

# 위험관리와 보수유지

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Reactive Risk Management  
(사후 관리?)

VS.

Proactive Risk Management  
(사전 관리?)

## 프로젝트 위험



## Risk Management (위험 관리)

Risk 특징 → concerns future happenings

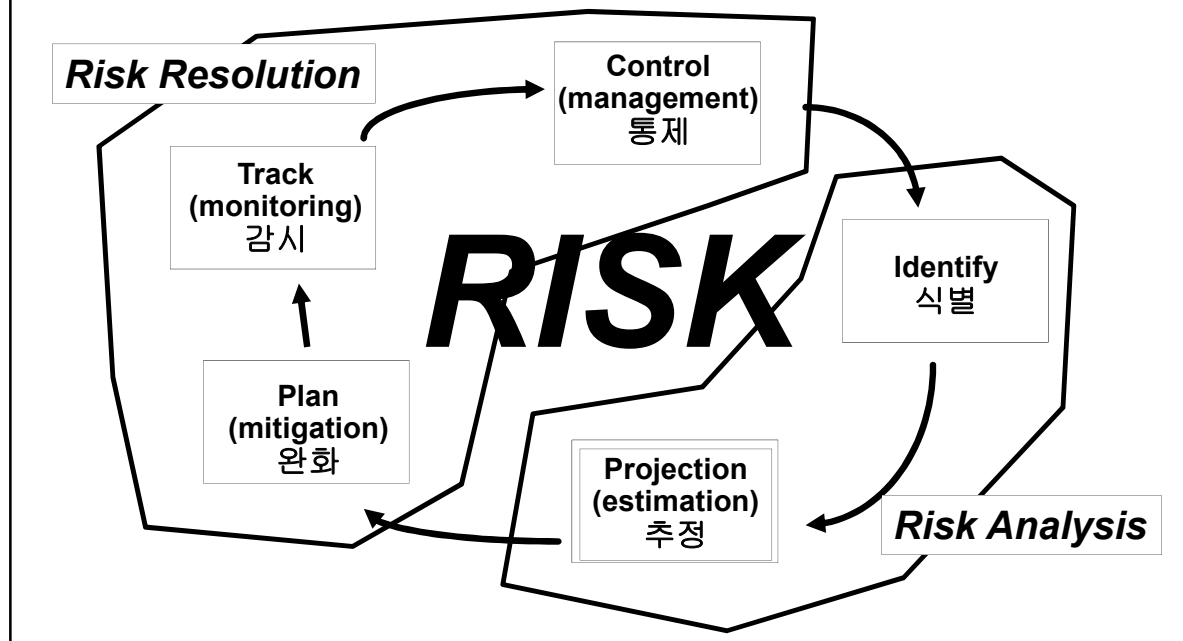
### ■ Risk analysis

- Risk identification (위험 식별)
- Risk projection(estimation) (위험 추정)

### ■ Risk resolution (RMMM)

- Risk mitigation (위험 완화)
- Risk monitoring (위험 감시)
- Risk management(control) (위험 통제)

# Risk Management Paradigm



## Risk Identification (식별)

- *Product size (PS)* — risks associated with the overall size of the software to be built or modified.
- *Business impact (BU)* — risks associated with constraints imposed by management or the marketplace.
- *Customer characteristics (CU)* — risks associated with the sophistication of the customer and the developer's ability to communicate with the customer in a timely manner.
- *Process definition (PD)* — risks associated with the degree to which the software process has been defined and is followed by the development organization.
- *Development environment (DE)* — risks associated with the availability and quality of the tools to be used to build the product.
- *Technology to be built (TE)* — risks associated with the complexity of the system to be built and the "newness" of the technology that is packaged by the system.
- *Staff size and experience (ST)* — risks associated with the overall technical and project experience of the software engineers who will do the work.

## Risk Due to Product Size (PS)

### ***Attributes that affect risk:***

- estimated size of the product in LOC or FP?
- estimated size of product in number of programs, files, transactions?
- percentage deviation in size of product from average for previous products?
- size of database created or used by the product?
- number of users of the product?
- number of projected changes to the requirements for the product? before delivery? after delivery?
- amount of reused software?

## Risk Due to Business Impact (BU)

### ***Attributes that affect risk:***

- affect of this product on company revenue?
- visibility of this product by senior management?
- reasonableness of delivery deadline?
- number of customers who will use this product
- interoperability constraints
- sophistication of end users?
- amount and quality of product documentation that must be produced and delivered to the customer?
- governmental constraints
- costs associated with late delivery?
- costs associated with a defective product?

## Risks Due to the Customer (CU)

### ***Questions that must be answered:***

- Have you worked with the customer in the past?
- Does the customer have a solid idea of requirements?
- Has the customer agreed to spend time with you?
- Is the customer willing to participate in reviews?
- Is the customer technically sophisticated?
- Is the customer willing to let your people do their job—that is, will the customer resist looking over your shoulder during technically detailed work?
- Does the customer understand the software engineering process?

## Risks Due to Process Definition (DE)

### ***Questions that must be answered:***

- Have you established a common process framework?
- Is it followed by project teams?
- Do you have management support for software engineering
- Do you have a proactive approach to SQA?
- Do you conduct formal technical reviews?
- Are CASE tools used for analysis, design and testing?
- Are the tools integrated with one another?
- Have document formats been established?

## Technology Risks (TE)

### ***Questions that must be answered:***

- Is the technology new to your organization?
- Are new algorithms, I/O technology required?
- Is new or unproven hardware involved?
- Does the application interface with new software?
- Is a specialized user interface required?
- Is the application radically different?
- Are you using new software engineering methods?
- Are you using unconventional software development methods, such as formal methods, AI-based approaches, artificial neural networks?
- Are there significant performance constraints?
- Is there doubt the functionality requested is "do-able?"

## Staff/People Risks (ST)

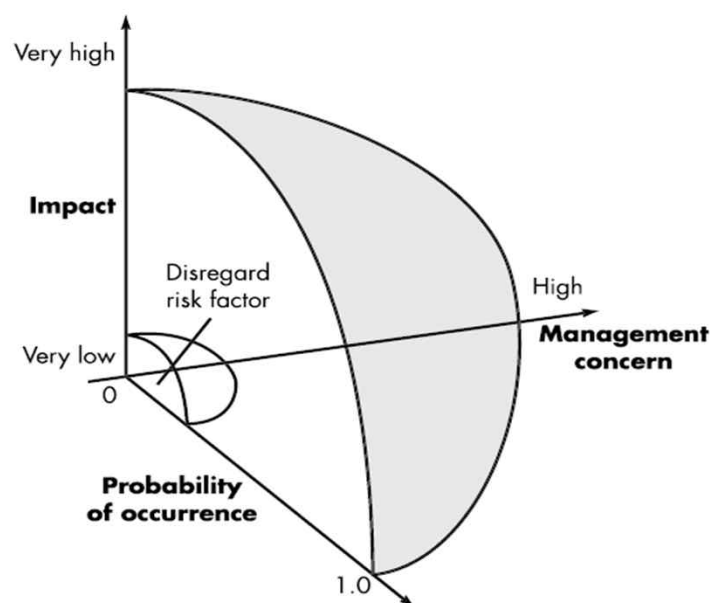
### ***Questions that must be answered:***

- Are the best people available?
- Does staff have the right skills?
- Are enough people available?
- Are staff committed for entire duration?
- Will some people work part time?
- Do staff have the right expectations?
- Have staff received necessary training?
- Will turnover among staff be low?

# Risk Projection

- *Risk projection*, also called *risk estimation*, attempts to rate each risk in two ways
  - the likelihood or probability that the risk is real
  - the consequences of the problems associated with the risk, should it occur.
- There are four risk projection steps:
  - establish a scale that reflects the perceived likelihood of a risk
  - delineate the consequences of the risk
  - estimate the impact of the risk on the project and the product,
  - note the overall accuracy of the risk projection so that there will be no misunderstandings.

# Risk Projection



# Risk Table

Risks	Category	Probability	Impact	RMMM		
				Mitigation	Monitoring	Management

# Risk 영향 평가

범주	컴포넌트		성과	지원	비용	일정
	1	2				
재앙적	1	요구사항을 충족하는 데 실패했을 때 임무 실패 초래			증가된 비용과 일정지연을 초래하는 실패는 예상치 \$500K을 초과	
	2	기술적 성능이 달성되지 못하는 중대한 저하	대응하지 못하거나 지원하지 못하는 소프트웨어	중대한 재정적인 부족, 예산초과 가능성	도달할 수 없는 IOC	
결정적	1	요구사항을 충족하는 데 실패했을 때 임무 성공이 의심스러울 정도의 시스템 성능이 저하됨			운영상의 지연과 증가된 비용을 초래하는 실패는 예상치 \$100~\$500K이 소요	
	2	기술적 성능에서 약간의 감소	소프트웨어 변경에서 사소한 지연	중대한 재정적 자원의 부족, 초과 가능성	IOC에서 저하 가능성	
최저한	1	요구사항을 충족하는 데 실패했을 때 부차적인 임무 손상을 초래			비용, 영향 및 회복가능한 일정이 예상치 \$1K~\$100 K소요	
	2	기술적 성능에서 최소에서 약간의 감소	대응적인 소프트웨어 지원	충분한 재정적인 자원	실제적이고 달성 가능한 일정	
하찮은	1	요구사항을 충족하는 데 실패했을 때 불편함 또는 아직 가동되지 않는 영향을 초래			사소한 비용과 일정에 영향을 주는 오류는 예상치 \$1K 소요	
	2	기술적 성능에서 어떤 감소도 없음	쉽게 지원가능한 소프트웨어	가능한 예산 내	초기에 쉽게 달성 가능한 IOC	



## Building a Risk Table

Risks	Category	Probability	Impact	RMMM
Size estimate may be significantly low	PS	60%	2	
Larger number of users than planned	PS	30%	3	
Less reuse than planned	PS	70%	2	
End users resist system	BU	40%	3	
Delivery deadline will be tightened	BU	50%	2	
Funding will be lost	CU	40%	1	
Customer will change requirements	PS	80%	2	
Technology will not meet expectations	TE	30%	1	
Lack of training on tools	DE	80%	3	
Staff inexperienced	ST	30%	2	
Staff turnover will be high	ST	60%	2	
Σ				
Σ				
Σ				

Impact values:  
 1—catastrophic  
 2—critical  
 3—marginal  
 4—negligible

## Building the Risk Table

- Identify the risks
- Decide the category
- Estimate the probability of occurrence
- Estimate the impact on the project on a scale of 1 to 4, where
  - 1 = catastrophic
  - 2 = critical
  - 3 = marginal
  - 4 = negligible

## RMMM

- Mitigation — how can we avoid the risk?
- Monitoring — what factors can we track that will enable us to determine if the risk is becoming more or less likely?
- Management — what contingency plans do we have if the risk becomes a reality?  
→ e.g., “knowledge transfer mode”

## Risk Mitigation, Monitoring, and Management

- For large project, 30-40 risks are identified
- Pareto 80-20 rule  
→ shows that 80% of risk  
are in 20% of identified risk.

♣ Pareto 법칙: 이태리 경제학자 Pareto가 1900년대 만든 법칙  
예: “스마트폰 사용자의 20%가 전체 통화량의 80%를 쓴다.”

# Recording Risk Information

**Project:** Embedded software for XYZ system  
**Risk type:** schedule risk  
**Priority** (1 low ... 5 critical): 4  
**Risk factor:** Project completion will depend on tests which require hardware component under development. Hardware component delivery may be delayed  
**Probability:** 60 %  
**Impact:** Project completion will be delayed for each day that hardware is unavailable for use in software testing  
**Monitoring approach:**  
 Scheduled milestone reviews with hardware group  
**Contingency plan:**  
 Modification of testing strategy to accommodate delay using software simulation  
**Estimated resources:** 6 additional person months beginning ...

# Recording Risk Information

Risk information sheet			
Risk ID: P02-4-32	Date: 5/9/09	Prob: 80%	Impact: high
<b>Description:</b> Only 70 percent of the software components scheduled for reuse will, in fact, be integrated into the application. The remaining functionality will have to be custom developed.			
<b>Refinement/context:</b> Subcondition 1: Certain reusable components were developed by a third party with no knowledge of internal design standards. Subcondition 2: The design standard for component interfaces has not been solidified and may not conform to certain existing reusable components. Subcondition 3: Certain reusable components have been implemented in a language that is not supported on the target environment.			
<b>Mitigation/monitoring:</b> 1. Contact third party to determine conformance with design standards. 2. Press for interface standards completion; consider component structure when deciding on interface protocol. 3. Check to determine number of components in subcondition 3 category; check to determine if language support can be acquired.			
<b>Management/contingency plan/trigger:</b> RE computed to be \$20,200. Allocate this amount within project contingency cost. Develop revised schedule assuming that 18 additional components will have to be custom built; allocate staff accordingly. Trigger: Mitigation steps unproductive as of 7/1/09.			
<b>Current status:</b> 5/12/09: Mitigation steps initiated.			
Originator: D. Gagne		Assigned: B. Laster	

## Homework #3: 위험관리

### 1. Risk Table 작성 (필요시 가정 및 상상!)

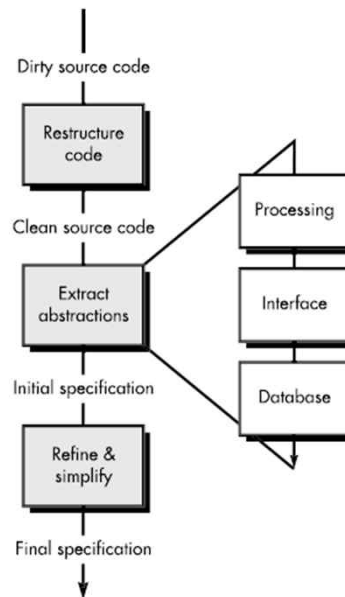
- (1) Risk item
- (2) Category
- (3) Probability
- (4) Impact
- (5) Risk Mitigation
- (6) Risk Monitoring
- (7) Risk Management (Control)

## Maintainability (보수유지)

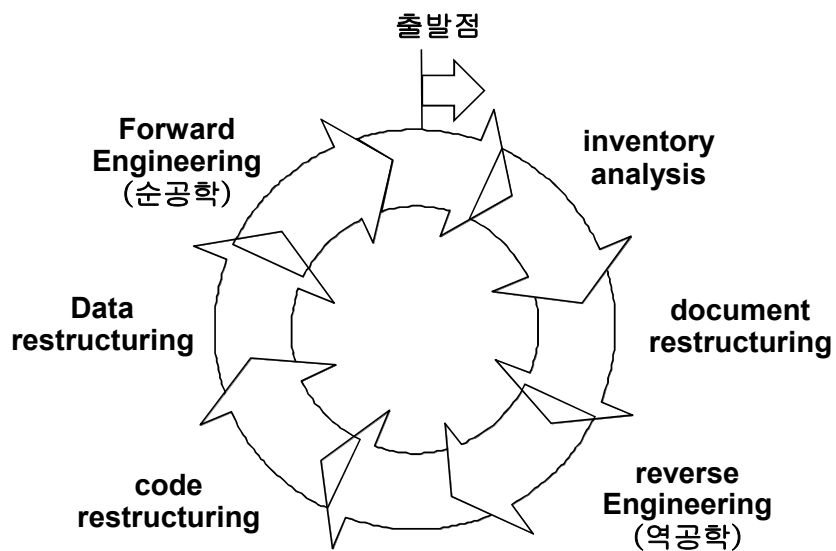
➔ Qualitative indication of the ease with which existing S/W can be;

- Corrected           (오류 수정)
- Adapted           (환경 적응)
- Enhanced           (기능 강화)

## Reverse Engineering (역공학)



## Software Reengineering (재공학)



프로젝트 관리 사례:  
미국방성 시스템개발 방법론

**SYSTEMS  
ENGINEERING  
FUNDAMENTALS**



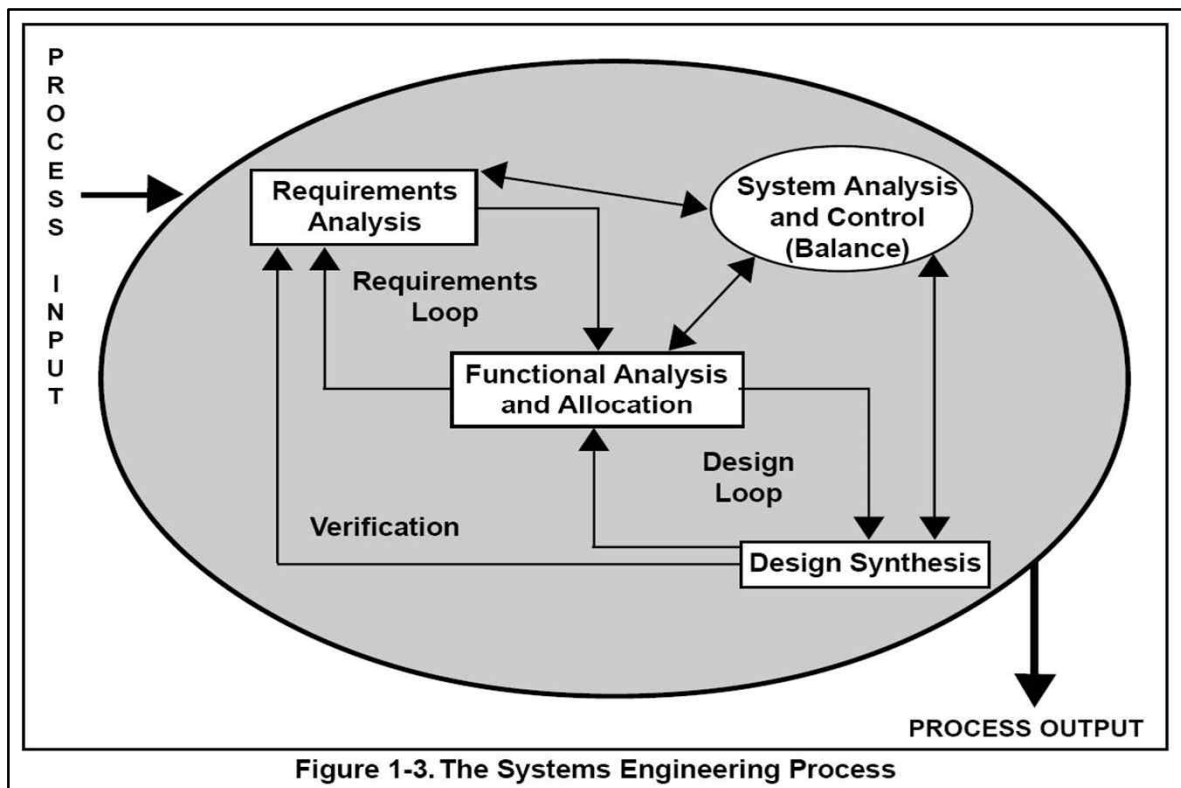


Figure 1-3. The Systems Engineering Process

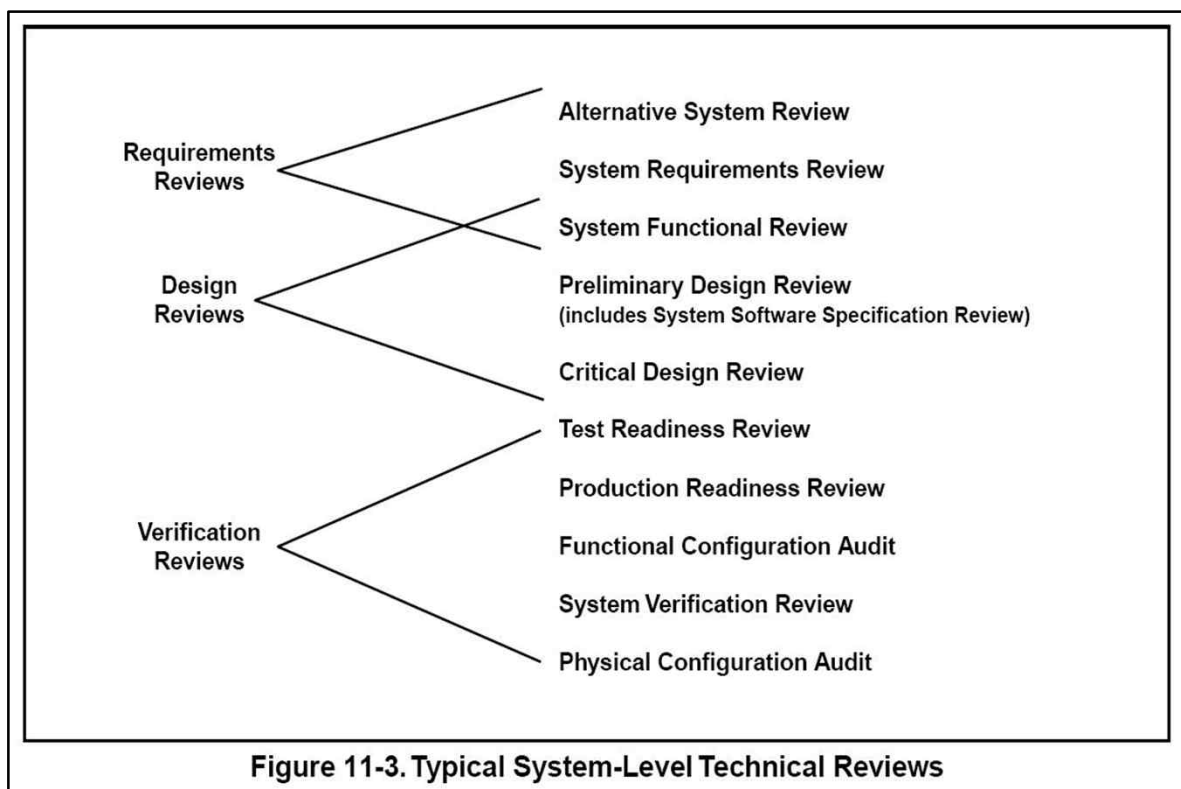


Figure 11-3. Typical System-Level Technical Reviews

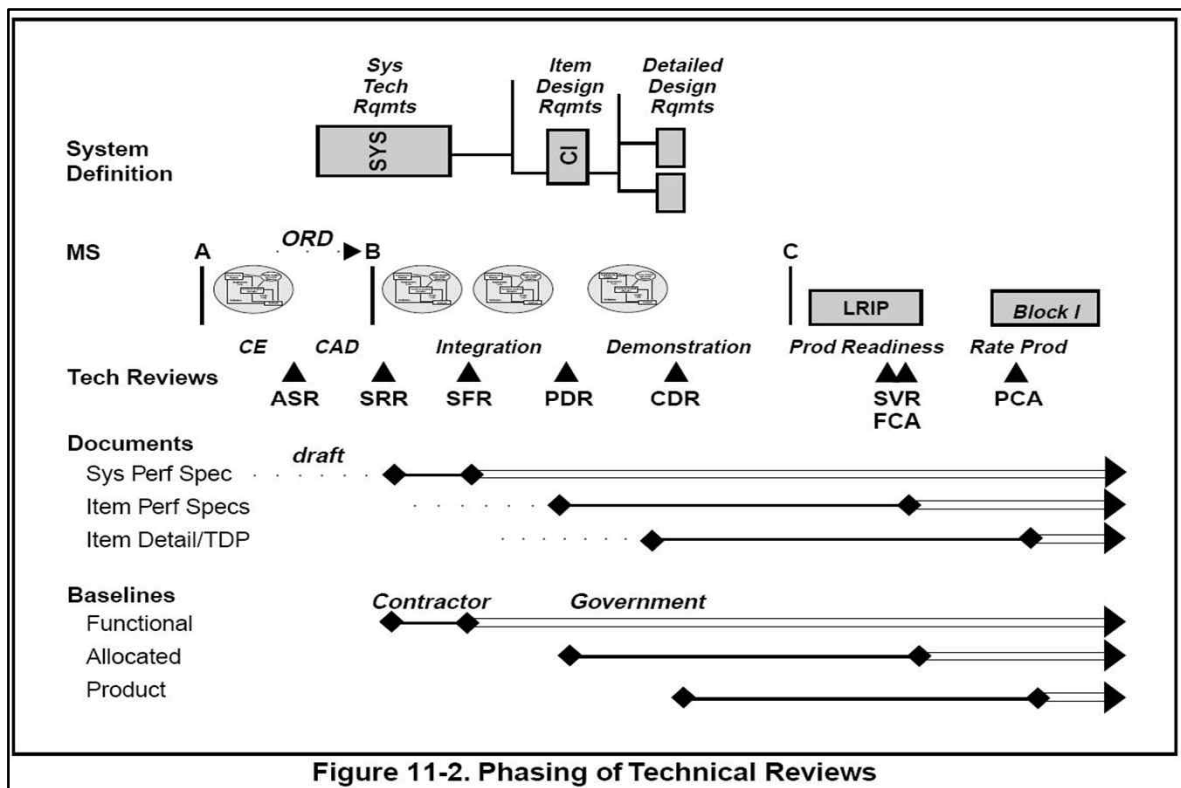


Figure 11-2. Phasing of Technical Reviews

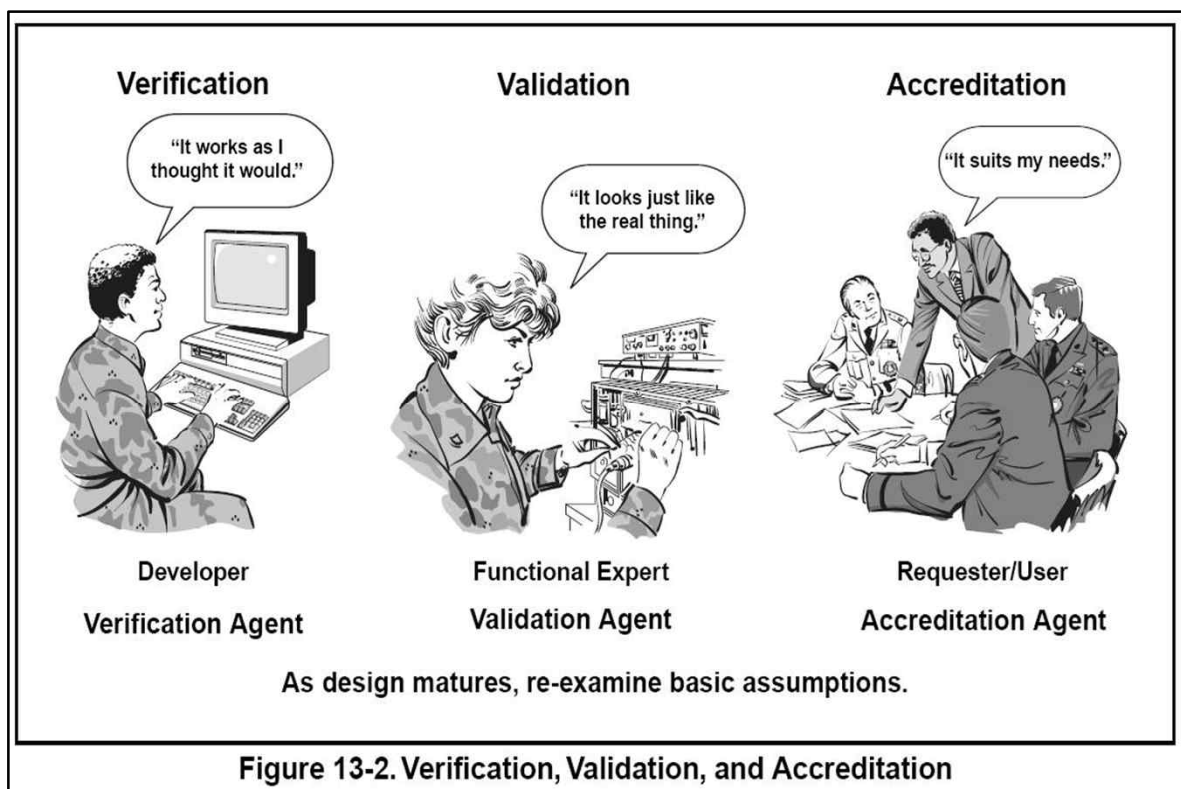
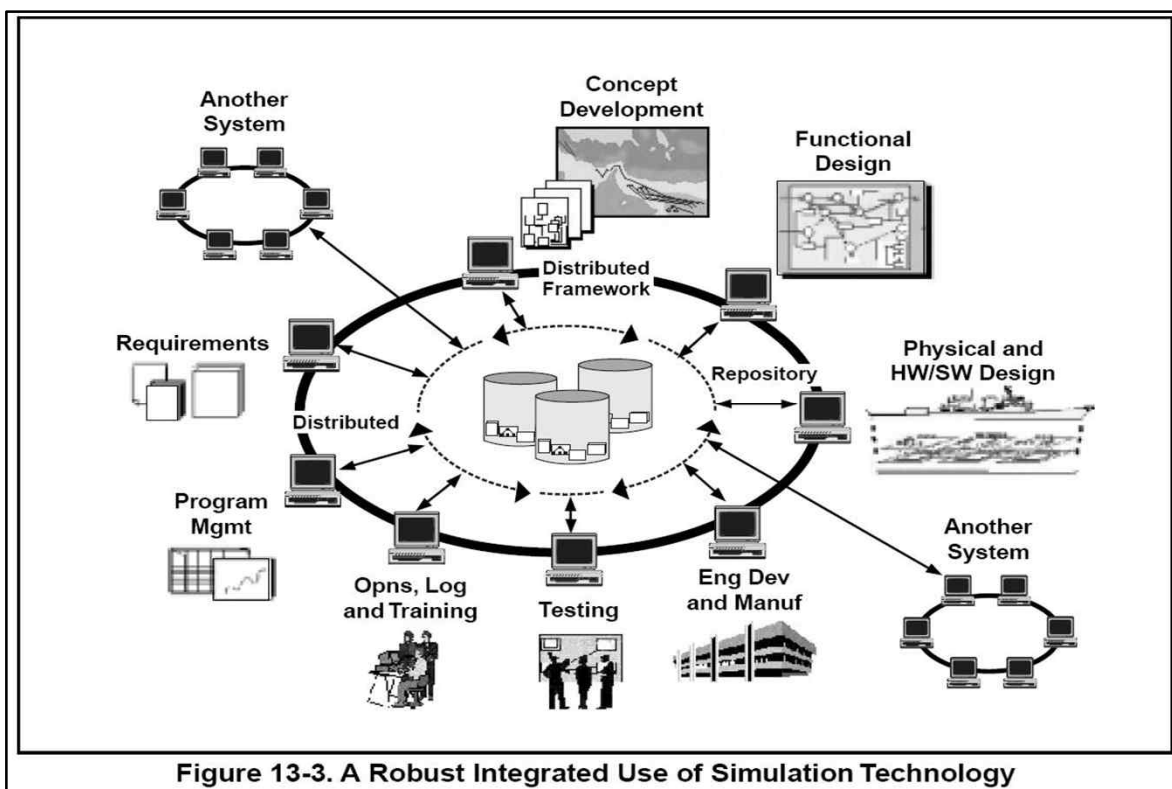
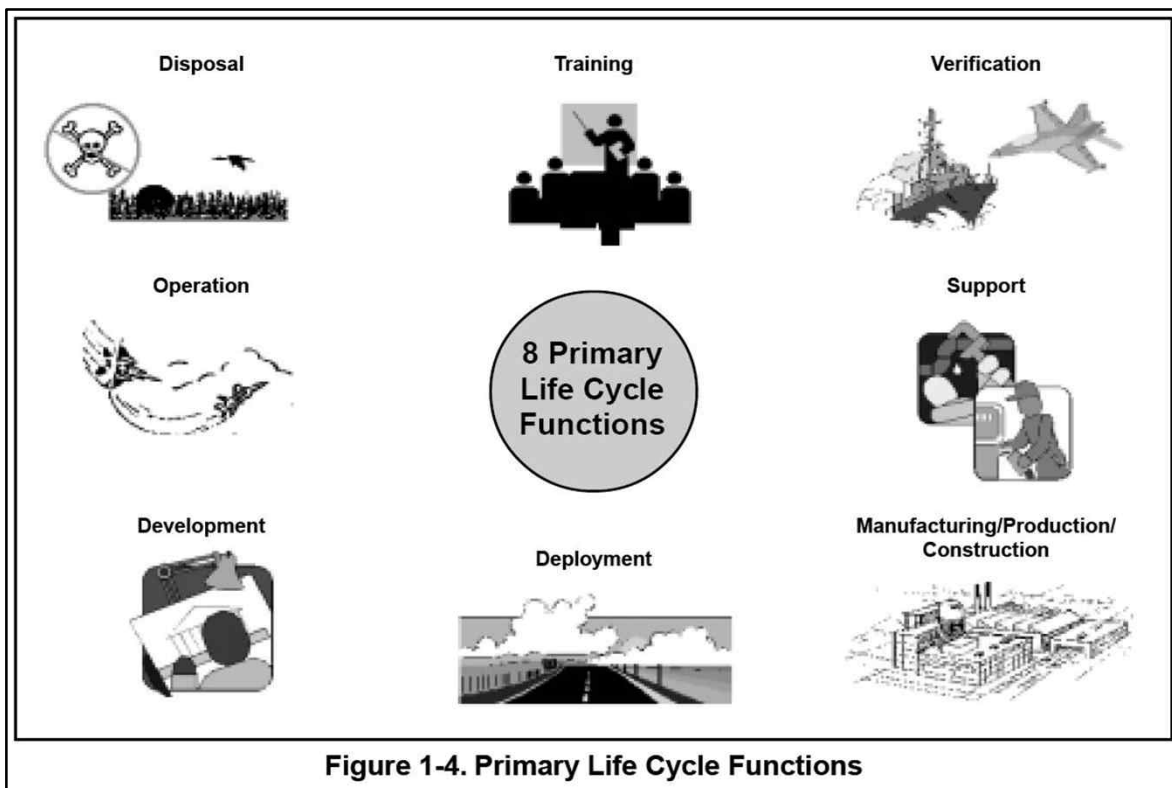


Figure 13-2. Verification, Validation, and Accreditation





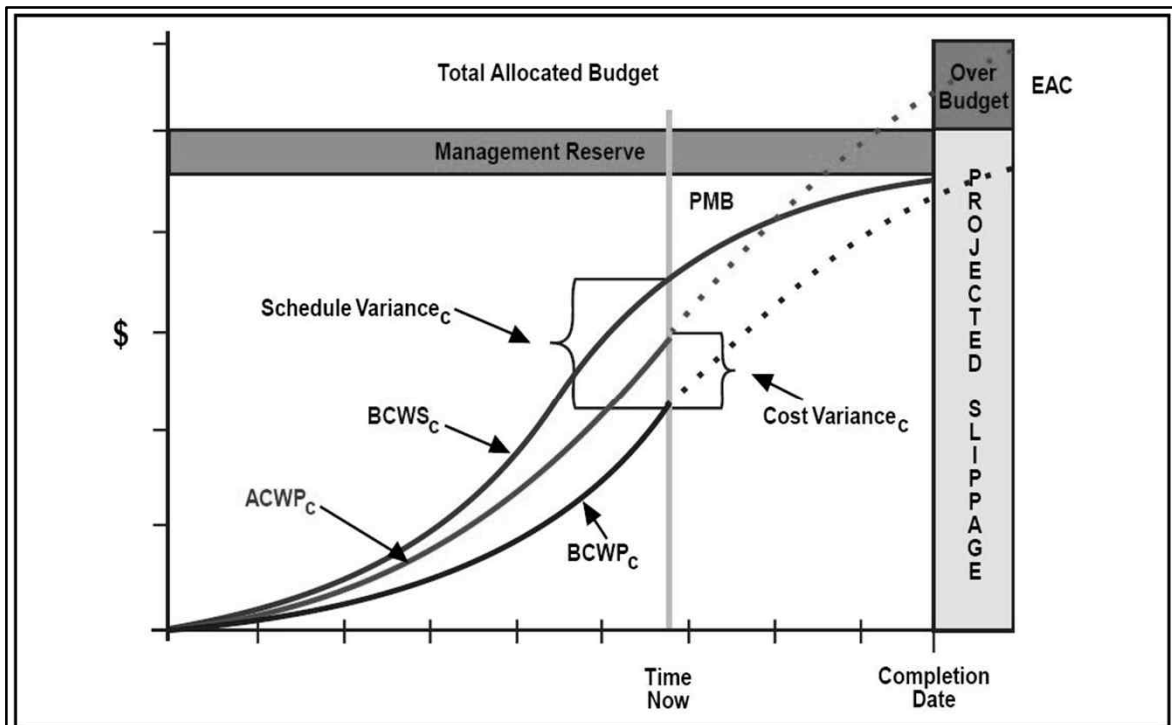


Figure 14-1. Earned Value Concept

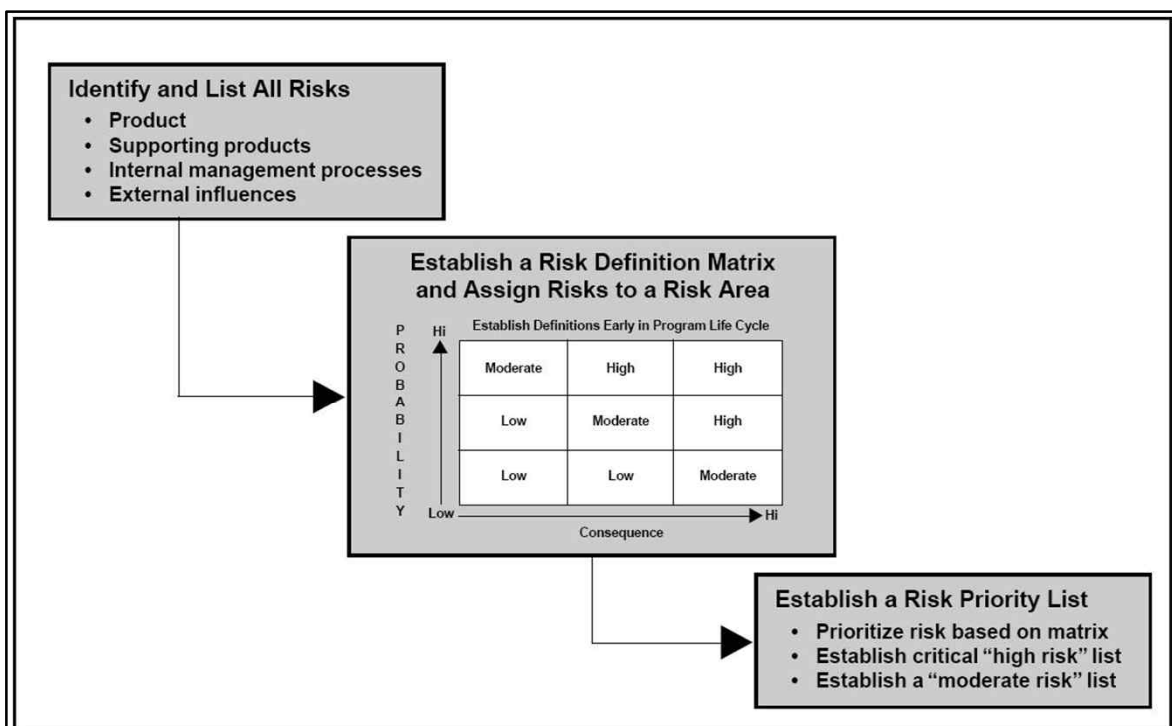


Figure 15-4. Initial Risk Identification