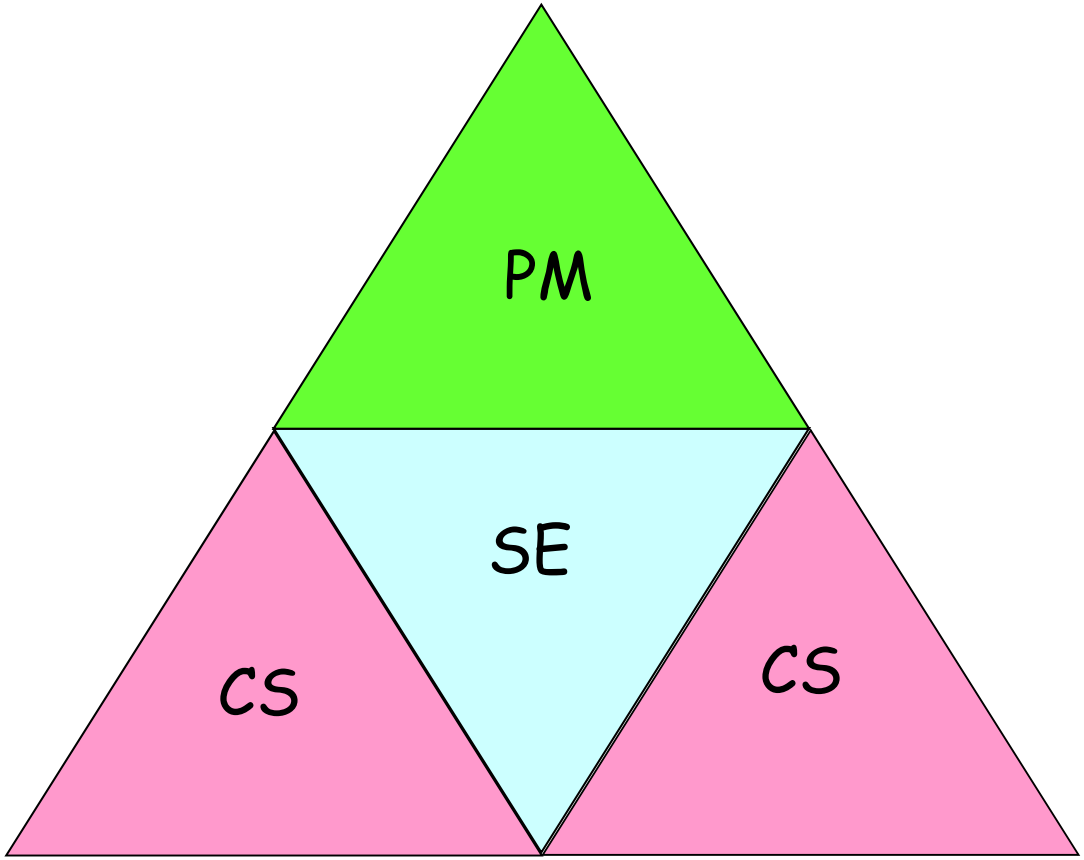
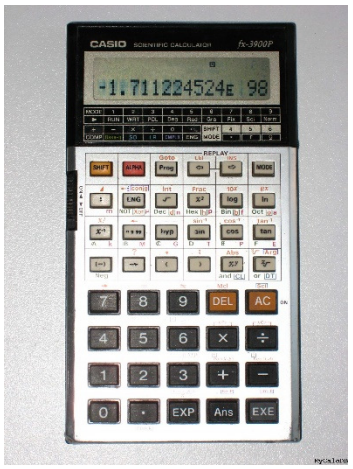
Project Managers

First, know where you are!



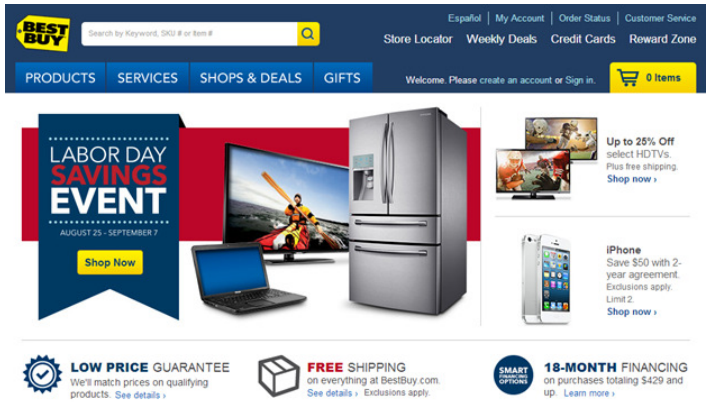
Evolution of Software and Hardware

In the old days, Personal Computing was about
a Type Writer and a Calculator



Evolution of Software and Hardware

Today, Personal Computing is the internet of things and its Apps

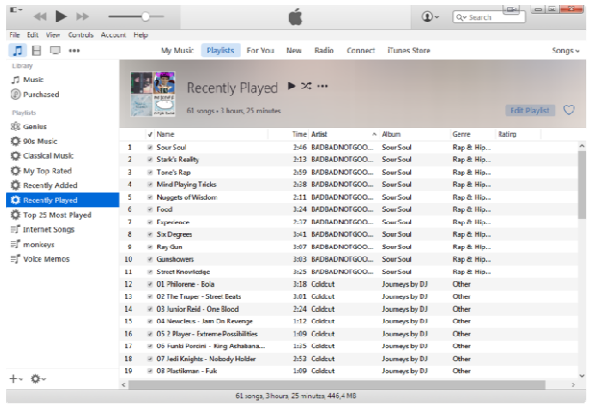


Evolution of Software and Hardware

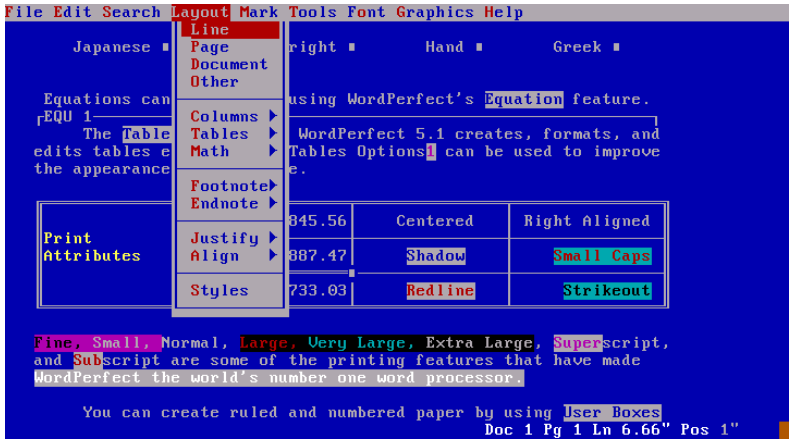
In the old days, the challenge for your computer was to beat the Type Writer

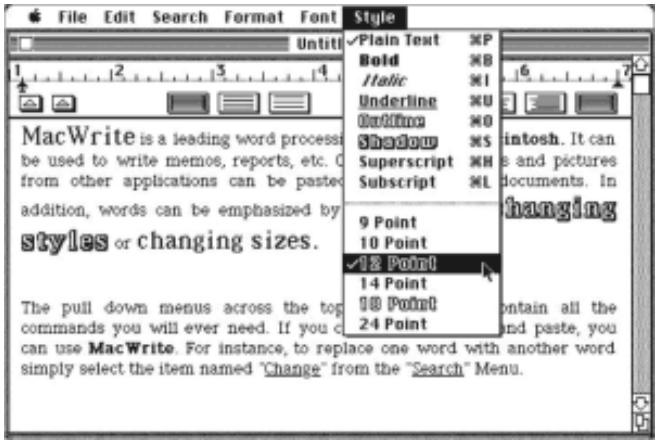
Evolution of Software and Hardware

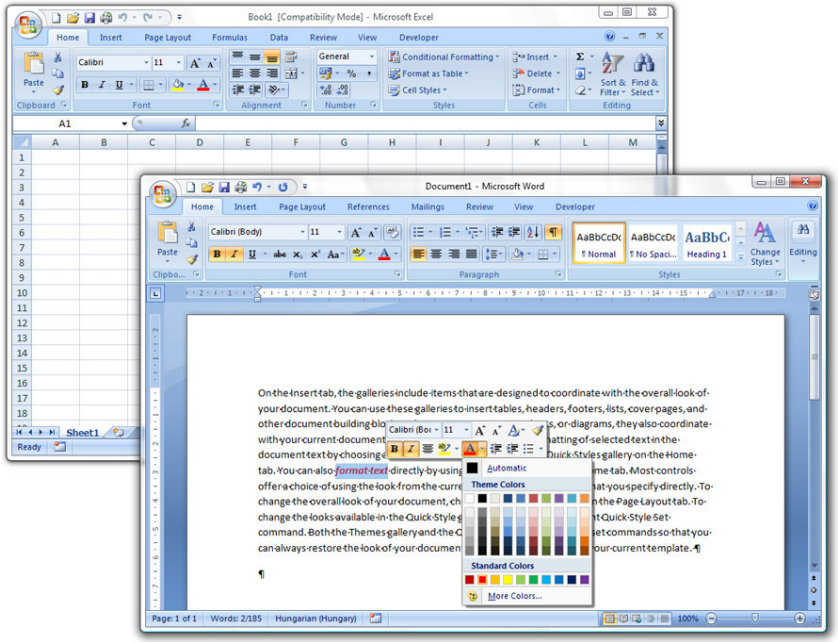
Today, the challenge for your computer whether it can do everything



Evolution of Software and Hardware

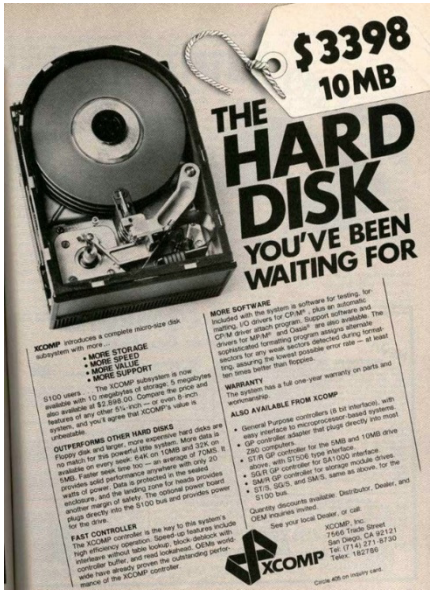


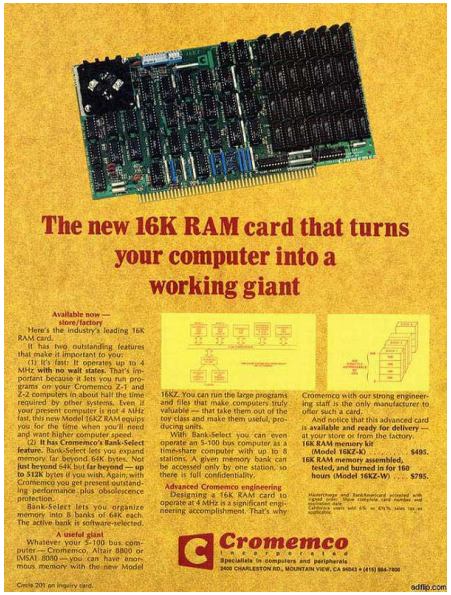




Evolution of Software and Hardware

Hard Disk Prices in the old days of PC





Evolution of Software and Hardware

Hard Drive Prices Today

Add to Compare

WD - My Passport Ultra 1TB External USB 3.0/2.0 Portable Hard Drive - Classic Black

Model: WDBGPU0010BBK-NESN | **SKU:** 7869174

Included Free: 1 item

See More Options

USB 3.0 and 2.0 interfaces; password protection; 256-bit AES hardware encryption; WD Backup software; data transfer rates up to 5 Gbps via USB 3.0 and up to 480 Mbps via USB 2.0

PRICE MATCH GUARANTEE

$57.99

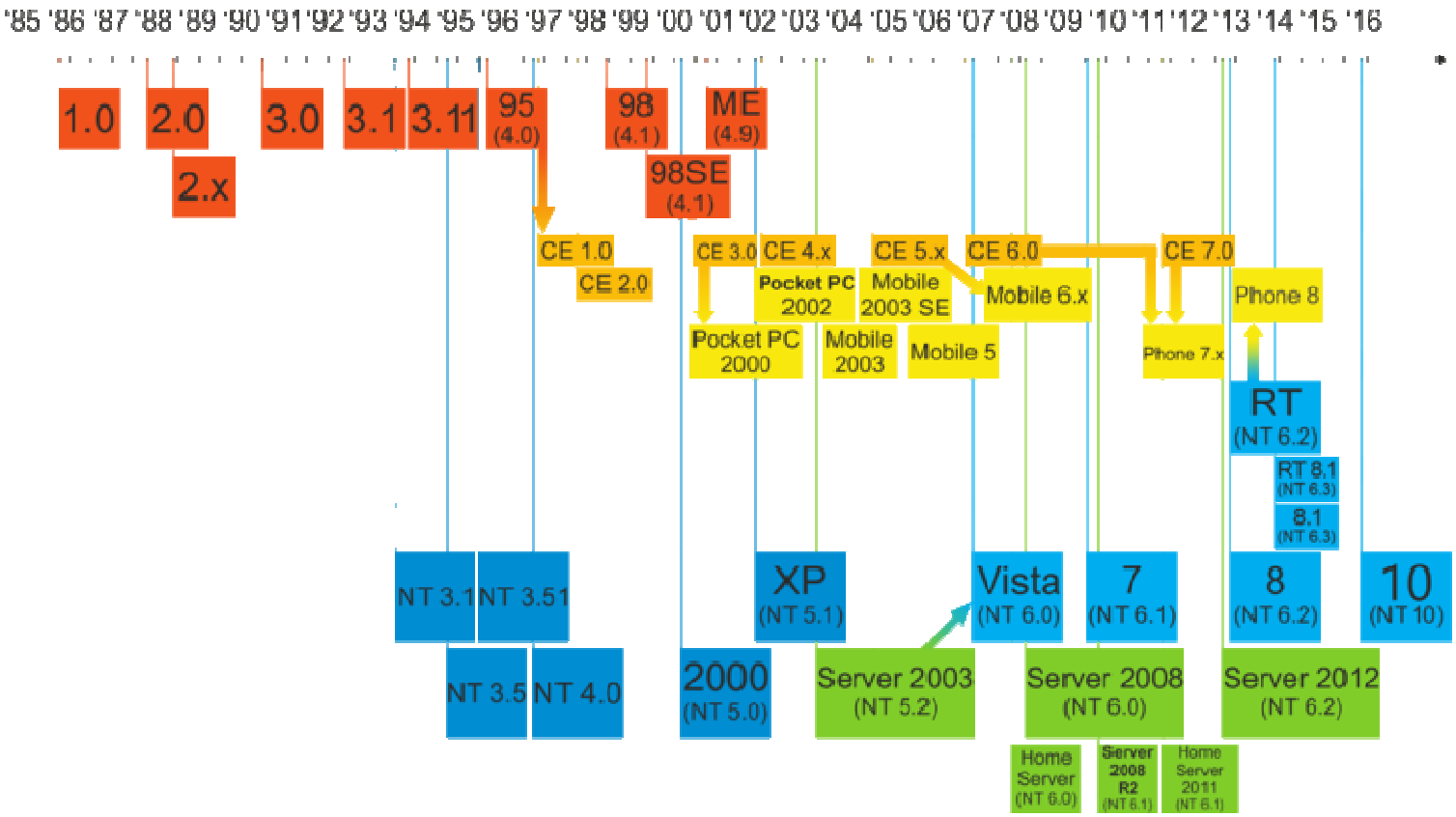
ON SALE

SAVE $2 (Reg. $59.99)

Check Stores

Evolution of Software and Hardware

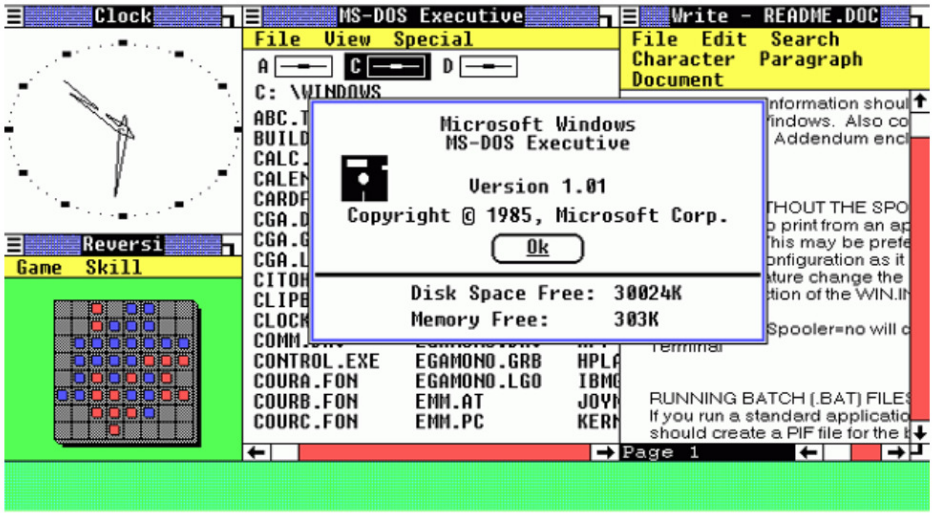
MS Windows Releases



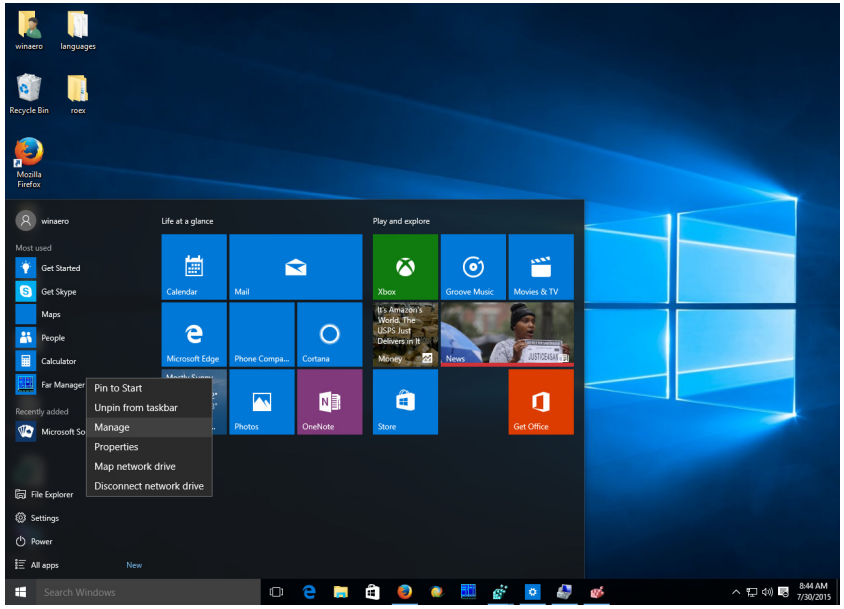
Evolution of Software and Hardware

MS Windows Releases

Windows 1

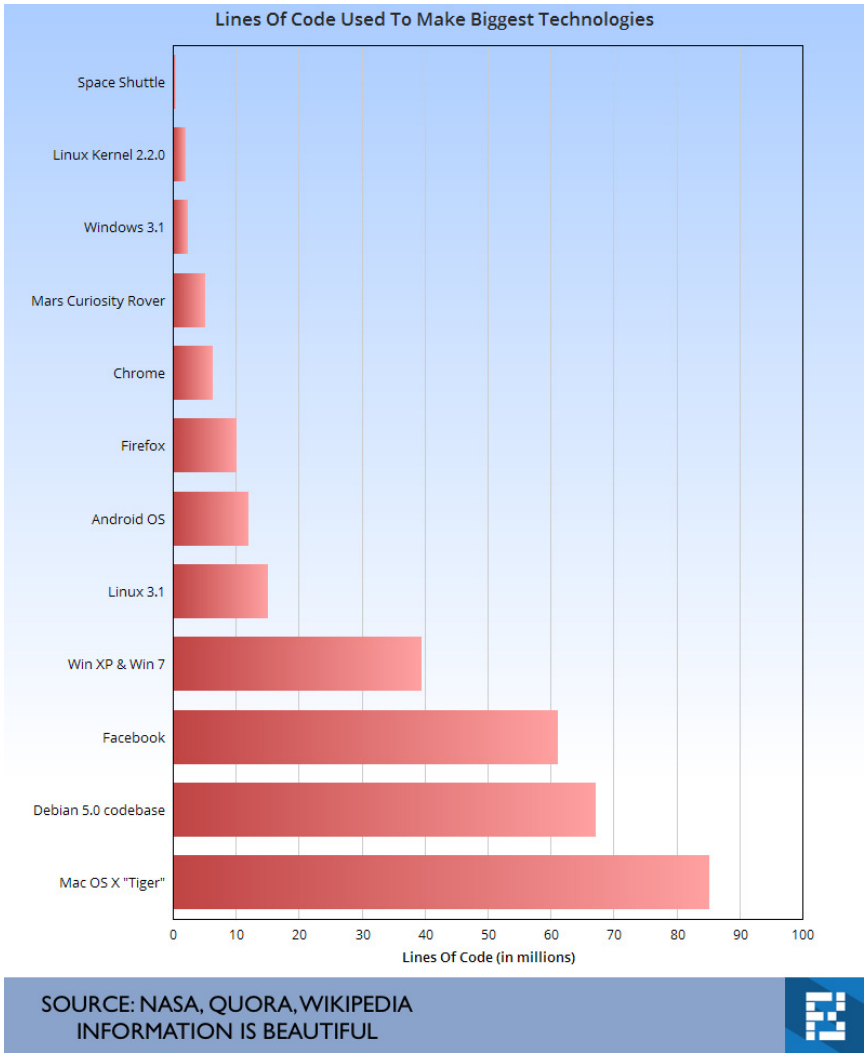


Windows 10



Evolution of Software and Hardware

Software Platforms and OS



Evolution of Software and Hardware

- "How big is Google? We can answer that question in terms of revenue or stock price or customers or, well, metaphysical influence. But that's not all. Google is, among other things, a vast empire of computer software. We can answer in terms of code."

- "Google's Rachel Potvin came pretty close to an answer Monday at an engineering conference in Silicon Valley. She estimates that the software needed to run all of Google's Internet services—from Google Search to Gmail to Google Maps—spans some 2 billion lines of code. By comparison, Microsoft's Windows operating system—one of the most complex software tools ever built for a single computer, a project under development since the 1980s—is likely in the realm of 50 million lines."

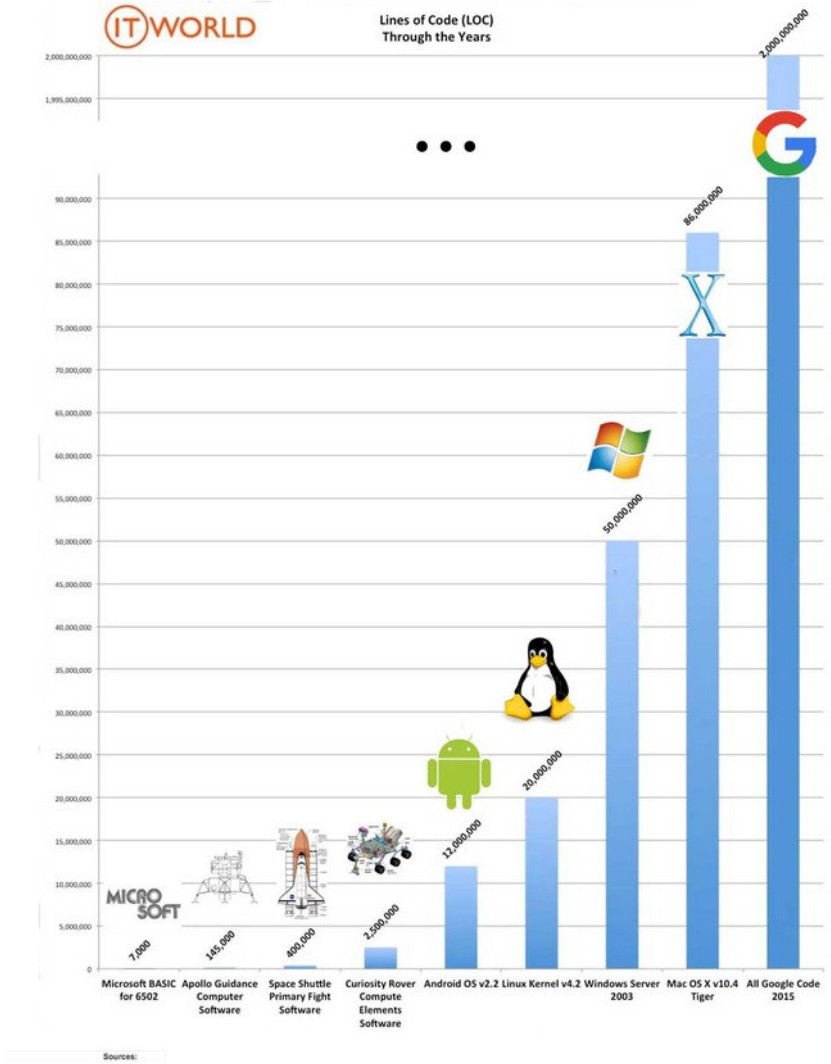
Source: https://www.wired.com/2015/09/google-2-billion-lines-codeand-one-place/

Evolution of Software and Hardware

- "Last week, Google engineering manager Rachel Potvin, speaking at the @Scale conference in San Jose, said that, as of last January, Google's total code base was 2 billion lines of code. This mammoth collection of code, she explained, spans 9 million source files which take up 86 terabytes of storage. To manage it all, Google created its own home-grown version control system called Piper, to which the company's 25,000 developers commit 15,000 changes per day."

Source: http://www.itworld.com/article/2985099/application-management/thats-one-big-repository-heres-how-many-lines-of-code-google-has.html

Evolution of Software and Hardware



Source: http://www.itworld.com/article/2985099/application-management/thats-one-big-repository-heres-how-many-lines-of-code-google-has.html

Project Managers

- Growing demand for software project managers
  - Organizations have become customer-driven.
  - Organizations have evolved from function to process structures.
  - Organizations are using task forces more frequently.
  - Organizations have become more project-oriented.

- From the organization perspective, project managers are needed to:
  - Gain market share
  - Be first to market
  - Stay profitable
  - Maintain Quality

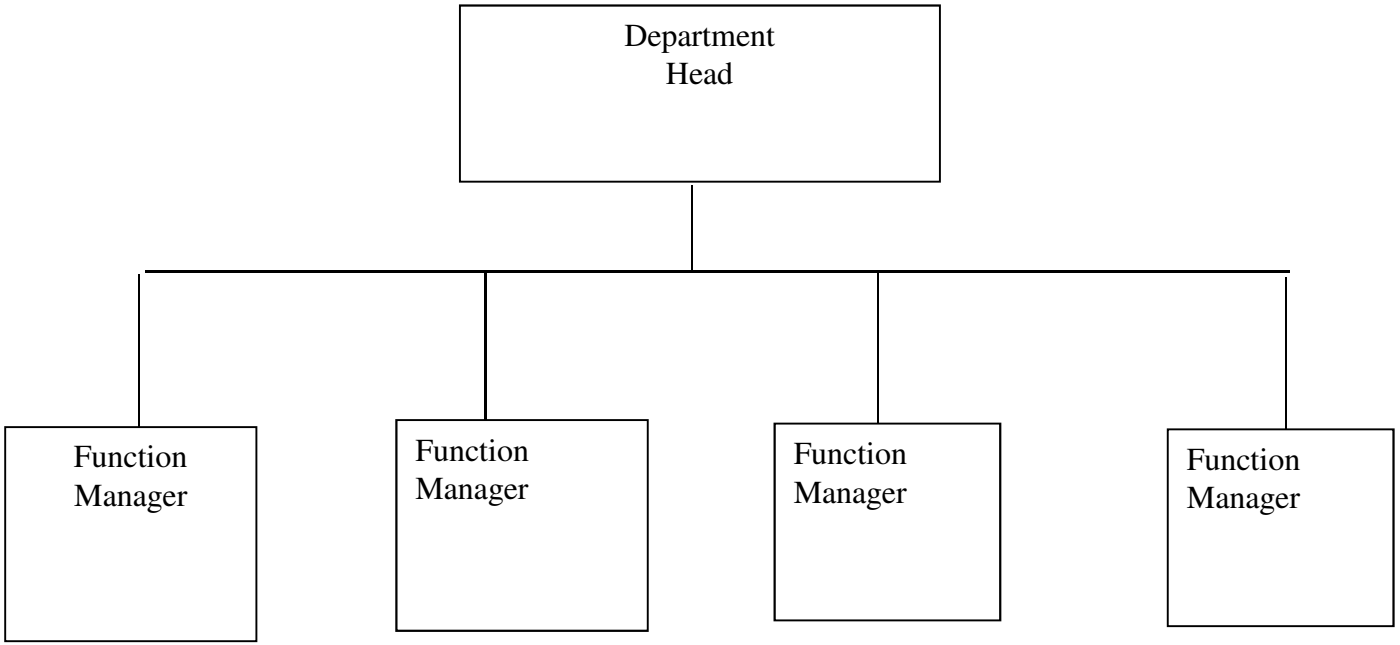
Project Managers

- Project Managers are mainly responsible to all issues related to the software project; issues may vary depending on the project scale, some of the common issues are:
  - Schedule
  - Budget
  - Quality
  - Delivery of products
  - Locking resources
- Bottom line, as a project manager you will notice that most of your time is consumed chasing and collecting the status of project tasks.

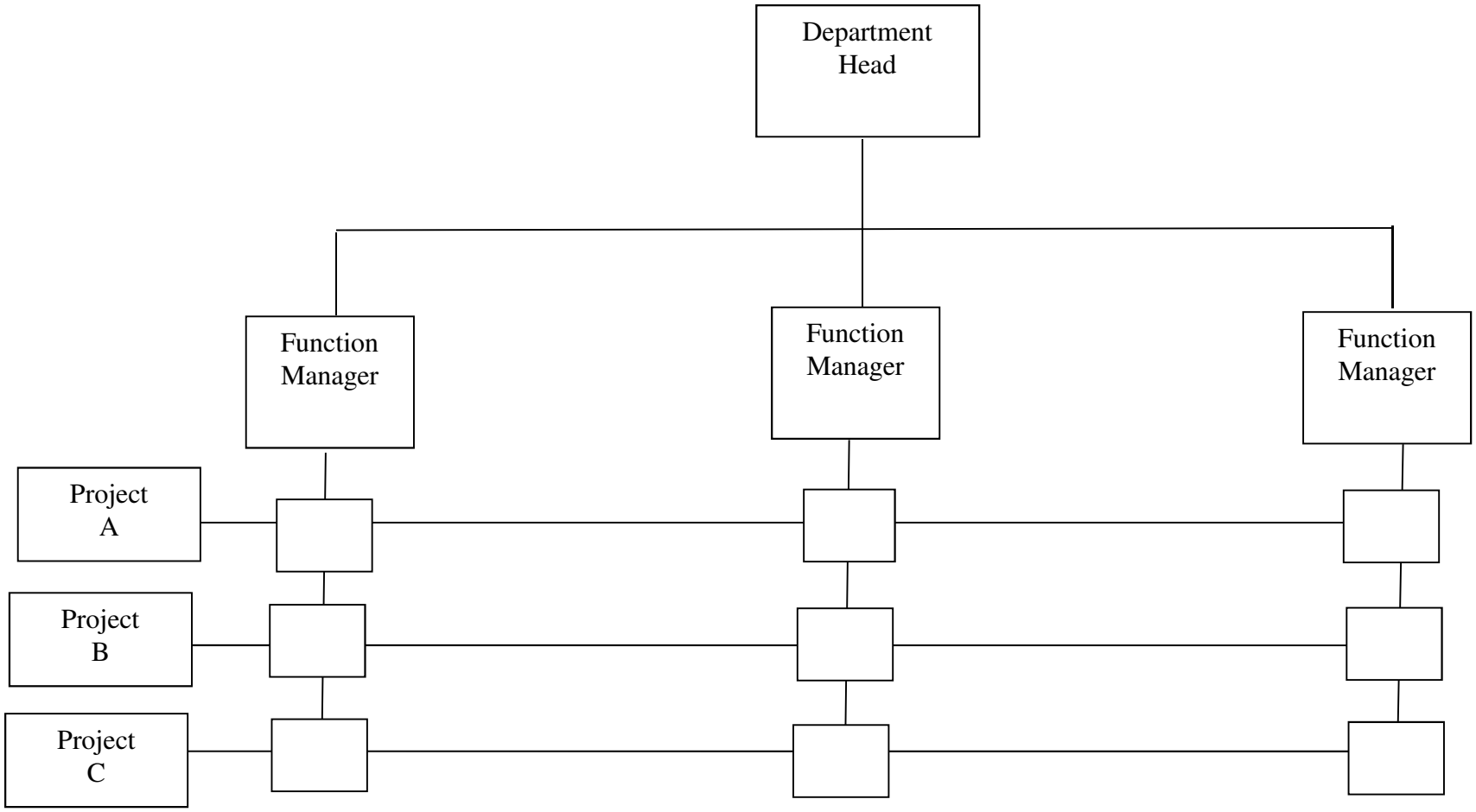
Organizational Environments

- The functional structure
- The matrix structure

The Functional Structure



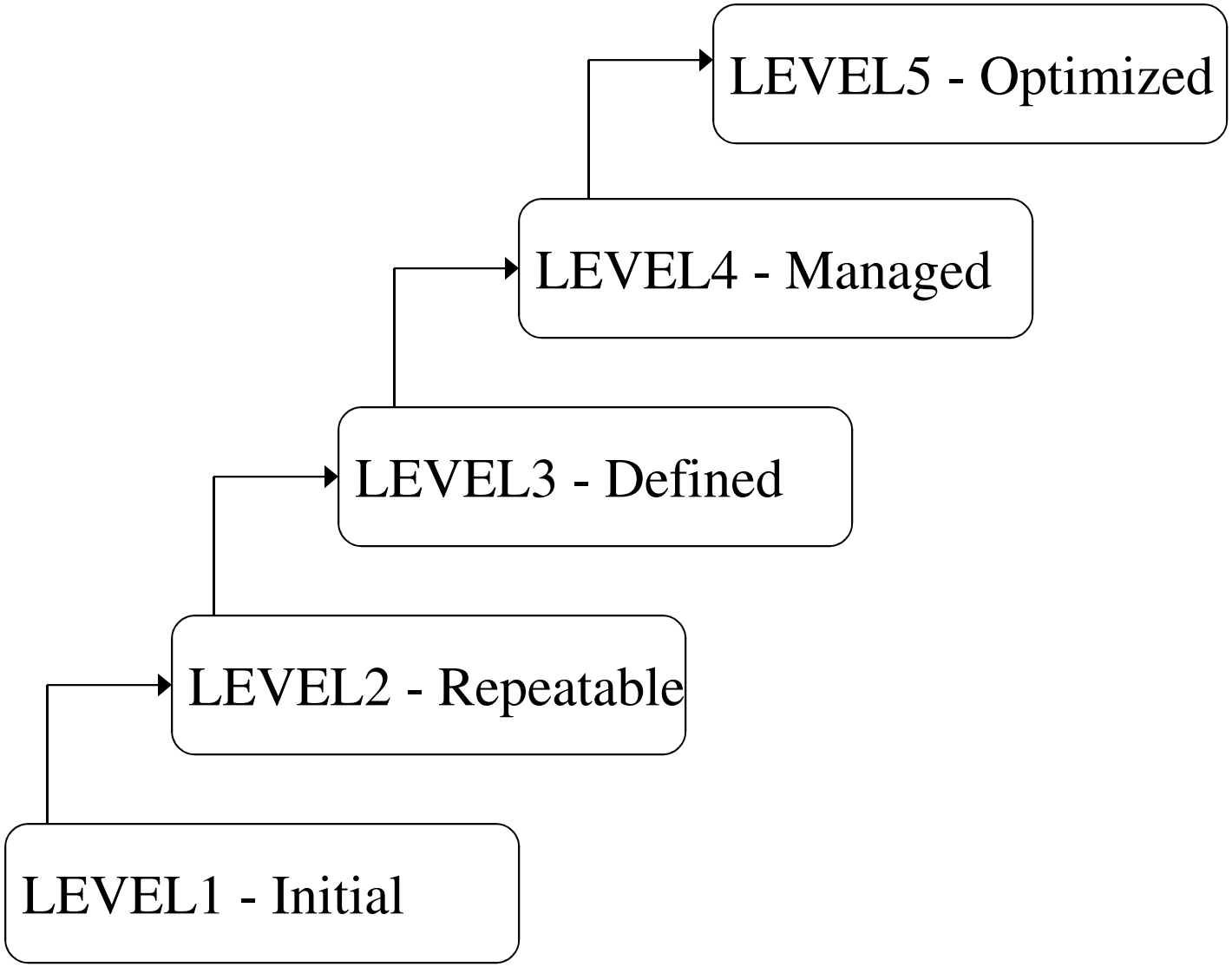
The Matrix Structure



The CMM : SEI's Capability Maturity Model

- The CMM for Software is a framework that was developed by the Software Engineering Institute, often referred to as SEI, at Carnegie Mellon University by observing the best practices in software and other organizations.

The CMM : SEI's Capability Maturity Model



CMM's KPA : Key Process Area

- Each level has a Key Process Area , KPA, except Level 1
- Level 2 – Repeatable
  - Requirements Management
  - Software Project Planning
  - Software Project Tracking & Oversight
  - Software Subcontract Management
  - Software Quality Assurance
  - Software Configuration Management

CMM's KPA : Key Process Area

- Level 3 – Defined
  - Organization Process Focus
  - Organization Process Definition
  - Training Program
  - Integrated Software Management
  - Software Product Engineering
  - Intergroup Coordination
  - Peer Reviews

CMM's KPA : Key Process Area

- Level 4 - Managed
  - Software Quality Management
  - Quantitative Process Management

CMM's KPA : Key Process Area

- Level 5 - Optimizing
  - Process Change Management
  - Technology Change Management
  - Defect Prevention

The Project Manager Responsibilities

1. Project planning
2. Managing the project
3. Lead project team
4. Building client partnerships
5. Targeting to the business

Classifying Project Managers

Managers:

- **Who is who?**
- **Who manages what?**

- Four classifications for project managers:
  - **Team leader**
  - **Project manager**
  - **Senior project manager**
  - **Program manager**

Classifying Project Managers

- **Team leader.** Team leaders have responsibility for part of the project. They are generally assigned responsibility for an activity and can have a small number of staff assigned to the activity whose work they will manage.

- **Project manager.** This individual will have management responsibility for projects that are classified as simpler, less complex, lower risk, or not mission-critical. They are the more junior of the two classes of project manager

Classifying Project Managers

- **Senior project manager.** These are more experienced of the two project manager classes. They are qualified to manage projects that are more complex, higher risk, or mission-critical.

- **Program manager.** This classification is reserved for those individuals who have achieved the highest level of professionalism and experience in project management. They will often manage project managers on very complex or multiproject undertakings.

Assessing the Project Managers

- Two levels of characteristics determine success or failure as a project manager:
  - *Skills : can be measured and a person can acquire them through training*
  - *Competencies: . We can see them in practice, but we cannot measure them, can't be acquired through training; observing the non-verbal behavior is an example.*

Phases For
Software Project Management

Few Rules Before We Embark in SPM

- Horse power needed

Few Rules Before We Embark in SPM

- Man power needed

Few Rules Before We Embark in SPM

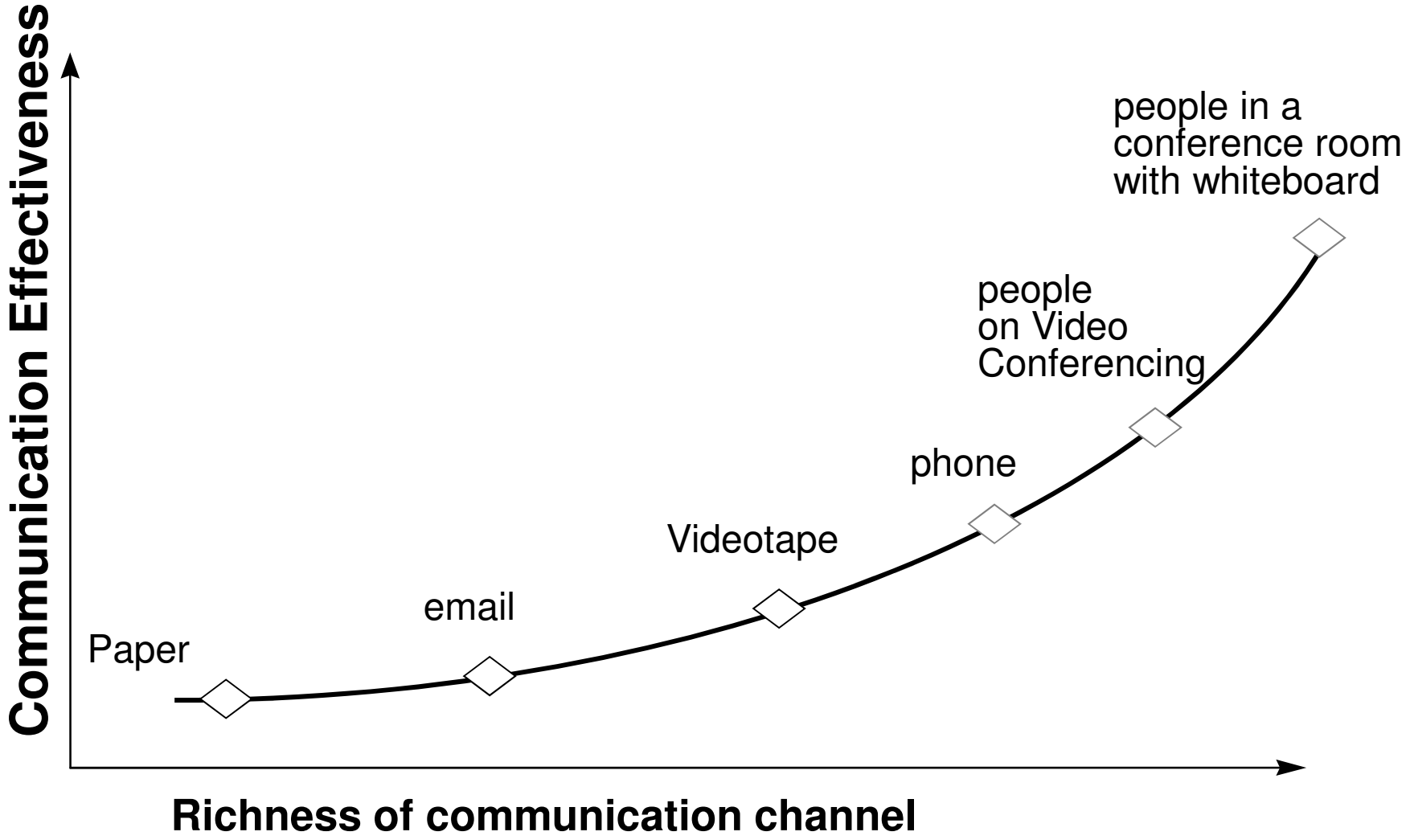
- Like the Ball-Game where the coach puts a plan to win the game based on **defense/offense strategy**, similarly in SPM you have to have a plan where :
    - Defense: skills, knowledge, experience
    - Offense: deliver on time, within budget, and with quality

Few Rules Before We Embark in SPM

- It is a TEAM work …

Few Rules Before We Embark in SPM

- And finally, communicate, communicate, and communicate!



Definition of a Project

- A *project* is a sequence of unique, complex, and connected activities having one goal or purpose and that must be completed by a specific time, within budget, and according to specification.

What is a Program?

- A *program* is a collection of projects.
- The projects must be completed in a specific order for the program to be considered complete. Because they compromise multiple projects, they are larger in scope than a single project.
- For example, the Untied States government has a space program that includes several projects such as the Challenger project. A construction company contracts a program to build an industrial technology park with several separate projects.

Project Parameters

- Five constraints operate on every project:
  1. Scope
  2. Quality
  3. Cost
  4. Time
  5. Resources
- A change in one of these constraints can cause a change in another constraint to restore the equilibrium of the project
- Let's discuss each one of these in detail …

Scope

- *Scope* is a statement that defines the boundaries of the project. It tells not only what will be done but also what will not be done.
- In the information systems industry, scope is often referred to as a *functional specification*.
- In the engineering profession, it is generally called a *statement of work*.
- Scope may also be referred to as a document of understanding, a scooping statement, a project initiation document, and a project request form

Quality

- Two types of quality are part of every project:
  - The first is *product quality*. This refers to the quality of the deliverable form the project.
  - The second type of quality is *process quality,* which is the quality of the project management quality itself. The focus is on how well the project management process works and how can it be improved. Continuous quality improvement and process quality management are the tools used to measure process quality.

Cost

- The X-amount of dollars that it will cost to do the project is another variable that defines the project; the budget that has been established for the project.
- This is an important factor for projects that create deliverables that are sold to external customers

Time

- The customer specifies a timeframe within which the project must be completed.
- Cost and time are inversely related to one another. The time a project takes to be completed can be reduced, but cost increases as a result.

Resources

- Resources are assets, such as people, equipment, physical facilities, or inventory, that have limited availabilities, can be scheduled, or can leased from an outside party. Some are fixed, others are variable only in the long term. In any case, they are central to the scheduling of project activities and the orderly completion of the project .

Project Classification

Class	Duration	Risk	Complexity	Technology	Problems
A	> 18 months	High	High	Breakthrough	Certain
B	9-18 months	Medium	Medium	Current	Likely
C	3-9 months	Low	Low	Best of breed	Some
D	< 3 months	Very Low	Very Low	Practical	None

Phases of the Project Management

- There are five phases of the project management life cycle:
  1. Define - Scope the project
  2. Plan - Develop the project plan
  3. Execute - Launch the plan
  4. Monitor - Monitor/ control project progress
  5. Close - Close out the project

Scope the project

- State the problem/ opportunity.
- Establish the project plan.
- Define the project objectives.
- Identify the success criteria.
- List assumptions, risks, obstacles

Develop the project plan

- Identify the project activities.
- Estimate the activity duration.
- Determine resource requirements.
- Construct/ analyze the project network.
- Prepare the project proposal.

Launch the plan

- Recognize and organize the project team.
- Establish team operating rules.
- Level project resources.
- Schedule work packages.
- Document work packages.

Monitor/control project progress

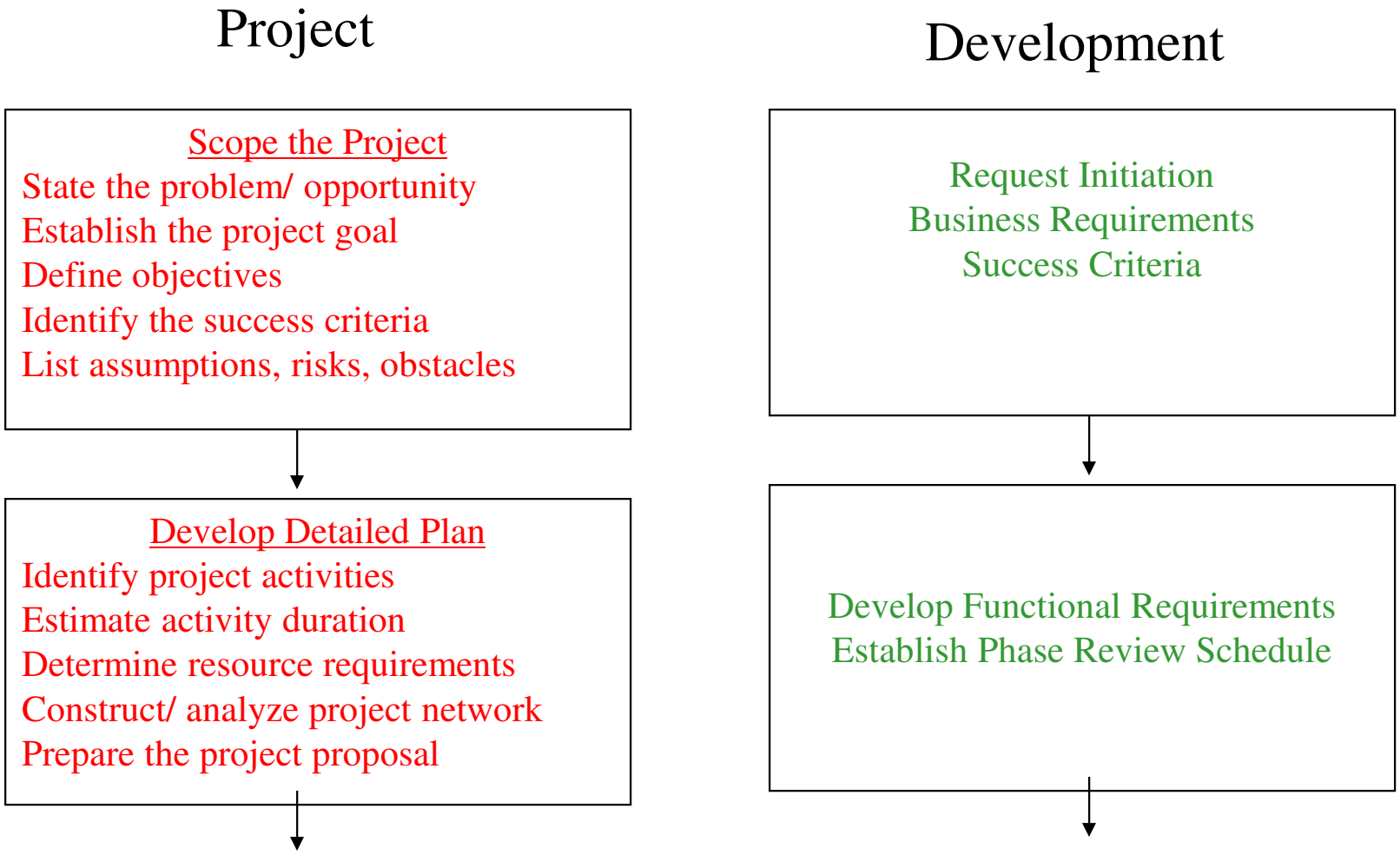
- Establish progress reporting systems.
- Install change control tools/process.
- Define problem-escalation process.
- Monitor project progress versus plan.
- Revise project plans.

Close out the project

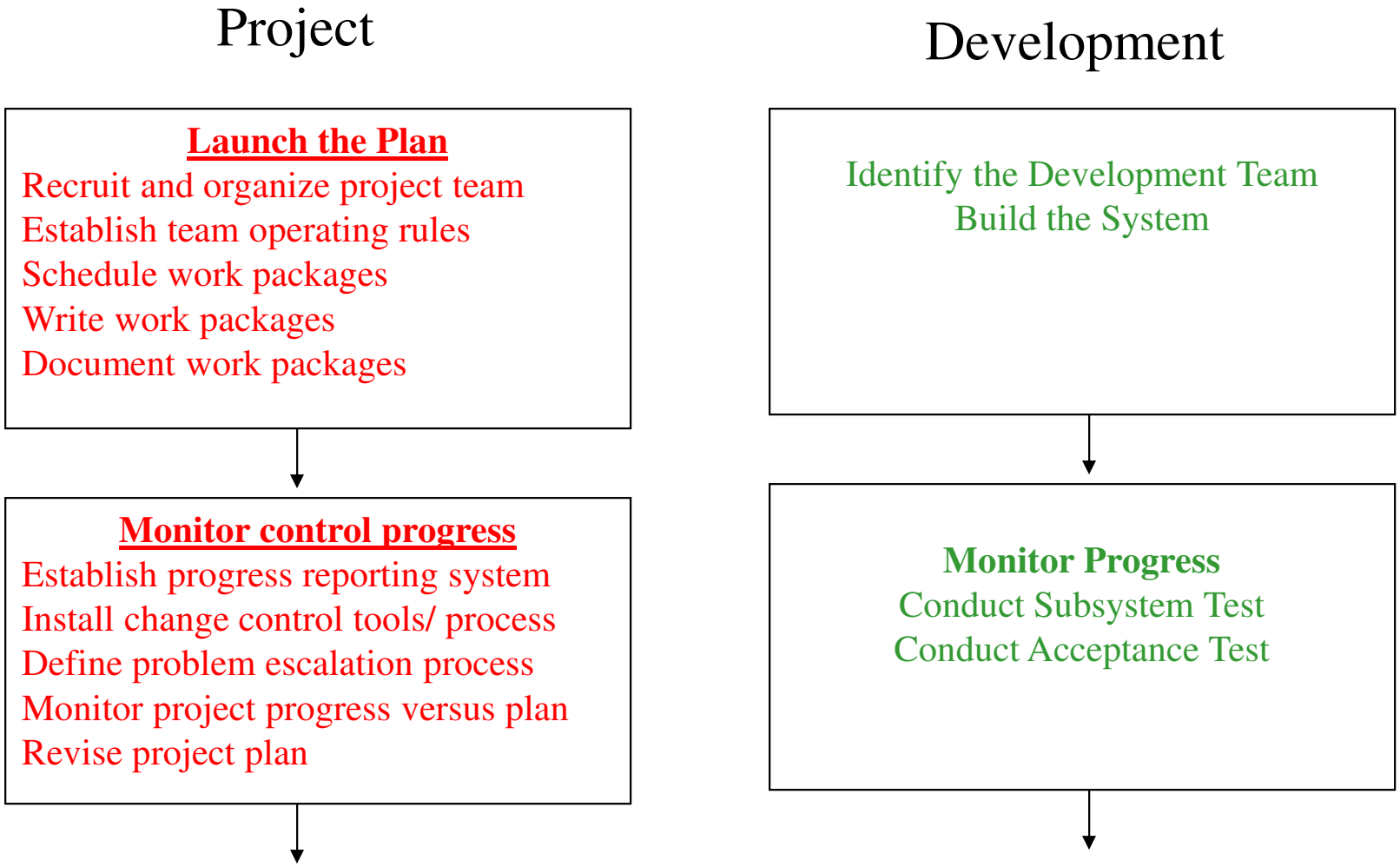
- Obtain client acceptance.
- Install project deliverables.
- Complete project documentation.
- Complete post-implementation audit.
- Issues final project report.

Project Management and Software Development life cycles

- There are similarities between the software development life cycle and the project development life cycle.



Project Management and Software Development life cycles



Project Management and Software Development life cycles

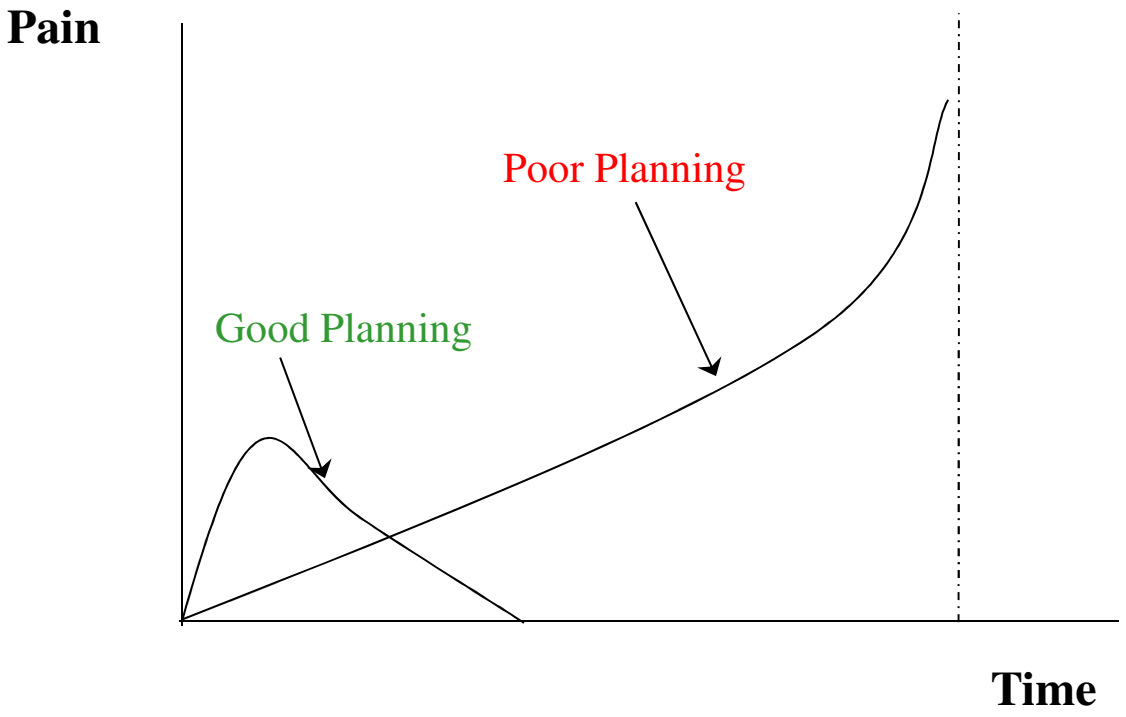
Project

Close out the project
Obtain client acceptance
Install project deliverables
Complete project documentation
Complete post implementation audit
Issue final project report

Development

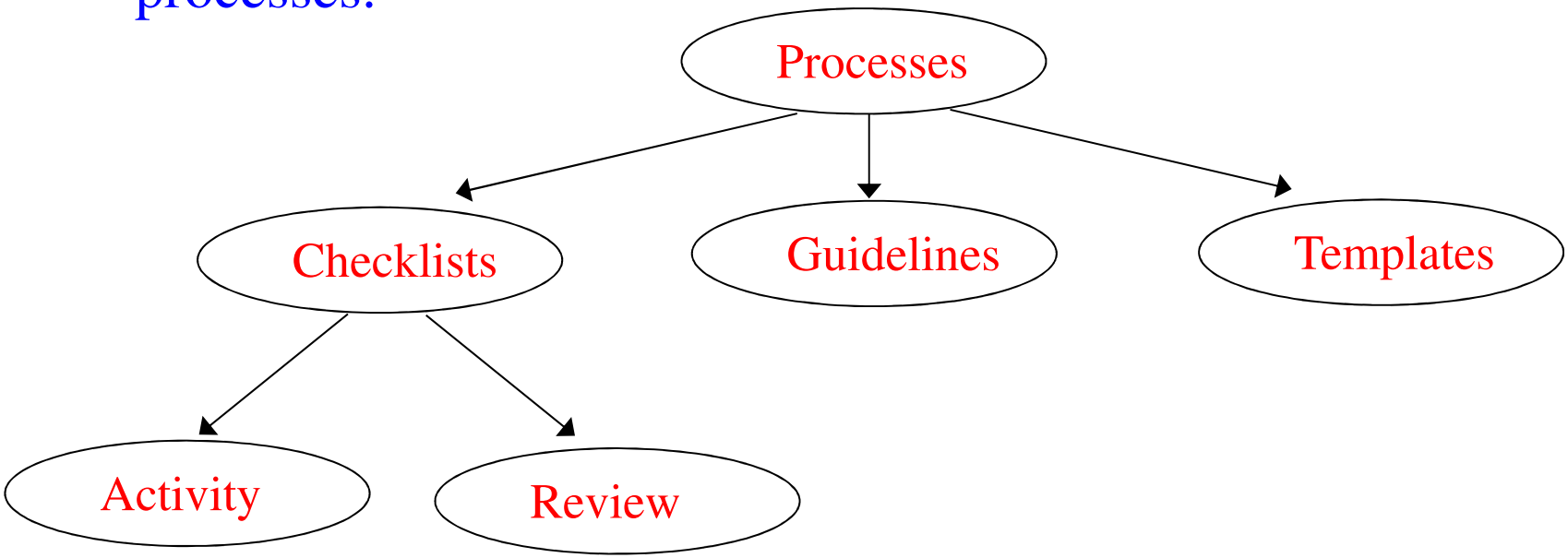
Evaluate System Performance
Conduct Post-Project Review

The Pain Curve for Project Planning

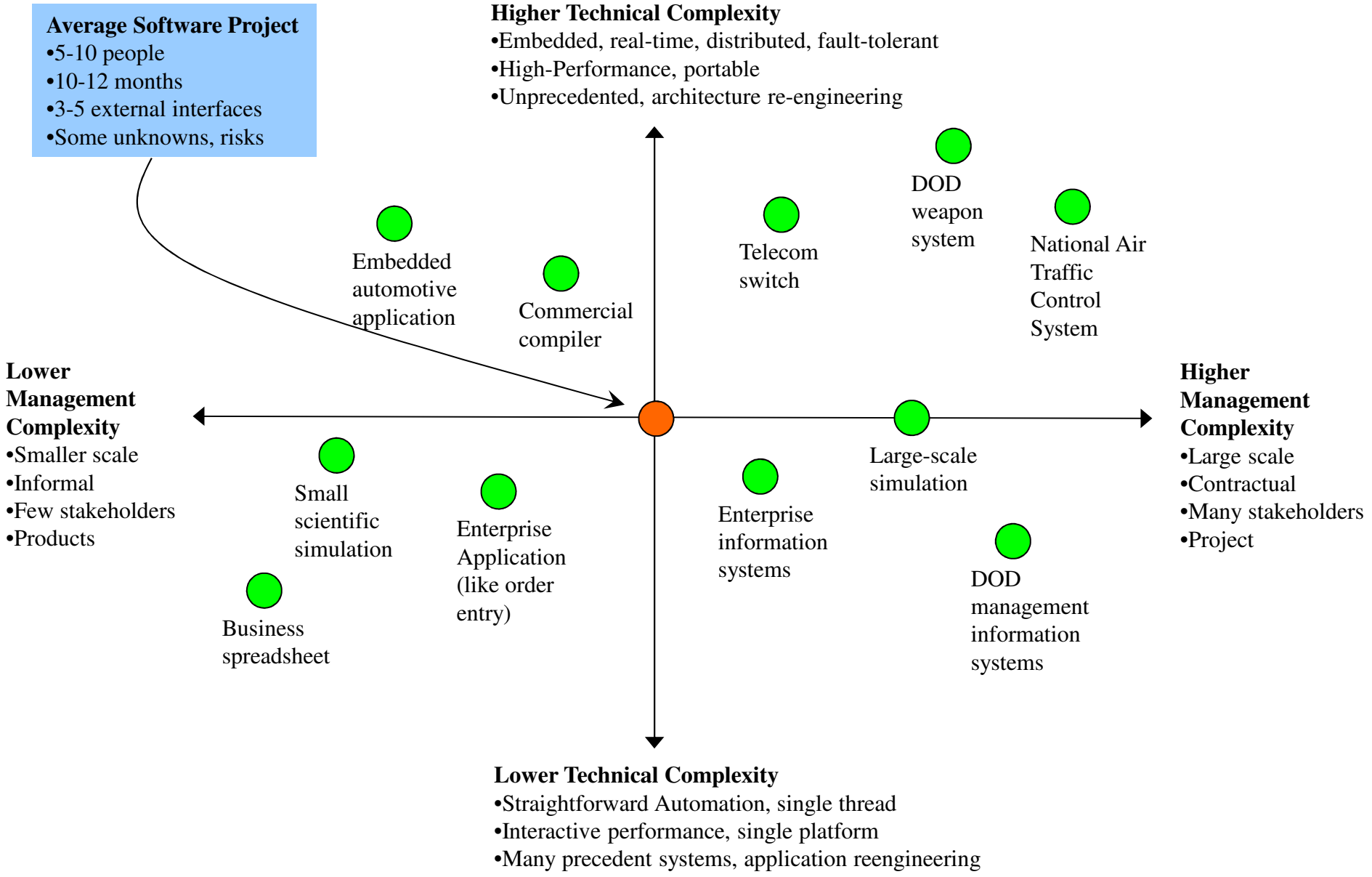


Process Assets and the Body of Knowledge System

- A process encapsulates an organization's experience in form of successful recipes.
- Process descriptions,generally, contain the sequence of steps to be executed, who executes them, the entry/exit criteria for major steps, etc.
- Guidelines, checklists, and templates provide support to use the processes.



Process Variability



State of the Practice in Software Management

- Factors that may influence the success or failure of the software projects could be:
    1. Social Factors
    2. Technology

State of the Practice in Software Management

Technologies on Unsuccessful Projects

- No historical software measurement data
- Failure to use automated estimating tool
- Failure to use automated planning tool
- Failure to monitor progress or milestones
- Failure to use effective architecture
- Failure to use effective development methods
- Failure to use design reviews
- Failure to use code inspections
- Failure to include formal risk management
- Informal, inadequate testing
- Manual design and specification
- More than 30% creep in user requirements

Technologies on Successful Projects

- Accurate software measurement
- Early use of estimating tools
- Continuous use of planning tool
- Formal progress reporting
- Formal architecture planning
- Formal development methods
- Formal design reviews
- Formal code inspections
- Formal risk management
- Formal testing methods
- Automated design and specification
- Automated configuration control
- Less than 10% creep in requirements

State of the Practice in Software Management

Social Factors on Unsuccessful Projects

- Excessive schedule pressure
- Executive rejection of estimates
- Severe friction with clients
- Divisive corporate politics
- Poor team communications
- Naïve senior executives
- Project management malpractice
- Unqualified technical staff
- Generalists used for critical tasks: quality assurance, testing, planning, estimating

Social factors on Successful Projects

- Realistic schedule pressure
- Executive understanding of estimates
- Cooperation with clients
- Congruent management goals
- Excellent team communications
- Experienced senior executives
- Capable Project management
- Capable technical staff
- Specialists used for critical tasks: quality assurance, testing, planning, estimating

Chaos of Software Projects

- Standish Group published a report on 1995 reaches the following conclusions:
  - U.S. companies would spend $81 billion on cancelled software projects in 1995
  - 31% of software projects studied were canceled before they were completed
  - 53% of software projects overran by more than 50%
  - Only 9% of software projects for large companies were delivered on time and within budget. For medium-sized companies the number was 16%, and for small-sized companies the number was 28%

Define the Project

- There is a need for clear understanding of exactly what was to be done. Project definition starts with the ***Conditions of Satisfaction*** document based on conversation with the customer.
- ***Project Overview Statement*** is generated from the Conditions of Satisfaction document .
- The Project Overview Statement clearly states what is to be done.
- Once the ***Project Overview Statement*** is approved, the scooping phase is complete.

The Project Overview Statement

- The Conditions of Satisfaction statement provides the input we need to generate the POS.
- The POS is a short document that concisely states what is to be done in the project, why it is to be done, and what business value it will provide to the organization when completed.
- The main purpose of the POS is to secure senior management approval and the resources needed to develop a detailed project plan.
- It will be reviewed by the managers who are responsible for setting priorities and deciding what projects to support. It is also a general statement, it is not detailed technical statement.

Parts of the POS

- The POS has five component parts:
  1. Problem/ opportunity
  2. Project goal
  3. Project objectives
  4. Success criteria
  5. Assumptions, risks, obstacles

S.M.A.R.T. characteristics for Goal

- **Doran's S.M.A.R.T. characteristics provide the criteria for a goal statement:**
  - **Specific: Be specific in targeting and objective.**
  - **Measurable: Establish measurable indicator(s) of progress.**
  - **Assignable: Make the object assignable to one person for completion.**
  - **Realistic: State what can realistically be done with available resources.**
  - **Time-related: State when the objective can be achieved; that is, duration**

POS Form – For Customer and PM

PROJECT OVERVIEW STATEMENT	Project Name	Project No.	Project Manager
Problem/ Opportunity			
Goal			
Objectives			
Success Criteria			
Assumptions, Risks, Obstacles			
Prepared by	Date	Approved By	Date

The Project Definition Statement : PDS

- Just as the customer and the project manager benefit from the POS, the project manager and project team can benefit from a closely related document, which we call the *Project Definition Statement (PDS).*
- The PDS uses the same form as the POS but incorporates ***considerably more detail***. The detailed information provided in the PDS is for the use of the project manager and the project team:

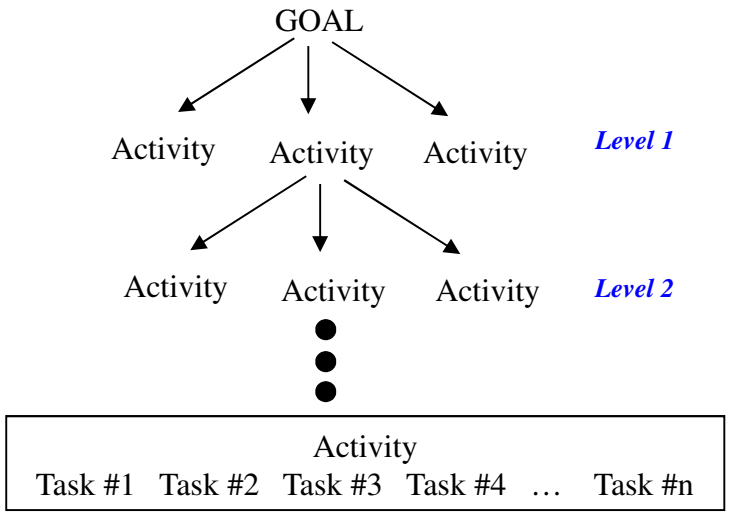
PDS Form

PROJECT DESCRIPTION STATEMENT	Project Name	Project No.	Project Manager
Problem/ Opportunity			
Goal			
Objectives			
Success Criteria			
Assumptions, Risks, Obstacles			
Prepared by	Date	Approved By	Date

The Work Breakdown Structure

- The Work Breakdown Structure (WBS) is a hierarchical description of the work that must be done to complete the project as defined in the Project Overview Statement (POS) .
- The WBS terms
  - *Activity* : An activity is simply a chunk of work.
  - *Task* : A task is a smaller chunk of work.

The Work Breakdown Structure



Uses for the WBS

- **Thought process tool:**
  - the WBS is a design and planning tool.
  - It helps the project manager and the project team visualize exactly how the work of the project can be defined and managed effectively.
- **Architectural design tool:**
  - the WBS is a picture of the work of the project and how the items of work are related to one another.

Uses for the WBS

- **Planning tool:**
  - In the planning phase, the WBS gives the project team a detailed representation of the project as a collection of activities that must be completed in order for the project to be completed.
  - It is at the lowest activity level of WBS that we will estimate effort, elapsed time, and resource requirements; build a schedule of when the work will be completed; and estimate deliverable dates and project completion .

Uses for the WBS

- **Project status reporting tool.**
  - The WBS is used as structure for reporting project status.
  - The project activities are consolidated from the bottom as lower-level activities are completed.
  - Completion of lower-level activities cause higher-level activities to be partially complete.
  - Therefore, WBS defines milestone events that can be reported to senior management and to the customer .

Generating the WBS

- The WBS is generated during the Joint Project Planning (JPP) session.
- Two different approaches to building the WBS:
  - Top-Down Approach
  - Bottom-Up Approach

Top-Down Approach

- The top-down approach begins at the goal level and successively partitions work down to lower levels of definition until the participants are satisfied that the work has been sufficiently defined.
- Once the project activities have been defined, they will allow you to estimate time, cost, and resource requirements first at the activity level and then aggregate to the project level.
- Two variations of this approach:
  - ***Team Approach***
  - ***Subteam Approach***

Top-Down Approach

- ***Team Approach***
  - The team approach requires more time to complete than the subteam approach even though it is the preferred approach.
  - In this approach the entire team works on all parts of the WBS. For each Level 1 activity, appoint the most knowledgeable member of the planning team to facilitate the further decomposition of that part of the WBS. Continue with similar appointments until the WBS is complete.
  - This approach allows all members of the planning team to pay particular attention to the WBS as it is developed, noting discrepancies and commenting on them in real time.

Top-Down Approach

- ***Subteam Approach***
  - The first step is to divide the planning team into as many subteams as there are activities at Level 1 of the WBS. Then follow these steps:
  - The planning team agrees on the approach to building the first level of the Work Breakdown Structure.
  - The planning team creates the Level 1 activities.
  - A subject matter expert leads the team in further decomposition of the WBS for his or her area of expertise.
  - The team suggests decomposition ideas for the expert until each activity within the Level 1 activities meets the WBS completion criteria.

Bottom-Up Approach

- This approach is more like a brainstorming session than an organized approach to building the WBS.
- The bottom-up procedure:
  - The planning team agrees to the first-level breakdown.
  - The planning team is then divided into as many groups as there are first-level activities.
  - Each group then makes a list of the activities that must be completed in order to complete the first-level activity. Someone in the group identifies an activity and tells it to the group. The process repeats itself until no new ideas are forthcoming. The group then sorts activities that are related to one another.
  - Each group then reports to the entire planning team the results of its work final critiques are given, missing activities added, redundant activities removed.

Six Criteria to Test for Completeness in the WBS

- The WBS is developed as part of JPP session. But how do you know that you've done this right? Each activity must possess six characteristics to be considered complete-that is, completely decomposed. The six characteristics are
  - Status/ completion is measurable
  - Start/ end events are clearly defined
  - Activity has a deliverable
  - Time/ cost is easily estimated
  - Activity duration is within acceptable limits
  - Work assignments are independent

Let us review each one in detail …

Six Criteria to Test for Completeness in the WBS

- **Measurable Status :** The project manager can ask for the status of an activity at any point in time during the project. If the activity has been defined properly, that question is answered easily.
  - Example: a system's documentation is estimated to be about 300 pages long and requires approximately four months of full-time work to write, here are some possible reports that project manager can provide regard the status:
    - I've written 150 pages, so I guess I am 50 percent complete.

Six Criteria to Test for Completeness in the WBS

- **Bounded :**
  - Each activity should have a clearly defined start and end event.
  - Once the start event has occurred, work can begin on the activity.
  - The deliverable is most likely the end event that signals work is closed on the activity.
  - For example, using the systems documentation example, the start event might be notification to the team member who will manage the creation of the systems documentation that the final acceptance tests of the systems are complete. The end event would be notification to the project manager that the customer has approved the systems documentation.

Six Criteria to Test for Completeness in the WBS

- **Deliverable**
  - The result of completing the work that makes up the activity is the production of a deliverable.
  - The deliverable is a visible sign that the activity is complete.
  - This could be an approving manager's signature, a physical product or document.

Six Criteria to Test for Completeness in the WBS

- **Cost/Time Estimate**
  - Each activity should have an estimated time and cost of completion.
  - Being able to do this at the lowest level of decomposition in the WBS allows you to aggregate to higher levels and the total project cost and the completion date.

Six Criteria to Test for Completeness in the WBS

- **Activity Independence**
  - It is more important that each activity be independent. Once work has begun on the activity, it can continue reasonably without interruption and without the need of additional input or information until the activity is complete.
  - Though it is possible that an activity could be scheduled during different times based on resource availability.

Approaches to Building the WBS

- There are many ways to build the WBS. There is no one correct way to create the WBS. Hypothetically, if we put each member of the JPP session in a different room and asked that person to develop the project WBS, they might all come with different answers.
- There are three general approaches to building the WBS:

Approaches to Building the WBS

- **Noun-type approaches**. Noun-type approaches define the deliverable of the project work in terms of the components (***physical*** or ***functional***) that make up the deliverable.
- **Verb-type approaches.** Verb-type approaches define the deliverable of the project work in terms of the actions that must be done to produce the deliverable. These include the ***design-build-test-implement*** and project ***objectives*** approaches.
- **Organizational approaches**. Organizational approaches define the deliverable of the project work in terms of the organizational units that will work on the project. This type of approach includes the department, process, and geographic location approaches.

Representing the WBS

- There are two ways to represent the WBS:
  - Outline Format
  - Hierarchical Format

- Both convey the same information

WBS for House: Outline Format

1 SITE PREPARATION
- 1.1 Layout
- 1.2 Grading
- 1.3 Excavation

2 FOUNDATION
- 2.1. Erect Forms
- 2.2. Pour Concrete
- 2.3. Remove Forms

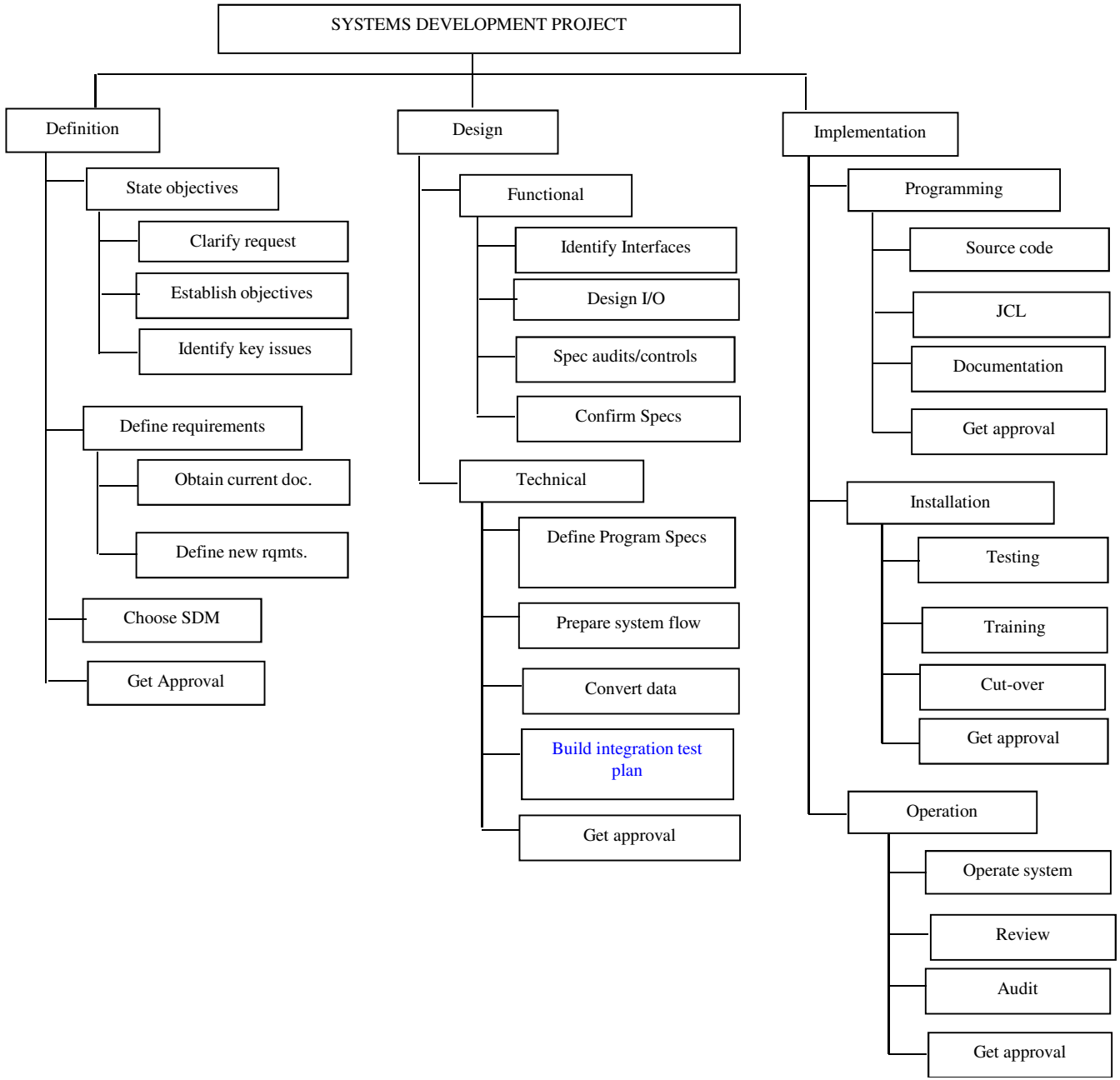
3 FRAMING
- 3.1.Floor Joists
  - 3.1.1. Install first-floor joists
  - 3.1.2. Install second-floor joists
- 3.2. Subflooring
  - 3.2.1. Install first-floor subflooring
  - 3.2.2. Install second-floor subflooring
- 3.3. Stud Walls
  - 3.3.1. Erect first-floor stud walls
  - 3.3.2. Erect second-floor studwalls
- 3.4. Frame the roof

4 UTILITIES
- 4.1. Electrical
  - 4.1.1. Do rough-in Work
  - 4.1.2. Get Building Inspection
  - 4.1.3. Do Finish Work
- 4.2. Gas
  - 4.2.1. Do rough-in Work
  - 4.2.2. Get Building Inspection
  - 4.2.3. Do Finish Work
- 4.3. Water
  - 4.3.1. Do rough-in Work
  - 4.3.2. Get Building Inspection
  - 4.3.3. Do Finish Work

5 WALLS
- 5.1. Hang Sheetrock
- 5.2. Tape and Bed

6 ROOFING
- 6.1. Install Sheathing
- 6.2. Lay Shingles

7 FINISH WORK
- 7.1. Install Cabinets
- 7.2. Install Appliances
- 7.3. Install Furnace
- 7.4. Lay Carpet
- 7.5. Paint Walls and Molding
- 7.6. Hang Wallpaper
- 7.7. Lay Tile

8 LANDSCAPING

WBS for Waterfall systems Development Methodology