

Managing Software Quality and Business Risk



Risk Register Approach

Assumptions



- The basic principles of risk are understood
- Realistic opportunities for change exist
- You are experienced as a project manager

Risk is difficult



- The problem is writing down what you don't know.
- Relates to project plans
- Risk planning is designed to make you think about what you don't know and to plan to handle it in the future

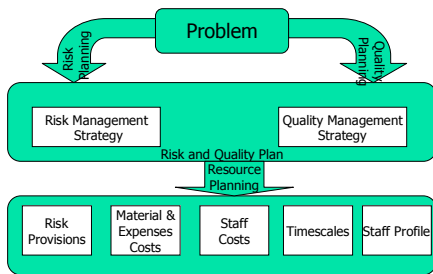


Risk is inter-related

- Related to
 - Quality
 - Requirements
 - Resource Planning
 - Development Methods



Links Summarised





- Michael Jackson once gave advice to a programmer, he said
"Don't optimise; but, if you must, do it last"
 - We can paraphrase for the project manager
"Don't compromise on the ideal plan; but, if you must, do it last"
- In other words get the plan right first then take on more risk to get the "right" answer



Various forms of risk

- Technical Risk
- Business Risk



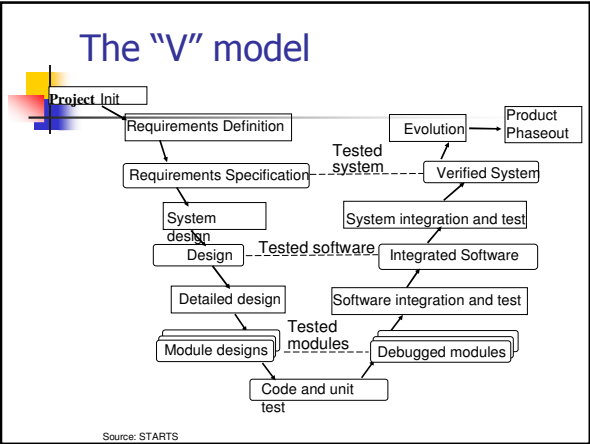
Technical Risk

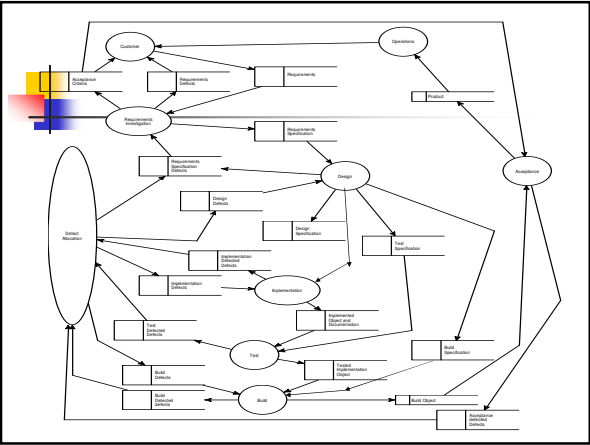
- At this early stage the question is;
"What are the uncertainties in the problem we have to solve and what do we need to do during the problem to resolve them"
- Other Risks derive from our attempts to do this or the failure of our plans to do so

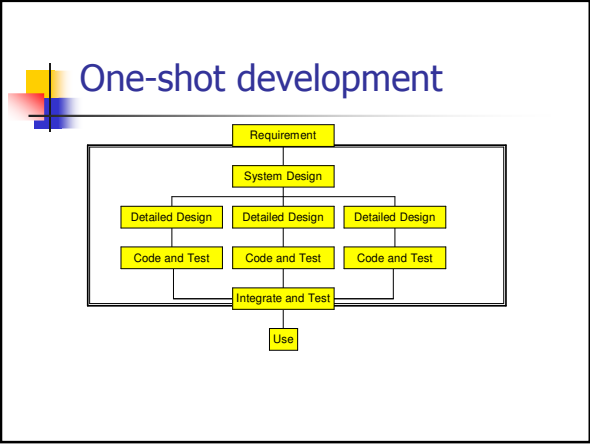


Process Models of Development

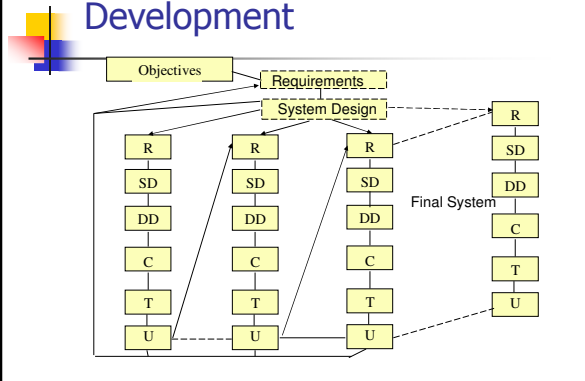
- The Process model we follow defines how we plan to protect ourselves from generic risks by giving us reviews V&V and an outline of the project plan tying these together



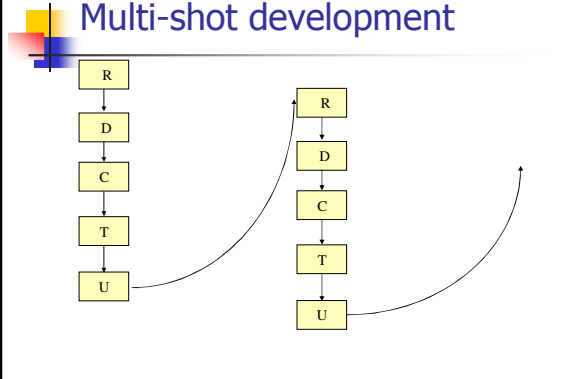




Evolutionary incremental Development



Multi-shot development

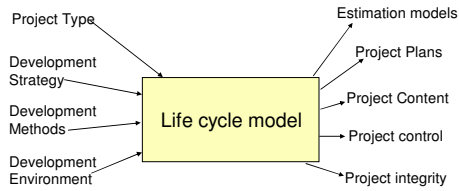


Strategy Summary

Strategy	Characteristics	Used When
One-shot	Linear Progression, fast if req not changed	Requirement, development and target environment well understood
Phased incremental	Sub-system at a time	System can be partitioned into independent modules
Evolutionary Development	Continuous change	Requirements subject to continual change
Prototyping	Working model of parts of the system	Requirement, design or environment not-well understood
Multi-shot	Succession of independent developments	Requirement very fuzzy system can not be planned



Choosing a life cycle model





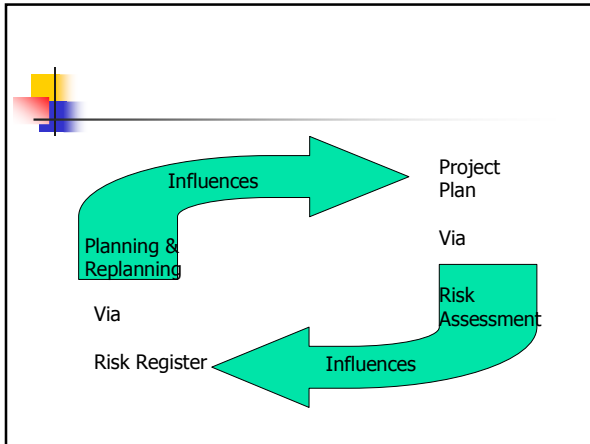
Consequences

- Should aim to give overall shape to project with a shape to survive the pressures on it
- Initial risk registry should be reviewed based on the typical issues facing the project
- Each project is unique so we need now to do detailed planning of what is in our registry



Detailed

- Process model gives a division of a project into phases with decision points for risk etc as information becomes available during the phase
- Prototypes can be introduced to reduce uncertainty
- Allow for small number of iterations around those activities we can't guarantee to get right first time



Business Risk

- To assess business risk you must have a business case
- If you don't have one create one for yourself as the project manager
- From the business case we are looking for
 - Whole life costs
 - System goals
 - Side effects

Whole Life Costs

- Initial Development Costs
 - Effort, Equipment Profit
- Costs of Ownership
 - Maintenance, Reliability, Recovery
- Exercise
 - Identify whole life cost items in your environment
 - Produce a list of decisions you make during development that affect costs of ownership



System Goals

- For support of a financial package the software acts as an enabler
- Provision of software for web based access to bank accounts has the goal of reducing cost per transaction
- Aero engine manufacturer wants the control software to give him a quieter more efficient engine
- Note these are not detailed requirements, might not even be stated
- Exercise
 - For a project you know what where the system goals



Side Effects

- Not the driving reason for having the system, but
- Beneficial
 - Good battlefield communication system means better co-ordination, but side effect could be better morale
- Detrimental
 - Quieter more efficient engine, but needs more maintenance staff with different skills
- Exercise
 - Identify side effects, if any that exist for the project you have chosen



Value or Variability

- For all types of goals
 - Is it the absolute value
 - Is it the unpredictability
- Each will have different implications

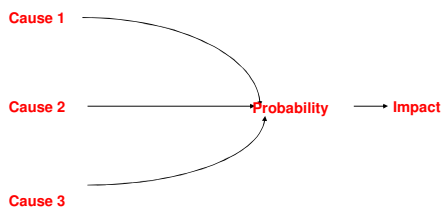
Risks as threats to the business case

- What threatens
 - Life cycle costs
 - Beneficial side effects
 - Achievement of business goal
- What increases the chance or impact of
 - Detrimental side effect

Finding the risks

- Our own experience
 - Always challenge the applicability
- Workshops
 - Run two
 - Senior
 - Junior
 - They will have different views

Causes, Impacts and Probability



Example

- From the text provided try to build a cause and effect diagram for the major risks

First Headings for a simple risk register

- Number
- Description
- Causes
 - I.e. is there a hierarchy of risks

Cause Effect Tree



Risk Register

Risk	Risk Description	Causes
1	We exceed the development cost target	
2	At peak demand we can not handle twice the throughput	
3	We are not ready for the start of the peak	
4	We reduce mistakes but not by 2/3	
5	The supplier of the warehouse management fails to deliver customised version	3
6	Machinery Installer fails to get machinery in place for integration with software	3
7	Fail to get sufficient staff trained in time	3
8	Key people we need to push through changes are overloaded	3

9	The requirements being pushed by marketing are not properly validated	5
10	There is demand for more "gold plating" than can be incorporated in time	5
11	New facilities are being built in and we feel obliged to incorporate	5
12	The algorithms that control the movement in packing are not right for this warehouse	2
13	Staff can not cope with new technology	2
	+others	

Binary and Sliding Risk

- Binary Risk
 - The event will either occur or it will not

- Sliding Risk
 - The impact of the event is variable

Event Uncertainty and Estimate Uncertainty

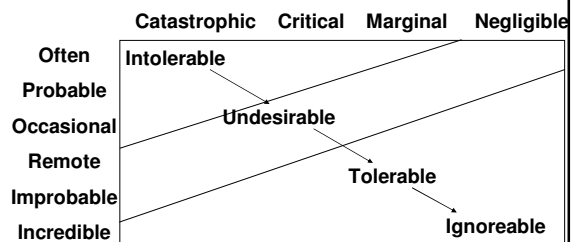
- Event Uncertainty
 - Something in the world may or may not happen
 - I.e it has some intrinsic variability

- Estimate Uncertainty
 - We are not certain about aspects of the development itself
 - I.e It reflects our lack of concrete information rather than its intrinsic variability

Qualitative risk assessment

<u>Frequency</u>	<u>Consequence</u>
Often	Catastrophic
Probable	Critical
Occasional	Marginal
Remote	Negligible
Improbable	
Incredible	

Qualitative Risk assessment (2)



First Estimates

	Very Unlikely (VU)	Unlikely (U)	Likely (L)	Very Likely (VL)
Life Threatening (L)				
Product Threatening (P)				
Expensive in Cost & Time (E)				
Some Cost or Time Penalty (S)				
Negligible Impact (N)				

- ### Is this good enough
- Although this feels crude, it is probably good enough for initial workshops
 - Keeps focus on "big ones"
 - Intention at this stage is simply to look for easy way to handle
 - Not statistical simply prioritisation of effort

- ### Updating the risk register
- We can determine for each risk whether it is caused by event uncertainty or estimating uncertainty. Mark this in register
 - We identify clearly what the uncertainty is
 - We add a course assessment of the uncertainty concerned
 - We add a course assessment of the impact

Updating the risk register after analysis

Risk	Risk Description	Causes	Source	Nature	Prob	Impact
6	The machinery installer fails to get the machinery in place ready for integration in time	3	Event	The supplier may not have the capability to deal with our requirements in time	U	P
7	We fail to get sufficient people trained in the use of the system in time	3	Estimate & Event	We are uncertain of the length of training and there may not be enough candidates	L	E
8	Key people needed to push through the work are overloaded	3	Estimate	We are uncertain as to the load and other commitments at that time	L	S
9	The requirements being pushed by marketing are not fully validated	5	Event	They may not be validated	L	E

Updating the risk register after analysis (2)

Risk	Risk Description	Causes	Source	Nature	Prob	Impact
10	We demand more gold plant than can reasonably be incorporated in the time available	5	Estimate & Event	We are uncertain about what it will take to deal with the changes and it may not be possible to rein in requirements change	U	E
11	Planned new facilities are being incorporated into the machinery and we feel obliged by the customers to exploit these from day 1	5	Event	It may not be possible to compromise on these sufficiently to meet the deadlines	VU	P
12	The algorithms that control the movement and picking of stock may not be right for the way the warehouse is being set up	2	Estimate	We are uncertain how the flow will look and what are the dynamics of the working warehouse	U	E
13	Staff can not cope with the new technology	2	Event	It may be we don't have appropriate staff with the right background to be trained	L	S

Risk Planning and Risk Reduction

- A risk threatens the cost-benefit model that justified the project, it makes it less likely to succeed in business terms
- Risk Reduction methods explore options to remove or reduce the threat
- Attack probability or impact or both
- Costs commensurate with the risk value



Types of Reduction

- Pre-emptive
 - Actions take place before the risk materialises
 - Information Buying
 - reduces estimating uncertainty
 - Risk Influencing
 - Generally attacks the probability of an event
 - Contractual Transfer
 - Someone else better to manage the risk



Reactive Risk Reduction

- Planned to take effect after the risk materialises
 - Contingency Plans
 - Insurance



Pulling threads together

		Reactive risk measures		Pre-emptive risk measures		
		Contingency	Insurance	Info Buying	Risk influence	Transfer
Estimating uncertainty	Prob			✗		✗
	Impact	✗	✗			✗
Event uncertainty	Prob				✗	✗
	Impact	✗	✗			✗



Updating the risk register with risk reduction measures and owners

Risk	Description	Reduction Measures	Owner
6	As Before	Ensure the Supplier is aware of the business criticality to both parties, Increase the visibility of this activity	SGL
7	As Before	Get some estimates from a training company. Find how long things took at last major change and scale up Discuss need to raise salary levels for trained staff to encourage.	MOA
8	As Before	Inventory other activities of key staff. Negotiate with other parties to free time now	TJH
9	As Before	Get high level agreement that any changes to requirements must go through a change board	ABC



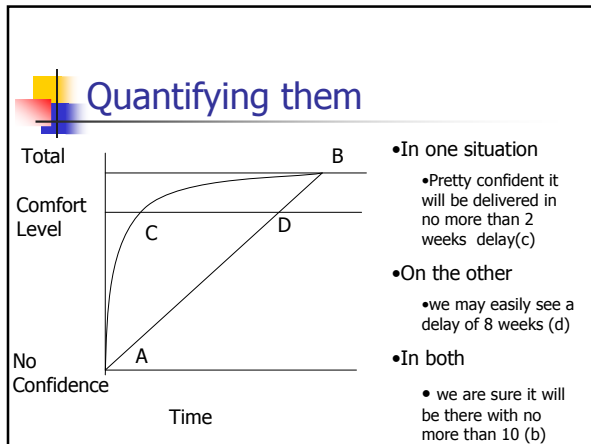
Updating the risk register with risk reduction measures and owners

10	As before	Get agreement to firm estimates quickly impose strict change control	QAE
11	As before	Get agreement that the change board must approve all changes to requirements	ABD
12	As before	Prepare simulations to test algorithms, consider use of consultants recommended by other retailers who had similar requirements	SGL
13	As before	Analyse key staff and move less adaptable away from key posts	SAD



Residual Risk

- That which remains after
 - We have taken our risk reduction actions
 - Choosing to ignore a risk
- So far qualitative has been enough
 - Now we need to think about quantification



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- More on Quantification**
- We must decide which shape represents our feelings about the risk best
 - Shape acb is saying somewhere between 0 to 10 weeks delay but we feel it is unlikely to be more than 2
 - Shape adb is saying it is somewhere between 0 and 10 weeks delay and we are not sure but think it could be at the worse end
 - These may just be private picture and the actions depend on the use we are putting the information

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- Input to a pricing decision**
- Each provision for residual risk should be at a *Confidence Level set for Commercial Reasons*
 - Influenced by
 - Competition
 - Desire to break into new markets
 - Not necessarily what we are comfortable with as a risk level



Quantification of binary risks

- Suppose DBMS we plan to use has promised new security features in the next release
 - We need these
 - Rumour says they may not be in
- Provision
 - Impact say 55k extra effort to implement ourselves
 - Impact otherwise 0K
- Can only be handled from a portfolio perspective
 - We are making a series of "bets" on the probabilities of occurrence of this type of event



Quantification of Binary Risks

- Suppose we assess the probability at 40% then we would make a provision of $55k \cdot .4 = 22k$
- In reality we will either be
 - down 33K
 - Up 22k
- This 22k can not just be spent but must be banked to cover those occasions when we lose the bet



Quantification Summary

- Each individual risk provision is derived from commercial environment and technical judgement
- We should have
 - The least impact we could suffer
 - Chosen level of provision
 - Worse level we could suffer (without getting silly)

Updating the risk register again

Risk	Residual Risk	Best Case	Chosen Case	Worst Case
6	Machinery installer fails to get it in place in time for integration	0	10	30
7	We fail to get sufficient staff trained in the operation of the system in time	0	5	20
8	We can not reduce the overload on the key people	0	0	10
9	Marketing push through un-validated requirements	0	0	30

Updating the risk register again

Risk	Residual Risk	Best Case	Chosen Case	Worst Case
10	More knobs and whistles are demanded than can be incorporated in the time	0	0	20
11	The pressure to use the new machinery features from day 1 can not be resisted	0	0	0
12	The algorithms are not right for the way the warehouse is set up	0	5	20
13	Staff can not cope with the new technology	10	15	20

Full set of risk register fields

Risk Number	A unique identifier for the risk
Risk Description	A brief description of the risk in cause effect terms
Causes	A list of risks that this risk causes
Source of Uncertainty	An indicator saying whether the uncertainty is caused by event or estimating uncertainty
Nature of Uncertainty	A description of the event or estimating uncertainty causing the event
Probability	An assessment of the likelihood the risk will materialise
Impact	An Assessment of the scale of the impact the risk could have if it materialised



Register Fields

Chosen risk reduction Measures	A list of the pre-emptive and or reactive measures chosen to manage the risk
Risk Owner	The name of the person(s) delegated to manage this risk and monitor it
Residual Risk	The nature of the risk that remains once the chosen risk management has had its full effect
Best Case Value	An assessment of the impact on effort or schedule in the best case
Chosen Case Value	The level chosen to dictate provision for the residual risk
Worst Case Value	An assessment in terms of impact on cost and schedule in the worst case



Risk Register

- Where impact can not be sensibly rendered into cost or schedule terms we may need another set of impact fields
- Keep it
 - Spreadsheet
 - Small Access Database
 - Purpose built product



Opportunity not risk

- Why not manage opportunities the same way
 - Opportunity Identification
 - Spot them
 - Opportunity Analysis
 - Take them apart and analyse them
 - Opportunity Response Planning
 - Decide what will increase the likelihood or impact of an opportunity
 - Opportunity Resolution and Monitoring
 - Do what you decide



Summary

- Software Development is a risky endeavour
- Strategies depend on the risks you perceive and what must be done to reduce them to a reasonable level
- Usually first step is to determine process model of development



Summary

- 2nd step is to review those aspects of risk which are not addressed by the lifecycle, and create a risk register
- 3rd step is to iterate via revisions of the project plan and specific risk management actions until remaining risks are at an acceptable level
- 4th step is to actively manage and monitor these throughout the lifecycle of the project on a day to day basis



Overall Benefits of the Approach

- Risks are actively managed
- Opportunities are actively managed
- Provision is intelligently estimated against individual residual risks rather than guessed at as some gross overall multiplier
- A dialogue can be opened aimed at reducing overall risk to the project and increasing customer satisfaction
