Risk Management: The Undiscovered Dimension of Project Management

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It must be remembered that there is nothing more difficult to plan, more deceitful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institution, and, moreover, the labors of those who would gain by the new ones—Machiavelli (The Prince, 1513).

Experience has shown that risk management must be of critical concern to project managers, as unmanaged or undermanaged risks are one of the primary causes of project failure. What we know, we plan for and are more often successful than not. However, without mitigation, risks will introduce chaos and failure into an otherwise well-planned and managed project. This paper addresses the underlying process of successful risk management: the identification, mitigation strategy and contingency planning, and ongoing management of project risks. It is designed to provide additional techniques for practicing project managers and to provide risk management awareness for their client sponsors.

Numerous texts address risk management and statistical methods to calculate a range of “estimates” to account for the duration risk of activities in a project task network. In addition, project management software and other tools help deal with the operational problems of resource allocation. A list of useful tools that apply mathematical rigor to the uncertainty of task planning and scheduling is supplied at the end of this paper. However, none of the techniques assume that risks are identified and can be uniformly addressed by increasing project time frame or resources. Unfortunately, these assumptions don’t always hold true.

Managing a successful project is like walking the high wire, a complex balancing act fraught with competing distractions. The successful tightrope walker has years of practice and starts training on a “low” wire. Much attention is paid to the setting of the guy wires and support poles to provide a predictable tension on the high wire. Moreover, intense focus is required for the task at hand and to ignore the noisy crowds. A prospective tightrope walker who has not gained competence through experience and who has not properly set up the tightrope environment is sure to fall.

Likewise, rare is the project manager who can deal with the inherent risks, distractions, and complexities of project management without detailed plans and processes. Unfortunately, risk management is not always approached with the rigor of other project management processes (i.e., scope, change management, issue management, conflict resolution, deliverable-based work breakdown development and scheduling, etc.).

Over time, many project managers learn to manage risk by denial, sidestepping, and attempting to shield themselves. They develop various patterns of behavior to fend off the impact of risk-based failure, such as:

- Adding nonjustified contingency time, money, or resources to the project plan (i.e., “padding” the estimate)
- Pointing fingers and placing blame elsewhere
- Begging forgiveness and renegotiating scope when the “unknown” occurs
- Taking shortcuts in quality assurance activities in an attempt to avoid risk impact or missing milestones
- Eliminating infrastructure deliverables (e.g., training, metadata documentation)
- Reacting with a “It’s just one of those things” behavior and expecting the client to accept it.

The trouble with these behaviors is that there is no learning and, therefore, they tend to be repeated.

All of the above behavior patterns are reactive, lead to project failures, and serve to weaken the credibility and confidence of the project manager. I am not about to suggest that there are not unforeseen circumstances that can seriously impact a project. However, there are steps that a project manager can and should take to mitigate and minimize the impact of “foreseeable” risk-based failure.

Before exploring the steps to successful project risk management, it’s useful to examine the characteristics of some project environments. The project manager is selected from the ranks of successful “doers.” Correspondingly, membership on a project team comes as a positive recognition of past work and success. It naturally follows that project team planning and environment perceptions are positively focused (i.e., the project manager and team members are optimistic, positive individuals who believe they can do anything, without regard to time or resources). This does not imply failure, as many projects are successfully completed by “super-human”
efforts of a few individuals. However, over-optimism represents a "Pollyanna" management approach and can lead to disaster.

During the project proposal and planning phases, the project manager draws on past personal experience, the project team, and the client community to develop a project plan. Generally, a series of "brainstorming" sessions are held to define goals and objectives, fix boundaries of the project (i.e., scope), quantify deliverables, develop a project life-cycle approach, and set the timetable, milestones, budget, and resources. This is the point in the project life cycle where risks should be identified and mitigation strategies developed; however, this often doesn’t occur. Many reasons exist for not spending the time and energy to carefully examine risks:

- Quantifying risks could lead to nonfunding of the project.
- Client doesn’t want to spend the time and energy.
- Client doesn’t believe the risks are real, anyway.
- Client wants a simple plan.

I believe there is another underlying force at work, too. The sociological trends of our society and current philosophy of team building emphasize the need to be positive—problems are opportunities; risks are challenges to be overcome; negative thoughts are socially suppressed. In this environment, to emphasize risks is to be labeled as a negative thinker and noncontributor—almost a pariah. It’s as if we’ve forgotten a basic survival instinct—risk aversion. Our evolution from the savanna plains of Africa was a systematic process of learning to avoid risks. Risk adverse behavior is a survival trait and should be included as a balancing factor, even in the sophisticated civilization of today.

I want to emphasize that there are positive, proactive steps to manage risk. The remainder of this paper will focus on the steps that a project manager can take to classify and identify risks, measure their impact, develop strategies to mitigate them, and plan for appropriate contingencies to minimize the impact of manifested risks. When practiced consistently within an organization, these steps can form the basis of a formal project risk management methodology.

In my experience, risks can be divided into two classes: recognizable risks and unmanaged assumptions.

Recognizable Risk Classification and Mitigation

Recognizable risks are those that can be identified during planning and engagement contracting activities. For the most part, they are highly visible and immediately apparent to everyone (or at least someone) involved with the project. Typical examples include new technology, financial resource constraints, staff resource limitations, changes to business process, etc. Historically, mitigation strategies have often been put in place for these kinds of risks.

Unfortunately, mitigation strategies can introduce risks of their own. For example, if the project calls for the introduction of new technology, training could be included in the project plan as a risk mitigation strategy. However, while training is necessary to acquire new skills, it is usually not sufficient. That is, coaching, mentoring, or at least the ready availability of an experienced practitioner is often required to ensure skill transfer and proficiency in a short period. Therefore, it would be advisable to include a contingency plan for an onsite expert or consultant, should the need arise.

It follows that as risks are identified, a risk mitigation plan should be developed and implemented. Further, a contingency plan should be included for high risks with a triggering circumstance or measure defined to invoke it. It may not be necessary to plan the contingency action in detail at this time; however, it is important to know what should be planned based on an appropriate trigger (i.e., set of warning signs). Continuing the new technology risk example, if anticipated productivity measures are not met, the expert is called upon.

Both risk mitigation strategies and contingency plans cost time, money, and resources to develop and implement. Rare would be the project where every risk was manifested and every contingency plan triggered. In addition, project sponsors often don’t want to spend the time (i.e., money) for detailed risk mitigation planning. Consequently, it may be more appropriate to set an overall risk mitigation budget as a percentage of the overall projected costs, rather than detail costing each identified risk’s mitigation strategy and contingency plan. Industry experience suggests a 5% contingency budget for identifying and tracking risks. In addition, I would suggest at least a 5% risk mitigation contingency budget for those risks not preplanned and budgeted in detail.

Risk Identification Techniques

To properly manage risks, they must first be "discovered." Two common techniques to accomplish this are experience-based and brainstorming-based risk assessment.

Experience-based Risk Assessment. The mark of a successful project manager (i.e., survival both organizationally and personally) is the ability to learn from experience (hopefully others’ experiences). The impact of mitigated risks encountered in past projects are imprinted indelibly in the psyche of the project manager and will be remembered in future projects. Why isn’t this knowledge resource more readily available to the new project manager?

As a manager and internal consultant for a large health care organization for many years, I experienced firsthand the continued relearning required of newly christened project managers. Upon examination, I realized that a major contributor to failure for uninstructed project managers was their naiveté about risk management. They were inevitably high producers, motivated to succeed, knowledgeable in the business, and well...
thought of throughout the organization. Why didn’t they all succeed? I would submit that many project management neophytes failed or decided not to follow a project management career because either the organization became impatient with the learning curve required to adequately mitigate risk or the stress of reacting to risks brought about premature burnout. If the project risk management experience of seasoned, successful project managers was readily available to the new one, then burnout and failure could be minimized. How can this be accomplished?

Project management texts, seminars, and consultancy-based methodologies stress the importance of project closure reviews as opportunities to increase an organization’s knowledge base. Unfortunately, closure activities, while frequently outlined in the project plan, are often only cursory executed. There is always too much to be done, a new project to start, or a new priority to address. Nevertheless, even if organizational culture minimizes the importance of project closure reviews, project managers should take it upon themselves to document their risk management experiences during the projects and proactively share them with other project managers. This experience can form the beginning of a project risk checklist so aid in examining potential project risks and prior mitigation and contingency plans.

Further, consulting organizations, ISO requirements, and the Software Engineering Institute Capability Maturity Model methods stress the importance of process definition, consistent implementation, and continuous improvement to increase organizational effectiveness. This should be applied to project risk management as well. If an organization will take the time to document risks and their mitigation strategies, review them at project closure (successful or not), and share them via a readily available knowledge repository, new project managers and the organization itself will be more successful.

Over time, information technology and management consultancies have recognized the value in building knowledge repositories from actual project experience to support their methodological approach to software development projects. Often included in these knowledge databases is a repository of risks commonly faced during the project life cycle. For example, Ernst and Young, in their Navigator System Series Automated Methodology Environment (AME), provide a standard set of project risk questionnaires for many types of software development projects. In addition, these risk questionnaires can be customized by the individual organization. When the risk questionnaire is completed, it automatically builds a project-specific risk database where high and medium risk items become risks for mitigation, and low risks become project assumptions. The AME tool provides the ability to associate risks with built-in or user-defined risk management strategies and contingency plans. At the conclusion of project planning, the AME tool generates a complete project plan document that includes the risks, mitigation strategies, and contingency plans. At project closure, the AME knowledge-repository database can be updated with results of risk management mitigation.

Brainstorming-based Risk Assessment. Facilitated brainstorming sessions with client stakeholders, project team members, and infrastructure support staff are the primary technique used to define risks and their mitigation strategies and contingency plans. The process defines risks in one column, mitigating strategy(s) in a second column, and potential contingency plans in a third column. Using this technique, one can readily determine where the organization is exposed to an unmitigated risk. This form of facilitated session is also known as “force-field analysis.”

Table 1 provides a short example of this technique. As can be seen in the example, the brainstorming session can identify multiple mitigation strategies or contingency plans for a risk.

Risk Classification. In the real world, there is neither money nor time nor resources to deal with all risks; therefore, management must choose which risks will have mitigation and contingency strategy plans developed and implemented for them. To enable this, it is important to develop an objective approach for classifying risks and establishing priorities. One approach is to examine each risk and classify it by the following three factors: category of risk, severity or impact on the successful completion of a project milestone, and probability or likelihood.

Risk Categories. Predefining risk categories provides a way to classify risks for inclusion in the organizational knowledge base. While every organization should establish its own risk categories based on its special needs, seven risk categories that I’ve found useful are Scope/Change management risk, operational risk, financial risk, project management risk, strategic risk, technology risk, and failed assumption.

Within any organization, certain risk categories may represent higher risks for project failure. For example, some organizations may have much experience introducing new technology and therefore understand how to deal with technology risks. On the other hand, another organization that has not introduced new technology for some time may need to be especially careful when doing so. It follows then that the risk categories themselves may have weighting factors assigned to modify the severity/probability risk-factor ratings. Such weighting factors may be of aid when quantifying overall project risk, but they are no substitute for proper risk mitigation strategy and contingency planning.

Risk severity relates to the impact on the project and business if the risk manifests itself and should be rated...
<table>
<thead>
<tr>
<th>Risk</th>
<th>Mitigation Strategy</th>
<th>Contingency Plan</th>
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</thead>
<tbody>
<tr>
<td>Lack of available project management skill</td>
<td>▪ Hire experienced project managers</td>
<td>▪ Establish project office and assign</td>
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<td></td>
<td>▪ Provide project management training</td>
<td>staff as aids to project manager</td>
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<td></td>
<td></td>
<td>▪ Provide project management mentors</td>
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<td></td>
<td></td>
<td>and coaching</td>
</tr>
<tr>
<td>Lack of skilled resources for programming</td>
<td>▪ Train staff</td>
<td>▪ Provide skill mentors and coaching</td>
</tr>
<tr>
<td></td>
<td>▪ Hire skilled staff</td>
<td>▪ Contract for missing skills</td>
</tr>
<tr>
<td></td>
<td>▪ Reprioritize skilled staff efforts to</td>
<td>▪ Hire additional skilled staff</td>
</tr>
<tr>
<td></td>
<td>align with strategic objectives</td>
<td></td>
</tr>
<tr>
<td>Too long between deliverables</td>
<td>▪ Create interim milestones</td>
<td>▪ Review significance of the</td>
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<td></td>
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<td>deliverables. If they’re worth the</td>
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<td></td>
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<td>effort than move them forward. If they</td>
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<td>should be delayed out some</td>
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<td></td>
<td></td>
<td>measurable time, then they should</td>
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<tr>
<td></td>
<td></td>
<td>not be part of the project.</td>
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<tr>
<td>Cutting edge, demanding technical effort</td>
<td>▪ Create series of technical prototypes</td>
<td>▪ Reduce complexity of technical</td>
</tr>
<tr>
<td></td>
<td>and &quot;prove as you go&quot;</td>
<td>architecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Increase temporal scope (i.e., time</td>
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<td></td>
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<td>frames) of project</td>
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**Table 1. Example of Risk vs. Strategy and Contingency Plan Analysis**

As well as quantifying risk severity and risk probability, other objective measures of risk should be considered. That is, where possible, the degree of impact on cost, schedule, and deliverable quality should be examined and quantified.

**Risk Mitigation Strategy and Contingency Plan Evaluation and Planning.** Table 2 provides an objective starting point for risk. First, all risks with either a high severity or probability should be examined in detail (i.e., severity/probability factor rating [SPR] of 3 or 2). They should have a mitigation strategy developed and included in the project plan and budget. If both the severity and probability factors are high (i.e., SPR of 3), then a detailed contingency plan with budget should be considered. If only one factor is high (i.e., SPR of 2), then it is probably appropriate to outline a contingency strategy with a trigger and leave the planning details until the contingency is triggered.

Next, for the areas with at least a medium severity or probability (i.e., SPR of 1), mitigation strategies should be developed. Then if monitoring shows an increase in risk during the project, a contingency plan should be considered.

Last, those risks with both a low severity and probability (i.e., SPR of 0) should have a metric established to allow monitoring. That is, the risk should be treated as a project assumption and dealt with in the same manner.

After developing mitigation and contingency strategies for the risks, it becomes the responsibility of the project manager and the assigned accountable person to provide continuous monitoring and risk status evaluation. For effective monitoring, a success measurement.
for the mitigation strategy and a "triggering" event that identifies when the contingency plan must be invoked to avoid or eliminate the risk. It is the mitigation success metric and triggering event that are tracked. In addition, throughout the life cycle of the project, the project manager, team members, and stakeholders should be alert for new risks.

Figure 1 represents a possible format for recording risks, their underlying assumptions, mitigation strategies, and contingency plans. Transforming this form into a database format would allow an even more automated method of capturing the risk management data, as well as providing an easy vehicle for reporting and administration. Such a database would provide the source for a risk assessment checklist, as mentioned earlier.

Aggregating Individual Project Risks. It would seem logical to sum the individual risks, calculate the average risk, and assign the average risk to the project as a whole. As long as the low-risk items are not included, this is probably a "safe" estimate. However, experience has shown me that high-risk items contribute more heavily to overall project risk and should be weighted more heavily.

The following formula may be more appropriate as it gives greater weight to the higher SPR:

\[ \text{Overall Project Risk} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (SPR_i)^2} \]

where the SPR are the individual n risk SPR.

To illustrate, Table 3 represents a project that has identified 10 risks. A simple average of the risks gives the result of 2.10. The overall project risk formula with n equal to 10 is computed as:

\[ \sqrt{\left(\frac{1}{10} \sum_{i=1}^{10} (SPR_i)^2\right)} = \sqrt{\frac{51}{10}} = 2.3 \]

Consistent with intuition and experience, the overall project risk formula results in a higher SPR than the simple average.

Another measure of aggregate project risk is the number of risks at each SPR level. For example, Table 3 identifies 10 risks for a project: 4 at SPR 1, 3 at SPR 2, and 3 at SPR 3. This represents 40% of the risks being high in both severity and probability and another 30% as high in at least one risk factor; this represents a potentially very risky project.

Additionally, the SPRs can change during a project's life cycle. By capturing the individual risk SPR change (i.e., SPR A), one can calculate the direction of change in aggregate SPR (either simple average or by the overall project risk formula). An increasing aggregate SPR would be an early alert that a project is getting into trouble and needs immediate attention to avoid failure.

Although members seem to represent objectivity, I would advise caution when relying on mechanistic calculations of overall project risk. The most important approach to dealing with project risk is to establish risk mitigation strategies and appropriate contingency plans and then to manage them.

Unmanaged Assumptions

In contrast to identifiable risks, unmanaged assumptions are neither visible nor apparent as risks and so can be the most dangerous. I believe they are introduced by organizational culture and that when unknowingly present in the project environment bring about incorrect perceptions and unrealistic optimism.

Assumptions are a fact. Every project management plan and methodology tells us to document our assumptions and to have them verified by the client or other sources. However, do we manage our assumptions? I would submit that we don't. Typically, when an assumption proves incorrect or a change in environment negates it, we "cry wolf" and fall back on the reactionary behavior described earlier.

Is this the best we can do? No! Assumptions should be managed in much the same way as risks, because, in fact, they are a new source of risk. To avoid surprise, assumptions about the project should also be documented and monitored to ensure that changing cit-
Figure 1. Project Risk Worksheet

A typical example of failing to manage assumptions was recently given to me by a colleague. A state agency was acquiring a document-imaging system to help modernize and automate its accounts payable process. The basic assumption was that the integration vendor could easily provide the agency with an application design and implementation to optimize the business process. Unfortunately, this was not the case, and the project timeframe began to lengthen as the vendor was forced to provide several iterative designs. This unmanaged assumption was recognized in time; so the project succeeded; however, there was much wasted time and sponsor anxiety generated before corrective action was taken.

What could have been done to avoid this situation? During the corrective action, it was recognized that an objective measure of the integration vendor’s progress would have surfaced the problem much earlier. For instance, if a time or iteration limit had been contractually specified, then corrective action would have been triggered earlier. The following possible corrective actions were discussed by the project team:

- Identify and contact with an experienced accounts payable document-imaging consultant.
- Allow for more design iterations in the project plan, as this was a pilot project.
- Differentiate between minimal system and process requirements and nice-to-have features.
- by examining the underlying assumption, defining an appropriate metric, and outlining corrective actions, the project could have proceeded without the stress generated by not recognizing that assumptions are risks that must be managed.

Assumption Identification Techniques. Project assumptions derive from three sources: experienced-based assumptions from prior project management exposure, those identified by brainstorming, and identified risks that have both a low severity and low probability.

Experience-based Assumptions. Not only does prior project experience give the project manager a source for risk identification and planning, but it also provides knowledge about assumptions that hold true within an organization and types of projects. For example, experience may show that any new technology implementation effort should have a cost contingency factor of 25%, or that sponsor availability can rapidly change during the course of a project. Appropriately documented, these are reasonable assumptions. However, they must be monitored and tracked for continued justification, as described in the following paragraphs.

Brainstorming-based Assumption Identification. Using the same brainstorming technique outlined earlier for risk
identification, assumptions can be identified, a metric to monitor continued applicability defined, and potential mitigation strategies examined. Table 4 provides an example of some typical assumptions with possible monitoring metric and mitigation strategies.

**Converting Low Risks into Assumptions.** The risk mitigation strategy and contingency plan evaluation and planning activity described earlier emphasizes that low-probability and low-severity risks should have a monitoring metric established for them. Once this is done, the risks can be reassigned as assumptions and tracked accordingly.

**Assumption Evaluation.** Having documented assumptions and identified a monitoring metric and potential mitigation strategy, it falls to the project manager and accountable person to periodically test the monitoring metric and ensure that no environmental change has occurred. If circumstances change an assumption to a risk, the established risk management process should be invoked.

Figure 2 represents a possible format for documenting assumptions, the monitoring measure, potential mitigation strategy, and the potential conversion to actual project risks.

**Enterprise/Program Risk Management**

In addition to establishing project risk management, an enterprise- or program-level risk management process should be considered. It is common for several major development projects to be occurring simultaneously across an organization. Moreover, similar risks may be encountered in these projects. If project risks are evaluated as previously described, then it becomes a simple, mechanical process to summarize them and examine the organizational implications of risk over all projects.

In my experience, if multiple projects have identified similar high risks (i.e., SPR of 2 or 3), then the potential impact on the organization as a whole is very high, even if interproject dependencies are low. Correspondingly, multiple medium project risks (i.e., SPR of 1), while not necessarily the highest concern to an individual project, represent a greater aggregate risk to the organization.

For example, if multiple projects are simultaneously introducing similar new technologies to the organization (e.g., client/server), then each project may rate the risk as either high or medium, depending on the project team skill set and risk-aversion mindset. Clients may only see or believe medium to low risk, if any, as the vendor marketplace has successfully exaggerated the "simplicity" of the new technology. It is certainly easy to envision (as well as demonstrate by past experience) that many or most of these new technology efforts will encounter difficulty and organizations will be forced to execute risk mitigation strategies and contingency plans.

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**Table 3. Example of Overall Project Risk Calculations**

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Monitoring Metric</th>
<th>Mitigation Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project scope is fixed by requirements definition in the project charter</td>
<td>Project change requests will not alter defined budget, resource or schedule by more than 5%</td>
<td>Reject additional change requests; Renegotiate budget, resources and schedule</td>
</tr>
<tr>
<td>Project team has sufficient experience in business area</td>
<td>Milestone deliverables are produced on schedule and meet quality metrics</td>
<td>Provide additional staff training; Provide mentoring</td>
</tr>
<tr>
<td>Project sponsor is readily available for issues/change request resolution</td>
<td>Issue/change requests are not resolved within two days</td>
<td>Delay project; Reaffirm sponsor availability via executive sponsor or steering committee; Change issues/change resolution accountability</td>
</tr>
</tbody>
</table>

**Table 4. Example of Assumptions Identification and Analysis**

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Figure 2. Project Assumption Worksheet

If the individual project risks with their mitigation strategies were examined from an enterprise-wide perspective, they would certainly be given greater weight. In addition, the organization can then act as a whole. For instance, a pilot project, which evaluates the new technology to establish its limits and usefulness, might be advisable and executed prior to each project proceeding. This would certainly provide lessons learned and avoid the costly impact of individual project risk mitigation and potential failure.

Conclusion
Successful project risk management will greatly add to the probability of project success. Identifying project risks and assumptions, documenting them, and including them in the overall project plans and processes is a justifiable activity. In fact, I would submit that it is a necessary one. At project closure, the project risk and assumption experience should be integrated into the organization's project management knowledge repository. In future projects, this knowledge base can serve as the starting point for risk identification and analysis. New and experienced project managers can use these past real-world experiences to reduce worry and burden and increase the likelihood of success.

Endnotes
For more information concerning project risk management, see the following:

Paul Rojer is a managing consultant with CIBER in Bellingham, WA. He has over 30 years of experience in the information technology field, including extensive practical and methodological experience in project management. He received his B.A. in computer science from the University of California at Berkeley. His industry background includes state and county governments and extensive experience in a large health maintenance organization.