Satyam
What Business Demands.

Software estimation: Art or Science?

Krishna M. Dasari CFPS, PMP

Satyam Computer Services Ltd.

8500 Leesburg Pike, Suite 202

Vienna, VA 22182

Krishna_Dasari@onsite.satyam.com

www.satyam.com

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Agenda

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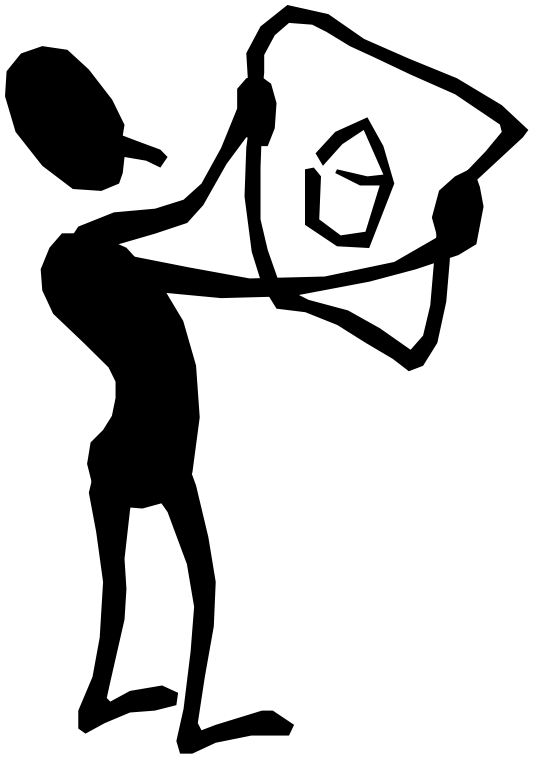
- Industry facts
- Causes for unrealistic estimates
- Definitions of Art and Science
- Estimation pitfalls
- Steps to effective estimation
- CMM model
- Art and Science of estimation
- Summary



Industry facts….

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According to the Standish Group CHAOS report (2003) on Software Projects:

- **15% are terminated before they produce anything**
- **66% are considered to have failed**
- **Of those that do complete the average cost blowout is 43%**
- **The lost dollar value in 2002 is estimated at $38bn with another $17bn in cost overruns**

Unrealistic estimates is a major factor in project failure

(Source: www.isbsg.org)

Common causes for Unrealistic Estimates

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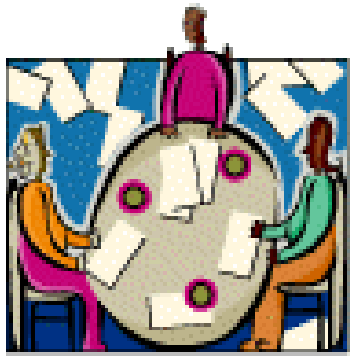
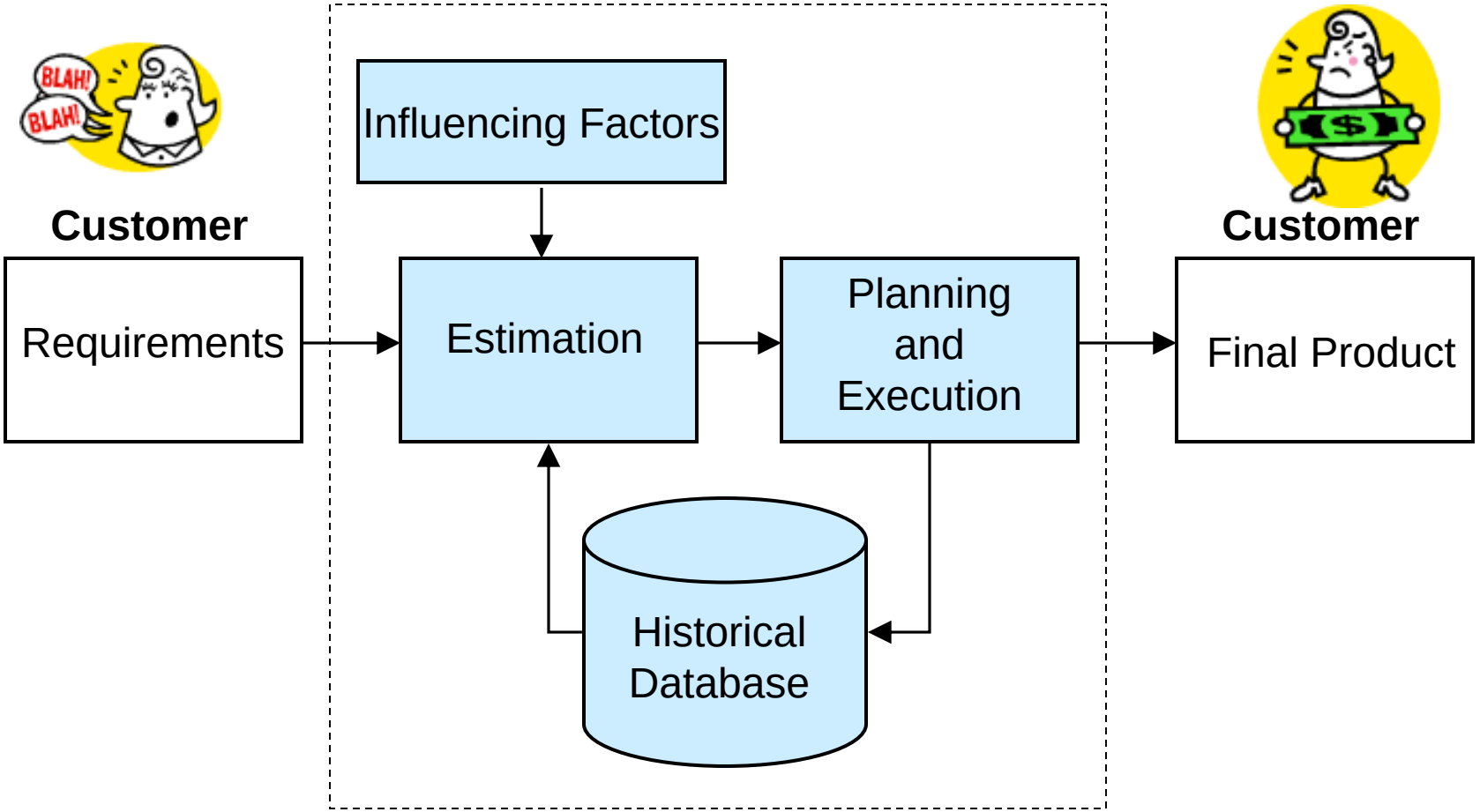
- Over-optimistic estimation
- Priced to win the contract
- Worked to beat the deadline

- Incomplete or late requirements
- Unclear requirements
- Changing requirements

- Lack of Communication
- Missed requirements
- Changes in design
- No historical data to base the estimate
- Rework due to defects



Estimation overview



The process may look simple, but the outcome is varied from organization to organization

Art and Science

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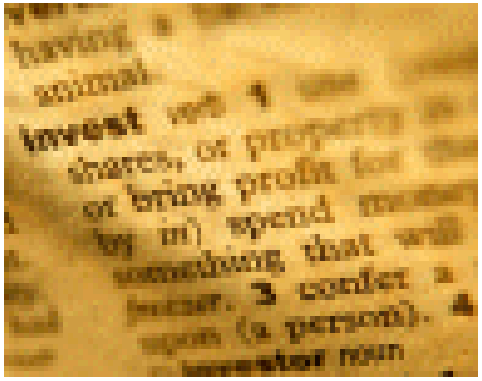
Definition in Dictionary

Art:

- **creative work or its principles; making or doing of things that display form, beauty, and unusual perception**

Science:

- **systematized knowledge derived from observation, study, and experimentation carried on in order to determine the nature or principles of what is being studied**
- **a branch of knowledge or study, esp. one concerned with establishing and systematizing facts, principles, and methods, as by experiments and hypotheses**



Source - Third college edition Webster's New World Dictionary of American English

Art and Science

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In Simple terms

Art :

- **Needs a lot of creativity**
- **Depends more on the person's ability to perform the activity**

Science:

- **Based on experiments, data and facts**
- **Repeatable and reproducible**
- **Does not depend on the person to perform the activity**

Effective Estimation

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The four major factors that contribute to effective estimation process:

1. **Sizing Requirements**
2. **Historical Database**
3. **Influencing Factors**
4. **Maturity of Organizational Processes**

Factors that make software estimation an Art

Estimation Pitfalls

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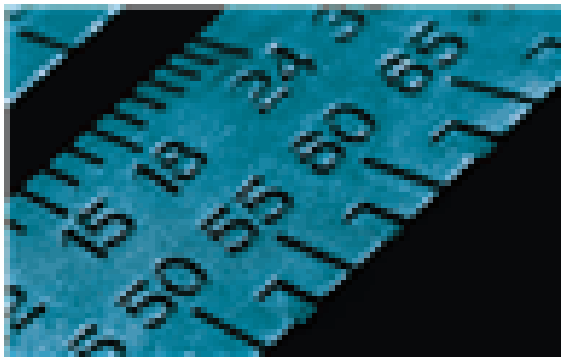
1. Sizing user requirements:

- **Requirements are not sized**
- **Size is not an input for estimation**
- **Standards for sizing are not defined at organizational level**



2. Historical Database:

- **Data collection process not defined**
- **Data is not collected as defined**
- **No such database maintained in the organization**
- **Unreliable data**

Estimation Pitfalls

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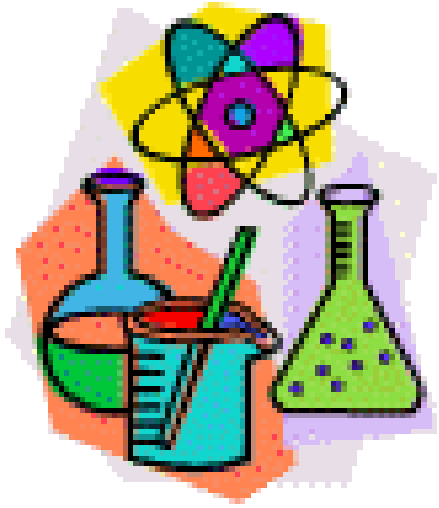
3. Influencing Factors:

- Influencing factors like type of project, technology, platform, risk, quality etc. are not identified for the project
- No distinction made between requirements and influencing factors during estimation
- Influencing factors are not documented or updated in historical database

4. Maturity of organizational processes:

- Processes at organizational level not defined
- Processes defined but not followed
- Processes are considered as liability by the projects

How can software estimation be made scientific?



Steps to Effective Estimation

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"*If the process is right, the results will take care of themselves*."
- Takashi Osada

- **Ensure estimation process is institutionalized at organization level**
- **Verify for the compliance of the process by regular audits, process reviews, etc.**
- **Adhere to the estimation process even if the goals of project are decided on business reasons like price to win, budget cap, etc.**

Steps to Effective Estimation Cont…

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"When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind." – Lord Kelvin

1. Sizing of the requirements:

- **Estimates should be based on size of requirements**
- **Sizing should be consistent across the organization**
- **The IFPUG Counting Practice Manual (CPM) for counting function point ensure consistency at organizational level**
- **ISO/IEC 20926:2003 standard for functional sizing also ensures consistency**

Steps to Effective Estimation Cont…

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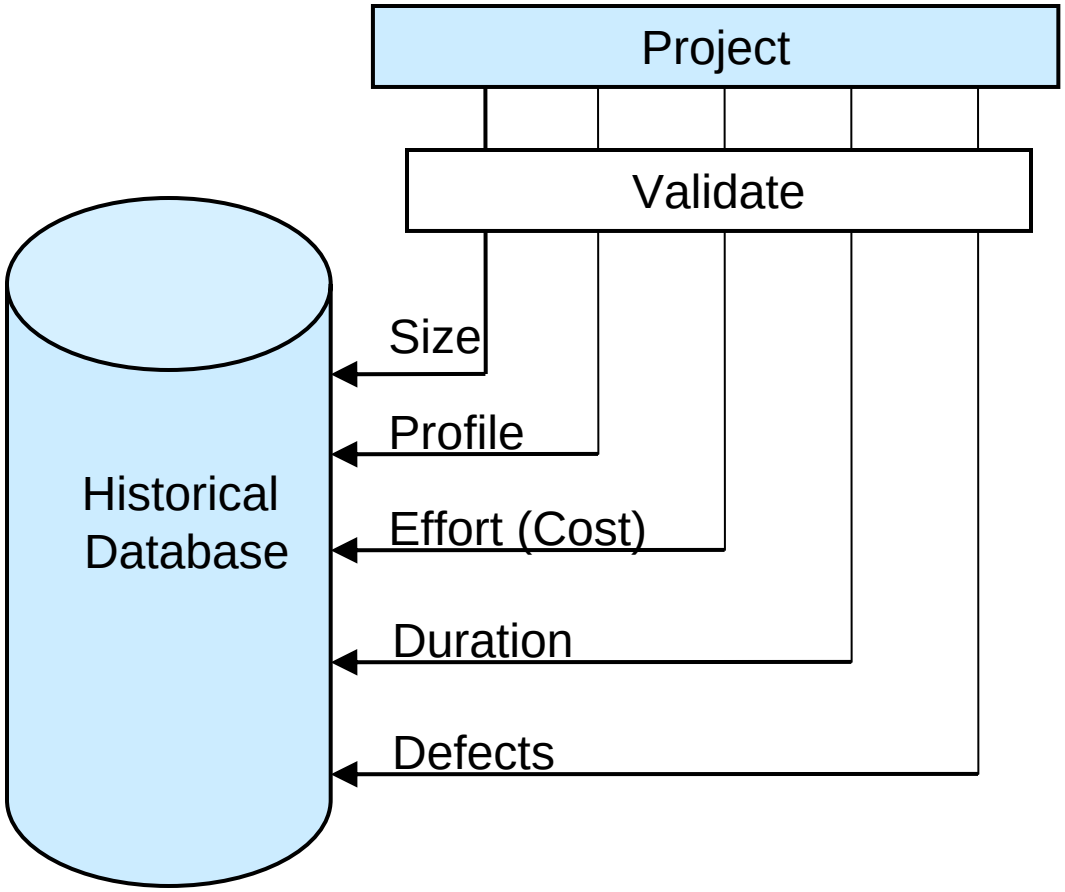
"What you reap is what you sow"

2. Historical Database

- **Data collection by design**
- **Data consistent across organization**
- **Verify the data is collected as planned**
- **Validate the data before storing in the historical database**
- **Function Points helps in bringing consistency in measure and metrics like**
  - **Size – FP**
  - **Productivity – FP/Hr**
  - **Duration – Days/FP**
  - **Quality – Defects/FP**



Steps to Effective Estimation Cont…

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Examples of inconsistent Data:

- **Different measure in different phases like FP, SLOC etc.**
- **Effort captured is mostly for compliance sake**
  - **Overtime not logged**
  - **Effort spent is logged in different category**
- **All Defects from reviews, pre- and post implementation not logged**
- **Change in scope not recorded**

Steps to Effective Estimation Cont…

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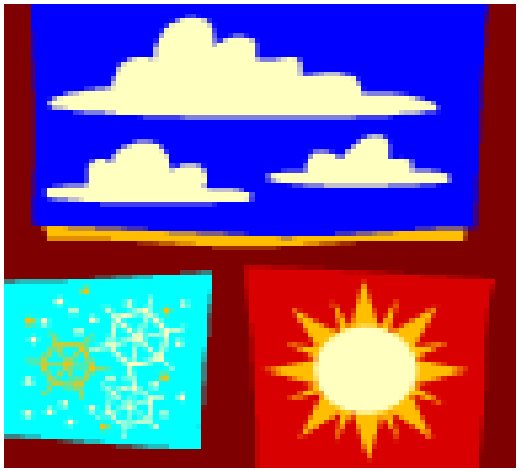
3. Influencing Factors

- **Influencing Factors like project profile, risks, issues, deviations, tailoring of processes, etc. have to be documented at the time of estimation**
- **The same should be updated whenever the the project is re-estimated**
- **Influencing factors have to be documented along with project data in historical database at the end of the project**



Steps to Effective Estimation Cont…

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4. Maturity of Organizational Processes

Estimation process alone is not sufficient to improve estimates

- **Effectiveness of estimation also depends on effectiveness of other processes in the organization**
- **Organization process capability maturity in general**

Steps to Effective Estimation Cont…

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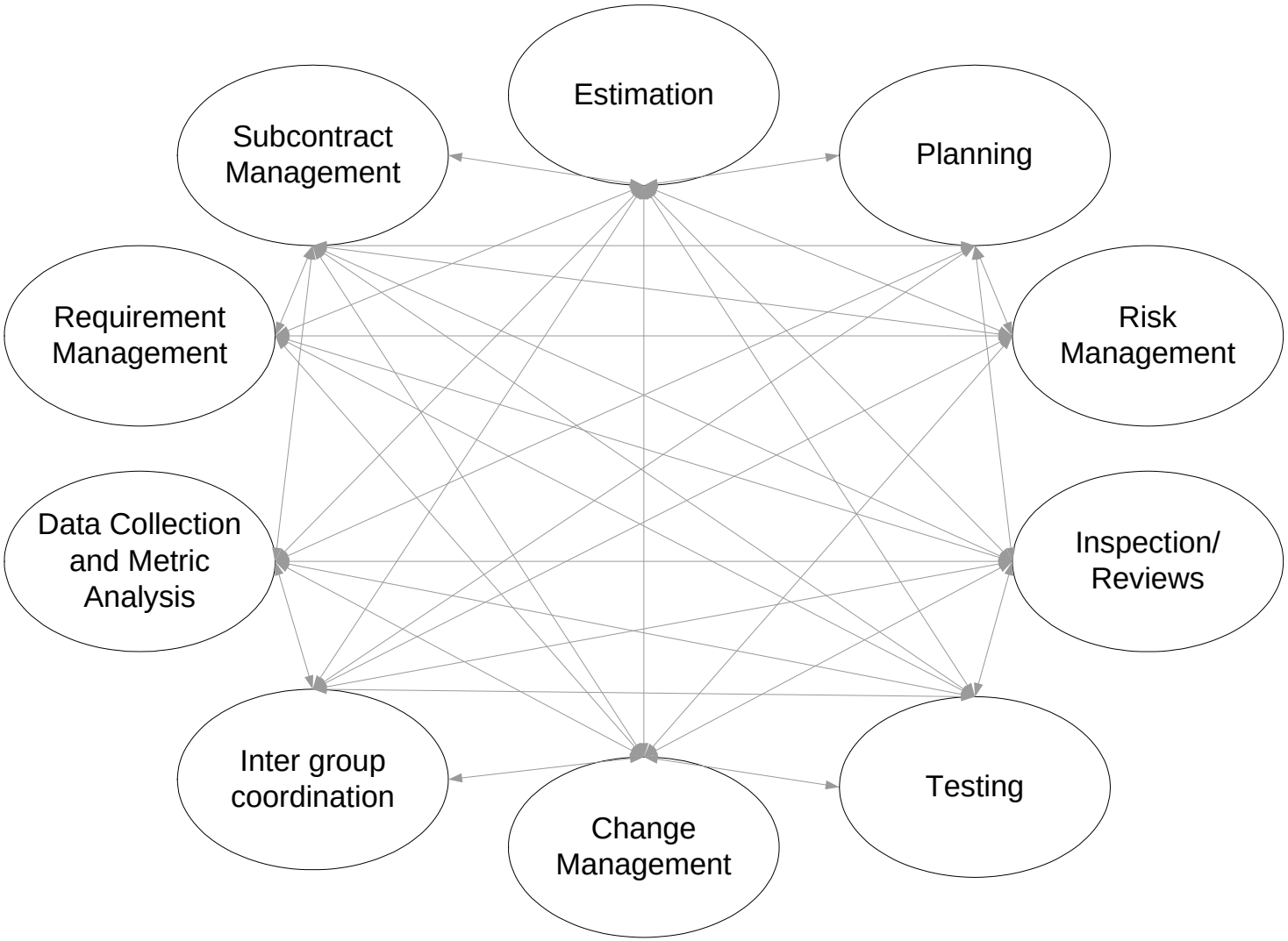
Processes should work for you, else it's time to work on processes



Note: This figure does not include all processes and relationships

Steps to Effective Estimation Cont…

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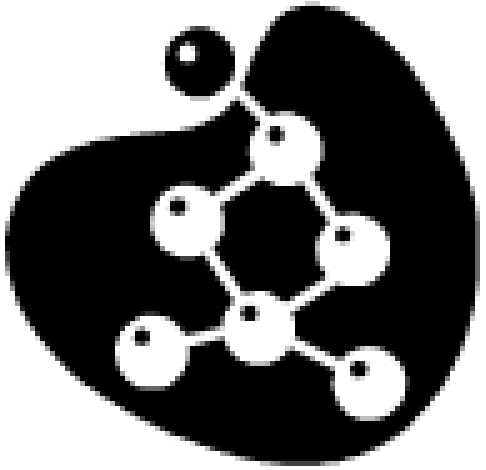
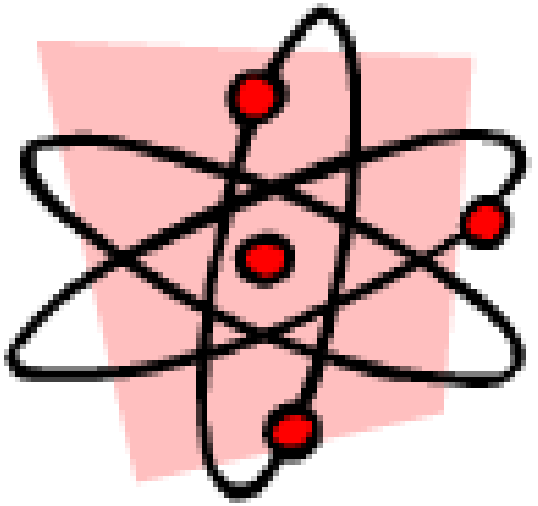
- All processes directly or indirectly depend on each other.
- Any change in a process affects the other processes in the organization
- Impact of change in the process to be analyzed and piloted before institutionalizing across the organization
- Processes are to be continuously audited and improved to avoid inconsistencies and redundancies.





What are CMM levels?

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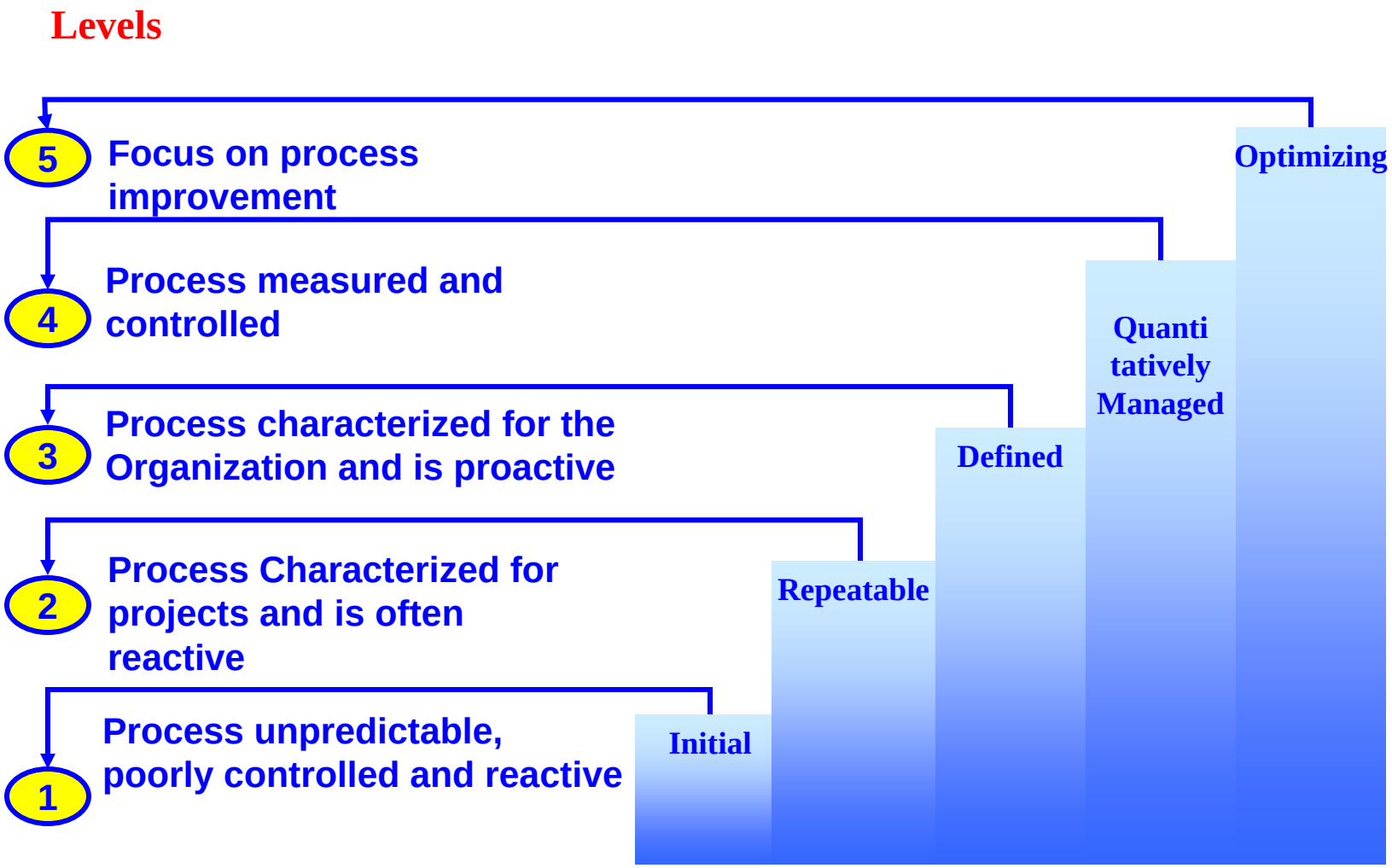

Initial Maturity Level (Level 1)

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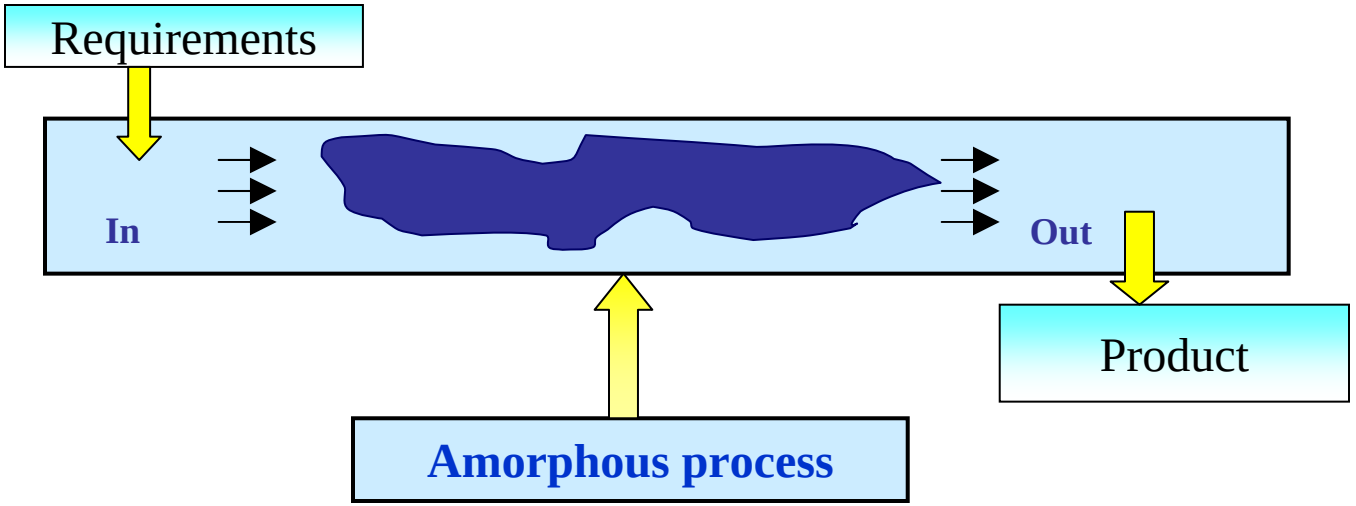
"Software Management is a Black Art"



Initial

- **Processes performed are adhoc and occasionally chaotic**
- **Performance - competence and heroics of the people**
- **High-quality and exceptional performance - best people**
- **Management practices not effective**
- **Performance difficult to predict**

Maturity Level (Level 2 and 3)

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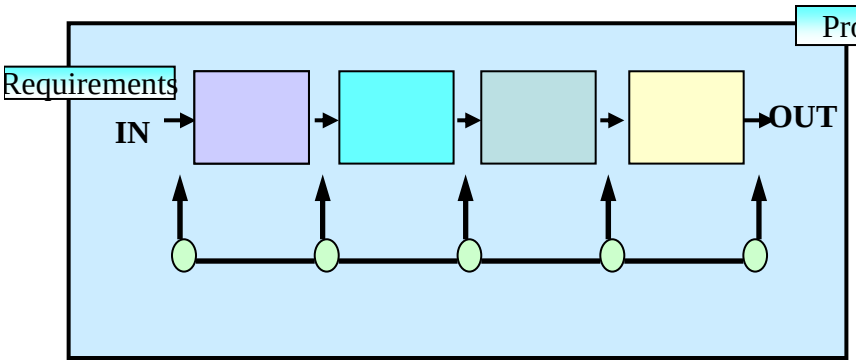
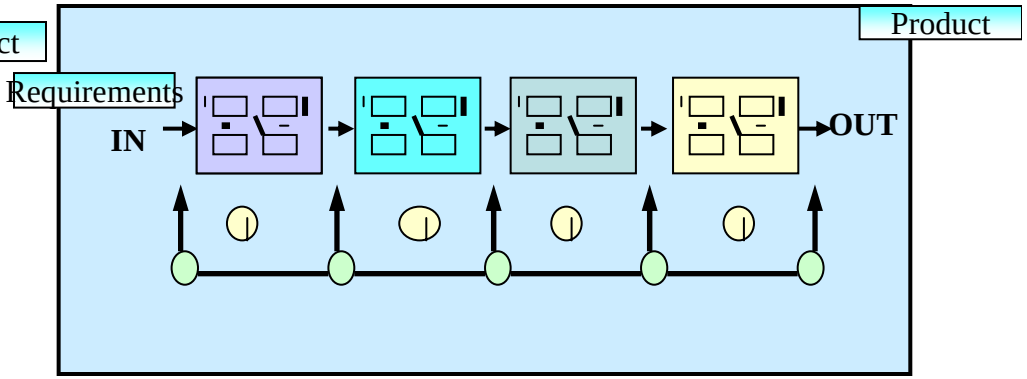
Project Management System is in Place



Repeatable

- **Past successes can be expected on similar projects.**
- **Disciplines -ensure existing practices retained during stress.**
- **Status of activities and work products -visible to management at defined points.**

Managed according to a Well-Defined Process



Defined

- **Roles and responsibilities in the process are understood**
- **The process followed for the software product is visible throughout the Project**

Maturity Level (Level 4 and 5)

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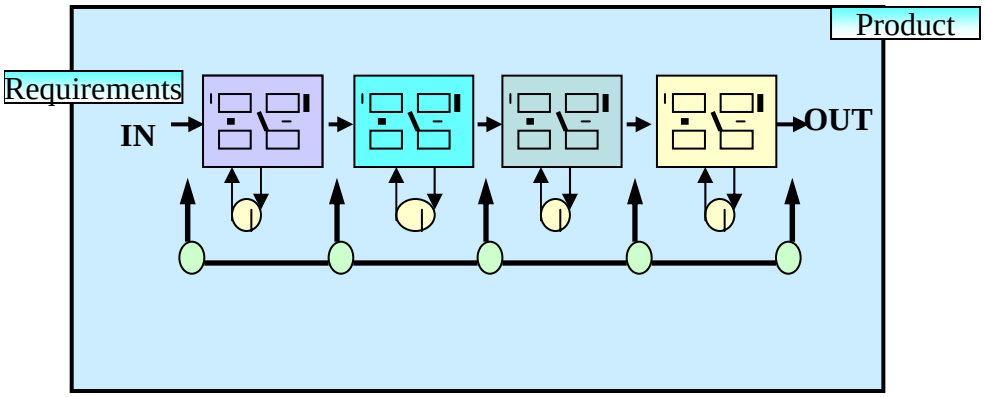
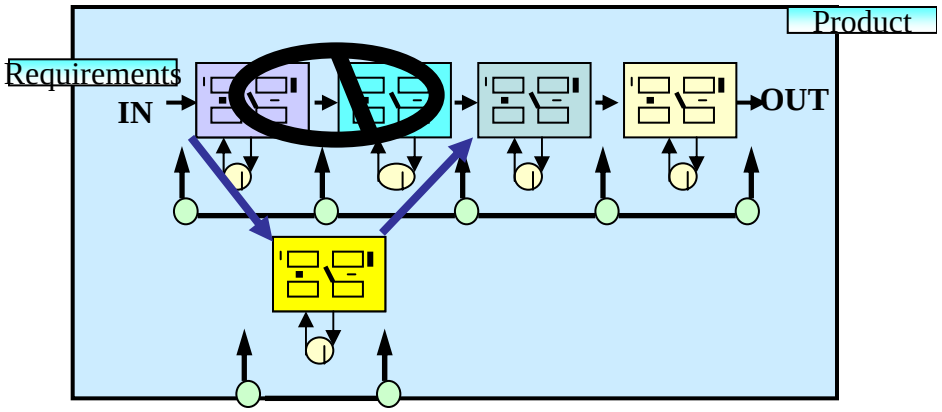
Product and Process are Quantitatively Managed



Quantitatively Managed

- **Management has an objective basis for making decisions**
- **Management is able to predict performance within quantified bounds**

Focus on Continuous Process Improvement



Optimizing

At this Level, Disciplined change is a way of life

Art and Science

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Estimation as an Art :

- **Needs a lot of creativity**
- **Depends more on the person's ability to estimate**
- **May not be consistent**

Estimation as a Science:

- **Based on data and facts**
- **Depends on the Processes**
- **Consistent**

Summary

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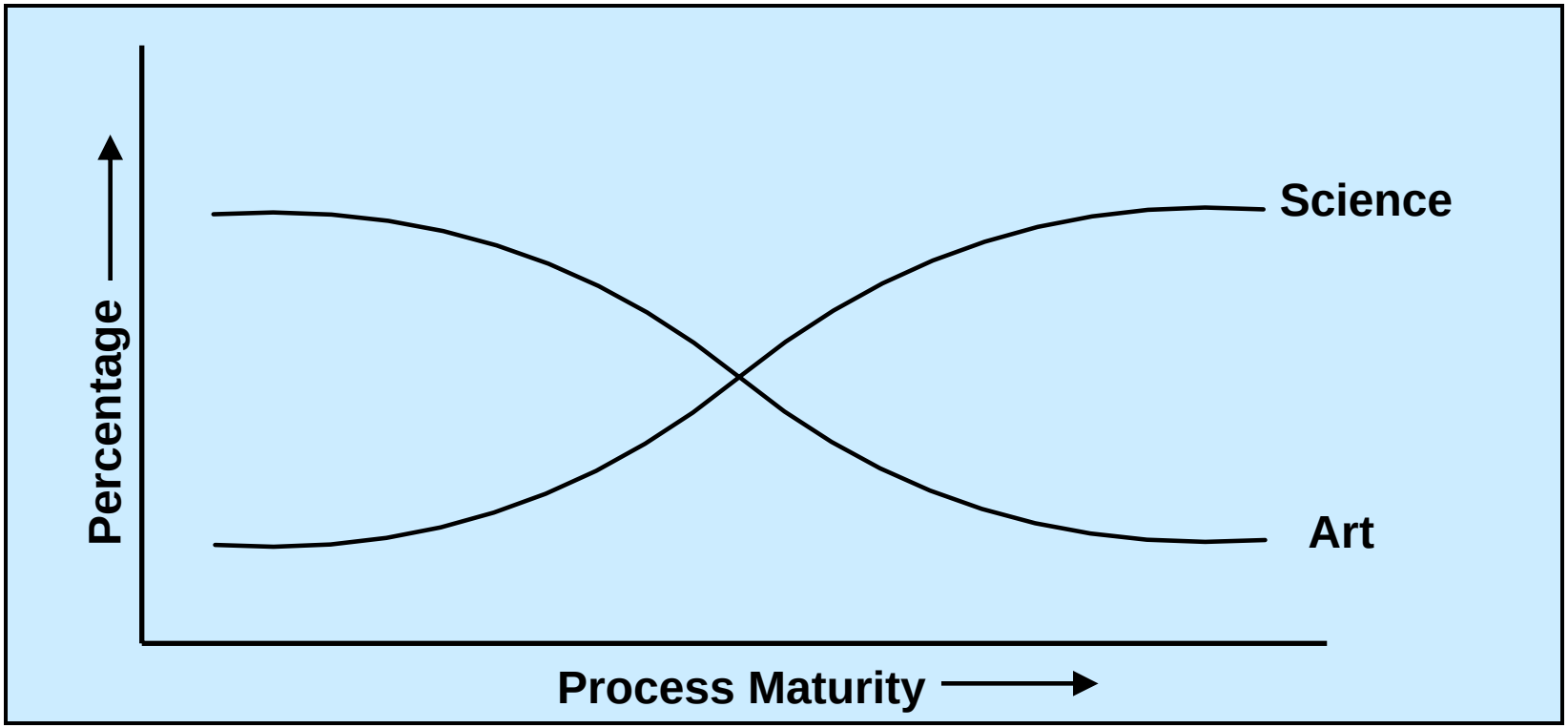
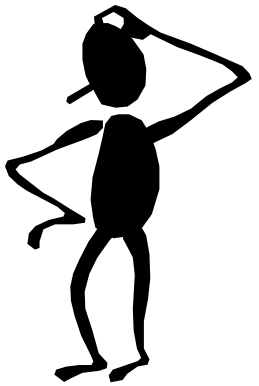
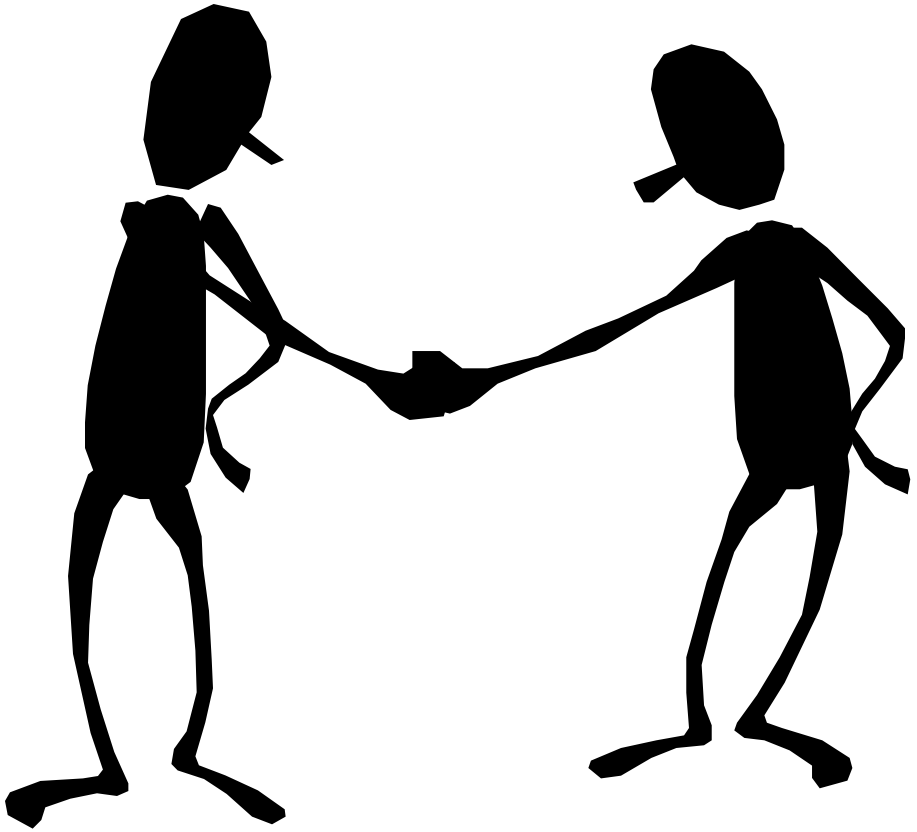
As the processes in an organization mature, estimation will be more of a Science than an Art



Now you can decide where your estimation process fits in this chart

Questions???





Thank you