Hazard Identification

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Contents

- Project Success Criteria
- Hazard Levels
- Relationship Between Levels
- Techniques for Hazard Identification

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Project Success Criteria

- Predicted milestones have been met
- Project completed on time
- Project completed within budget
- Product satisfies its requirements
- Customer and user needs satisfied
- Staff are happy to have worked on project

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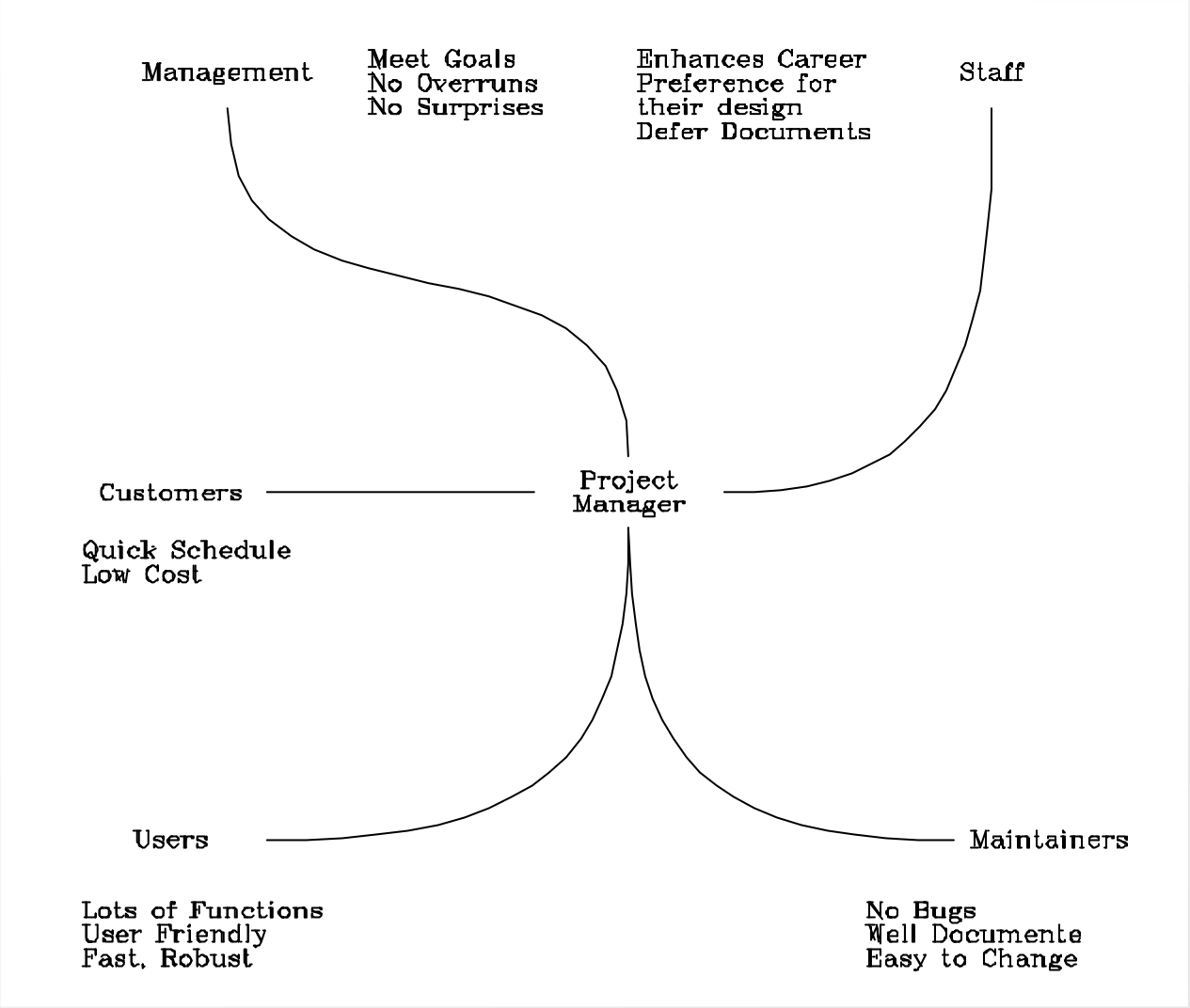
Who measures success?



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Failure and Control

- Not meeting project success criteria
- Project management control can not be imposed at this level
- Detection at this level is too late to allow effective corrective actions

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Management Failures

- Higher Management
  - Set Unrealistic Objectives
  - Set Vague Objectives
  - Fail To Set Any Clear Objectives
- Project Managers
  - Accept Inadequate Objectives
  - Accept Unclear Objectives

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Hazard Levels

- Top Level Hazard
  - Inverse of project success criteria
- Decompose into influence factors
  - situations that can be managed
- Need to manage/monitor
  - lower level factors that impact hazards
  - symptoms of top level hazards

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Top Level Hazards

- Budget Overrun
- Duration Overrun
- Poor Quality
- Failure to meet customer or user need
- Failure to meet requirements
- Dissatisfied staff

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Hazard Refinement

- Some straightforward
  - Budget and Timescales Overrun
- Some complex and ill-defined
  - Lack of customer satisfaction
  - Poor Quality
    - Reliability
    - Maintainability
    - Usability
- Must be clearly specified

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Consequences

- Duration Overrun
  - 1 week
    - £2000 damages
    - No impact on customer business
  - 1 month
    - £20000 damages
    - Some impact on customer business
  - 3 months
    - £200000 damages
    - Major impact on customer business

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Lower Level Hazards

- Factors which contribute to top level hazards
  - User Dissatisfaction
    - Clumsy interface
    - Poor response time
    - Missing functionality
  - Look for
    - Symptoms of these
    - Hazards which cause this problem
- Decompose to a manageable level

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Hazard Categories

- Second Levels against categories
  - Personnel
  - Management
  - Problem/Product
  - Constraints
  - Technology
- Consider each area against the top level hazard domains

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Example Expansions

- Personnel
  - Wrong skills/experience
  - Insufficient staff
- Management
  - Optimistic assumptions
  - Unrealistic plans
  - Subcontractors not controlled

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Example Expansions

- Problem/Product
  - Novel Problem
  - Stringent technical requirements
- Constraints
  - Stringent Timescales
  - Resource Conflict
- Technology
  - Novel Hardware
  - New Hardware and Software
  - New methods and tools

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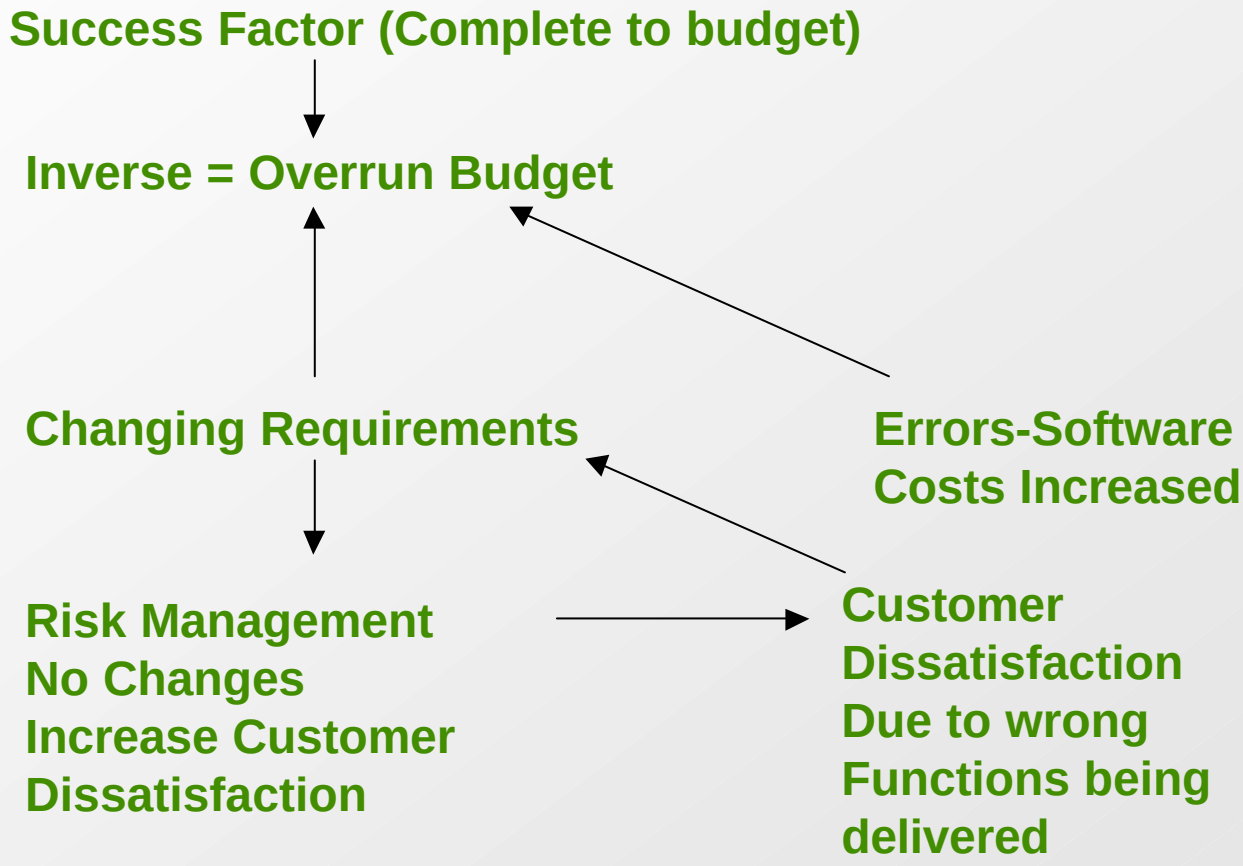
Relationships between Hazards



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Relationship Between Levels

- For Software
  - Not enough information to apply analytically
  - Each dimension considered separately
  - Lower Levels sum in a dimension
  - Top level only a vector as scales are not often comparable

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Techniques for Hazard Identification

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Contents

- Standard Checklists
  - Organisational
  - Local
- Scenario Analysis
  - Decision Drivers
  - Assumption Analysis
  - Other Techniques
- Supplementary Techniques

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Standard Checklists

- List of general project hazards
  - Are the requirements clearly stated?
- Lists categorised for different viewpoints
  - Stakeholder
  - Hazard Types
- Supporting Questions
  - Has the company done this type of project before?

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Sources of Standard Checklists

- Literature
  - Boehm
  - Cost Models
  - US Air Force
- Organisational Specific
  - GPT Guide to Risk Management
- Initial Creation
  - Brainstorming
  - Analysis of past projects

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Sources of Risk 1

- Contractual Environment
  - Unreasonable Customers
  - Defaulting Sub-Contractors
  - Late Delivery of components
  - Dependencies on and demands from other projects
  - Company Operation
  - Industrial Action
  - Disasters

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Sources of Risk 2

- Management/Process
  - Undefined responsibilities and authorities
  - Undefined Procedures
  - Unknown quality and control of developement products
  - Problems and Errors detected late
  - Inadequate technical approaches
  - Inadequate Support
  - Lack of Visibility

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Sources of Risk 3

- Technical
  - Requirements changes
  - Genuine changes of mind
  - Hidden implications emerge
  - Can not produce feasible design
  - Inconsistant design
  - Missing components
  - Inadequate testing time

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Sources of Risk 4

- Personnel
  - Wrong people available
  - Wrong availability
  - Too many people for current tasks
  - Too few people for current tasks

Example from Literature

- Boehm
  - Personnel Shortfalls
  - Unrealistic Schedules and Budget
  - Developing Wrong Software Functions
  - Developing Wrong User interfaces
  - Gold Plating
  - Continuous Stream of Requirements Changes
  - Shortfalls in External Components
  - Shortfall in External Tasks
  - Real Time Performance Shortfalls
  - Straining Computer Science Capabilities

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Example Lower Level Personnel

- Have you assumed you will get extremely capable staff?
- Are critical skills required which nobody currently has?
- Are there pressures to use available staff?
- Are there pressures to overstaff at early stages
- Are key project staff incompatible?

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Example Lower Level Personnel

- Are staff committed for the duration of the project
- Are staff committed full time
- Will staff actually be available when scheduled
- Do staff strengths match assignments
- Are task prerequisites met (e.g.. training)

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Cost Models

- If the method used to estimate has parameters
  - Identify factors which cause time/effort variations
  - May identify factors that affect major hazards

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Local Checklists

- Organisational checklists are only starting points
- Mapping to local practices is key
- Stop Checklists being tick lists, they are triggers

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Key Points about Checklists

- Need to be based on local practices
- Not just top level- need lower levels
- Ensure Completeness

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Scenario Analysis

- Similar to traditional Risk Management
  - What happens if?
  - How could we get into this problem situation?
- Mechanism for organising local expertise

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Starting Points

- Areas of concern
  - Safety Critical
    - Are there specific critical failures
  - Packages
    - Are they usable enough
    - What is their general reliability

Key Points Scenario Analysis

- Mechanism for
  - Organising thought
  - Structuring Discussion
- Only as good as the people who do it
- Support techniques improve the process

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Decision Driver Analysis

- Decisions made on non-technical grounds
  - Politically Driven
    - Equipment
    - Sub-contractors
    - Schedule and Budget
  - Marketing or Customer Driven
    - Gold Plating/Requirements Changes
    - Equipment
    - Schedule and Budget

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Decision Driver Analysis

- Solution Driven
  - Use of in-house components and tools
  - Use of new technology
  - Influence of product champions
- Short Term V Long Term
  - Staffing
  - Software Reuse
  - Reviews or solution freezes

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Assumption Analysis

- Major software risk items behind optimistic assumptions
- Causes
  - Ignorance
  - Conflict Avoidance
  - Pressure
- Avoidance
  - Past Experience
  - Capability Analysis
  - Sensitivity Analysis
  - Uncertainty Analysis

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Past Experience

- Extensive Effort reduction due to reuse
- *How much reusable software did not require rework?*
- Accurate plans based on size driven cost model suggests budget and timescales feasible
- *How often was size not underestimated?*

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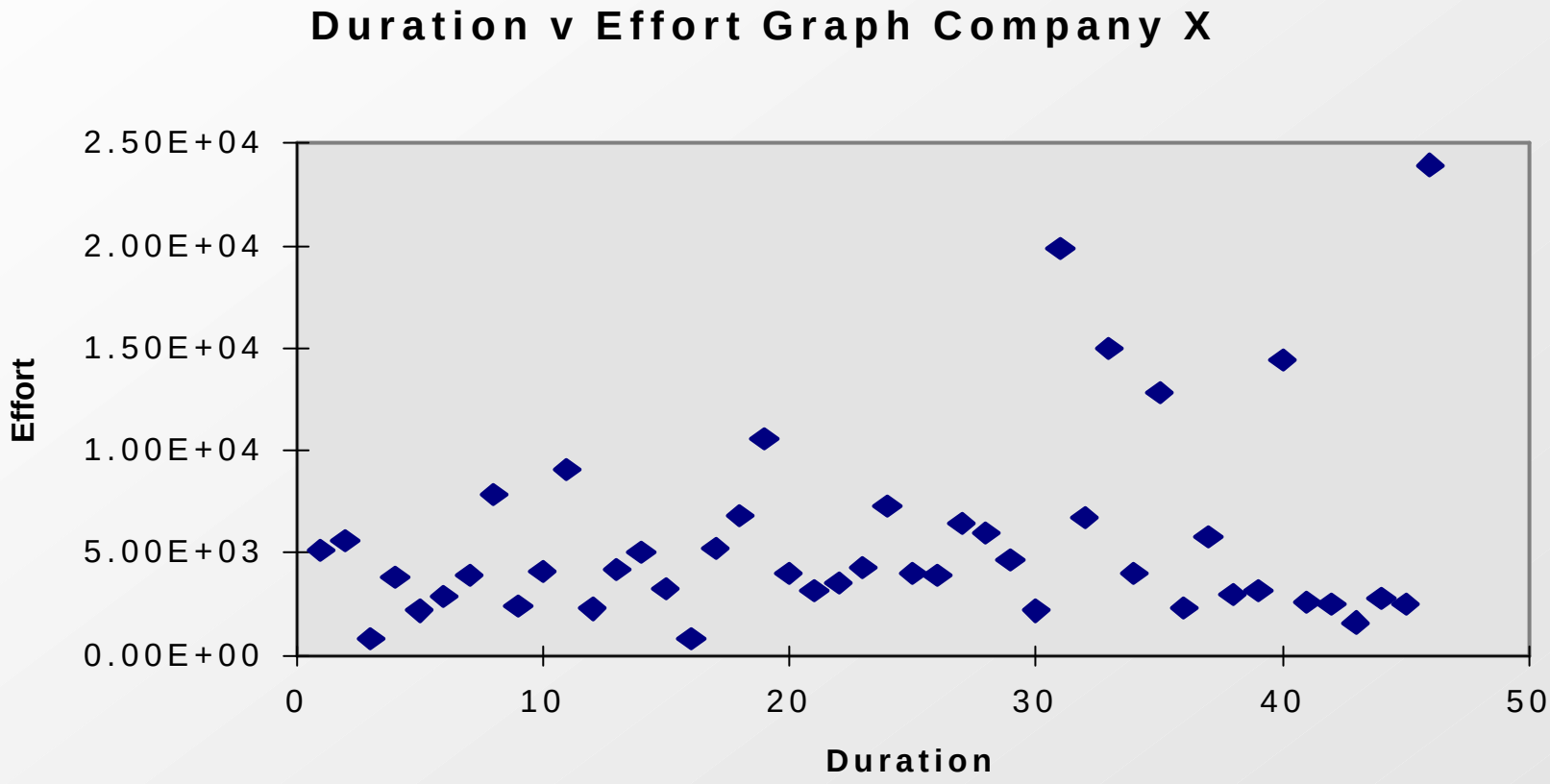
Effort v Timescales feasibility



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Capability Analysis

- What can we normally deliver
  - Effort
  - Schedule
  - Quality
  - Performance Characteristics
- What is the uncertainty
- How does this project fit

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Sensitivity Analysis

- Depends on availability of a model
  - Model relates
    - Project results
    - Factors that impact results
- Available models allow prediction of
  - effort
  - timescales
  - quality

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Example Sensitivity Analysis

- Cost Model

Effort = Productivity*Complexity*Size$^{1.2}$

Productivity in days per thousand lines of code

Complexity

High multiply by 1.5

Nominal multiply by 1.0

Low Multiply by 0.5

Size is estimated in thousands of lines of code

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Example Continued

- Initial
  - size = 50,000
  - Productivity = 3
  - complexity = 1.0
  - Effort = 328.0 person days
- What if Size =60000 and hence complexity goes to high (1.5)
  - Effort = 612.34 days

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Uncertainty Analysis

- Vague requirements
- Unstable requirements
- Poorly defined process/life cycle model
- Lack of knowledge of performance factors
- Poor, unknown or complex user interfaces
- Many interfaces with other systems

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Outstanding Issues

- Links between hazards
  - Some hazards are contingent on one another
  - Some are contingent on different project circumstances
  - See decision theory in risk reduction and control
- Problems can exist when risk management starts
  - Techniques for management problems in risk monitoring

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