IT project risk factors: The project management professionals perspective

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IT PROJECT RISK FACTORS: THE PROJECT MANAGEMENT PROFESSIONALS PERSPECTIVE

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ABSTRACT

The failure of systems development projects has plagued the IT industry for years. In fact, the 2004 Standish group report indicates that only 28 percent of software development projects are successful, down from previous estimates of 34%. This paper identifies IT project risk factors that pose threats to successful project implementation and describes project management professionals (PMPs) assessment of these risk factors. It concludes with suggested strategies for avoiding and/or mitigating these risks and associated implications.

Keywords: Project management risk, IT project risk, project success, project failure

INTRODUCTION

As new technologies continue to become a significant factor in organizations, the growth of software development projects has soared from 200,000 in 1998 to more than 500,000 initiated in 2001. However, the success rate for such projects remains unacceptably low. The Standish Group's 2004 "CHAOS" study update, incorporating data from several thousand software development projects, reveals that only 28 percent of IT projects were completed on time and on budget, down from a previous high of 34 percent. Another 18 percent (up from 15%) were canceled before completion of the development cycle, and the remaining 51 percent were completed over-budget, behind schedule, and contained fewer functions than originally specified [5]. Software project risk management advocates allege that identifying and analyzing threats to success can lead to actions that reduce the chance of failure and, in fact, increase the probability and impact of positive events. Many of the advocates are proponents of the Project Management Institutes' (PMI ®) common body of knowledge.

Dave Cleland, often headlined as the "father of project management" and Lew Ireland in the fourth edition of their Project Management text [4] describe a project as "a combination of organizational resources pulled together to create something that did not previously exist and that will provide a performance capability in the design and execution of organizational strategies". The project undertaking is temporary and intends to produce a unique product. Projects have occurred throughout recorded history. Until the 1980s however, project management focused primarily on providing schedule and resource data to project management. As information technology (IT) continues to play a more significant factor in business, the information technology (IT) "project gold rush" as described by the Standish Group, requires more sophisticated and better project management techniques.

In 1969 the Project Management Institute (PMI) was organized so project managers could share experiences between different industries. PMI now has over 200,000 members in over 250 chapters in over 90 countries. PMI conducts global, regional, and research events all over the world. The premise behind PMI is that there are certain similarities between projects regardless of size, complexity, or industry. The first edition of *A Guide to the Project Management Body of Knowledge* (PMBOK)® [1], PMI stated the common wisdom of the time — that the three primary things that needed to be managed on projects were cost, schedule, and performance (or quality). As the state of project management knowledge evolved, integrating factors such as risk, procurement, human resources, and communications were acknowledged to impact the success of a project. Risk is now recognized as one of the facilitating functions whose management is critical to project success.

The purpose of this paper is to better understand IT project risk factors from a project management professionals' (PMP) perspective. While 92 specific risks on IT projects were identified from literature as described below, those risks served as a means to the end of having experienced project managers describe how they believe risk should be handled. In the next section of the paper, we review prior work in IS research and describe the PMBOK® approach to project risk management. We then describe the establishment of a list of IT project risk factors and their subsequent examination by PMPs in executive seminars. Results described include the PMP ranking of risks by category as well as an examination of top risks for avoidance/mitigation strategies. Finally, we describe how to use the strategies both by creating a project management system with defined roles and by describing how to use the strategies at key points during a project's life. We felt that this was important since authors, such as Jedd [9], indicate that time is a critical factor in identifying, evaluating, and monitoring risk on IT projects.

BACKGROUND

Effective project management (PM) is vital to the success of any software development project. In fact, the management aspects of a project are typically more critical to its success than the technical aspects. Leung [11] identified the top ten common good management practices in Hong Kong and China. At the top of the list was the need to have a software project manager for each project. Among the list of management practices surveyed was the need to complete formal assessment of risk, benefits, and viability of projects prior to contractual commitment. In a comparison of management practices across Europe, Hong Kong, and China, the adoption rate for formal risk assessment measures was 73%.

The effective application of project management tools, including project risk management techniques, is necessary, but not sufficient. Critical to the success of projects and the professional

project management is the ability to continually enhance the underlying knowledge base. In a study of knowledge transfer mechanisms, Karlsen and Gottschalk [10] found a significant correlation between serial, strategic, and expert transfer of knowledge and project success. Expert transfer takes place when generic and explicit knowledge is transferred from an expert source to enable a project team to solve new problems applying new knowledge and new methods. The PMP in an organization is frequently the expert involved in knowledge transfer related to project management.

Organizations are being driven, by regulatory and commercial pressure, to spend more than ever on technology to manage risks. The TowerGroup estimates that outlays for risk management technologies will exceed $40 billion in the mid-2000s [12]. In order to increase the success rate of IS projects, managers must assess risks early and constantly throughout the life of the project. Proper risk assessment requires understanding what the risks are and which of these risks is most critical.

Identification of Software Project Risks

Using a rigorous, systematic approach, Schmidt, et al [15] developed an "authoritative" list of 33 risk factors using input from 41 practicing project managers. Comparison of the list of risk factors with those generated in previous studies suggests that this list is fairly comprehensive and nontechnical. The list of risk factors was organized into 14 groups based on the source of the risk and subsequently ranked in order of priority.

From this comprehensive list of risk factors, a set of risk factor groups was developed. Groups created are consistent with five risk groups previously established by Barki et al. [2]. Risk groups created include corporate environment, sponsorship/ ownership, relationship management, project management, scope, requirements, funding, scheduling, development of process, personnel, staffing, technology, external dependencies, and planning.

In a survey of IS executives, Oz and Sosik [13] collected quantitative and qualitative data concerning reasons why IS projects are abandoned. They identified 30 reasons for IS project abandonment. Five factors emerged from a factor analysis of surveys: lack of corporate leadership, poorly communicated goals/deliverables, inadequate skills and means, poor project management, and deviation from timetable/budget.

Fairley and Wilshire [5] in a unique examination of the sinking of the Royal Swedish Navy ship Vasa, parallel the problems of the Vasa project to the problems common to large software projects and offer antidotes. Table 1 summarized these software project risks.

Project Risk Management

The *PMBOK® Guide* — 3rd edition [1], defines Project Risk Management as "the processes concerned with conducting risk management planning, identification, analysis, responses, and monitoring and control on a project". Project Risk Management then involves the systematic process of identifying, analyzing, and responding to project risk. Project risk involves understanding the potential for problems as they might impede project success. In a study of project management maturity by industry group (including information systems) and knowledge area, project management risk ranked 7th among the eight core and facilitating functions examined. Of the four industries included, risk in the IS area ranked lowest in level of maturity (2.75 on a 5 point scale)

The objectives of project risk management are to minimize the probability and impact of potential risks while maximizing the probability and impact of potential opportunities. As described in the PMBOK® [1], project risk management processes include:

- Risk management planning — the process of deciding how to approach, plan, and execute risk management activities for a project
- Risk identification — determining which risks are likely to affect the project and documenting their characteristics
- Qualitative risk analysis — the prioritization of risks for further analysis and detailing their probability of occurrence and impact

Table 1
Literature Comparison of Software Project Risks

Schmidt, Lyytinen, Keil, and Cule	Oz and Sosik	Fairley and Willshire
Lack of top management commitment to the project	Poorly communicated goals/deliverables	Excessive schedule pressure
Failure to gain user commitment	Lack of corporate leadership	Changing needs
Misunderstanding the requirements	Inadequate skills and means	Lack of technical specifications
Lack of adequate user involvement	Poor project management	Lack of a documented project plan
Lack of required knowledge/skills in the project personnel	Deviation from timetable/budget	Excessive and secondary innovations
Lack of frozen requirements		Requirements creep
Changing scope/objectives		Lack of scientific methods
Introduction of new technology		Ignoring the obvious
Failure to manage end user expectations		Unethical behavior
Insufficient/inappropriate staffing		
Conflict between user departments		

- Quantification risk analysis — numerical analysis of the effect of identified risks on project objectives

- Risk response planning — development of options and actions to enhance opportunities and reduce threats (normally in the form of either strategies to avoid risk or to mitigate the impact if it occurs) to project objectives, and

- Risk monitoring and control — responding to changes in risk over the course of the project through identification, tracking and monitoring of risks, execution of risk response plans, and evaluation of their effectiveness

Royer [14] operationalizes the quantitative and qualitative risk analysis by instructing project managers to examine each risk by placing it into a category; estimating the impact if the risk event occurs; estimating the probability of the risk event; and analyzing when the risk can be expected.

An investigation of in-house software development practices describes active risk management as one of many necessary essentials in promoting project success. Using a sample of practitioners from financial, pharmaceutical, and insurance companies, Verner and Evanco [17] found that most developers and project managers perceive risk management processes and activities as creating extra work and expense; thus, risk management appears to be the least-practiced project management discipline. Through the use of logistic regression analysis, they found that risks managed throughout the project were among the best predictors of project success.

Project Risk Management has developed into an accepted discipline, with its own language, techniques, procedures and tools. The value of a proactive formal structured approach to managing risks and uncertainty is widely recognized. Many organizations are seeking to introduce risk management into their organizational and project processes in order to capitalize on the potential benefits. There are a number of areas where risk management needs to develop in order to build on the foundation that currently exists. One of the most important of these is the ability to measure effectiveness in managing risk. This measurement is often undertaken by project managers, many of whom are professionally certified.

The Project Management Professional

The PMP described in this study, is a professional certified through the PMI's project management certification program, a program designed to objectively assess and measure professional knowledge of project management. Initial certification requires an individual to have a combination of formal education and project based work experience of 4500 hours. PMPs must periodically re-certify to maintain their accreditation. The re-certification requires a member to accumulate a number of points for various activities. One method of accumulating points is to participate in a number of professional development activities. The workshop described here provided PMPs an opportunity to receive re-certification credit.

METHODOLOGY

In a previous study, key PMBOK® functions related to the IT discipline were extracted from the literature. Using a previously established research definition of project management and focusing on research specifically in the IT area, the lessons learned were identified as: the requirement for IS projects to include generally qualified project management professionals as well as business and technically trained project leaders; an empirically tested software risk assessment model (SRAM) for predicting outcomes of software projects; and identification of the top three IS project risk factors. These factors are the lack of top management commitment, failure to obtain user commitment, and misunderstanding of commitment [15].

Considering the implications of having project management professionals as a part of the IT development team and the risks associated with IS project success, we proposed to examine, in detail, the risks associated with IT projects and present these risks to PMPs to better gain their insight. For the purposes of presenting the risk factors to project management professionals for interpretation, a list of 92 risk factors divided into 9 groups was created. These risk factors were derived from the work of Schmidt et al [15], Oz and Sosik [13], and Fairley and Wilshire [5].

We collected the suggestions of experienced PMP practitioners that were participating in a PMI sponsored data collection and discussion seminar entitled "Cutting Edge IS/IT PM Research: Risk Factors Associated with Project Failure/Success". The group was made up of twenty-three individuals, all of whom are PMPs and who have a median of 12.4 years experience in IT project management. The experience ranged from 3 to 30 years. This data collection and discussion seminar was a concurrent track in a Regional PMI Professional Day and the participants self-selected to attend. The attendees collectively represent a wide variety of industrial, government, and consulting organizations. Participants were asked to examine risk factors presented in 9 categories of risk: corporate environment risks, funding and scheduling, requirements, personnel and staffing, project management, scope, relationship management, sponsorship/ownership, and a miscellaneous group.

Participants were randomly assigned to examine the risk categories. Working individually at first, participants were asked to rate each risk in their area as high, medium, or low. Any risk that was rated low by all individual raters was then dropped from further evaluation. The resulting list was comprised of 70 high or medium rated risk factors. Upon the completion of this task, the PMPs were organized into small groups, by risk category, to rank the risks from highest to lowest. Participants were asked to consider both the probability of the risk event happening and the consequences to a project if it did happen. The result of this analysis was the PMP's overall perception of risk to the success of IT projects.

PROJECT MANAGEMENT PROFESSIONALS PERCEPTION OF RISK FACTORS

Now we turn our attention to the top rated risk in each category (according to our participants) along with the avoidance and mitigation strategies they propose for dealing with each. The PMBOK® describes risk avoidance and risk mitigation as techniques associated with risk response planning designed to enhance opportunities and reduce threats to a project. Risk avoidance techniques are meant to either eliminate the risk or protect the project from the impact of the risk. Time, scope, quality, or cost objectives may be relaxed as part of the avoidance technique. Alternately, risk mitigation techniques intend to reduce the impact of an existing risk to an acceptable threshold

Table 2
Top Rated Risks

Risk Category	Top Rated Risks
Sponsorship/Ownership	Project has inadequate top management commitment.
Funding and Scheduling	Entire project must be budgeted at the outset.
Personnel and staffing	Project lacks enough staff or those with the right skills.
Scope	Requirements are ignored for the sake of technology.
Requirements	Project changes are managed poorly.
Relationship Management	Project fails to satisfy end-user expectations.

[PMBOK number]. Table 2 shows the risk categories along with the top rated risk in each category. First we will address each of the top risks individually, and then comment on them as a group to summarize. When we address each risk individually, we list separately the avoidance and mitigation strategies. Fretty [6] claims failure is being designed into many projects due to lack of sufficient avoidance strategies. While our participants identified both types of strategies, they identified more avoidance strategies.

To that end, we have now collapsed what were previously nine categories into six. Royer [14] states that every organization should establish their own risk categories based upon their unique needs. We simplified our categories since three pairs of the categories were observationally very similar (almost identical top rated risk) and a large overlap in strategies as to how to deal with the risk. For example, the category corporate environment's top risk is "project has a weak or lacking champion in senior management" and the top risk in the sponsorship/ownership category is "lack of top management commitment to the project". We combined these into "inadequate top management commitment". Similarly, the requirements top risk factor of "project changes are managed poorly" and the project management top risk factor of "not managing change properly" were combined. Finally, we combined the top scope risk factor of "users and developers ignore business requirements and develop systems for sake of technology" and the top miscellaneous category risk of "introduction of new technology".

Sponsorship/Ownership Risks

Sponsorship/ownership risks include such factors as corporate management's loss of interest in the project, the project has a weak/lacking champion, lack of corporate leadership, an unstable corporate environment, failure of corporate management to make decisions at critical junctions, lack of client buy-in to the project, conflict between user departments, and unethical behavior. The top risk in this group is the project may have inadequate top management commitment. Table 3 shows suggested strategies for dealing with inadequate top management commitment.

Many of the suggestions for dealing with inadequate top management commitment are avoidance strategies — that is trying to head the problems off before they become severe. Most of these strategies involve the role of the project's sponsor. Carr, et. al., [3] assert that the sponsor should set the project team's goals and vision, encourage and support the project team, and remove roadblocks. These strategies include trying to create the role of the sponsor, work around a weak or missing champion by having other roles such as the customer or project manager fill part of the traditional sponsor role, going over the sponsor's head, replacing the sponsor, forcing the sponsor or the steering team to either back or cancel the project, and several specific suggestions for developing and maintaining communications. There were also a few mitigation strategies suggested. These included continuing to secure commitments or refusing to continue work and continuing to use the communications that were established as avoidance strategies.

Table 3
Sponsorship Ownership
Inadequate top management commitment

Avoidance Strategies

Steering team should communicate the strategic value of the project.
Establish an executive project sponsor.
Emphasize the project benefits to the steering team.
The sponsor should ensure that the steering team is committed or drop the project.
Provide communications to the sponsor and customer as to the value of the project so they can sell it to their management.
Get a clear go or stop the project.
Communicate the project status frequently to all stakeholders.
Secure a working relationship with an "influencer" of the weak sponsor.
Project manager should take the lead and just involve the sponsor for approvals.
The customer may need to fill in and provide support.
Replace the sponsor or cancel the project.
Keep project benefits visible to senior management through short, in-person, informal meetings.
Identify weak links and resolve issues that could hinder project performance.

Mitigation Strategies

Obtain signoff on commitments or escalate.
Stop the project. Meet with the sponsor and management to make a go/no go decision.
Work with the sponsor and customer to understand the reasons for lack of commitment.
Establish and review management's expectations.
Bring management back on board using alternative communication methods.
Challenge the steering team to vote whether to continue the project.

Funding and Scheduling Risks

The funding and scheduling category contains risks such as: requires budgeting the entire project at the outset leading to under funding in later years, under funding of development, use of artificial deadlines, under funding of maintenance, deviation from budget, and having a user lead the project. The top ranked risk is that the entire project must be budgeted at the outset of the project.

Table 4
Funding and Scheduling
Entire project must be budgeted from the outset

Avoidance Strategies
Plan the project in phases. Detail the current phase only.
Develop the plan as the phases progress.
Budget the project one phase at a time.
Link funding to the planning horizon.
Projects should be estimated against phases.
Develop a resource allocation plan that supports the project plan.
Add in adequate contingency to maintain the project.
The initial budget should be understood as just that.
Mitigation Strategies
Re-evaluate the project cost-benefit, crashing, and other options.
Review funding at each phase gate to determine funding requirements for subsequent phases or years.
Use the change management process to approve added funding.
Perform risk assessment and communicate the results to all stakeholders.
Communicate the budget and schedule risks.
Explain shortfalls to the sponsor and customer and the need for additional funding.

Table 5
Personnel and Staffing
Project lacks enough people or those with the right skills

Avoidance Strategies
Determine project needs for each position. Review skills of those already assigned. Replace as required.
Early on in the project validate resource requirements and then evaluate available skill sets. Match resources. Recruit to fill gaps.
Use a roles and responsibility matrix to identify problem areas.
Do not commit to the project without appropriate skills.
Consider skill requirements in risk assessment.
Mitigation Strategy
Staff to meet requested deliverables or reduce requirements.
Try to get cross-project experience or external support on a temporary basis.
Document staffing gaps and secure approval to address them.
Replace team members or, if there is enough time, retrain them.
Re-assign people.
Work with the project team to determine how to get around the shortage.

The strategies to avoid this problem of insisting that the entire budget be approved at the project's inception include using an alternative phased approach to planning and budgeting projects, adding adequate contingency funds, and understanding that initial budgets are not very precise. Strategies for mitigating the impact should a project be under funded include periodically re-evaluating plans and budgets, using a change management process, continuing to perform risk analysis, clearly communicating budget and schedule risks, and getting the customer to commit to further funding or limit the project.

Table 6
Scope
Requirements are ignored for the sake of technology

Avoidance Strategies
Conduct a project feasibility study to determine its expected benefit to the business.
Link the business case to the business rules that are outlined in the functional requirements.
Validate the business case by having the executive sponsors prioritize the project based upon its business value.
Project should be rejected in the selection phase.
Reset expectations and proceed as a prototype.
Research and/or pilot new technology before rolling it out to the entire organization.
Analyze risk to meeting requirements.
Define alternatives if new technology is unsuccessful.
Look for another project.
Mitigation Strategies
Force re-evaluation of the project with top management.
Stop the project until you get a clear business case and understand the project's benefits.
Research alternative technologies and compare the justification for each.
Implement an alternative that was defined in your risk plan. Analyze its impact on cost, schedule, and scope.
Ask the marketing department to find a market for the "lost" technology.
Kill it.

Personnel and Staffing Risks

Personnel and staffing risks included the projects lack of enough people with the right skills, lack of required knowledge/skills in the project personnel, lack of available skilled personnel, incompetent IS professionals on the team, infrequent meetings of the project team, and excessive use of outside consultants. The highest rated of these was the first — the project lacks enough people or those with the right skills. Strategies for avoiding and mitigating the impact of this risk are shown in Table 5.

Strategies to ensure enough people with the right skills include determining the resource requirements, assessing the skills of those already assigned, recruiting to fill gaps, using a roles and responsibilities matrix to identify problem areas, and ultimately not committing to perform the project if you do not have the right skills available. If the project is underway and resource problems surface, mitigation strategies include reducing the scope if you cannot add sufficient staff, obtain temporary resources, replace or reassign people, and work with your existing team to determine how to overcome the shortage.

Scope Risk Factors

In the scope category, the top rated risk factor is the project may not be based on a sound business case (and the impact is business requirements are ignored for sake of interesting technology). Additional factors include objectives are unclear or misunderstood, scope tends to creep, requirements tend to creep, and

Table 7
Requirements
Project changes are handled poorly

Avoidance Strategies
Perform organizational readiness exercises prior to a major project.
Assign an experienced project manager skilled in change management and monitoring progress.
Develop a clear, concise, and agreed-to charter before starting work.
Establish a clear change control process.
Establish a project change control committee and chairman.
Require sponsor approval of changes.
Require steering team approval of major changes.
Use and track earned value measures in evaluating project status.
Mitigation Strategies
Discuss with stakeholders.
Follow rules, procedures, and processes for handling changes.
Meet with customer and sponsor to review the change management plan and adjust if necessary, but more likely renew commitment to the plan.
Immediately assess the change control plan. Fix breaks in the current plan.
Evaluate the impact of change requests to schedule, budget, and ROI – then send to management for approval.
Revisit requirements, obtain approvals, and signoff baseline requirements.
Ensure the change control manager and team understand the process.
Add project management resources and re-do tasks not done properly.

changing needs are introduced when the project is already underway. Table 6 shows strategies for dealing with requirements that are ignored for the sake of technology.

Chasing technology instead of satisfying legitimate requirements can be avoided by using strategies such as conducting feasibility studies to determine expected benefit, validating the business case for the project with your sponsor, rejecting unworthy projects at the outset, piloting new technology before rolling it out, and defining alternative approaches to satisfying the legitimate business needs of the organization.

If problems arise when a project team ignores a requirement, top management should re-evaluate the project, stop the project if a strong business case cannot be developed, direct that an alternative approach be used, and kill the project if necessary. If the project team has started to develop a technology that does not support the business case but appears to be promising, top management may elect to roll this technology into a new project aimed at a market for which a business case can be justified.

Requirements Risks

Requirements risk factors include no agreement on goals, lack of understanding users' needs, not freezing the requirements, not identifying risks and contingency plans, not exerting proper control, having unclear lines of communication, and handling project changes poorly. The practitioner experts rated the final risk — handling project changes poorly as the top risk in this category. Strategies for dealing with this are shown in Table 7.

Strategies for avoiding the poor change handling that plagues some projects start with assessing your organization's readiness to execute a major project. Providing your organization is capable, assigning an experienced project manager is the next suggestion. Following this should be several typical project management practices of agreeing to a good charter before proceeding, establishing a change control process, determining in advance when you need to obtain approval from your sponsor and steering team, and agreeing to track progress and the need for changes.

Once the project is underway, follow the rules you established regarding changes and their approval, meet regularly with your sponsor and customers to discuss potential changes and secure their approval, evaluate the impact of potential changes, and redo any task that was not completed properly.

Table 8
Relationship Management
Failure to meet user expectations

Avoidance Strategies
Ask end user to participate on the steering team so feedback on expectations can be heard in time to address problems
Set clear requirements for scope in the project charter.
Hold design reviews with client to ensure needs are met.
Develop an approach to get feedback during the project.
Use requirements gathering sessions.
Include the right stakeholders in the requirements gathering process.
Define clearly scope and schedule.
Communicate the scope and schedule to all stakeholders.
Set up customer reviews at key milestones to ensure expectations are being met.
Mitigation Strategies
Include key stakeholders as soon as you notice a lack of expectation.
Meet with customers face-to-face to review expectations. Put them in writing and secure agreement by all.
Revisit scope and customer requirements.
Get sponsors to understand the problem so they help communicate the problem with customers.
Conduct "level set" meeting with customer and evaluate the impact on the project.
Review and enhance communication.

Relationship Management Risks

Risks that have been identified with managing project stakeholder relationships come from Schmidt et al [15] and include expectations are mismatched with deliverables, lack of cooperation from users, failure to identify all stakeholders, lack of appropriate experience from user representatives, and higher user expectations due to their growing sophistication. Ultimately, these all lead to the top rated risk which is failure to meet user expectations. This risk and strategies for dealing with it are shown in Table 8.

Methods to prevent a failure to meet user expectations include asking the user to be part of the steering team in order to obtain feedback quickly, set clear expectations in the project charter, hold requirements sessions with the user, hold design reviews

with the user, and generally work imaginatively to ensure all key stakeholders have been identified and that you obtain their input early and often. If you still fail to meet user expectations, as early as possible seek input from key stakeholders, meet with customers face to face, put agreements in writing, enlist the help of your sponsor, and improve project communications.

AVOIDANCE/MITIGATION FOR TOP RANKED RISKS

Collectively, the project managers offered many different strategies for avoiding and mitigating the impact of the selected risks. Sometimes similar strategies were suggested for more than one risk. We chose to present the strategies offered in a framework that is common to project management. That is, we first present strategies that deal with the entire project management system. Then we proceed with the strategies associated with each stage in the life of a project.

Many of the strategies for avoiding risks deal with establishing a project management system within the organization. The project management system suggested by the participants includes three executive roles: a steering team, a Chief Projects Officer, and a project sponsor. It also includes a project selection system and a stage-gate approach to planning and managing projects.

A steering team is often the general manager and their direct reports. This group of executives should collectively approve the selection of projects that best promote the organization's strategic plan, approve the choice of project sponsors and managers, offer general support and guidance as needed, and approve a project's movement through the various stages in its life. Specific strategies that were suggested for the steering team include selecting a sponsor, communicating the strategic value of the project, ensuring that initial budgets are treated as approximate and agreeing to review funding at each project stage or year, not committing to a project without assigning appropriate resources (including a sponsor and a project manager with enough experience), ensuring that a strong business case is made or the project is not selected, and considering spin-off projects to take advantage of developing technology.

A Chief Project Officer is generally a member of the steering team and is responsible for the selection and coordination of all project activity within the organization. Often this person has a different title and additional responsibilities, but the key is to have one person with organizational clout responsible for all of the organization's projects. The Chief Projects Officer may facilitate such strategies as assessing the organization's ability to conduct a major project, working with someone who has influence over a weak or reluctant sponsor, replacing a sponsor, canceling a project, determining resource needs and securing approval to fill them, developing approaches to secure feedback soon enough to use it, and forcing a project to be re-evaluated by the steering team to either change or cancel a troubled project.

Project sponsors are also generally executives who serve on the steering team. Sponsors are frequently too busy to work a substantial amount of time on a project, but have power within the organization and have a strong interest in the successful outcome of the project. Sponsors help select and mentor the project manager, provide guidance and support as needed, and help the project behind the scenes. Specific strategies proposed for sponsors include emphasizing benefits of the project to the steering team to ensure their initial and continued commitment, selecting project managers and teams with significant experience and working with them to overcome resource shortage issues, ensuring the link between the business case and functional requirements is clear and well understood by all participants, working with the project team to develop and commit to a clear project charter, and numerous strategies dealing with ensuring that communication and control are sufficient.

Projects, undertaken to create a unique product, service, or other result, are the vehicles for organizations to achieve their goals. As such, they should be carefully selected. Ensuring that approved projects are truly necessary helps the organization both by ensuring resources are spent in an effective manner and by establishing the justification for projects that will lead to commitment. The commitment is essential since many projects will have trying times and need workers to give extra effort to successfully complete their work. Suggested strategies dealing with proper project selection were to only select a project if the organization is assessed as being capable of handling a project of that size and complexity, a convincing business case be articulated, the project is prioritized, enough staffing is available, and a feasibility study is conducted if the project involves untested technology.

The final part of a project management system proposed by several of the project managers is a stage-gate system for planning and managing projects. This means each project will go through several defined stages and at the end of each stage is a gate that must be passed via approval of some kind before the project is allowed to progress to the next stage. Our other suggestions deal with specific actions that should be implemented during each stage to actively manage risks. This is consistent with current project management thought leaders such as Hoffman [8] who asserts that project management requires a closed-loop system to continuously identify, assess and respond to risks. For simplicity, we use a four-stage model of initiating, planning, executing, and closing projects.

Stage-Gate Project Management

In the initiating stage, the overwhelmingly popular suggestion was to have the project team write a charter and to get their sponsor to approve it. A project charter is a simple, signed agreement between people performing a project and a representative for those who will use the output. It is frequently only two or three pages long. A charter forces the project team and champion to develop a common understanding about the project and creates enough visibility that if a project approach is not sound, the project can be cancelled before it progresses any further.

The project managers suggested including several specific sections to a charter. First, a business case (why are we doing this project) needs to be included both to allow for smart project selection and to enhance buy-in. Second, clear goals, requirements, and deliverables must be outlined so that everyone is trying to accomplish the same thing. Third, the project team must understand the needs of their users — how will the system being developed be used? Fourth, the team should uncover as many risks as they can, determine which are significant, and decide how to either avoid or mitigate them. Fifth, there should be a clear understanding of roles and responsibilities — who will do what. Sixth, metrics should be established so the project team knows how their work will be judged and so they can tell as they progress whether their progress is satisfactory. Seventh, the project team should decide how they will operate as a team — how will decisions be made, how communications will be conducted, and how will they treat each other. Eighth, the project team should decide on a change

management system so they are able to monitor progress, make decisions regarding changes, and manage the inevitable changes that will be thrust upon them. Ninth, the team should look at the work of recently completed projects to determine lessons learned — how would they repeat methods that worked and avoid problems other projects had. Finally, the team and the sponsor should sign the charter to gain a sense of commitment so they will be willing to work extra hard to overcome the difficulties that arise.

The project managers also suggested several methods for planning projects that will be helpful in avoiding and/or mitigating risks. First, there should be requirements gathering sessions with the users to determine, in detail, the entire user wants and needs. This is the essential first step in planning so the team can understand who all of the stakeholders are and prioritize their requirements. The team then needs to construct a work breakdown structure (WBS). This is the document that breaks the project into all the small deliverables that must be created. The team needs to use the deliverables identified in the requirements gathering sessions as a starting point and continually ask — are there any more detailed and/or interim deliverables that must be created?

Once the WBS is complete, it is used as the basis for determining resource requirements, schedule, budget, risk analysis, and control systems. For each identified deliverable in the WBS the team needs to ask how would we create that? What tasks are required? The team then needs to assign clear responsibility for each task identified in the WBS. A roles and responsibilities matrix may be developed for this. Even tasks that multiple people will work on need to have one person assigned as the primarily responsible party to avoid missed work and finger pointing later. Also once the WBS is complete, the tasks can be scheduled.

Three types of logic need to be considered: the logical order in which the tasks must be completed, the resource (people) who will complete each task, and any imposed dates (often the users determine certain dates for reviews). Budgets are yet another essential planning and control device that can be established once the WBS is complete. The project manager needs to know the budget to avoid any funding misunderstandings later with the user. For long-term projects with many unknowns, there may be only enough certainty to develop detailed schedules and budgets for the first phase at this point. Quite a few of the strategies identified were variations of this theme – don't commit too soon to too much detail.

The team can also perform a detailed risk analysis once the WBS is complete. This is similar to the risk identification in the charter, but in more depth. Now that more details have been uncovered regarding all of the work activities that must be accomplished, the team can look in more detail at all of the risks. Just as the high-level risk identification in the charter sometimes would encourage a project to be performed in a different way or not select a project at all, this detailed risk analysis can help a team decide to use a different approach, create contingency plans, or cancel a project entirely.

The project team should also develop a communications plan for their project. This asks the questions who needs to know something about the project, what does each need to know, when do they need to know it, and what is the most effective method for them to understand it? The communications plan should include work authorization and deliverable approval methods. Communication plans are vital since many projects fail because of poor communications. The final planning tool that is helpful is the project kick-off meeting. This meeting is conducted so that all interested parties can first hear the detailed plans and the progress to date on the project and can ask any questions they have. This is a last chance to get everyone together to develop the common understanding and buy-in that are so critical to project success.

The project execution stage on IS projects often is two or more sub-stages (such as develop, code, and test). Nevertheless, the main goals during this stage are to perform the agreed upon work and to manage the users expectations. Keys to managing risk at this stage are to use several of the documents that were developed earlier such as the charter including the change management portion and the communications plan including the work authorization and deliverable approval portions.

The project managers suggested two primary tactics during the project closure stage. First, is to continually build relationships with the users. This allows the users to better understand how to use the developed system and to be more comfortable with the development team. That leads to the second tactic — capturing lessons learned. The lessons will enable the project team to perform their future projects better and will help the users feel better about their experience.

CONCLUSION

The failure of IT systems development projects has been well documented. While there are many reasons for these failures, they can typically be categorized as cost, time, and performance (quality) issues.

As a way to help overcome these project failures, the literature was examined to identify those risk factors that plague the systems development process. The result was a list of 92 risk factors that were presented to members of the PMI for ranking. The result of the ranking was the categorization of systems development risk factors as well as the judgment of their perceived importance of each specific risk within each category. Subsequent to the submission of this manuscript, Wallace, Keil, and Rai [18] developed and tested an exploratory model of software project risk and project performance. Grounded in sociotechnical systems theory, six dimensions of software project risk were identified: organizational environment risk, user risk, requirements risk, project complexity risk, planning/control risk, and team risk. These results are consistent with the systems development risk factors identified here and include the added dimension of solicitation of avoidance and mitigation strategies for each category.

This study, through its rigorous analysis, will help systems developers to avoid the pitfalls commonly associated with project failures. We encourage other researchers to conduct similar studies in the future since IT challenges are constantly evolving and new strategies should be developed to actively avoid and mitigate the changing risks.

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