A Fast, Easy Approach to Risk Management

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- ***Introduction of science metrics to planning and scheduling***
- ***A modeling approach to ensuring best practices in project planning***
- ***Managing risk by optimizing planning***
- ***Making large, complex plans manageable***

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A new method, based on quantum probability, is introduced to define the quality of project plans in terms of probable success

Complex project plans are created in the context of some very broad influences – how project sponsorship was developed, the team experience, the technical risk, and a host of other factors, including even the organizational maturity and internal decision-making process of the enterprise in which the project is carried out.

It is a given that it would be an unfair expectation for project managers to attempt to gain a complete understanding of how projects might behave subject to all these influences. Still, in terms of gaining an early understanding of the probability of meeting a target schedule, all these factors must, in the end, be reflected somehow as changes in task durations and dependencies.

One way to gain early understanding of how a project schedule might behave is to apply PERT/CPM to the schedule, followed by a Monte Carlo simulation to develop a distribution function for meeting the intended milestone. In this approach, a basic required input for each task is the expected duration, a minimum duration and a maximum duration. The problem here is the factoring of the influences – some of which are clearly unknown – into specific 3 point estimates. Even if there is some understanding of what the direct work estimates might be, it is well known that there is always a significant contribution from so-called “hidden work” that permeates through a project, not included on estimates of direct work, which is strongly dependent on such factors as the internal decision-making process, on how quality decisions might be made, and so on. Where would a program manager find this information?

Of course for any large project, even compiling 3 point estimates for the direct work is often an unrealistic burden, and equally important - and seldom discussed - is the fact that the method is mathematically unsuitable when applied to one-off tasks where there is no knowledge of the expected distribution.

This is the most attractive feature of the new quantum method: useful results can be obtained even with no new information or incomplete information. The method is highly abstract in the sense that the project is described as a physical structure, but allows a large number of project influences to be easily included without undue effort on the part of the project manager.

Tasks and their duration are constructed as though made up of packet waves, where the amplitudes of these waves are expected to be coherent at milestone dates. As shown in figure 1, each task contributes to meeting a given milestone in a way that is directly related to its coherence. When planned tasks slip from their expected duration, they are said to be perturbed, and their contribution to milestones will change, thereby affecting the probability function of the planned milestone. The process of evaluating milestone probability as a result of task perturbations is at the core of the approach.

What is exciting about this radically different approach is that it *does not* require additional duration estimates to be made, but still calculates a milestone probability distribution. In fact, there is good reason to believe the analysis is *actually more accurate*. It is well known, for example, that for large or complex projects, there are always a substantial number of task dependencies. These overlapping highly interdependent tasks cause projects to generate huge—and largely unanticipated—volumes of coordination overhead that is entirely hidden from a project Gantt chart. It is not planned or even acknowledged, yet these interdependencies are a key cause of project coordination difficulties and schedule slips. Traditional project management approaches and tools focus only on direct work, which tend to reinforce overly optimistic estimates.

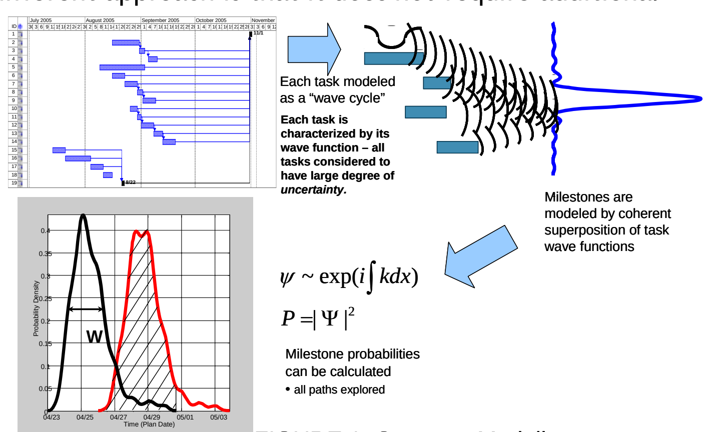

FIGURE 1: Quantum Modeling

What makes this new approach potentially more accurate is that for large projects it is not individual tasks that lead to failure, *but overall poor project structure,* where dependencies dominate. Further, it is project structure in the context of an organization's maturity, decision-making process, and communications ability that is important. This is exactly what can be easily captured by the quantum method, and what is completely ignored using conventional tools.

Using quantum probability, *all* scheduled tasks are assumed to be uncertain, and all tasks are modeled to "interfere" with one another in the same way that physical wave structures might interfere with one another. Certain project structures can be "brittle" in the sense that even small slips will cause milestone slip, while other projects are "robust" in that they will tolerate large changes in task duration.

The degree to which tasks might be uncertain and the importance of hidden work compared to direct work is modeled by considering a project as a network of tasks, whose functions are to pass on completed production work as though they are packets of information in order to complete milestones. These tasks are under the control of an external communications network that is dependent not only by the ability to coordinate and communicate between tasks themselves, but are also dependent on the organizational structure of the enterprise.

There has been significant and useful research done principally by Yam Jin and Raymond Levitt at Stanford (The Virtual Design Team: A Computational Model of Project Organizations", *Journal of Computational and Mathematical Organization Theory 2* (3), Fall, 1996) to try to quantify the coordination work in terms of extra work volume to extend given task durations. While taking the level of abstraction of projects to the task level will certainly lead to improvement, the advantage of the quantum model is that it allows significant predictions to be made with only very high level abstractions about the organization, about the environment in which the project resides, and about particular task classes.

Using the fact that these quantum probability estimates are fast and easy to generate for any project, Project executives have an enhanced ability to predict project results, and have better control over project approval decisions based on quantifiable, predictive data. The method has been shown to return useful results for any project for 50+ tasks, but the larger the project, the more powerful and useful it will be.

Ibico (www.ibico-cor.com) has proprietary predictive software based on quantum probabilities, and offers desk-top software that seamlessly works with any Microsoft Project File. In less that 2 minutes, a number of reports are generated, which are aimed at executive, managerial and operational groups. These reports detail the probabilities for each milestone, and also include specific recommendations to improve the project.