Uncertain Projects in an Uncertain World

Allan Jones MSc FAPM MCMI PGCHE

Leeds Metropolitan University
Introduction

• You’ve received the mandate from the sponsor, had the kick off meeting with the project team and suppliers, planned your project and suddenly you are having problems.

• The original project now appears to be complex than expected and those major milestones appear to be in jeopardy. The project is about to overrun its planned duration.

• The next reporting period is imminent, the sponsor is losing confidence and you are starting to have sleepless nights! Oh dear!
Background

• Explore opportunities as alternative ways to manage projects
  – In particular consider alternative approaches to traditional Planning, Scheduling, Monitoring and Control techniques
  – Appreciate the differences between traditional certain (deterministic) planning and uncertain (probabilistic) planning
  – Consider the level of uncertainty within the project.
Background

• Consider the use of modelling techniques to predict project outcomes
  – Project outcomes are affected by different factors at diverse time points.

• During the life cycle of a project, predicting project outcomes at different stages requires the analysis of dissimilar factors, (Russel et al. 1997; Griffith et al. 1999)
Normal planning output

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My Not So Little Project</td>
<td>30 days</td>
</tr>
<tr>
<td>2</td>
<td>Start</td>
<td>0 days</td>
</tr>
<tr>
<td>3</td>
<td>Package One</td>
<td>11 days</td>
</tr>
<tr>
<td>4</td>
<td>Task A</td>
<td>4 days</td>
</tr>
<tr>
<td>5</td>
<td>Task B</td>
<td>5 days</td>
</tr>
<tr>
<td>6</td>
<td>Task C</td>
<td>2 days</td>
</tr>
<tr>
<td>7</td>
<td>Package Two</td>
<td>16 days</td>
</tr>
<tr>
<td>8</td>
<td>Task D</td>
<td>6 days</td>
</tr>
<tr>
<td>9</td>
<td>Task E</td>
<td>3 days</td>
</tr>
<tr>
<td>10</td>
<td>Task F</td>
<td>7 days</td>
</tr>
<tr>
<td>11</td>
<td>Package Three</td>
<td>9 days</td>
</tr>
<tr>
<td>12</td>
<td>Task G</td>
<td>7 days</td>
</tr>
<tr>
<td>13</td>
<td>Task H</td>
<td>2 days</td>
</tr>
<tr>
<td>14</td>
<td>End</td>
<td>0 days</td>
</tr>
</tbody>
</table>

The Normal Planning Output which every Project Manager has . . .
A robust plan based on a WBS which is fully linked, resourced managed and with costs - Smashing
A Planning Breakdown Structure

- Elementary
  - To do list
  - To do with dates
  - Matrix
- Normal
  - Fully Linked, Resourced and Costed
- Complex
  - PERT Recursive
  - Critical Chain
  - Chaos

Deterministic

Probabilistic
Task | Task Description | Resources | Due Date          | Comments
-----|------------------|-----------|-------------------|--------
1     | Ordering         | Buyer     | 21st January 08   |        |
2     | Delivering       | Producer  | 2nd June 08       |        |
3     | Installing       | Contractor| 16th June 08      |        |
4     | Commissioning    | Engineer  | 4th August 08     |        |
<table>
<thead>
<tr>
<th>Task</th>
<th>Task Description</th>
<th>Resources</th>
<th>Due Date</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ordering</td>
<td>Buyer</td>
<td>21&lt;sup&gt;st&lt;/sup&gt; January 08</td>
<td>Done</td>
</tr>
<tr>
<td>2</td>
<td>Delivering</td>
<td>Producer</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; June 08</td>
<td>Promised</td>
</tr>
<tr>
<td>3</td>
<td>Installing</td>
<td>Contractor</td>
<td>16&lt;sup&gt;th&lt;/sup&gt; June 08</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Commissioning</td>
<td>Engineer</td>
<td>4&lt;sup&gt;th&lt;/sup&gt; August 08</td>
<td></td>
</tr>
</tbody>
</table>
Tracking the Normal

Planning Breakdown Structure

- Elementary
- Normal Tracking
- Complex
Remember this – it was only a moment ago!

The Normal Planning Output which every Project Manager has . . . and which can now be tracked.
Tracked and . . .

My Not So Little Project

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>31 Mar '06</th>
<th>07 Apr '06</th>
<th>14 Apr '06</th>
<th>21 Apr '06</th>
<th>28 Apr '06</th>
<th>05 May '06</th>
<th>12 May '06</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>My Not so Little Project</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>95%</td>
</tr>
<tr>
<td>2</td>
<td>Start</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>3</td>
<td>Package One</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>4</td>
<td>Task A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>Task B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>6</td>
<td>Task C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>7</td>
<td>Package Two</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>35%</td>
</tr>
<tr>
<td>8</td>
<td>Task D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>9</td>
<td>Task E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20%</td>
</tr>
<tr>
<td>10</td>
<td>Task F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>11</td>
<td>Package Three</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>Task G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>13</td>
<td>Task H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0%</td>
</tr>
<tr>
<td>14</td>
<td>End</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Beware just a bit.
With planning it is easy to see what is happening.
With tracking it is not so easy to see what is happening.
Traditional Planning Approach

• Notion of absolute certainty
• As project managers do we drive individuals to achieve the (average) task duration estimate?
• Work fills the time, (Parkinson, 1955)
• What value does deterministic planning hold for contemporary project practitioners?
Probabilistic Planning

We are about to enter a scary world!
Planning Breakdown Structure

- **Elementary**
  - To do list
  - To do with dates
  - Matrix

- **Normal**
  - Fully Linked, Resourced
  - and Costed

- **Complex**
  - **PERT**
  - Recursive
  - Critical Chain

**Deterministic**

**Probabilistic**
“Failure to effectively manage uncertainty causes most project failure.” (Goldratt, 1994; Leach, 2005)
Uncertainty or just chaos

- Standard planning techniques are inadequate for projects involving uncertainty in the project duration and task durations, (Dawson and Dawson,1998).

- A standard (traditional) approach to managing uncertainty within a probabilistic project is unlikely to yield the results expected, (Zwikael et al. 2007).
Chaos?

• Demeulemeester and Herroelen (2002), suggest the usual project management practices do not allow for or incorrectly factor uncertainty into project tasks

• …and they support the view that a probabilistic project is one whereby the Work Breakdown Structure – WBS has some inherent instability.

• As uncertainty is a fact of life in any significant project, it is the management of that uncertainty that is the key issue, (Rand, 2000).
Probabilistic Planning

• The notion that project certainty is impossible and that therefore decisions must be based on probabilities.
• The principle whereby nothing is certain.
• Whenever analytical approaches fail, or appear to overwhelm one’s capacity to obtain numerical answers, one turns to … statistical sampling, (Elmaghraby, S.E., 1977)
Wembley Stadium

12.45pm

FA confirms Cup final change

Play-off finals switched to Cardiff too

Staff and agencies
Tuesday February 21, 2006
Guardian Unlimited

The Football Association has confirmed this season’s FA Cup final will not be played at the new Wembley Stadium.

FA chief executive Brian Barwick made the decision following a visit to the stadium site yesterday.

Constructors Multiplex had already issued a statement saying that the FA had decided to move the game to the Millenium Stadium on May 13. They rated the chances of the stadium being ready for that date at only 70%.
Normal Distribution Curve

Most Likely
50/50

Optimistic
0%

70%

Pessimistic
100%

Duration in Time
Achieving the desired outcome

• Drive people to achieve the average estimated task duration
Fuzzy Logic - FL

• FL was first developed by Zadeh, in the 1960s, for representing uncertain and imprecise information.
  – That which aims at modelling the imprecise modes of reasoning to make rational decisions in an environment of uncertainty and imprecision, (Zadeh 1965; quoted by Chien and Cheng, 2007)
Untangling The New Fangled

1. Determine the Optimistic, Most Likely and Pessimistic durations
   - NB: Note the use of *Determine*, not *Guess*.
2. Select a suitable Probability Distribution!
3. Run a Simulation and Hey Presto, we can predict the Probability of Completing within defined time periods.
Untangling the New Fangled

What is this telling us

![Risk Output Graph]

- X-axis: Duration
- Y-axis: % Probability of Completion
- The graph shows an increasing trend in probability of completion as duration increases.
Reality?

A little reminder…as uncertainty is a fact of life in any significant project, it is the management of that uncertainty that is the key issue, Rand (2000).
Making The Transition

Planning Breakdown Structure

Elementary
To do list
To do with dates
Matrix

Normal
Fully Linked, Resourced and Costed

Complex
PERT
Recursive Critical Chain
Chaos
Consequences 1

The management of risk includes both opportunity and threat (Opportunity here incorporates not only finishing a bit sooner than you thought, but also **not** finishing as late as you might!):

– If Opportunity is to be gained, Risks have to be monitored and the impact on subsequent tasks predicted – Managing the interface (between tasks).
– An appropriate planning horizon must be kept in view and good communication maintained.
– Opportunities will only be achieved if there is a flexible supply chain.
– There is a cost to make all of this happen.
Making The Transition
What we think we learned

• There must be total integration between the Plan and the Risk Register - The Risk Register cannot be a document sitting on the shelf.

• Education and training needs to work on tracking and control and on probabilistic stuff – the emphasis today is largely on deterministic.
Making The Transition  
What we think we learned

• Some folks, but a small number, were making a structured transition from Deterministic to Probabilistic planning.

• More folks are making the transition but based on insufficient planning and often on deterministic thinking.

• Lots do Monte Carlo at the beginning . . . and at the end, when it needs doing very regularly

• Tracking is no longer easy – Keep an eye on the profile of task performance.

• Planning for an uncertain future is easier.
What we think we now know

• Hypothesis
  – Deterministic planning and control appears to be of less value to projects containing uncertainty and chaos
  – Applying deterministic controls to uncertain projects is likely to result in failure
  – Need to encourage the application of probabilistic modelling techniques. Qualified or certified programme and project managers.
Questions?

a.r.jones@leedsmet.ac.uk