Get the detailed slides and spreadsheets from:


(yes, capitalization is important!)
Risk: The Final Agile Frontier

Troy Magennis
@t_magennnis
Troy.Magennis@focusedobjective.com
I LOVE IT WHEN
A PLAN COMES TOGETHER
Plan A
Plan B
Planc
Definition: **Risk**

Anything that causes actual outcome to be different than the planned (or expected / desired) outcome.
No Plan = No Risk

Cheapest and most rigorous form of risk management...
"Expectation is the root of all heartache"
- Shakespeare
Definition: **Risk**

Anything that causes actual outcome to be different than the planned expected or desired outcome.
Financial Risk
- Having funding/cash
- Having a strategy
- Economic prioritization
- Real Options

Technical Risk
- Real Options
- Right Staff / liquidity
- Dev Practices
- Dependencies
- Constraints

Market Risk
- Lean Startup
- Agile Processes
- Competitive Awareness

“Aleatory Risk”
Cannot be reduce by more info
Monte Carlo Forecasting

Image thanks to Larry Maccherone
Simulated Burn Downs (first 50)

**What is this chart?**
This chart shows the simulated burn-down trends. It shows the first 50 trials and visually shows the general hotspots and outlier dates.

1. Step
2. How
3. Throughput. How many completed stories per week or sprint do you estimate low and high bounds?

<table>
<thead>
<tr>
<th>Throughput estimate/samples are per</th>
<th>Week</th>
<th>7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low guess</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Highest guess</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>

Use historical throughput data **OR** enter a low and high estimate below. Use: Estimate

<table>
<thead>
<tr>
<th>Low guess</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest guess</td>
<td>5</td>
</tr>
</tbody>
</table>
Ten #Failed Forecasting Plan Assumptions

By Troy Magennis
@t_magennnis
FocusedObjective.com
Option 1 & 2 need analysis, or do they?

> 2x Option 3 is excluded
Item Estimation Always Fails

Item Estimation (maybe) works

See full story at http://brodzinski.com/2015/01/slack-time-value.html
Can’t forecast high utilization systems using item size

Trucks move at same speed as cars
For high utilization systems we need to track system level impediments.

“Things that impact EVERY item”
And “System Utilization”
Network Throughput Test

Slides and spreadsheets at

Bit.ly/SimResources

(Case SENSITIVE)
Distribution Arithmetic

Uniform + Uniform =

Max 12

Uniform × Uniform =

Max 36
1: Missed Start Date

Mistake when planning portfolios
1: Missed Start Date

Actual Start Date > Planned Start

- How the planned date was chosen?
- Who signs off on the decision to do this project?
- Causes of past delays?
- Possible delays of this project?
- Give estimates as duration rather than end-date
- Keep history of planned date versus start date delay
- Model start date risk using the historical range of delays
2: No Team (Team not ready)
3: Partial Team (Team < planned)
4: Partial Body Staffing
5: Missing Skillsets
3, 4 & 5: Team Skill and Strength

• How were the skill-sets required determined
• Did skill level factor into team planning
• What other duties do the planned staff perform (production support, etc.)
• How ramp up time for new members is considered

• Plan what skills are necessary for the project
• Perform Capability Matrix to find skill gaps and resolve
• Estimate and plan how long it takes from “hire to productive” for skills
• Only plan using “productive date” (not the hire date)
# Capability Matrix

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<td>Know nothing</td>
</tr>
<tr>
<td><strong>Team 1</strong></td>
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<td>Can start from nothing and create</td>
</tr>
<tr>
<td><strong>Team 2</strong></td>
<td>Can start from nothing and create</td>
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---

**General guidelines:** 0 = bad, 1 = single point of failure, >2 cool!

**Player Coaches:** These are the people/teams who can create new work and teach others. You need these people.

**Players:** These are the people/teams who can maintain current work, but struggle to create new.

**Bench:** These are the people/teams who although haven't got this skill yet, have the tools required.
Amdahl's Law indicates that the speedup from parallelizing any computing problem is inherently limited by the presence of serial (non-parallelizable) portions.
8 parallel teams with 75% parallelizable work = 3x
Amdahl was an Optimist
Team Dependency Diagram
Chances at least one team not delayed

1 in $2^n$

or

1 in $2^7$

or

1 in 128
7 dependencies
1 chance in 128
<table>
<thead>
<tr>
<th>6 dependencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 chance in 64</td>
</tr>
</tbody>
</table>
5 dependencies
1 chance in 32
7: Dependency Impacts

Your timetable != Someone else’s

- Determine complexity in build order dependencies
- Determine is-aligned priorities
- Determine what incentives are in place
- Look for re-organization opportunities to reduce dependencies
- Reduce batch sizes
- Communicate initial and updated information often
- Build incentives to align priorities
Mistake for startups & older systems

8: Carried over defects and debt
9: Ship Stoppers
10: Splitting

Mistake when forecasting using data

Historical throughput/velocity based on pre and post split work

Product Backlog

Sprint Backlog
Forecast

Assumption 1

Assumption 2

Assumption 3

Assumption ...

Assumption n
Monte Carlo Forecasting
What is this chart?
This chart shows the simulated burn-down trends. It shows the first 50 trials and visually shows the general hotspots and outlier dates.

1. Start
2. How many completed stories per week or sprint do you estimate low and high bounds?

| Low guess | 20 | Highest guess | 30 |

3. Throughput. How many completed stories per week or sprint do you estimate low and high bounds?

Throughput estimate/samples are per Week: 7 days

Use historical throughput data OR enter a low and high estimate below. Use: Estimate

| Low guess | 1 | Highest guess | 5 |
Calls to action...

- Understand when estimation is NOT needed
- Track failed assumptions not work item status
- Build achievable plans and goals
  - Free tools / Spreadsheets / Exercises: Bit.ly/SimResources
- Twitter: @t_magennis
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Troy Magennis (@t_magennis)
Entangled: Solving the Hairy Problem of Team Dependencies
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Option 1 & 2 need analysis, or do they?

Option 1

Option 2

Option 3

> 2x Option 3 is excluded
Penalty of being late – lost revenue, etc.
Network Throughput Test

Slides and spreadsheets at Bit.ly/SimResources (Case SENSITIVE)
Item Estimation works

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Can’t forecast high utilization systems using item size

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“Things that impact EVERY item”
“System Utilization”
For the same distance:

- Time of Day
- Day of week
- Multiple lanes?
- Traffic lights (luck, #)
- Other drivers (stupidity)
- Weather / Road conditions
For the same project:
When we start
Time of year/season
Number of teams/people
Dependencies
Other project timelines
 Interruptions
1: Missed Start Date

Mistake when planning portfolios
1: Missed Start Date
Actual Start Date > Planned Start

Planned Start

Actual Start

December
January
February
March

2 Month Delay
Decision Delay
1: Missed Start Date

Actual Start Date > Planned Start

- How the planned date was chosen?
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- Give estimates as duration rather than end-date
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2: No Team (Team not ready)
2: Team Not “Ready” at Start Date
Actual Team = 0

Planned Start ➔ Possible Start ➔ Actual Start

- December
- January
- February
- March

3 Month Delay

Team Delay
2: Team Not “Ready” at Start Date
Actual Team = 0

- Is the team in place already? Can I see them?
- What are they working on now? Is it likely to be delayed?
- Higher priority projects?
- Plans to hire aren’t always achievable by given date
- Plan environment factors: space to sit, equipment, meeting space
- What infrastructure does the team need to “start” work?
3: Partial Team (Team < planned)
3: Team Not at Strength
Actual Team < Planned Team

- Planned Start
- Possible Start
- Actual Start

December  → January  → February  → March

3 Month Delay

Team Delay

@t_magennis
4: Partial Body Staffing
4: Partial Body Staffing

Actual Team “sometimes =” Planned

Planned Start  Possible Start  Oops!

December  January  February  March

Track interruptions

Team Delay
5: Missing Skillsets
5: Team Does Not Have Needed Skills
Actual set(skills) < planned set(skills)

- Planned Start
- Possible Start
- Full Strength!

December
January
February
March

CSS / JavaScript

Java / C#
3, 4 & 5: Team Skill and Strength

- How were the skill-sets required determined
- Did skill level factor into team planning
- What other duties do the planned staff perform (production support, etc.)
- How ramp up time for new members is considered

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<td>Can start from nothing and create</td>
<td>Can tweak it or do easier work</td>
</tr>
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<td>Know nothing</td>
<td>Can start from nothing and create</td>
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### Analysis:

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<tr>
<td><strong>Player Coaches: Ability to Create</strong></td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Players: Ability to Maintain</strong></td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Bench: Ready to Train Up</strong></td>
<td>1</td>
<td>0</td>
<td>1</td>
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**General guidelines:** 0 = bad, 1 = single point of failure, >2 cool!

- **Player Coaches:** These are the people/teams who can create new work and teach others. You need at least one (right?). Are you managing this?
- **Players:** These are the people/teams who can maintain current work, but struggle to create new work. If new work isn’t expected income, are you managing this?
- **Bench:** These are the people/teams who although haven’t got this skill yet, have the tools required to perform this task if needed.
Amdahl's Law indicates that the speedup from parallelizing any computing problem is inherently limited by the presence of serial (non-parallelizable) portions.
6: Overstated Parallel Effectiveness

\[ S(N) = \frac{1}{(1-P) + \frac{P}{N}} \]

8 parallel teams with 75% parallelizable work = 3x
6: Overstating Parallel Scalability
Actual Benefit $<$ Assumed Benefit

Diagram:
- Idea → Planning / Pre "Go" Decision
  - Team 1
  - Team 2
  - Team 3
  - Team n
  → Integration / Distribution
  - Customer

Comparative bar chart:
- Serial
- Parallel
- Serial
6: Overstating Parallel Scalability

Actual Benefit < Assumed Benefit

- What are the serial parts of a complete system path (often shared resources)?
- How do teams plan to integrate work?
- How do teams co-ordinate and plan work?
- What are the inter-dependencies between teams?

- Find ways to eliminate serial paths.
- Track and prioritize fixing blockers in serial paths.
- Organize teams to reduce inter-dependencies.
- Remind people non-linearity of parallel scaling.
Amdahl was an Optimist

Error for high team count
Team Dependency Diagram
Chances at least one team not delayed

\[
1 \text{ in } 2^n \\
\text{or}
\]

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Sprint Backlog
Monte Carlo Forecasting

Image thanks to Larry Maccherone
What is this chart?
This chart shows the simulated burn-down trends. It shows the first 50 trials and visually shows the general hotspots and outlier dates.

Bit.ly\SimResources

1. Story counts
2. How many artifacts do you expect?
3. Throughput. How many completed stories per week or sprint do you estimate low and high bounds?

Throughput estimate/samples are per Week 7 days

Use historical throughput data OR enter a low and high estimate below. Use: Estimate

Low guess 20 Highest guess 30

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What distribution fits cycle time data and why...

THE SHAPE OF CYCLE TIME
If we understand how cycle time is statistically distributed, then an initial guess of maximum allows an inference to be made.

Alternatives -

• Borrow a similar project’s data
• Borrow industry data
• Fake it until you make it... (AKA guess range)
Why Weibull

• Now for some Math – I know, I’m excited too!

• Simple Model
• All units of work between 1 and 3 days
• A unit of work can be a task, story, feature, project
• Base Scope of 50 units of work – Always Normal
• 5 Delays / Risks, each with
  – 25% Likelihood of occurring
  – 10 units of work (same as 20% scope increase each)
Normal, or it will be after a few thousand more simulations.
5th %:  62  25th%: 63  75th%: 72  95th%: 78

Histogram

Base + 1 Delay
5th %: 62  25th%: 64  75th%: 77  95th%: 87

Histogram

Base + 2 Delays
5th %: 62  25th%: 65  75th%: 78  95th%: 91

Histogram

Base + 3 Delays

Count

Up to and including values for Intervals (Monte Carlo)
Base + 4 Delays
<backlog type="custom">
    <deliverable name="Base">
        <custom count="50" />
    </deliverable>
    <deliverable name="Delay1" skipPercentage="75">
        <custom count="10" />
    </deliverable>
    <deliverable name="Delay2" skipPercentage="75">
        <custom count="10" />
    </deliverable>
    <deliverable name="Delay3" skipPercentage="75">
        <custom count="10" />
    </deliverable>
    <deliverable name="Delay4" skipPercentage="75">
        <custom count="10" />
    </deliverable>
    <deliverable name="Delay5" skipPercentage="75">
        <custom count="10" />
    </deliverable>
</backlog>

<columns>
    <column id="1" estimateLowBound="1" estimateHighBound="3" wipLimit="2">Work</column>
</columns>

<forecastDate startDate="01-May-2012" costPerDay="2500" />
Exponential Distribution (Weibull shape = 1)
The person who gets the work can complete the work
Teams with no external dependencies
Teams doing repetitive work E.g. DevOps, Database teams,
Weibull Distribution (shape = 1.5)
Typical dev team ranges between 1.2 and 1.8
Rayleigh Distribution (Weibull shape = 2)
Teams with MANY external dependencies
Teams that have many delays and re-work. E.g. Test teams
What Distribution To Use...

• No Data at All, or Less than < 11 Samples *(why 11?)*
  – Uniform Range with Boundaries Guessed (safest)
  – Weibull Range with Boundaries Guessed (likely)

• 11 to 30 Samples
  – Uniform Range with Boundaries at 5^{th} and 95^{th} CI
  – Weibull Range with Boundaries at 5^{th} and 95^{th} CI

• More than 30 Samples
  – Use historical data as bootstrap reference
  – Curve Fitting software
Probability Density Function

Histogram

Weibull

Scale – How Wide in Range. Related to the Upper Bound. *Rough* Guess: (High – Low) / 4

Shape – How Fat the distribution. 1.5 is a good starting point.

Location – The Lower Bound

\[
\begin{align*}
\alpha &= 1.5178 \\
\beta &= 31.965 \\
\gamma &= 0
\end{align*}
\]
Brilliant!

The Kanban Kick-start Field Guide - Sandvik IT (C. Achouiantz & J. Nordin)

@t_magennis
Histogram of possible Return on Inv.

- Kills Humans
- Kills rats
- Does nothing or kills rats

Likelihood

-30 -20 -10 $0 +10 +20 +30 +40 +50

Break Even.
risk events

- Nothing Goes Wrong
- Performance OR Vendor Delay
- Performance AND Vendor Delay

Time

Probability
Less Resources (Financial Risk)

Low Adoption (Market Risk)

Low Cashflow (Financial Risk)

Delay (Technical Risk)

Risk Positive Feedback Loop
Key Point

Occurrence of a risk Increases exposure to other risks

Break the chain early
<table>
<thead>
<tr>
<th>Risk Matrix</th>
<th>Low Likelihood (1)</th>
<th>Medium Likelihood (2)</th>
<th>High Likelihood (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Impact (3)</td>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Medium Impact (2)</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Low Impact (1)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Likelihood</td>
<td>Acceptable risk</td>
<td>Unacceptable risk</td>
<td>Unacceptable risk</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------</td>
<td>-------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Very likely</td>
<td>Medium 2</td>
<td>High 3</td>
<td>Extreme 5</td>
</tr>
<tr>
<td>Likely</td>
<td>Acceptable risk</td>
<td>Acceptable risk</td>
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</tr>
<tr>
<td></td>
<td>Low 1</td>
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<tr>
<td></td>
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<td>Low 1</td>
<td>Medium 2</td>
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What is the chance it will happen?

- Minor
- Moderate
- Major

Impact

How serious is the risk?
**IMPACT ON ACHIEVEMENT OF OBJECTIVES**

<table>
<thead>
<tr>
<th>Category</th>
<th>Financial Impact Potential</th>
<th>Stakeholder Faith Impact</th>
<th>Operational Impact</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td>$&gt;$ 5 m</td>
<td>Long-term</td>
<td>Challenging</td>
<td>High Risk</td>
</tr>
<tr>
<td>Moderate</td>
<td>$&lt; 5 m$</td>
<td>Short-term</td>
<td>Extensive</td>
<td>Medium Risk</td>
</tr>
<tr>
<td>Minor</td>
<td>$&lt; 500,000$</td>
<td>Some concern</td>
<td>Some</td>
<td>Low Risk</td>
</tr>
</tbody>
</table>

**Likelihood of Occurrence**

- Low
- Medium
- High