perform functions that were more reliably supported in the single-vendor mainframe environments of old. With, for example, scores of programmers or integration testers relying on toolsets that require "shake out" time, productivity can be seriously affected.

Here are two techniques for managing technology risk on the large-scale IT project:

- **Demonstration Lab:** New technologies must be thoroughly tested and integrated into a project's unique development process in order to be effective. The large-scale project is wise to set up a demonstration lab where all technologies are tested before use by the project team. This lab not only tests for operation-to-spec but tests the use of the tool in the manner the project as a whole will be using it.

- **Ongoing R&D:** It is prudent to devote a small team to ongoing research and development activities. Their agenda proceeds independently of the project's plan. However, they provide valuable insights into what is possible using new technologies and approaches. For example, before a document management project explores read/write optical disk as part of its business solution, it would be beneficial for the R&D team to have used it and communicated back to the team on the functionality and the risks and opportunities presented. The R&D team can also suggest changes to already decided technical directions as better tools emerge in the rapidly changing client/server software market-place.

9. Knowledge Transfer

For the results of projects to be sustainable, IS organizations must plan what it will take to maintain and enhance the systems over the long-term. The IS team which will be responsible for supporting systems must be qualified to do just that. Team members without adequate knowledge risk causing productivity and quality problems. At worst, without attending to knowledge transfer as an explicit priority, there is a risk the systems solution will become too complex for ongoing support by the internal IS support team.

For large-scale projects knowledge transfer is not optional -- it is a key to success. Most large-scale projects develop systems that are not only strategic to the business but also large and complex. Before taking on support duties, the support team members must be current in their knowledge of the development standards, system design, technology infrastructure,
and system functionality. Project management must pay careful attention to the lead time for knowledge transfer, the logistics for training and mentoring, and the critical path in terms of “learning curves,” trainers and training facilities.

Formal knowledge transfer planning is irrelevant on some smaller projects. Their support teams are often assembled from the development team. However, on large-scale projects even if the support team is drawn from the development team, the support team members may only have been exposed to a fraction of the overall systems development. Large-scale development efforts also often rely on outside contractors to aid in peak staffing. The expertise gained by these external resources must be transferred to the support team before their contracting assignments end.

One technique that is very effective in large-scale projects to manage the risk of poor knowledge transfer is the assignment of a dedicated, full-time Knowledge Transfer Manager. It would be his/her responsibility to develop a knowledge transfer plan early in the project and to weave this plan into the overall project plan. Typical aspects of this plan will be early identification of support team members, a training needs analysis, training, assignments alongside project experts to foster mentoring, and rotations through business user roles to improve understanding of business functionality.

10. Project Organization

The discipline of developing and maintaining an organization chart helps clarify roles and reporting lines. Such an organization chart is best reviewed in comparison with the project task plan and staffing plan to ensure coverage of critical tasks.

The area of project organization is fraught with risk. Here are some examples of project organization risk:

• Complex project structures make it difficult to maintain clear lines of accountability and control.

• Key project roles may be inadequately covered.

• Team members’ skills and capabilities may be mismatched to their positions on the project.

• A poorly structured organization leaves some team member overworked, detrimentally affecting morale and resulting in “burn-out.”

Large-scale projects make the challenge of creating a workable project organization much more difficult than with a smaller project. For example, scopes of responsibility for programming, data administration, and CASE tool support teams must be carefully thought through so that work does not slip through the cracks.

Here are two techniques for managing the project organization that are tailored for risk management on the large-scale IT project:

• Understand “Fractured” Project Manager Role: The individual or individuals filling the project manager role on the large-scale project must learn to delegate duties that would normally be considered part of the project manager’s job on smaller projects. For example, the role of maintaining relationships and communications with executive management and the business user community may need to be delegated to another team member. (See also discussion of risk 1). Another example of a role that should be delegated to another team member is be project administration management. This role includes supervising those who administratively maintain status reports, time sheets and the project control system.

• Dynamic Reorganizations: Large-scale projects tend to reorganize in very short intervals. Those who are more familiar with smaller projects may mistake the frequent reorganization of large-scale projects as chaos. It is best to accept the need to reorganize on perhaps a weekly basis as a fact of large project life -- and to manage expectations of project sponsors accordingly. A large-scale project that avoids dynamic reorganization will quickly find itself inappropriately organized for the current project reality.

Conclusion

Successfully managing the large-scale information technology project requires that one take a fresh perspective on risk management. One must go well beyond the obvious and typical mitigation and detection techniques. New and some seemingly radical approaches must be used. The large-scale information technology project truly is a different animal than the smaller project.