Why One Size Does Not Fit All

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Strategic Project Leadership®
The New Science of PM
The SPL Strategic Assets

- Project Requirements
- Commitments
- Resources
- Strategy
- Spirit
- Organization
- Processes
- Tools
Adaptive Project Processes

(One Size Does Not Fit All)
Classical Project Phases

- Initiation
- Planning
- Execution
- Termination

Revise Requirements
Revise Plans
Revise Design
Project Management
The Three Major Processes

When do you stop them?

Product Requirement Process
Managerial Process
Design Process
Entire Adaptive Iterative Approach

Freeze Requirements

Requirements → Planning → Specs → Design & Build → Test → Complete

Revise Requirements → Revise Plans → Revise Design

Dynamic Project Management

Traditional PM
## A Framework for Adaptation

<table>
<thead>
<tr>
<th>Category</th>
<th>Project Types</th>
<th>PM Impact Organization, Process, PMr, Team</th>
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Adapting the Organization to Context and for Business Results

(One Size Does Not Fit All)
Understanding and Adapting Organizational Structures

Organization - need for clear definition of roles, & responsibilities - “who does what”

Formal, Quasi-formal, Informal

Integration                Differentiation

Need the Right Balance for your Project

No best way, When to Reorganize
It is Difficult to Create Balance

Weak Integration

Heavy Integration

Technology Gaps

Balanced Organization
What is Best for Your Project
Creating the Right Balance in Your Organization

Advantages:
- Integration
- Customer focus
- Product responsibility
- Business accountability

Disadvantages:
- No differentiation
- Less expertise
- Less tech. excellence
- Less experts’ utilization

Advantages:
- Differentiation
- Expertise
- Learning
- Tech. excellence
- Experts’ utilization

Disadvantages:
- No integration
- No customer focus
- No product responsibility
- No business accountability

Difficulties:
- Politics
- Two boss system
- Conflict about:
  - Resources,
  - People,
  - Tasks,
  - Time,
  - Methods, etc.
Recommended High Level View of Your Project Organization

Product Approval Committee (Top Management)

Professional Review Team (Experts in Their Field)

Core Team

Sponsor

Decisions

Support

Solutions

Ideas

Information Plans

Information Problems

Information

Authority

Customer

Full Project Team

Information Plans

Decisions

Support

Solutions

Ideas

Information

Authority
Build Hierarchical and Dynamic Plans

- Master plan – Entire project
- Medium detail plans – 4 to 6 Months
- Detailed work plans – Weeks

Time
The Decreasing Rate of Uncertainty

Level of Uncertainty vs. Time
Reducing Requirements and Design Uncertainty

Uncertainty of Technical Specs and Design

Ideal World

Real World

Requirements Freeze

Specifications and Design Freeze

Project Completion

Levels Determined by Novelty, Technology, And Other Uncertainties

Project Start

Uncertainty of Requirements
Managing Project Dynamics

- Plans Built According to Uncertainty
- Revise Your Plans and Use Cycles
- Freezing Points and Number of Cycles Depend on Uncertainty
- Adapt your PM Style
CS Tips for Managing Uncertainty

- Identify highly uncertain tasks and manage them differently and separately
- Resolve high uncertainty elements early
- Build pilots and early learning lessons
- Isolate the uncertain tasks from the rest
- Look for trouble - Create internal sensors
- Reward the messengers of bad news
- Solve problems when they are small (alligators) – don’t wait for big fires
- Protect yourself from high uncertainty by guaranteeing enough contingency resources, slack, and buffers
The Diamond Model

(Adapting PM to Context)
### TPM Myth

<table>
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<th>Myth</th>
<th>Reality</th>
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<tbody>
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<td>One size fits all projects</td>
<td>Projects differ, and you must adapt your project management style to the environment, product, and task</td>
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Adapting PM to Context

- Project Goals
- Uncertainty
- Complexity
- Constraints
- Environment

» ...

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Project Types

Complexity
- Array
- System
- Assembly
- Component

Technology
- Super-High Tech
- High-Tech
- Medium-Tech
- Low-Tech

Novelty
- Derivative
- Platform
- New to Market
- New to World

Pace
- Regular
- Fast/Competitive
- Time-Critical
- Blitz
Four Dimensions for Distinction Among Project Types

- **Novelty** – How new is the product to customers and users
  » Derivative, Platform, New-to-the-Market, New-to-the-World

- **Technology** – How much new technology is used
  » Low-tech, Medium-tech, High-tech, Super High-tech

- **Complexity** – How complex is the system and its subsystems
  » Component/Material, Assembly, System, Array

- **Pace** – How Critical is the Time frame
  » Regular, Fast/Competitive, Time-Critical, Blitz

**Each Type Has a Unique Impact on Project Management**
The Impact of the Diamond Dimensions on Project Management

Technology

Complexity

Novelty

Pace

Later design freeze
More design cycles
Strong Functions

Complex Organization
Formality

Less market research
Later requirement freeze
More requirement cycles

Autonomy
Time Control
Pure Project Organization

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# Novelty Definitions

<table>
<thead>
<tr>
<th>Project Novelty</th>
<th>Definition</th>
<th>Examples of Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Derivative</td>
<td>Producing extensions or improvements of existing products or services</td>
<td>Development of a new version of a personal computer. Upgrading a production line.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Streamlining organizational procedures.</td>
</tr>
<tr>
<td>New-to-the-Market</td>
<td>Adapting a product from one market to a new market.</td>
<td>The first PC, Microwave Oven, Commercial GPS.</td>
</tr>
<tr>
<td>New-to-the-World</td>
<td>Introducing a new concept, a new idea, or a new use of a product, which</td>
<td>The first Enterprise Resource Planning (ERP) package. The first photo-static copying</td>
</tr>
<tr>
<td></td>
<td>the world has never seen before</td>
<td>machine (Xerox). The first Walkman. Segway, the personal transportation system.</td>
</tr>
</tbody>
</table>
Managing New to the World” Projects

- Markets that don’t exist cannot be analyzed
- Business plans are typically wrong
  » Define a range of outcomes and keep updating
- Flexible product development
  » Fast prototyping, obtain market feedback ASAP
  » Accept many changes, Freeze requirements late
- Strive for market share, not financial goals
- Make sure you become the industry standard
- Invest aggressively in marketing
- If no market share after 4-6 years, pull out
# Project Types Based on Levels of Technological Uncertainty

<table>
<thead>
<tr>
<th>Level of technological uncertainty</th>
<th>Low-Tech</th>
<th>Medium-Tech</th>
<th>High-Tech</th>
<th>Super-High-Tech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitions</td>
<td>Uses only existing, well-established, and mature technologies</td>
<td>Mostly existing technologies; limited new technology or a new feature</td>
<td>Uses many new, recently developed, existing technologies</td>
<td>Key project technologies do not exist at the time of project initiation</td>
</tr>
<tr>
<td>Examples</td>
<td>Construction, road building, utilities, build-to-print</td>
<td>Derivatives or improvements of products; new models in established industries (e.g., appliances)</td>
<td>New systems in a fast-moving industry (e.g., computers, military systems)</td>
<td>New, unproven concepts beyond the technological state of the art (e.g., Apollo moon landing program)</td>
</tr>
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</table>
The Impact of Technology on Risk and Design

Legend:

A - Low-Tech
B - Medium-Tech
C - High-Tech
D - Super High-Tech

B: 1-2 – Number of Design Cycles

N – No. of cycles required to choose the final technologies

Possible time ranges for design freeze, number of design cycles, and risk areas for project outcomes
Managing Super High-Tech Projects

- Need to develop non-existing technologies during the project
  - Select among several candidate technologies
  - Must build a small scale prototype
- Need state of the art functional technology groups
- Add 3-5 cycles after final technology selection
- Must have more than 40% contingency resources
Managing Array Projects

- Project performed across many organizations
  » Countries, Cultures, Languages

- Need long preparation time of all parties
  » Education, Training,

- Detailed formal rules and procedures essential
  » Clear interfaces, common tools

- Communication and control essential
The Pace Dimension: Available Timeframe

- **Regular** - A clear timeframe, delays not critical (Public, Govt., Internal)
- **Fast/Competitive** - Time to market is a competitive advantage
- **Time-Critical** - Completion time is critical to success (Window of opportunity – Y2K, Space)
- **Blitz** - Crisis project (War, natural disaster, Industrial crisis)
# Managing Blitz Projects

## Organization and Process
- Immediate response is necessary
- No time to plan, be there
- Pure project organization
- Empower local leaders
- Work around the clock

## Four Critical Principles
1. Ownership
2. Spirit of success – “Failure not an option” – Optimism
3. Total authority to project leader
4. Network of support
The Impact of the Diamond Dimensions on Project Management

Technology

Complexity

Novelty

Pace

Later design freeze
More design cycles
Strong Functions

Complex Organization
Formality

Less market research
Later requirement freeze
More requirement cycles

Autonomy
Time Control
Pure Project Organization
Mars Climate Orbiter

Complexity  

Technology

Novelty

Array  System  Assembly

Deriv. Platform  NTM  NTW

Regular  Fast/Competitive  Time-Critical  Blitz

Dr = (MTW, HT, Sy, TC)
Da = (Pl, MT, As, TC)

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The Story of Two Modern Projects

Airbus A380

Boeing 787
787 History

- 2003 - Program Approved
- 2004 - Program Launched – 1st Delivery Planned 2008
- 2005 - Final configuration selected
- 2006 - Subsystem design start
- 2007 - Gap found between cockpit and fuselage sections
- 2007 - 1st delay announced 3 months
- 2007 - Unplanned redesigns added, suppliers’ crisis, work taken back
- 2008 - Backlog reaches 900 orders (down to 821 in 2012)
- 2009 - Additional redesigns
- 2010 - 8th delay announced – indefinitely
- 2011 - 1st Delivery – 3 years delay

Summary (2012):
  » Schedule – Original: 49 Months, Actual: 89 Month
  » Cost – Original: $20B, Actual (estimate) $40B
787 Innovative Challenges

- Composite materials body (80% by volume)
- New avionics
- Outsourcing subsystem design - 700 suppliers
- Built to performance incentive model
The 787 Program
# Boeing 787 Dreamliner Program

## Actual Events and a Simulated Alternative

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual Event</th>
<th>Simulated Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>Program approved</td>
<td>Program approved</td>
</tr>
<tr>
<td>2004</td>
<td>Program launched – Original 1&lt;sup&gt;st&lt;/sup&gt; delivery date planned for 2008</td>
<td>Program launched – 1&lt;sup&gt;st&lt;/sup&gt; delivery planned for 2009</td>
</tr>
<tr>
<td>2005</td>
<td>Final configuration selected</td>
<td>Assessment of program challenges, uncertainty, complexity and their impact on plan and resources</td>
</tr>
<tr>
<td>2006</td>
<td>Subsystem design start</td>
<td>Final configuration selected</td>
</tr>
<tr>
<td>2006</td>
<td></td>
<td>Detailed subsystem design, together with extensive policy and control guidelines prepared. Vendor selection criteria and training program prepared.</td>
</tr>
<tr>
<td>2007</td>
<td>Gap found between cockpit and fuselage</td>
<td>Extensive training and certification of subcontractors</td>
</tr>
<tr>
<td>2007</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; delay announced – 3 M</td>
<td>Performing 3 planned design cycles, close work with suppliers. Extensive integration and prototype testing.</td>
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<td>2007</td>
<td>Unplanned redesign added; suppliers crisis, work taken back</td>
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<td>2008</td>
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<td>2009</td>
<td>Additional unplanned redesigns</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; delivery – on time -18 month after original date</td>
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<tr>
<td>2010</td>
<td>8&lt;sup&gt;th&lt;/sup&gt; delay announced - indefinitely</td>
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<tr>
<td>2010</td>
<td>50 orders cancelled</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; delivery 40 months later than originally scheduled</td>
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The Diamond Can Be Used for

» Adaptive Planning
» Selecting PM Style
» Communication Language
» Putting a Project Back on Track
» Retrospective Analysis
So Why Major Programs Still Fail?

- Risk Management is not working

- Failure is always in assessing the difficulty involved in the new, “innovative” part of the project

- We need a new framework to analyze and control the innovative part – the difficulty
Change the Question

Instead of asking,

“What Can Go Wrong?”

We should ask,

“How Long Will it Take to Get it Right?”

“What is the Challenge?”
Instead of Risk Management,

Challenge Management
Challenge Analysis

- Project Challenges May Depend on:
  - Uncertainty
  - Complexity
  - Constraints
  - Environment
  - ...
### Challenge Management Technique

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<th>New Challenge</th>
<th>What to Do</th>
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<tr>
<td>Other</td>
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# Airbus 380

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<tr>
<td>Novelty</td>
<td>2-3</td>
<td>Airport fit and regulations</td>
<td>Prove fit and get approval</td>
</tr>
<tr>
<td>Technology</td>
<td>2</td>
<td>Typical development</td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
<td>4</td>
<td>Integration Cross Cultures</td>
<td>Standards Coordination</td>
</tr>
<tr>
<td>Pace</td>
<td>2</td>
<td>Typical</td>
<td></td>
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# Boeing 787

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<td>3</td>
<td>Comp matri body Electronic controls</td>
<td>Extra des cycles Later freeze</td>
</tr>
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<td>Complexity</td>
<td>4</td>
<td>Integration Outsourcing</td>
<td>Training contractors, Coordination</td>
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Quantifying the Challenge Level

- Diamond Values Determine the Challenge
- Diamond Values = (N,T,C,P)
- Calculated Challenge Level (Ch) = Exp [a\times N + b\times T + c\times C + d\times P]
- Typical Weights: (a,b,c,d) = (.2, .15, .5, .15)
- Segway: D = (4, 3, 3, 2), Ch = Exp [3.05] = 1122
- Apollo: D = (4, 4, 4, 3), Ch = Exp [3.85] = 7079
- Walkman: D = (4, 2, 2, 2), Ch = Exp [2.4] = 251
- Airbus A 380 = 1584, Boeing 787 = 1412
Meeting Project Commitments Under High Uncertainty

- The higher the uncertainty, the less predictable are your required resources
- Detailed plans are not helpful
- Overruns should be accepted, not expected
- Must use prototypes to resolve uncertainty early
- Must protect yourself with contingency resources and payback bonus if not used
- Reasonable Contingency Levels:
  » Low – 5-10%, Medium – 10-20%, High – 20-40%, Super High – 40-60%
Space Shuttle
The Space Shuttle Program

1969  Initial proposal - to go to Mars in 1980s
      Were asked to look for low-cost alternatives

1972  (August) Development approved; Shuttle only - $5.2B
      Based on known technologies - “success oriented”

1972  (November) Design freeze – configuration, technologies

1978  First flight scheduled

1981  Actual first flight - 60% budget overrun

1982  System declared operational

1986  Challenger accident

2003  Columbia accident

2011  Last flight

Total Cost: $173B, 14 Lives
Space Shuttle Program
Initial Uncertainties
(Innovative Parts)

- First two-medium space vehicle
- First reusable space vehicle
- Liquid fuel engines and an external tank
- Huge 75 Ton glider
- 5000 Miles glide from reentry to landing
- First orbital flight with a live crew
- No crew escape system
### Space Shuttle Management Style

<table>
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<th>Actual Style</th>
<th>Alternative Style</th>
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<td>Success oriented</td>
<td>Look for trouble</td>
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<tr>
<td>Off-the-shelf items</td>
<td>Alternative technologies</td>
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<tr>
<td>Early configuration and design freeze</td>
<td>Late freeze; Build a small-scale prototype</td>
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<tr>
<td>Low flexibility</td>
<td>High flexibility</td>
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<tr>
<td>Early operational</td>
<td>Extended development</td>
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<tr>
<td>Limited communication</td>
<td>Intensive communication</td>
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<th>Type C</th>
<th>Type D</th>
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<td>High-Tech</td>
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The Space Shuttle Program

\[ Dr = (NTW, SHT, Sy, Re) \]
\[ Da = (Pl, HT, Sy, FC) \]
Different Project Objectives

- Money Making Projects
- Money Saving Projects
- Business Building Projects
- Business Saving Projects
- Infrastructure
- Research and Technology Development
- Problem Solving
- Maintenance
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CS Tips on Adaptation and the Diamond

- Identity the highest level on each dimension
- If in doubt between two levels, select the higher one
- Specific levels are typically subjective – company dependent
- The bigger the Diamond, the bigger the challenge, the risk, and the opportunity
- Higher Diamonds require increased contingency funding
- Build your own company’s dimensions
The Diamond Can Be Used for

» Adaptive Planning
» Selecting PM Style and Process
» Communication Language
» Putting a Project Back on Track
» Retrospective Analysis
Dynamic Project Management

- Expect Change!
- Adjust Yourself to Uncertainty
- Revise Your Plans
Useful
Dynamic Adaptation Processes

Agile PM – Scrum Software Dev.

Spiral Development
Looking at Your Project Uncertainty

Level of Uncertainty

Time
The Project Diamond

- Technology
- Complexity
- Novelty
- Pace
Project Types

Complexity

Array      System    Assembly  Component

Technology

Super-High Tech
High-Tech
Medium-Tech
Low-Tech

Novelty

Derivative Platform New to Market New to World

Pace

Regular
Fast/ Competitive
Time-Critical
Blitz
Novelty Types

- Technology
- Complexity
- Pace

Less market research
Later requirement freeze
More requirement cycles
Technology Types

- **Technology**
  - Super-High Tech: Later design freeze, More design cycles, Stronger Functions
  - High-Tech
  - Medium-Tech
  - Low-Tech

- **Complexity**
- **Novelty**
- **Pace**
Complexity Types

Complex organization
Formality Increases

Complexity

Array  System  Assembly  Component

Technology

Novelty

Pace
Pace Types

Complexity

Technology

Novelty

Pure Project Organization
No Matrix

Pace

Fast/ Competitive
Time-Critical

Autonomy
Time Control
Four Dimensions for Distinction Among Project Types

- **Novelty** – How new is the product to customers and users
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The Impact of the Diamond Dimensions on Project Management

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Denver Airport

Segway
Denver International Airport Project

Automatic Bag – Handling System

Airport Construction Project
The Segway Project

Dr = (NTW, HT, Sy, F/C)
Da = (Pl, HT, Sy, F/C)

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