

***IEEE TMC Forum***  
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***How to Keep Engineering  
Projects on Track***

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# ***General Forum Purpose***



- ***Learning, Something to take home and use tomorrow***
  
- ***Share some of our experiences in these areas***

# ***Project Types Considered***



- This presentation discusses real, mixed talent, projects that use multiple skills not necessarily co-located
- Most of my experience is with real, combination hardware, firmware, FPGA, and software based products.

# ***What we will Cover Today***



- Only six of the “12 Best Strategies to Keep Engineering Projects on Track” are covered due to time limitations
- The total “12 Strategies” are defined next and are available on my website

# Summary of 12 Best Strategies



1. Learn to value the early days of the Project as if they were the same as the final days (XX)
2. Generate a Detailed Specification and System Block Diagram (XX)
3. Develop an approach to handle unk-unks (Risk Management Plus) (XX)
4. Determine high risk areas before beginning planning (Risk Management) (XX)
5. Generate a detailed Project Plan
6. Develop a practical method to track project progress and costs (XX)

# **12 Best Strategies (Cont'd)**



7. *Have periodic Project Review meetings*
8. *Give support to the project team*
9. *Follow up with upper management on agreements with team members*
7. *Take into account the almost inevitable project slips at Debug and Test*
8. *Have an approach for the almost inevitable project cost overruns*  
*(XX)*
9. *Develop a built in method of feedback for the next project*

## **\* *Value Early Part of Project***



- A day at the beginning of Project just as valuable as (or more valuable) than a day at the end.
- More Value = Time to Plan
- The Student Paper Problem?

# ***Student Paper Problem***



- Students are given an assignment for a report at the beginning of semester.
- They begin to work on the paper just a few days before it is due and put in lots of effort.
- A common problem in many projects
- Management focus is mostly on “final due date” not the intermediate milestones of the project

# ***Energy “Ramps Up” on Project***



- Project Starts off slow, then goes faster (The “Fuzzy Front End”)
- There is often “Early Project Drift” – Often other projects compete for resources = slow staffing
- Is the project really underway? How would you know it? -- Definition? Sponsor? Resources?

# ***Examples of Early Delay***



- A past project took six weeks to ramp up; the plan was two weeks - Loss of four weeks early on
- A poor initial spec had to be completely redone
- The planned in personnel resources with the appropriate skill levels were not available

# ***Reducing Early Delay***



- Get early management true “Sponsorship”
- **“Rev Up”** yourself and **Core** team early  
(Requires Public Relations and similar skills)
- Hold a Team Kickoff Meeting (Offsite?)
- Set an “early-on”, very visible, project milestone

# **\* *Generate Detailed Spec and System Block Diagram***



- The most visual early document is a clean System Block Diagram that shows the primary functional blocks, plus the Functional Spec.
- Decide on the level of detail in the Functional Spec and Block Diagram – a real judgment call
- Start with a less detailed Software Spec. Begin with an early functional and architectural approach – another judgment call

# ***Generate Detailed Spec and System Block Diagram (2)***



- Often the specification step is avoided due to lack of clarity on the product requirements.
- These ideally would be “signed off” by the major functional managers. (Often a tough task)
- Requirements often change throughout the project. Have a process for dealing with this, and it’s schedule impact.

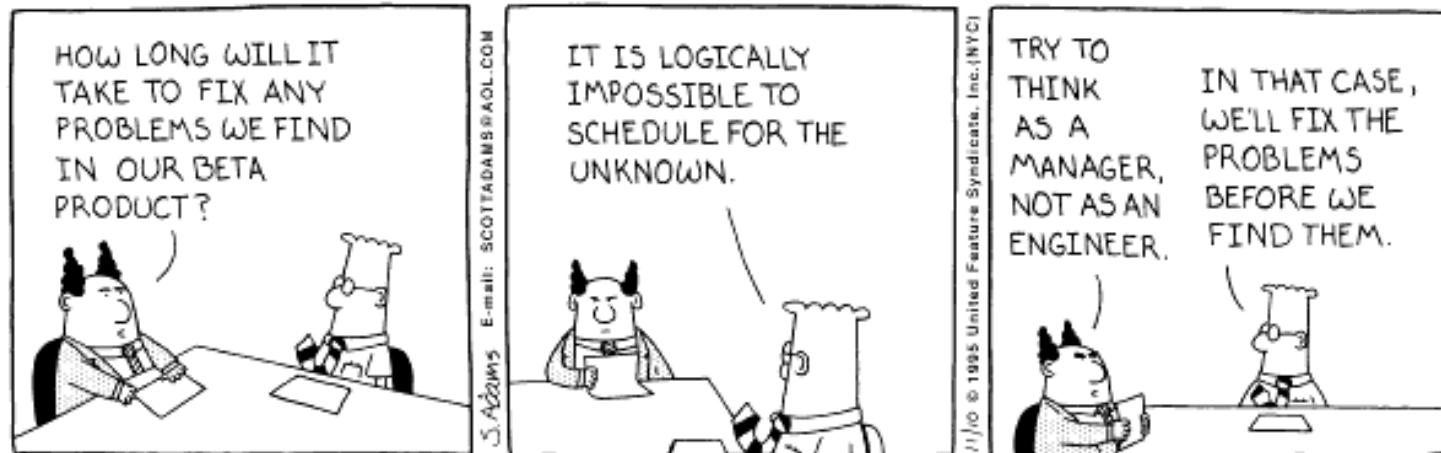
# **\* *Have a Process for Handling the Unk-Unks***



- How to handle the Unknown-Unknowns
- What is a “Known - Unknown” - A Predictable Risk - Use Risk Management (Example: Exact Length of task on a project is not predictable)
- Unk-Unk is an unknown risk - It comes up “out of the blue” and is unpredictable

# ***How Dilbert Handles Risk***

**Dilbert has a surefire method to handle unk-unks as follows:**



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# ***Handling Unk-Unks***



- Develop “Early Detection Systems”
- Have a method to E-Mail High Priority Items that come up to all Team members so they are noticed
- Management by “walking (or talking) about”
- Listen to the team members a lot

# ***Handling Unk-Unks (2)***



- Drive to “Testing Early” - Picks up hidden problems early – “The Chicken Test”
- Assign 10% to 15% Contingency to schedules and costs (consider strongly using project buffers)
- Have Design and Process Reviews with “Third Parties”
- Hire experienced outsiders to assist with early Risk Management - makes potential risks “known” early

# **\* *Determine High Known Risk Areas before Planning***



- These risks are the “known-unknowns”
- Use Formal Risk Management Techniques to handle them
- If an element has a high enough risk break it out into separate project(s) within the overall project.
- An alternative is to generate a mitigation “Plan B” to deal with the alternative, and determine a trigger for going into it.

# ***High Risk Area Solutions***



- Focus on purchases from outside vendors or sub-projects done at remote sites.
- Check out areas of new technology. This includes new hardware, software, firmware or FPGA development packages.
- Get these checks started very early on in the project.
- Consider a higher cost alternative as a second source. Decide when to trigger this.

# ***\*Handling Tracking of Project Schedule & Cost Metrics***



- Ideal - Set Up Standard Accounting System, with PM Management Info System in-built
- Simple approach using Excel Spreadsheets and lots of work - Include Tracking of Cost (vs Budget) and Schedule (vs Initial Plan, Baseline?)
- Other Team Oriented "Soft" Metrics (Analogous to "Index of Consumer Confidence")

# ***Tracking of Metrics***



- Have a Practical method to track Project progress and costs – (Slipped schedule = higher cost)
- Some examples of a lack of tracking in Past Projects - Major metric problems are **slow schedule and cost reporting** and **Lack of visibility** of estimated and actual cost and schedule
- What can be done to keep this from occurring?

# ***Solving Metrics Problems***



- Hire a special “Project Coordinator” to follow metrics as their main job
- Focus on several, “hard and visible” milestones at fixed intervals in the project
- Make sure the cost reporting personnel understand the criticality of their information
- Use “Quasi-Earned Value” to track the project

# **\* *Handling Project Cost Overruns***



- Project Costs almost always overrun estimates as they end. This is due to accumulation of all previous risk factors.
- Addressing this is scary for higher level Management unless they have already planned it in. (Includes handling VC funding running out)
- Generate good Metrics to keep good track of cost over time, with low delay and high accuracy.

# ***Strategy Summary***



- Value Early Part of Project
- Generate a Detailed Plan and Block Diagram
- Have a Process for Handling Unk-Unks
- Determine High Risk Areas Before Planning
- Have a practical method to track progress and cost
- Have an approach to handle project cost overruns

# ***\*Generalized Types of Project Models***



- CPM (Critical Path Method, 1945)
- PERT (Project Evaluation Review Technique, 1957)
- Waterfall Model (1956, Software, 1970)
- Earned Value Model (1960's)
- Stage (Phased) Gate Model (1986)

# ***Generalized Types of Project Models (Con't)***



- Concurrent Engineering Model (1980's?)
- Incremental / Spiral Model (Software, 1986)
- Critical Chain PM Model (1997?)
- Agile (and Related) Models (Software, 1995?)

# ***Further Info***



- Check Website <http://www.angotti.com> for more info, free copy of complete paper - Under Free Resources, second page
- Call 408-739-5046 or E-Mail [carl@angotti.com](mailto:carl@angotti.com)