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# Project Management

## Přednáška KIV/SI č.5

# Introduction to Project Management

# Motivation for Studying IT Project Management

- IT projects have a terrible track record
  - A 1995 Standish Group study (CHAOS) found that only 16.2% of IT projects were successful and over 31% were canceled before completion, costing over $81 B in the U.S. alone
- The need for IT projects keeps increasing
  - In 2000, there were 300,000 new IT projects
  - In 2001, over 500,000 new IT projects were started

# Advantages of Using Formal Project Management

- Better control of financial, physical, and human resources
- Improved customer relations
- Shorter development times
- Lower costs
- Higher quality and increased reliability
- Higher profit margins
- Improved productivity
- Better internal coordination
- Higher worker morale

# What Is a Project?

- A project is a temporary endeavor undertaken to create a unique product, service, or result.

(PMBOK® Guide 2004, p. 5)

# Attributes of project

- unique purpose
- temporary
- project is developed using progressive elaboration
- require resources, often from various areas
- should have a primary sponsor and/or customer
- involve uncertainty

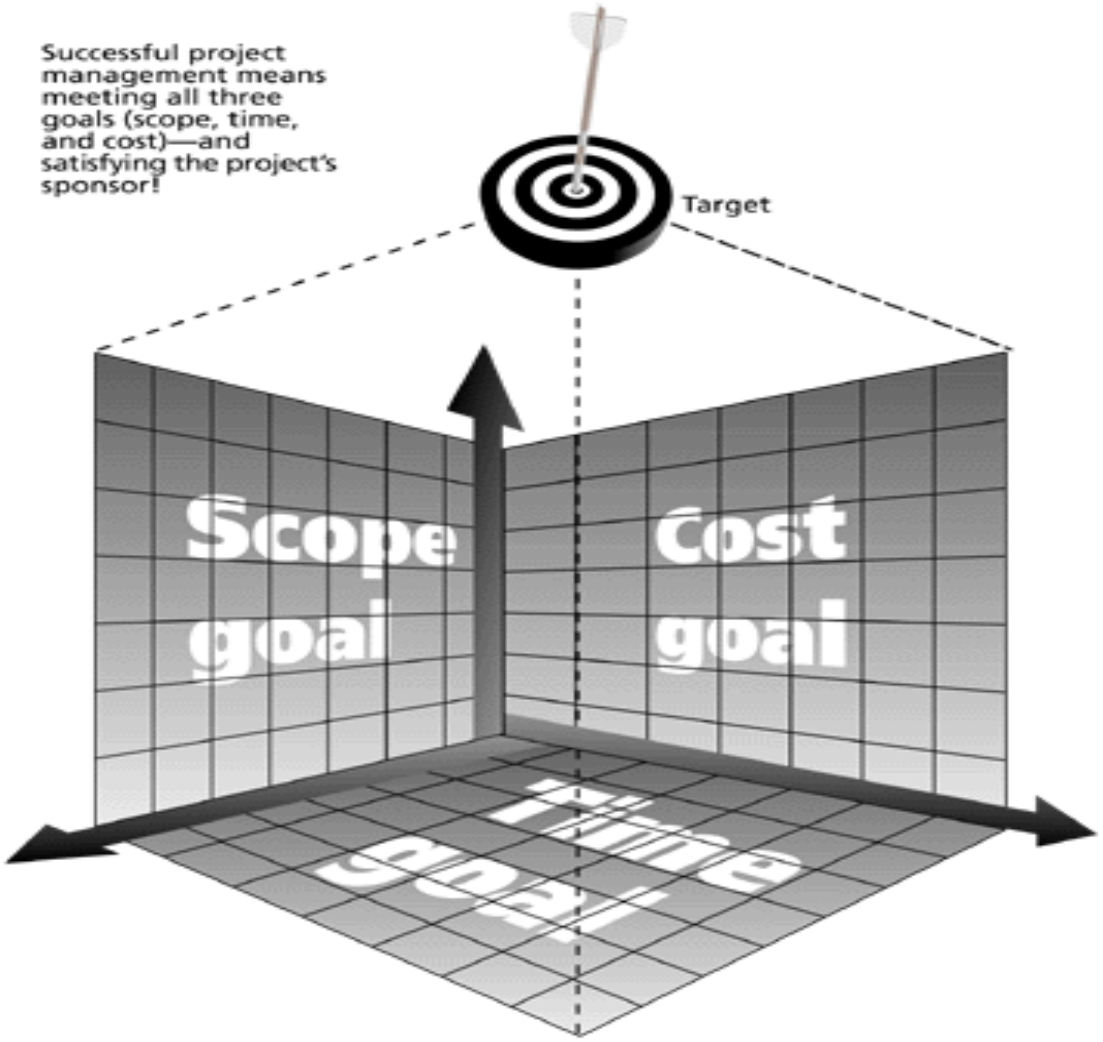
# Samples of IT Projects

- Many organizations upgrade hardware, software, and networks via projects
- Organizations develop new software or enhance existing systems to perform many business functions
- Note:  “IT projects” refers to projects involving hardware, software, and networks

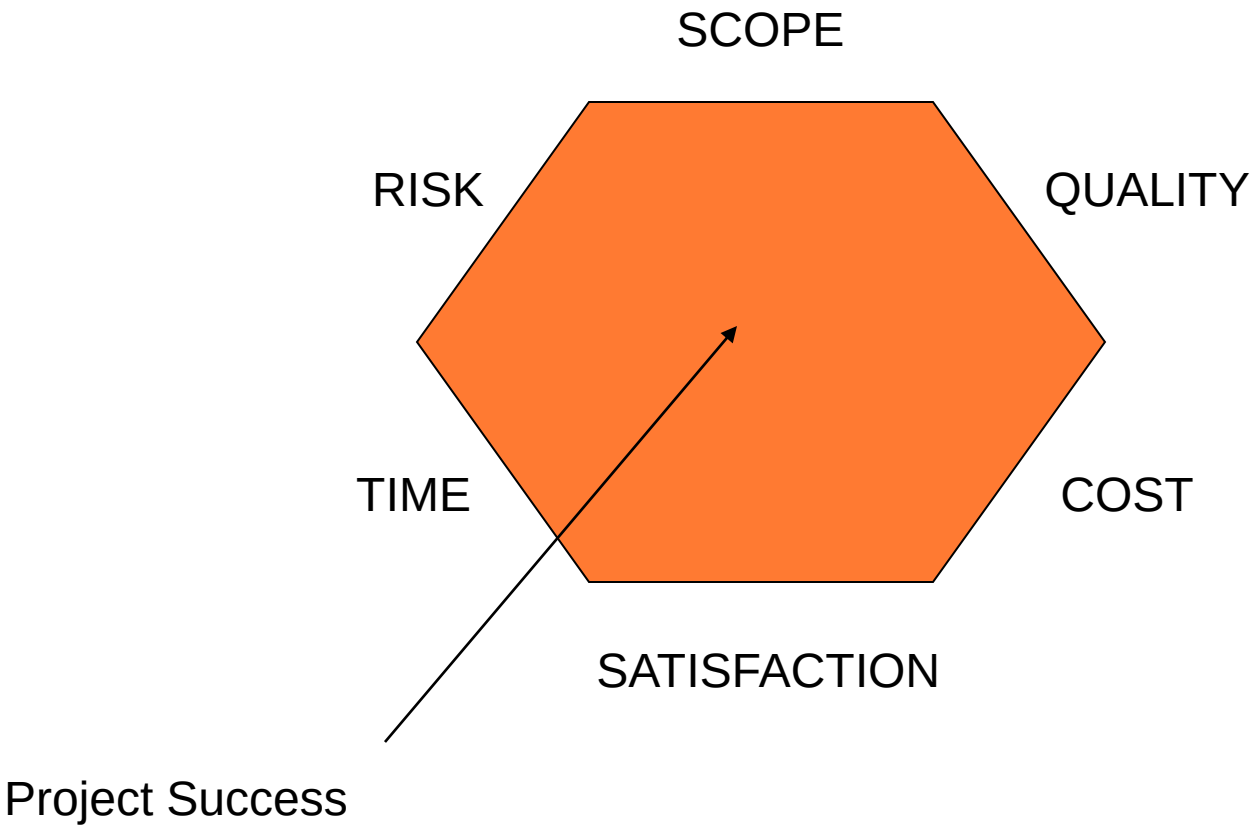
# The Triple Constraint

- Every project is constrained in different ways by its
  1. Scope goals:  What is the project trying to accomplish?
  2. Time goals:  How long should it take to complete?
  3. Cost goals:  What should it cost?
- It is the project manager's duty to balance these three often competing goals

# The Triple Constraint of Project Management



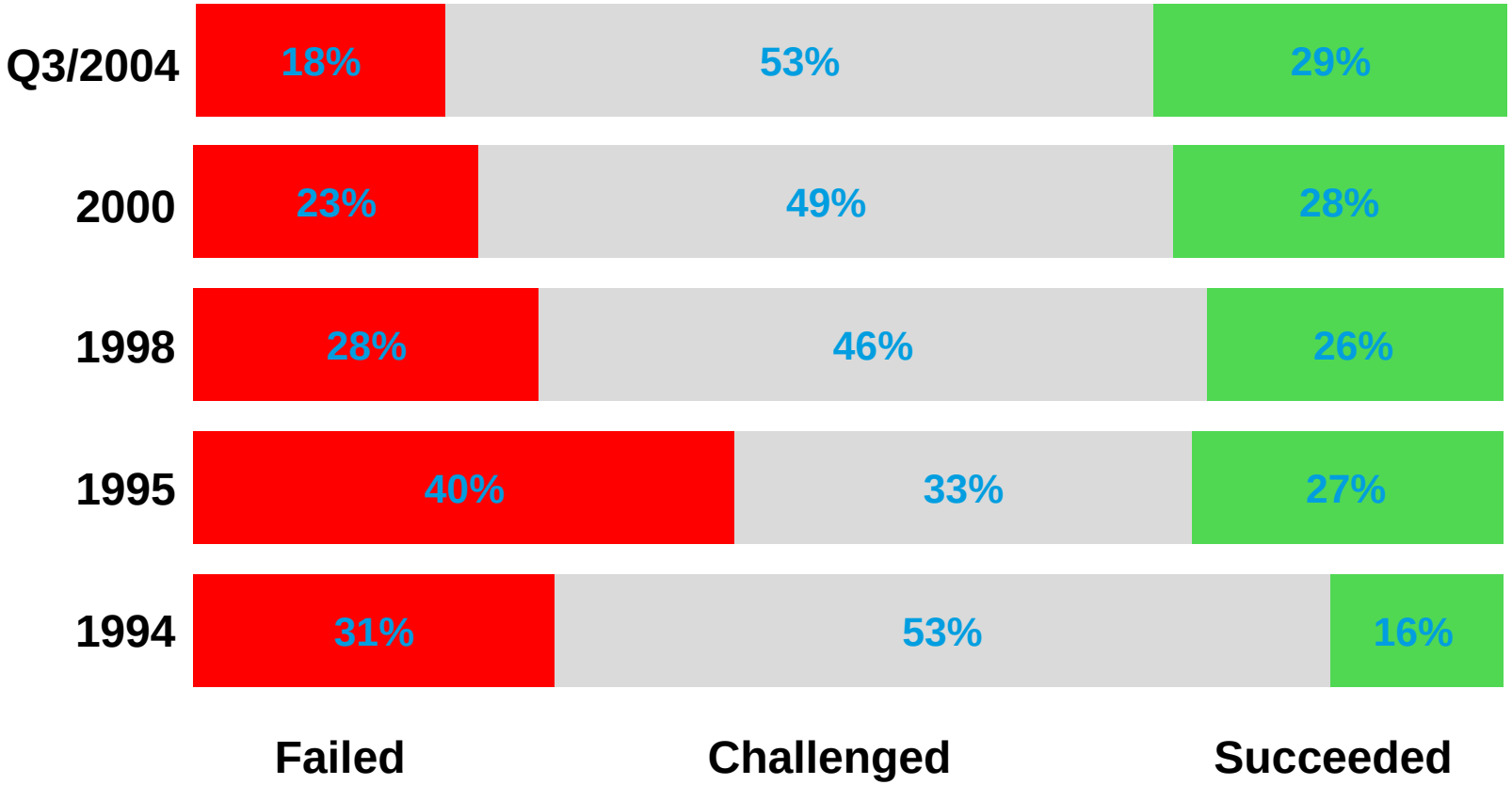
# The Multiple Constraint of Project Management



# The 2001 Standish Group Report - Decided Improvement

- Time overruns significantly decreased to 163% compared to 222%
- Cost overruns were down to 145% compared to 189%
- Required features and functions were up to 67% compared to 61%
- 78,000 U.S. projects were successful compared to 28,000
- 28% of IT projects succeeded compared to 16%

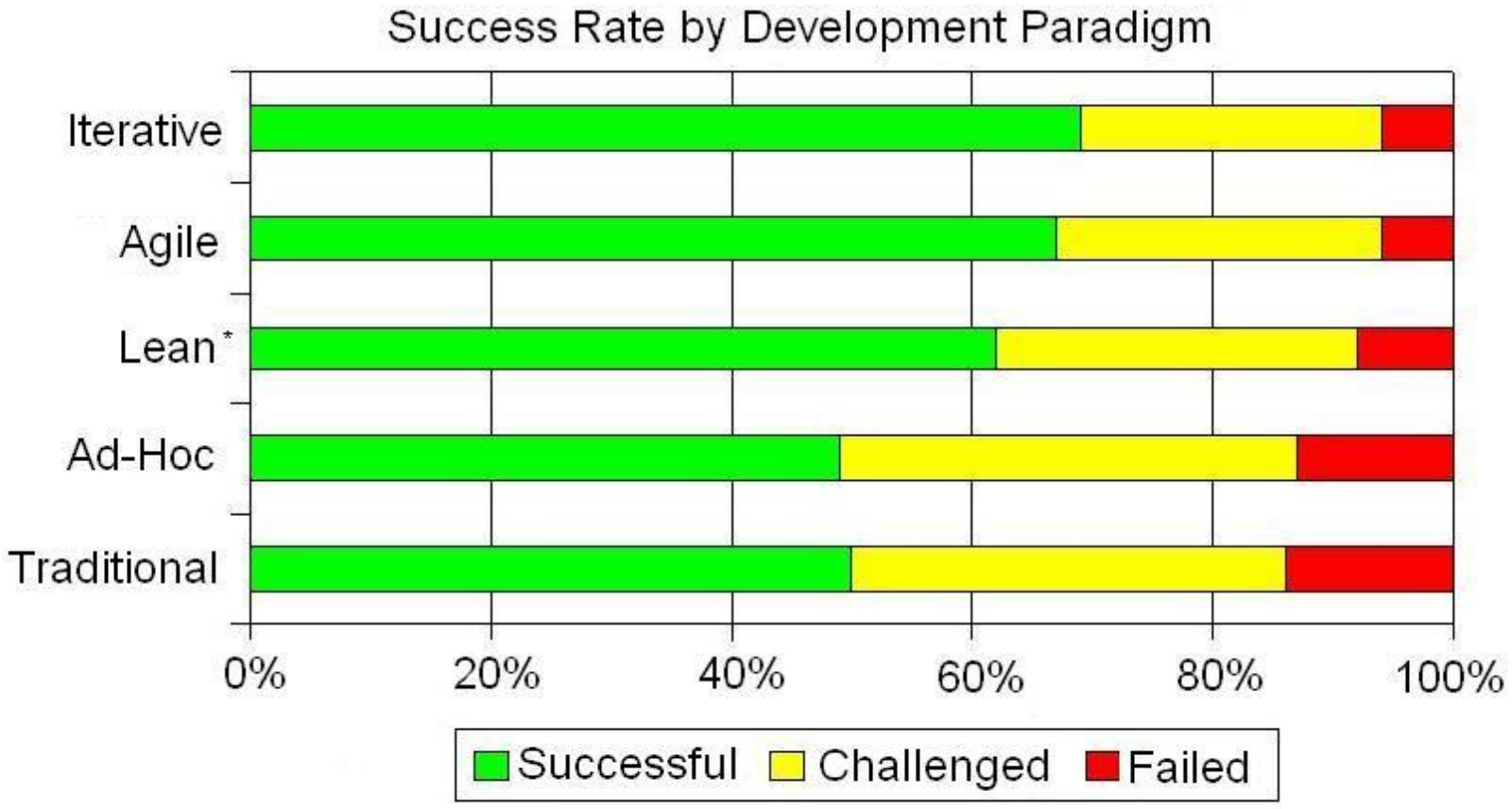
# The 2001 Standish Group Report - Decided Improvement




This chart depicts the outcome of the 30,000 application projects in large, medium, and small cross-industry U.S. companies tested by The Standish Group since 1994.

Source: The Standish Group International, *Extreme Chaos, The Standish Group International, Inc., 2000-2004 Research Reports*

# SW projekty vs metodiky




2011 is the first year where we asked about Lean.
We only had 40 respondents for this paradigm.

Copyright 2011 Scott W. Ambler www.ambysoft.com/surveys/

# Why the Improvements?

"The reasons for the increase in successful projects vary. First, the average cost of a project has been more than cut in half. Better tools have been created to monitor and control progress and **better skilled project managers with better management processes** are being used. The fact that there are processes is significant in itself.“*

*The Standish Group, "CHAOS 2001: A Recipe for Success" (2001)

# What Helps Projects Succeed?

| | |
|---|---|
| • Executive support | 18 |
| • User involvement | 16 |
| • Experienced Project manager | 14 |
| • Clear bussines objectives | 12 |
| • Minimized scope | 10 |
| • Standard software infrastructure | 8 |
| • Firm basic requirements | 6 |
| • Formal methodology | 6 |
| • Reliable estimate | 5 |
| • Other criteria, small milestones, proper planning, competent staff, and ownership | 5 |

**The Standish Group, „Extreme CHAOS“, 2001**

# Project Delivery Winners

- Use an integrated toolbox
- Grow project leaders
- Develop a streamlined project delivery process
- Measure project health using metrics

# What is Project Management?

- Project management is “the application of knowledge, skills, tools, and techniques to project activities in order to meet project requirements”

Project Management Body of Knowledge (PMBOK® Guide), 2000, p. 6)

# What is Project Management?

- Project management is accomplished through the application and integration of the project management processes of initiating, planning, executing, monitoring and controlling, and closing. The project manager is the person responsible for accomplishing the project objectives.
- Managing a project includes:
  - Identifying requirements
  - Establishing clear and achievable objectives
  - Balancing the competing demands for quality, scope, time and cost
  - Adapting the specifications, plans, and approach to the different concerns and expectations of the various stakeholders.

# Project Stakeholders

- Stakeholders are the people involved in or affected by project activities
- Stakeholders include
  - Project sponsor
  - Project manager
  - Project team
  - Support staff
  - Suppliers
  - Opponents

# Project Management Framework

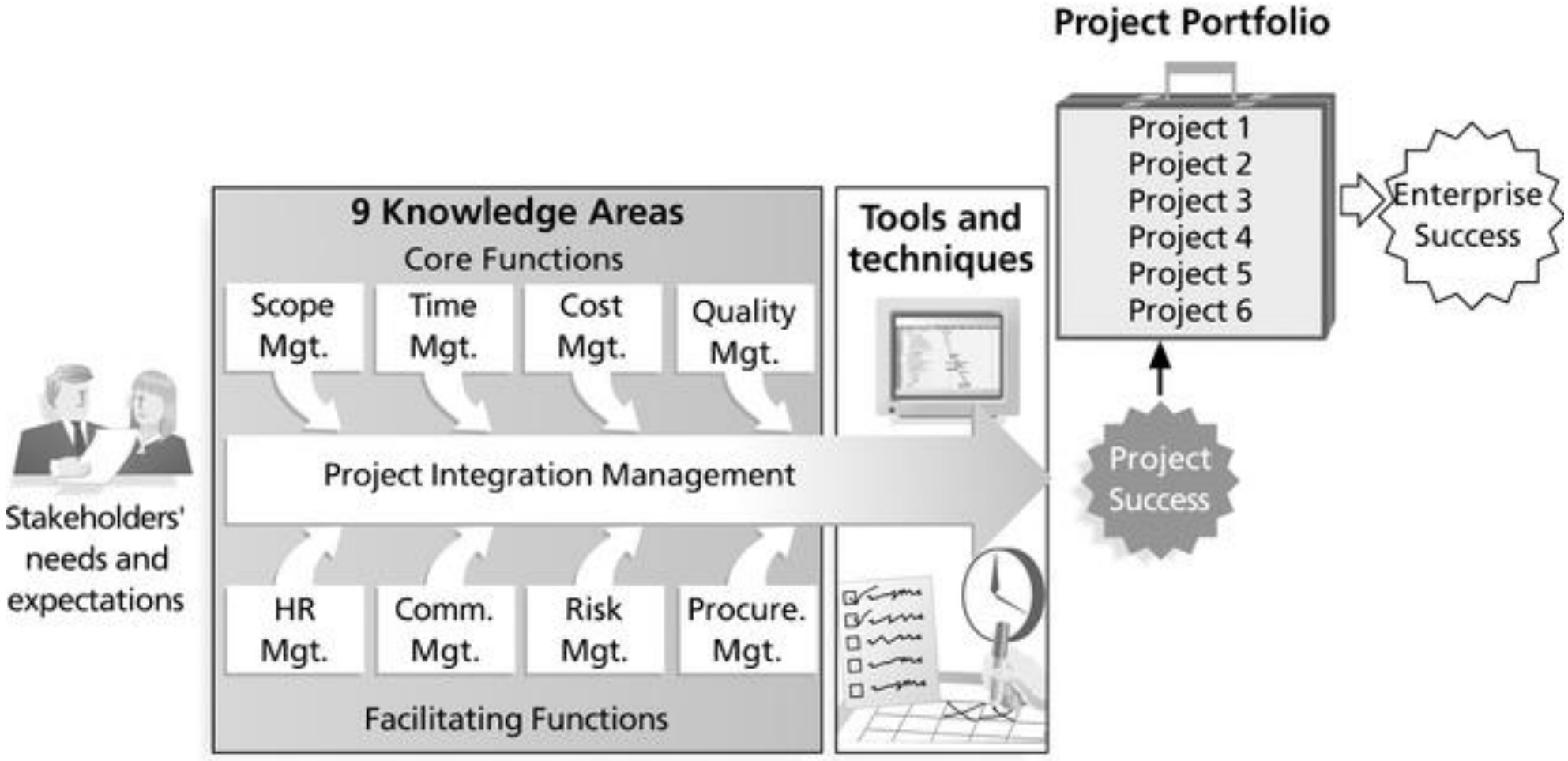



*Figure 1-2. Project Management Framework*

# PM Tools and Techniques

- Project management tools and techniques assist project managers and their teams in various aspects of project management
- Some specific ones include
  - Project Charter, scope statement, and WBS (scope)
  - Gantt charts, network diagrams, critical path analysis, critical chain scheduling (time)
  - Cost estimates and earned value management (cost)

# PM Tools and Techniques

1. Integration management
2. Scope
3. Time
4. Cost
5. Quality
6. Human resource
7. Communications
8. Risk
9. Procurement

# How PM Relates to Other Disciplines

- Much of the knowledge needed to manage projects is unique to the discipline of project management
- Project managers must have knowledge and experience in:
  - The Project Management Body of Knowledge
  - Application area knowledge, standards, and regulations
  - Understanding the project environment
  - General management knowledge and skills
  - Interpersonal skills.

# Suggested Skills for Project Managers

- Project managers need a wide variety of skills
- They should be comfortable with change, understand the organizations they work in and with, and be able to lead teams to accomplish project goals
- Project managers need both “hard” and “soft” skills.  Hard skills include product knowledge and knowing how to use various project management tools and techniques, and soft skills include being able to work with various types of people

# Suggested Skills for a Project Manager

- Communication skills:  listening, persuading
- Organizational skills:  planning, goal-setting, analyzing
- Team Building skills:  empathy, motivation, esprit de corps
- Leadership skills:  set examples, be energetic, have vision (big picture), delegate, be positive
- Coping skills:  flexibility, creativity, patience, persistence
- Technological skills:  experience, project knowledge

# Fifteen Project Management Job Functions*

- Define scope of project
- Identify stakeholders, decision-makers, and escalation procedures
- Develop detailed task list (work breakdown structures)
- Estimate time requirements
- Develop initial project management flow chart
- Identify required resources and budget
- Evaluate project requirements
- Identify and evaluate risks
- Prepare contingency plan
- Identify interdependencies
- Identify and track critical milestones
- Participate in project phase review
- Secure needed resources
- Manage the change control process
- Report project status

*Northwest Center for Emerging Technologies, "Building a Foundation for Tomorrow: Skills Standards for Information Technology,"Belleview, WA, 1999

# Significant Characteristics of Effective and Ineffective PM's

**Effective Project Managers**

- Lead by example
- Are visionaries
- Are technically competent
- Are decisive
- Are good communicators
- Are good motivators
- Stand up to upper management when necessary
- Support team members
- Encourage new ideas

**Ineffective Project Managers**

- Set bad examples
- Are not self-assured
- Lack technical expertise
- Are poor communicators
- Are poor motivators

# History of Project Management

- Some people argue that building the Egyptian pyramids was a project, as was building the Great Wall of China
- Most people consider the Manhattan Project to be the first project to use “modern” project management (125K people)
- Polaris Missile - Submarine-launched, two-stage solid-fuel nuclear-armed ballistic missile
- Apollo Mission
- OS/360 – Fred Brooks – (Mythical Man-Month)

# The Project Management Profession

- The job of IT Project Manager is in the list of the top ten most in demand IT skills
- Professional societies like the Project Management Institute (PMI) have grown tremendously
- Project management research and certification programs continue to grow

# Project Management Certification

- PMI provides certification as a Project Management Professional (PMP)
- A PMP has documented sufficient project experience, agreed to follow a code of ethics, and passed the PMP exam
- The number of people earning PMP certification is increasing quickly
- PMI and other organizations are offering new certification programs

# Growth in PMP Certification, 1993-2002

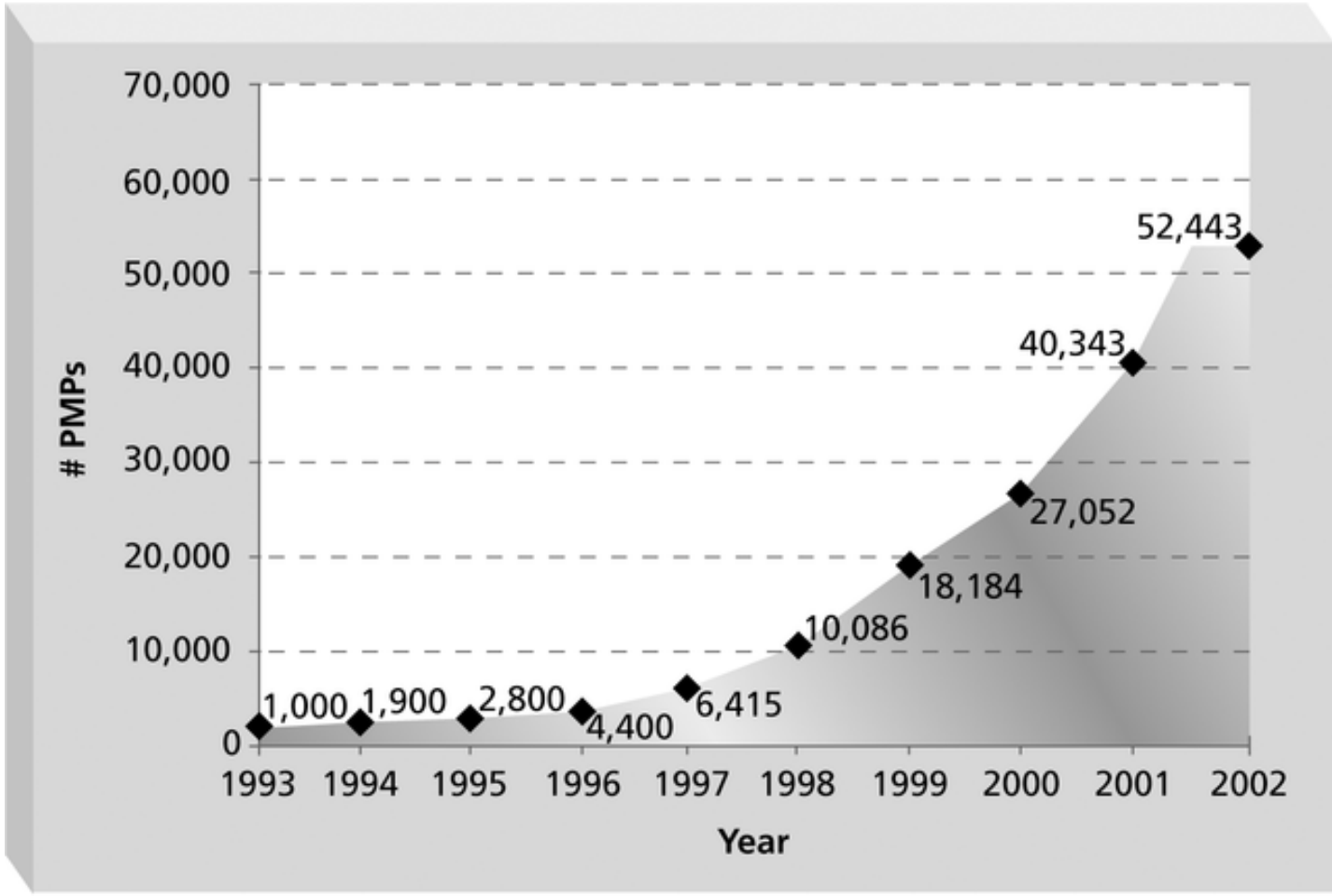



*Figure 1-6. Growth in PMP Certification, 1993–2002*

# Ethics in Project Management

- Ethics is an important part of all professions
- Project managers often face ethical dilemmas
- In order to earn PMP certification, applicants must agree to the PMP code of professional conduct

# Project Management Software

- By 2003, there were hundreds of different products to assist in performing project management
- Three main categories of tools exist:
  - Low-end tools: Handle single or smaller projects well, cost under $200 per user
  - Midrange tools:  Handle multiple projects and users, cost $200-500 per user, Project 2000 most popular
  - High-end tools:  Also called enterprise project management software, often licensed on a per-user basis

# You Can Apply Project Management to Many Areas

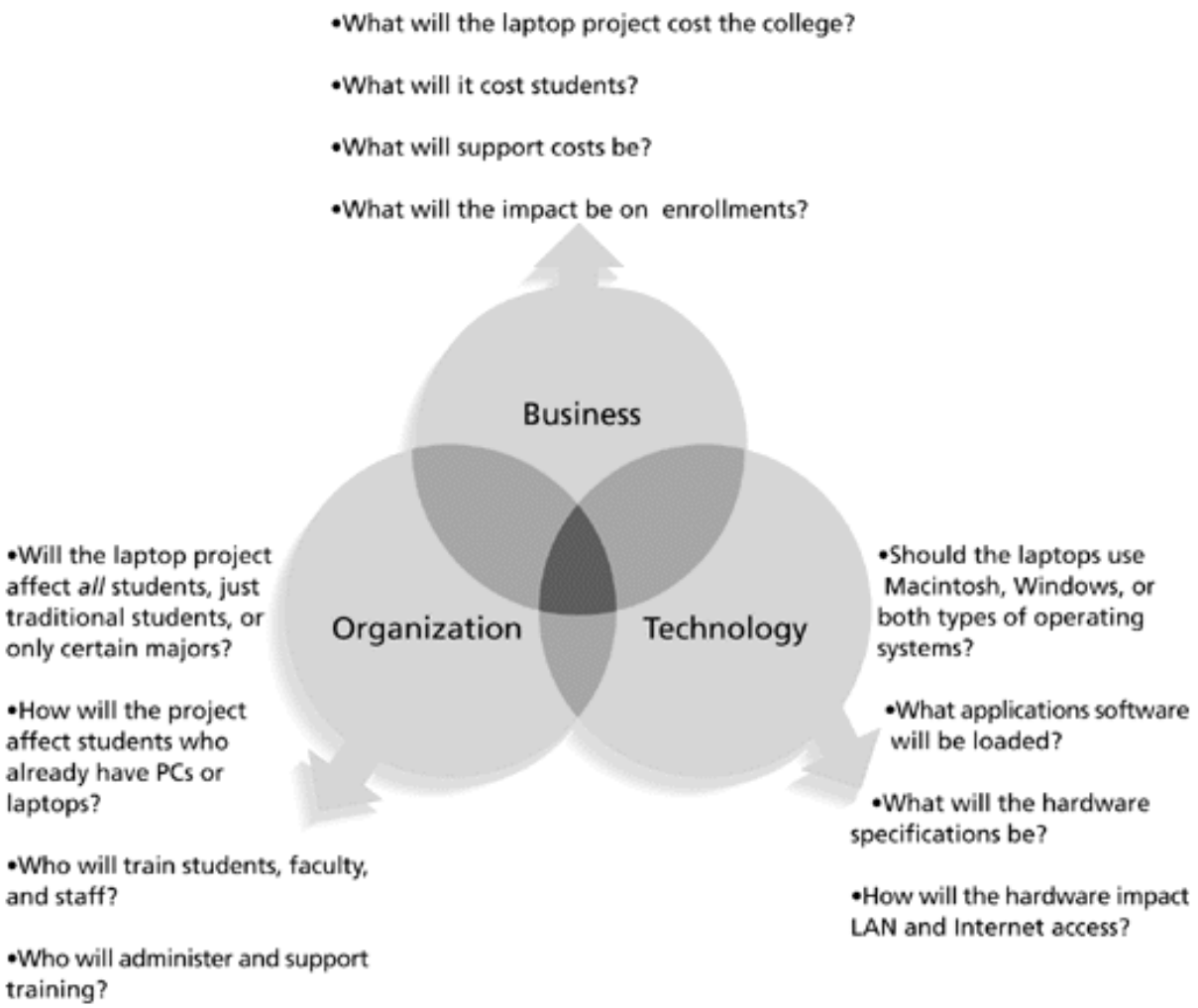
- Project management applies to work as well as personal projects
- Project management applies to many different disciplines (IT, construction, finance, sports, event planning, etc.)
- Project management skills can help in everyday life

# Project Management and IT Context

# Projects Cannot Be Run in Isolation

- Projects must operate in a broad organizational environment
- Project managers need to take a holistic or systems view of a project and understand how it is situated within the larger organization

# Three Sphere Model for Systems Management



# Understanding Organizations

| | |
|---|---|
| **Structural frame:** Focuses on roles and responsibilities, coordination and control. Organizational charts help define this frame. | **Human resources frame:** Focuses on providing harmony between needs of the organization and needs of people. |
| **Political frame:** Assumes organizations are coalitions composed of varied individuals and interest groups. Conflict and power are key issues. | **Symbolic frame:** Focuses on symbols and meanings related to events. Culture is important. |

# Many Organizations Focus on the Structural Frame

- Most people understand what organizational charts are
- Many new managers try to change organizational structure when other changes are needed
- 3 basic organizational structures
  - functional
  - project
  - matrix

# Basic Organizational Structures

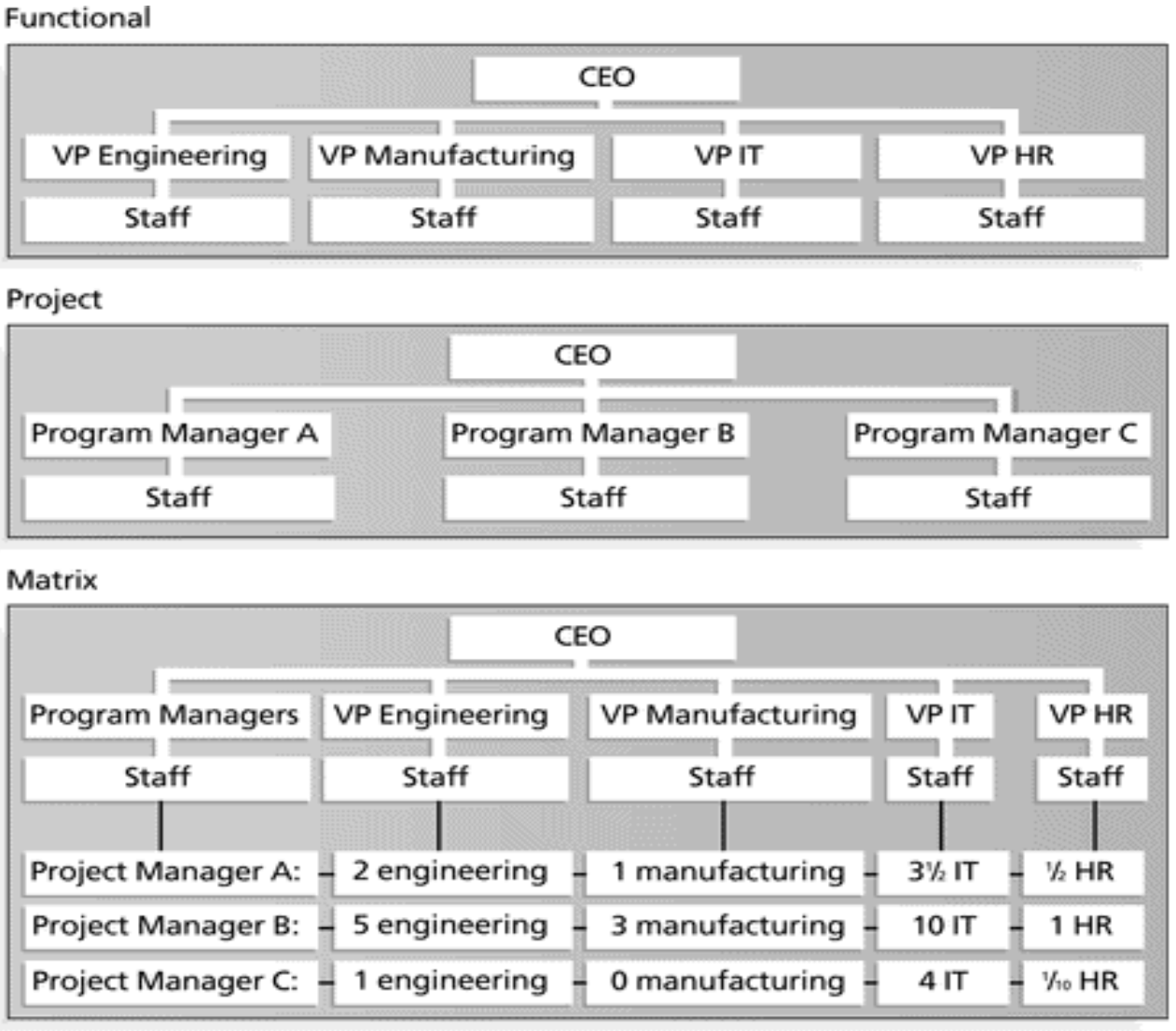



*Figure 2-2. Functional, Project, and Matrix Organizational Structures*

# Organizational Structure Influences on Projects

**Table 2-1: Organizational Structure Influences on Projects**

| | FUNCTIONAL | MATRIX | | | PROJECT |
|---|---|---|---|---|---|
| | | WEAK MATRIX | BALANCED MATRIX | STRONG MATRIX | |
| Project manager's authority | Little or none | Limited | Low to Moderate | Moderate to high | High to almost total |
| Percent of performing organization's personnel assigned full-time to project work | Virtually none | 0–25% | 15–60% | 50–95% | 85–100% |
| Project manager's role | Part-time | Part-time | Full-time | Full-time | Full-time |
| Common title for project manager's role | Project Coordinator/ Project Leader | Project Coordinator/ Project Leader | Project Manager/ Project Officer | Project Manager/ Program Manager | Project Manager/ Program Manager |
| Project management administrative staff | Part-time | Part-time | Part-time | Full-time | Full-time |

PMBOK® Guide 2000, 19.

**The organizational structure influences the project manager's authority, but project managers need to remember to address the human resources, political, and symbolic frames, too.**



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# Organizational Culture

**Stephen P. Robbins : Organizational Behavior**

1. **Member identity**
2. **Group emphasis**
3. **People focus**
4. **Unit integration**
5. **Control**
6. **Risk tolerance**
7. **Reward criteria**
8. **Conflict tolerance**
9. **Means-ends orientation**
10. **Open-system focus**

# Recognize the Importance of Project Stakeholders

- Recall that project stakeholders are the people involved in or affected by project activities
- Project managers must take time to identify, understand, and manage relationships with all project stakeholders
- Using the four frames of organizations can help meet stakeholder needs and expectations
- Senior executives are very important stakeholders

# What Helps Projects Succeed?

According to the Standish Group's report "CHAOS 2001: A Recipe for Success," the following items help IT projects succeed, in order of importance:

- **Executive support**
- User involvement
- Experienced project manager
- Clear business objectives
- Minimized scope
- Standard software infrastructure
- Firm basic requirements
- Formal methodology
- Reliable estimates

# Why Projects Fail ?

- an unrealistic deadline is establishes
- changing requirements
- predictable and/or unpredictable risks
- technical difficulties
- miscommunication among project staff
- failure in project management

# Need for Top Management Commitment

- Several studies cite top management commitment as one of the key factors associated with project success
- Top management can help project managers secure adequate resources, get approval for unique project needs in a timely manner, receive cooperation from people throughout the organization, and learn how to be better leaders

# Need for Organizational Commitment to IT

- If the organization has a negative attitude toward IT, it will be difficult for an IT project to succeed
- Having a Chief Information Officer (CIO) at a high level in the organization helps IT projects
- Assigning non-IT people to IT projects also encourages more commitment

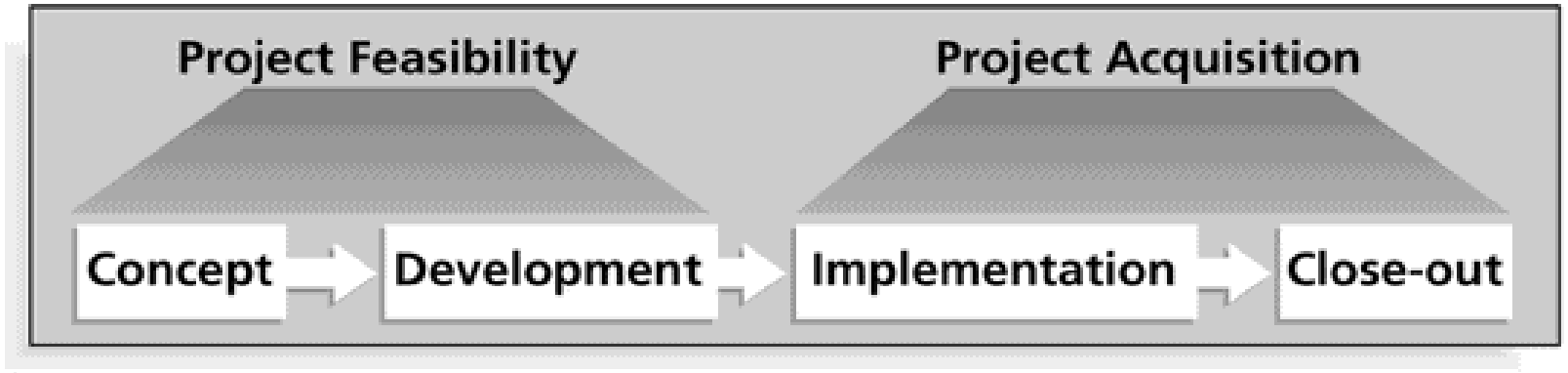
# Need for Organizational Standards

- Standards and guidelines help project managers be more effective
- Senior management can encourage
  - the use of standard forms and software for project management
  - the development and use of guidelines for writing project plans or providing status information
  - the creation of a project management office or center of excellence

# Project Phases and the Project Life Cycle

- A project life cycle is a collection of project phases
- Project phases vary by project or industry, but some general phases include
  - concept
  - development
  - implementation
  - support

# Phases of the Project Life Cycle




| Sample deliverables for each phase | Concept | Development | Implementation | Close-out |
|---|---|---|---|---|
| | Management plan | Project plan | Last work package | Completed work |
| | Preliminary cost estimate | Budgetary cost estimate | Definitive cost estimate | Lessons learned |
| | 3-level WBS | 6+-level WBS | Performance reports | Customer acceptance |

*Figure 2-3. Phases of the Project Life Cycle*

# Product Life Cycles

- Products also have life cycles
- The Systems Development Life Cycle (SDLC) is a framework for describing the phases involved in developing and maintaining information systems
- Systems development projects can follow
  - predictive models: the scope of the project can be clearly articulated and the schedule and cost can be predicted
  - adaptive models: projects are mission driven and component based, using time-based cycles to meet target dates

# Predictive Life Cycle Models

- The waterfall model has well-defined, linear stages of systems development and support
- The spiral model shows that software is developed using an iterative or spiral approach rather than a linear approach
- The incremental release model provides for progressive development of operational software
- The prototyping model is used for developing prototypes to clarify user requirements
- The RAD model is used to produce systems quickly without sacrificing quality

# Adaptive Life Cycle Models

- Extreme Programming (XP): Developers program in pairs and must write the tests for their own code. XP teams include developers, managers, and users
- Scrum: Repetitions of iterative development are referred to as sprints, which normally last thirty days. Teams often meet every day for a short meeting, called a scrum, to decide what to accomplish that day. Works best for object-oriented technology projects and requires strong leadership to coordinate the work

# Distinguishing Project Life Cycles and Product Life Cycles

- The project life cycle applies to all projects, regardless of the products being produced
- Product life cycle models vary considerably based on the nature of the product
- Most large IT systems are developed as a series of projects
- Project management is done in all of the product life cycle phases

# Why Have Project Phases and Management Reviews?

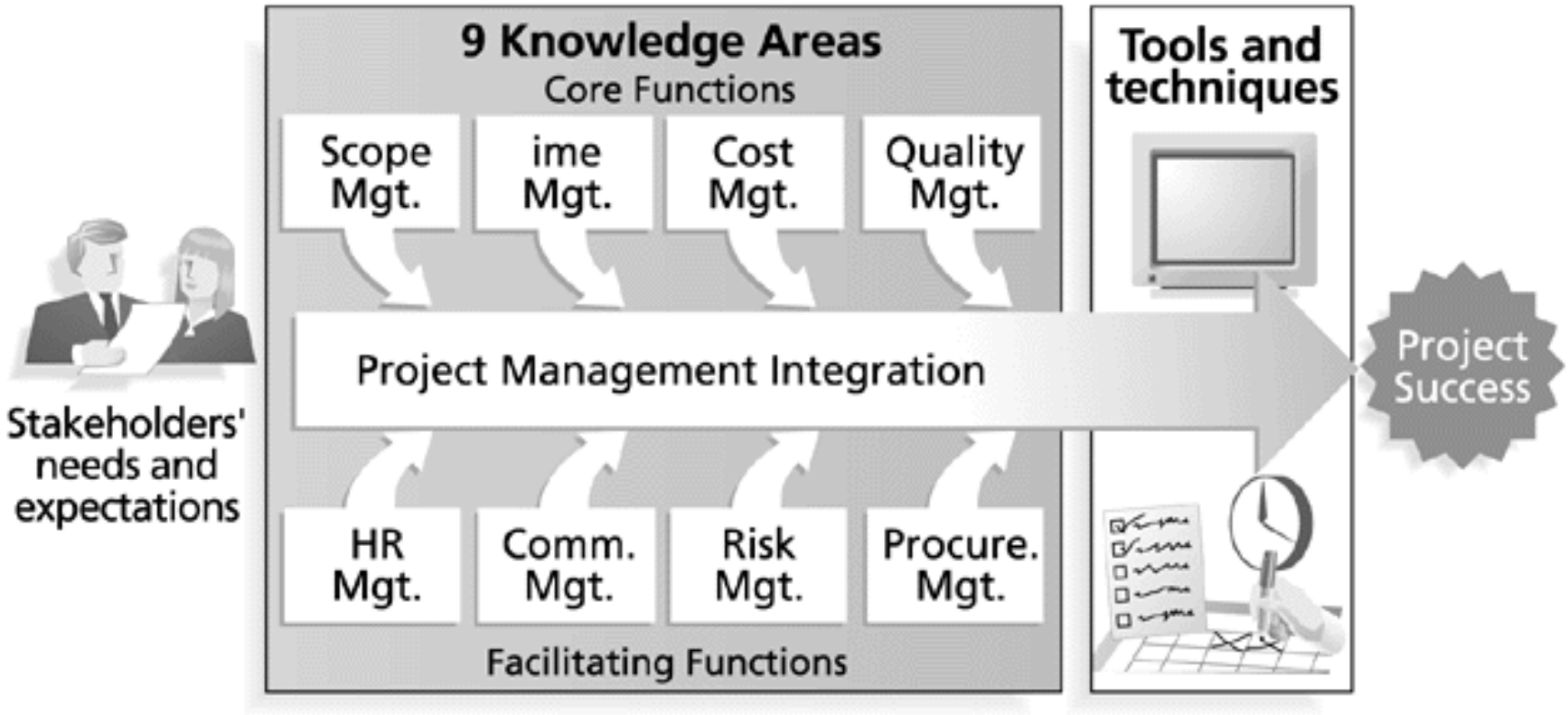
- A project should successfully pass through each of the project phases in order to continue on to the next
- Management reviews (also called phase exits or kill points) should occur after each phase to evaluate the project's progress, likely success, and continued compatibility with organizational goals

# The Context of IT Projects

- IT projects can be very diverse in terms of size,  complexity, products produced, application area, and resource requirements
- IT project team members often have diverse backgrounds and skill sets
- IT projects use diverse technologies that change rapidly.  Even within one technology area, people must be highly specialized

# Project Integration Management

# Project Integration Management




**The Key to Overall Project Success:**
**Good Project Integration Management**

# Good Project Integration Management

- Project managers must coordinate all of the other knowledge areas throughout a project's life cycle
- Many new project managers have trouble looking at the "big picture" and want to focus on too many details
- Project integration management is not the same thing as software integration

# Project Integration Management Processes

- Develop the Project Charter
- Develop the Preliminary Project Scope Statement
- Develop the Project Management Plan
- Direct and Manage Project Execution
- Monitor and Control the Project Work
- Perform Integrated Change Control
- Close the Project

# Identifying Potential Projects

- Many organizations follow a planning process for selecting IT projects.
- It's crucial to align IT projects with business strategy.
- Research shows that:
  - Supporting explicit business objectives is the number one reason cited for investing in IT projects.
  - Companies with consolidated IT operations have a 24 percent lower operational cost per end user.
  - The consistent use of IT standards lowers application development costs by 41 percent per user.*

*Cosgrove Ware, Lorraine, "By the Numbers," *CIO Magazine* (*www.cio.com*) (September 1, 2002).

# Categorizing IT Projects

- One categorization is whether the project addresses
  - a problem
  - an opportunity
  - a directive
- Another categorization is how long it will take to do and when it is needed
- Another is the overall priority of the project

# Net Present Value Analysis

- Net present value (NPV) analysis is a method of calculating the expected net monetary gain or loss from a project by discounting all expected future cash inflows and outflows to the present point in time
- Projects with a positive NPV should be considered if financial value is a key criterion
- The higher the NPV, the better

# Net Present Value Example

Uses Excel's npv function

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Discount rate | 10% | | | | | |
| 2 | | | | | | | |
| 3 | PROJECT 1 | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | TOTAL |
| 4 | Benefits | $0 | $2,000 | $3,000 | $4,000 | $5,000 | $14,000 |
| 5 | Costs | $5,000 | $1,000 | $1,000 | $1,000 | $1,000 | $9,000 |
| 6 | Cash flow | ($5,000) | $1,000 | $2,000 | $3,000 | $4,000 | $5,000 |
| 7 | NPV → | $2,316 | | | | | |
| 8 | | Formula =npv(b1,b6:f6) | | | | | |
| 9 | | | | | | | |
| 10 | PROJECT 2 | YEAR 1 | YEAR 2 | YEAR 3 | YEAR 4 | YEAR 5 | TOTAL |
| 11 | Benefits | $1,000 | $2,000 | $4,000 | $4,000 | $4,000 | $15,000 |
| 12 | Costs | $2,000 | $2,000 | $2,000 | $2,000 | $2,000 | $10,000 |
| 13 | Cash flow | ($1,000) | $0 | $2,000 | $2,000 | $2,000 | $5,000 |
| 14 | NPV → | $3,201 | | | | | |
| 15 | | Formula =npv(b1,b13:f13) | | | | | |
| 16 | | | | | | | |
| 17 | RECOMMEND PROJECT 2 BECAUSE IT HAS THE HIGHER NPV. | | | | | | |

Note that totals are equal, but NPVs are not.

*Figure 5-2. Net Present Value Example*



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# Return on Investment

- Return on investment (ROI) is calculated by subtracting the project costs from the benefits and then dividing by the costs

  ROI = (total discounted benefits - total discounted costs) / discounted costs
- The higher the ROI, the better
- Many organizations have a required rate of return or minimum acceptable rate of return on an investment
- Internal rate of return (IRR) can by calculated by setting the NPV to zero

# Payback Analysis

- Another important financial consideration is payback analysis
- The payback period is the amount of time it will take to recoup, in the form of net cash inflows, the net dollars invested in a project
- Payback occurs when the cumulative discounted benefits and costs are greater than zero
- Many organizations want IT projects to have a fairly short payback period

# Charting the Payback Period

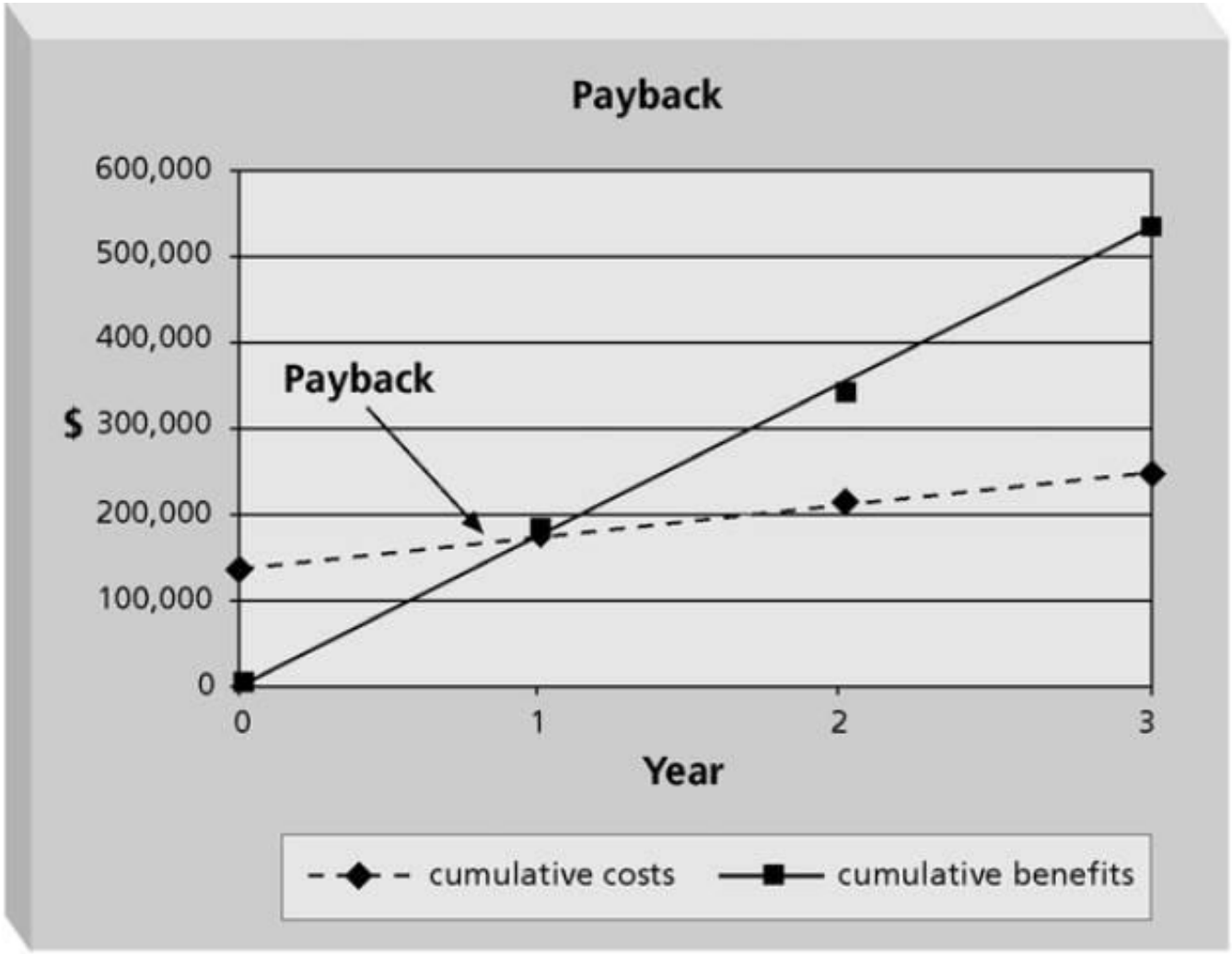


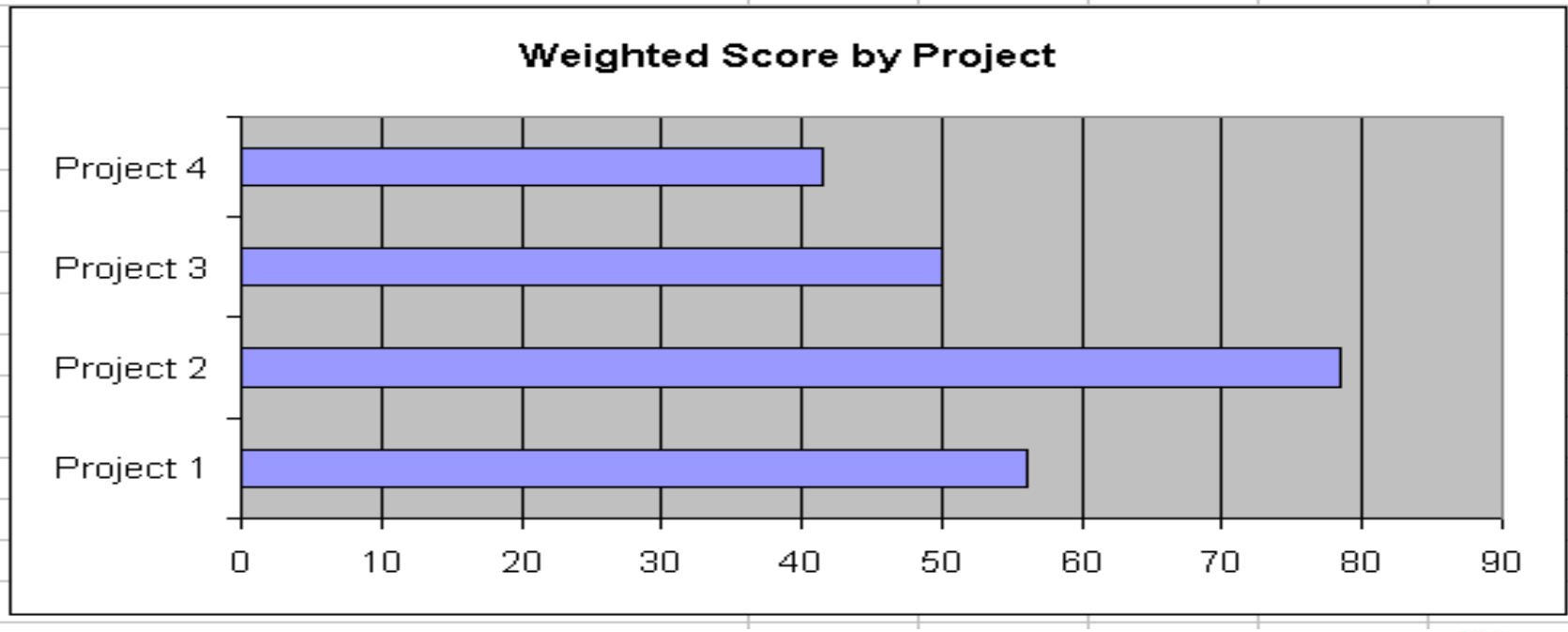

*Figure 5-4. Charting the Payback Period*

# Weighted Scoring Model

- A weighted scoring model is a tool that provides a systematic process for selecting projects based on many criteria
  - First identify criteria important to the project selection process
  - Then assign weights (percentages) to each criterion so they add up to 100%
  - Then assign scores to each criterion for each project
  - Multiply the scores by the weights and get the total weighted scores
- The higher the weighted score, the better

# Sample Weighted Scoring Model for Project Selection

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | **Criteria** | **Weight** | **Project 1** | **Project 2** | **Project 3** | **Project 4** |
| 2 | Supports key business objectives | 25% | 90 | 90 | 50 | 20 |
| 3 | Has strong internal sponsor | 15% | 70 | 90 | 50 | 20 |
| 4 | Has strong customer support | 15% | 50 | 90 | 50 | 20 |
| 5 | Realistic level of technology | 10% | 25 | 90 | 50 | 70 |
| 6 | Can be implemented in one year or less | 5% | 20 | 20 | 50 | 90 |
| 7 | Provides positive NPV | 20% | 50 | 70 | 50 | 50 |
| 8 | Has low risk in meeting scope, time, and cost goals | 10% | 20 | 50 | 50 | 90 |
| 9 | **Weighted Project Scores** | **100%** | **56** | **78.5** | **50** | **41.5** |
| 10 | | | | | | |



# Project Time Management

# Project Time Management Processes

- **Activity definition**: Identifying the specific activities that the project team members and stakeholders must perform to produce the project deliverables.
- **Activity sequencing**: Identifying and documenting the relationships between project activities.
- **Activity resource estimating**: Estimating how many resources a project team should use to perform project activities.
- **Activity duration estimating**: Estimating the number of work periods that are needed to complete individual activities.
- **Schedule development**: Analyzing activity sequences, activity resource estimates, and activity duration estimates to create the project schedule.
- **Schedule control**: Controlling and managing changes to the project schedule.

# Activity Definition

- An **activity** or **task** is an element of work normally found on the WBS that has an expected duration, a cost, and resource requirements.
- Project schedules grow out of the basic documents that initiate a project.
  - The project charter includes start and end dates and budget information.
  - The scope statement and WBS help define what will be done.
- Activity definition involves developing a more detailed WBS and supporting explanations to understand all the work to be done, so you can develop realistic cost and duration estimates.

# Activity Lists and Attributes

- An **activity list** is a tabulation of activities to be included on a project schedule. The list should include:
  - The activity name
  - An activity identifier or number
  - A brief description of the activity
- **Activity attributes** provide more information about each activity, such as predecessors, successors, logical relationships, leads and lags, resource requirements, constraints, imposed dates, and assumptions related to the activity.

# Milestones

- A **milestone** is a significant event that normally has no duration.
- It often takes several activities and a lot of work to complete a milestone.
- Milestones are useful tools for setting schedule goals and monitoring progress.
- Examples include completion and customer sign-off on key documents and completion of specific products.

# Activity Sequencing

- Involves reviewing activities and determining dependencies.
- A **dependency** or **relationship** relates to the sequencing of project activities or tasks.
- You *must* determine dependencies in order to use critical path analysis.

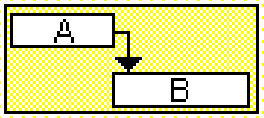
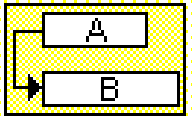
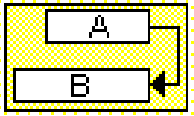
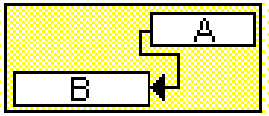
# Precedence Diagramming Method (PDM)

- Activities are represented by boxes
- Arrows show relationships between activities
- More popular than ADM method and used by project management software
- Better at showing different types of dependencies

# Task Dependency Types

**Task dependencies**

The nature of the dependencies between linked tasks. You link tasks by defining a dependency between their finish and start dates. For example, the "Contact caterers" task must finish before the start of the "Determine menus" task. There are four kinds of task dependencies in Microsoft Project:

| Task dependency | Example | Description |
|---|---|---|
| Finish-to-start (FS) |  | Task (B) cannot start until task (A) finishes. |
| Start-to-start (SS) |  | Task (B) cannot start until task (A) starts. |
| Finish-to-finish (FF) |  | Task (B) cannot finish until task (A) finishes. |
| Start-to-finish (SF) |  | Task (B) cannot finish until task (A) starts. |

# Sample PDM Network Diagram

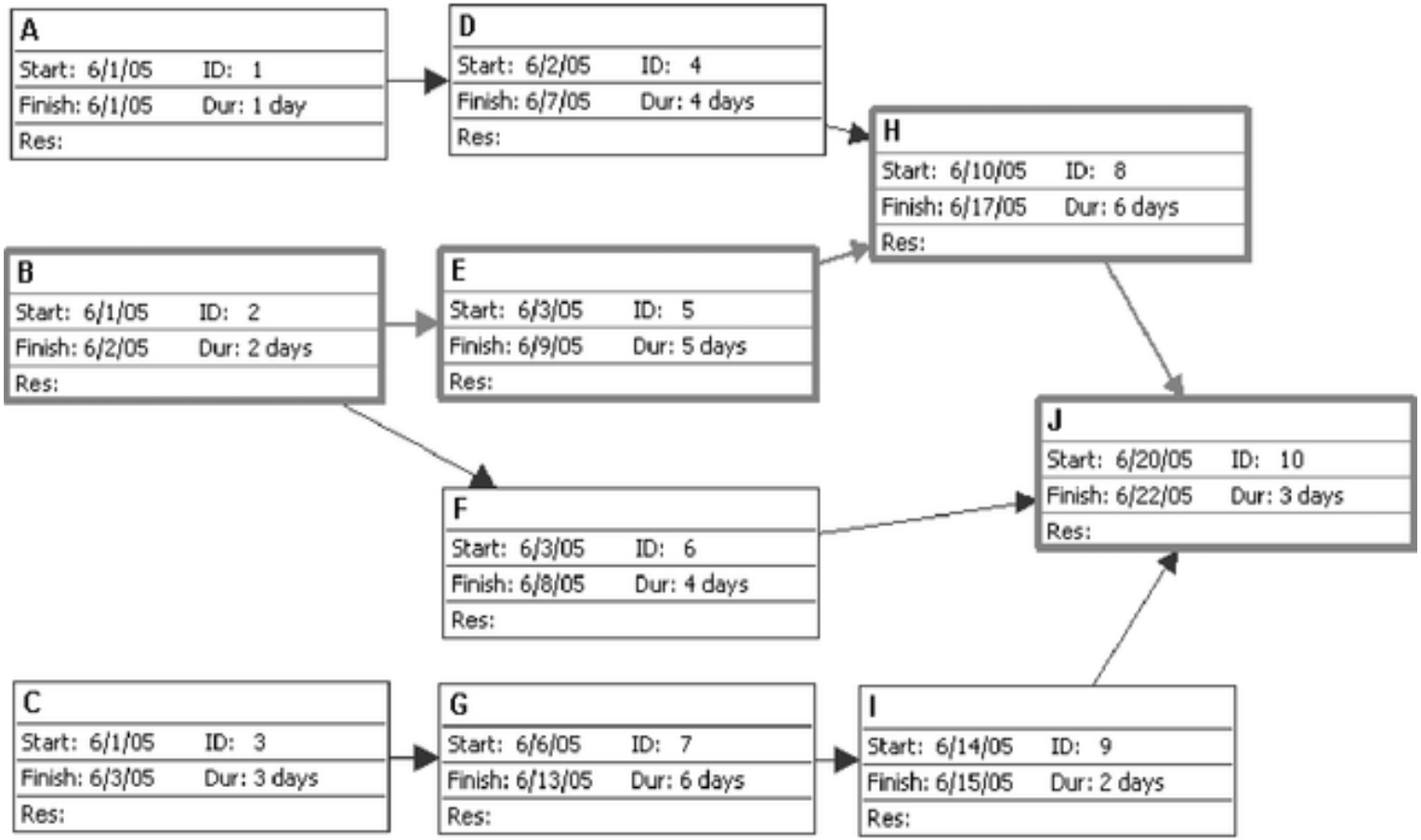
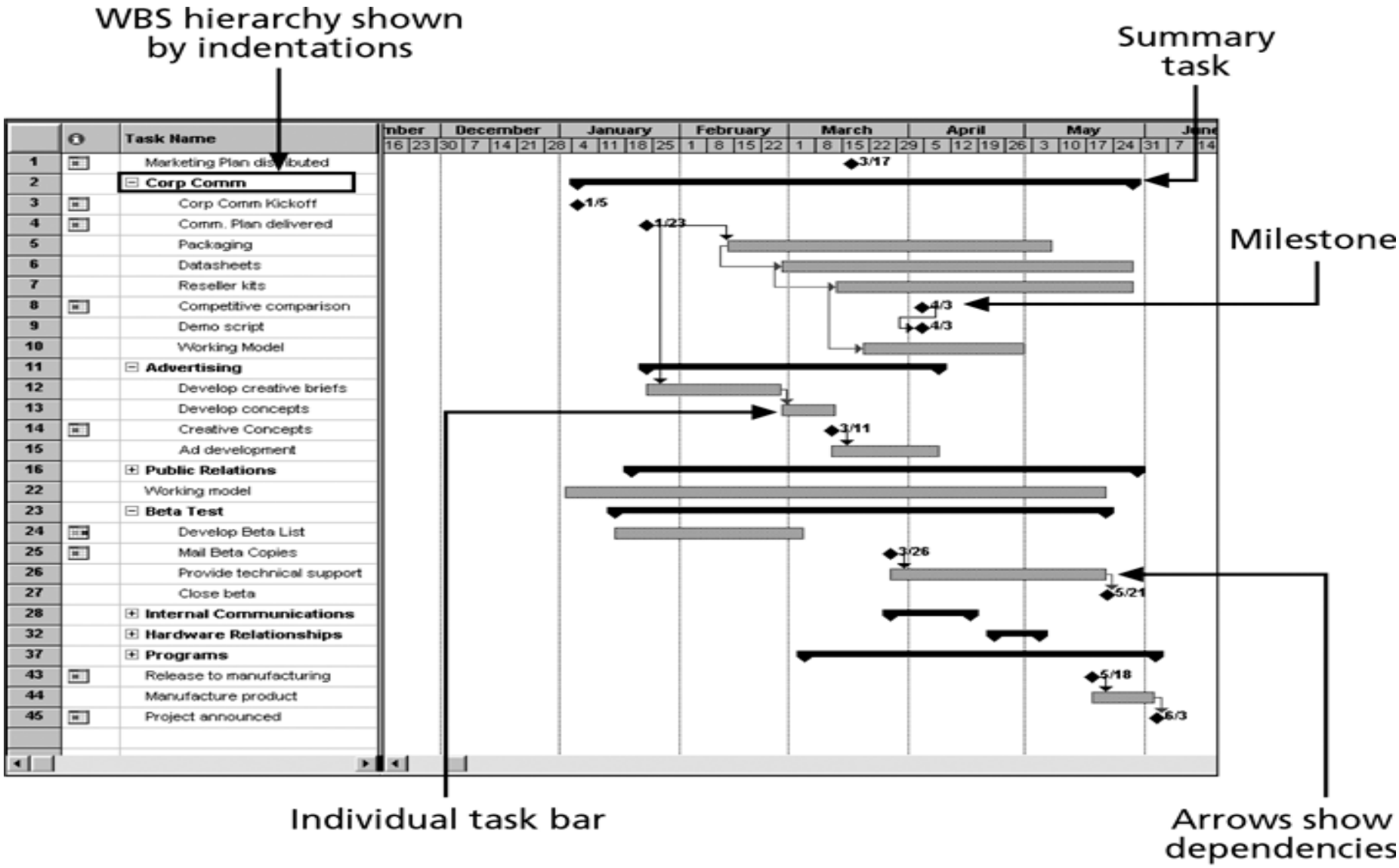



*Figure 6-4. Sample Precedence Diagramming Method (PDM) Network Diagram for Project X*

# Gantt Charts

- Gantt charts provide a standard format for displaying project schedule information by listing project activities and their corresponding start and finish dates in a calendar format
- Symbols include:
  - **Black diamond**: Milestones
  - **Thick black bars**: Summary tasks
  - **Lighter horizontal bars**: Durations of tasks
  - **Arrows**: Dependencies between tasks

# Gantt Chart for Software Launch Project



# Program Evaluation and Review Technique (PERT)

- PERT is a network analysis technique used to estimate project duration when there is a high degree of uncertainty about the individual activity duration estimates
- PERT uses probabilistic time estimates based on using optimistic, most likely, and pessimistic estimates of activity durations

# Critical Path Method (CPM)

- **CPM** is a network diagramming technique used to predict total project duration.
- A **critical path** for a project is the series of activities that determines the *earliest time* by which the project can be completed.
- The critical path is the *longest path* through the network diagram and has the least amount of slack or float.
- **Slack** or **float** is the amount of time an activity can be delayed without delaying a succeeding activity or the project finish date.

# Calculating the Critical Path

- Develop a good network diagram.
- Add the duration estimates for all activities on each path through the network diagram.
- The longest path is the critical path.
- If one or more of the activities on the critical path takes longer than planned, the whole project schedule will slip *unless* the project manager takes corrective action.

# Project Cost Management

# What is Cost and Project Cost Management?

- Cost is a resource sacrificed or foregone to achieve a specific objective or something given up in exchange
- Costs are usually measured in monetary units like dollars
- Project cost management includes the processes required to ensure that the project is completed within an approved budget

# Basic Principles of Cost Management

- Most CEOs and boards know a lot more about finance than IT, so IT project managers must speak their language
  - Profits are revenues minus expenses
  - Life cycle costing is estimating the cost of a project plus the maintenance costs of the products it produces
  - Cash flow analysis is determining the estimated annual costs and benefits for a project
  - Benefits and costs can be tangible or intangible, direct or indirect
  - Sunk cost should not be a criteria in project selection

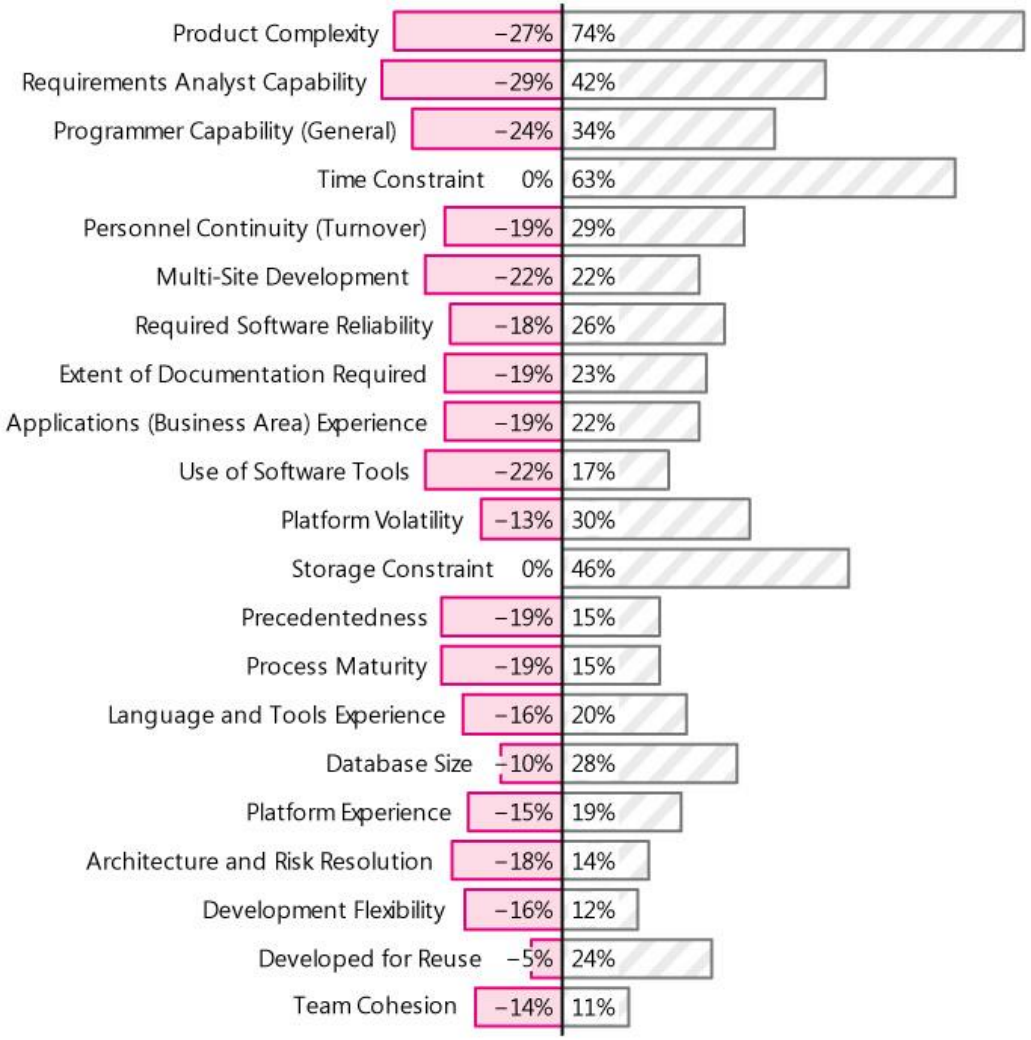
# Basic Principles of Cost Management

- **Tangible costs** or **benefits** are those costs or benefits that an organization can easily measure in dollars.
- **Intangible costs** or **benefits** are costs or benefits that are difficult to measure in monetary terms.
- **Direct costs** are costs that can be directly related to producing the products and services of the project.
- **Indirect costs** are costs that are not directly related to the products or services of the project, but are indirectly related to performing the project.
- **Sunk cost** is money that has been spent in the past; when deciding what projects to invest in or continue, you should *not* include sunk costs.

# Constructive Cost Model (COCOMO)

- Barry Boehm helped develop the COCOMO models for estimating software development costs
- Parameters include:
  - **Function points**: Technology-independent assessments of the functions involved in developing a system.
  - **Source Lines of Code** (**SLOC**): A human-written line of code that is not a blank line or comment.
- COCOMO II is a computerized model available on the Web
- Boehm suggests that only parametric models do not suffer from the limits of human decision-making

# Cocomo II factors arranged by potential to increase / decrease total effort



# Typical Problems with IT Cost Estimates

- Developing an estimate for a large software project is a complex task requiring a significant amount of effort. Remember that estimates are done at various stages of the project
- Many people doing estimates have little experience doing them.  Try to provide training and mentoring
- People have a bias toward underestimation.  Review estimates and ask important questions to make sure estimates are not biased
- Management wants a number for a bid, not a real estimate. Project managers must negotiate with project sponsors to create realistic cost estimates

# Project Quality Management

# What Is Quality?

- The International Organization for Standardization (ISO) defines quality as the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs
- Other experts define quality based on
  - conformance to requirements: meeting written specifications
  - fitness for use: ensuring a product can be used as it was intended

# Project Quality Management Processes

- Quality planning: identifying which quality standards are relevant to the project and how to satisfy them
- Quality assurance: evaluating overall project performance to ensure the project will satisfy the relevant quality standards
- Quality control: monitoring specific project results to ensure that they comply with the relevant quality standards while identifying ways to improve overall quality

# Quality Planning

- It is important to design in quality and communicate important factors that directly contribute to meeting the customer’s requirements
- Design of experiments helps identify which variables have the most influence on the overall outcome of a process
- Many scope aspects of IT projects affect quality like functionality, features, system outputs, performance, reliability, and maintainability

# Quality Assurance

- Quality assurance includes all the activities related to satisfying the relevant quality standards for a project
- Another goal of quality assurance is continuous quality improvement
- Benchmarking can be used to generate ideas for quality improvements
- Quality audits help identify lessons learned that can improve performance on current or future projects

# Quality Assurance Plan

**Table 8-1: Table of Contents for a Quality Assurance Plan**

1.0 Draft Quality Assurance Plan
- 1.1 Introduction
- 1.2 Purpose
- 1.3 Policy Statement
- 1.4 Scope

2.0 Management
- 2.1 Organizational Structure
- 2.2 Roles and Responsibilities
  - 2.2.1 Technical Monitor/Senior Management
  - 2.2.2 Task Leader
  - 2.2.3 Quality Assurance Team
  - 2.2.3 Technical Staff

3.0 Required Documentation

4.0 Quality Assurance Procedures
- 4.1 Walkthrough Procedure
- 4.2 Review Process
  - 4.2.1 Review Procedures

# Types of Tests

- A unit test is done to test each individual component (often a program) to ensure it is as defect free as possible
- Integration testing occurs between unit and system testing to test functionally grouped components
- System testing tests the entire system as one entity
- User acceptance testing is an independent test performed by the end user prior to accepting the delivered system

# The Cost of Quality

- The cost of quality is
  - the cost of conformance or delivering products that meet requirements and fitness for use
  - the cost of nonconformance or taking responsibility for failures or not meeting quality expectations

# Five Cost Categories Related to Quality

- Prevention cost: the cost of planning and executing a project so it is error-free or within an acceptable error range
- Appraisal cost: the cost of evaluating processes and their outputs to ensure quality
- Internal failure cost: cost incurred to correct an identified defect before the customer receives the product
- External failure cost: cost that relates to all errors not detected and corrected before delivery to the customer
- Measurement and test equipment costs: capital cost of equipment used to perform prevention and appraisal activities

# Maturity Models

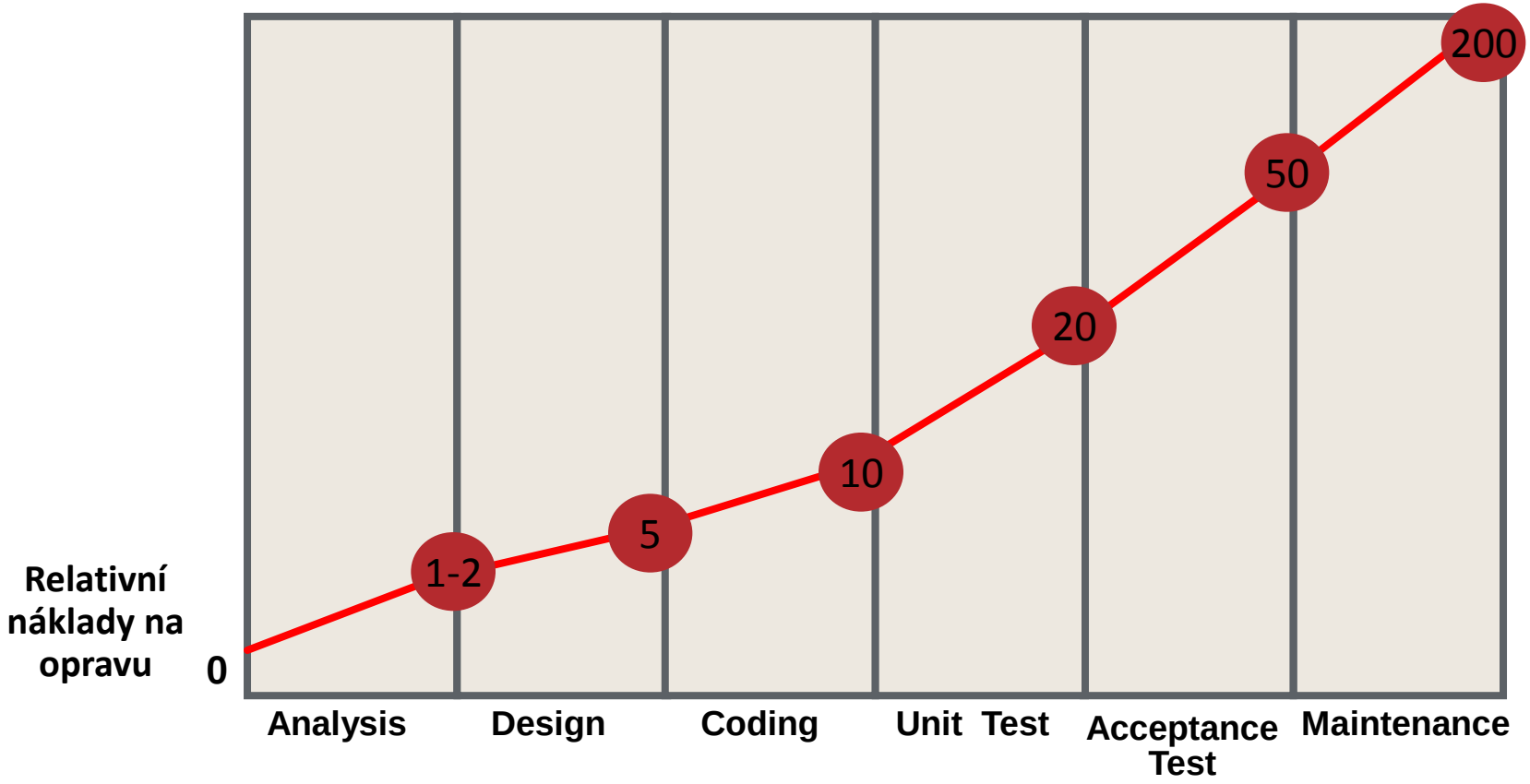
- Maturity models are frameworks for helping organization improve their processes and systems
  - Software Quality Function Deployment model focuses on defining user requirements and planning software projects
  - The Software Engineering Institute's Capability Maturity Model provides a generic path to process improvement for software development
  - Several groups are working on project management maturity models, such as PMI's Organizational Project Management Maturity Model (OPM3)

# Project Management Maturity Model

1. **Ad-Hoc**: The project management process is described as disorganized, and occasionally even chaotic. The organization has not defined systems and processes, and project success depends on individual effort. There are chronic cost and schedule problems.
2. **Abbreviated**: There are some project management processes and systems in place to track cost, schedule, and scope. Project success is largely unpredictable and cost and schedule problems are common.
3. **Organized**: There are standardized, documented project management processes and systems that are integrated into the rest of the organization. Project success is more predictable, and cost and schedule performance is improved.
4. **Managed**: Management collects and uses detailed measures of the effectiveness of project management. Project success is more uniform, and cost and schedule performance conforms to plan.
5. **Adaptive:** Feedback from the project management process and from piloting innovative ideas and technologies enables continuous improvement. Project success is the norm, and cost and schedule performance is continuously improving.

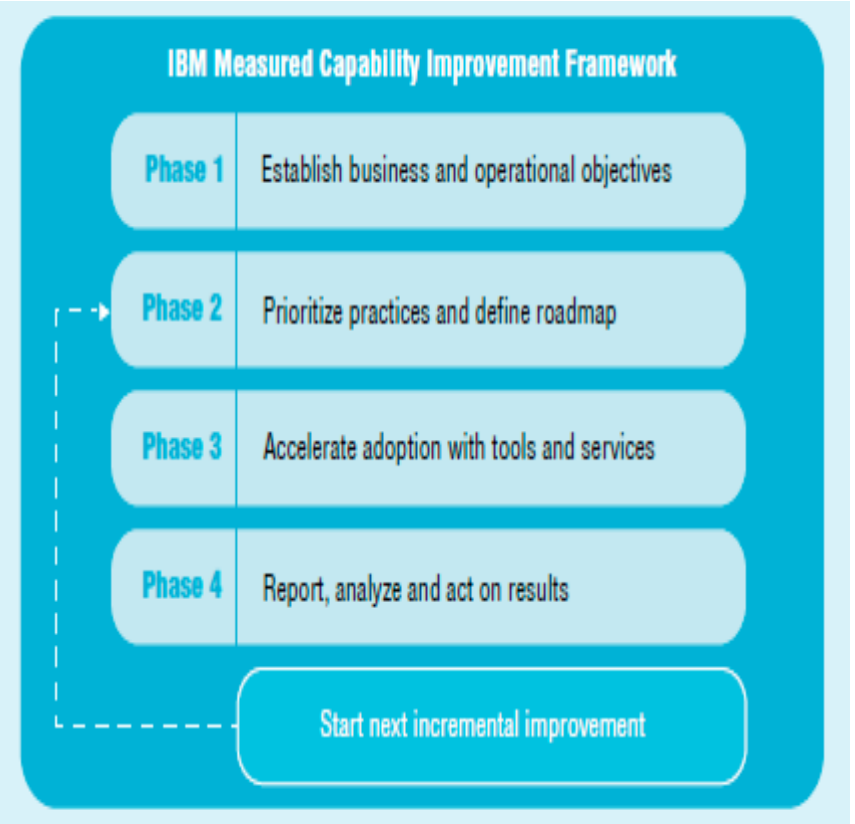
# Definice a správa požadavků vs. realita

- Více než 40% rozpočtu na vývoj padne na špatné a nekvalitní požadavky

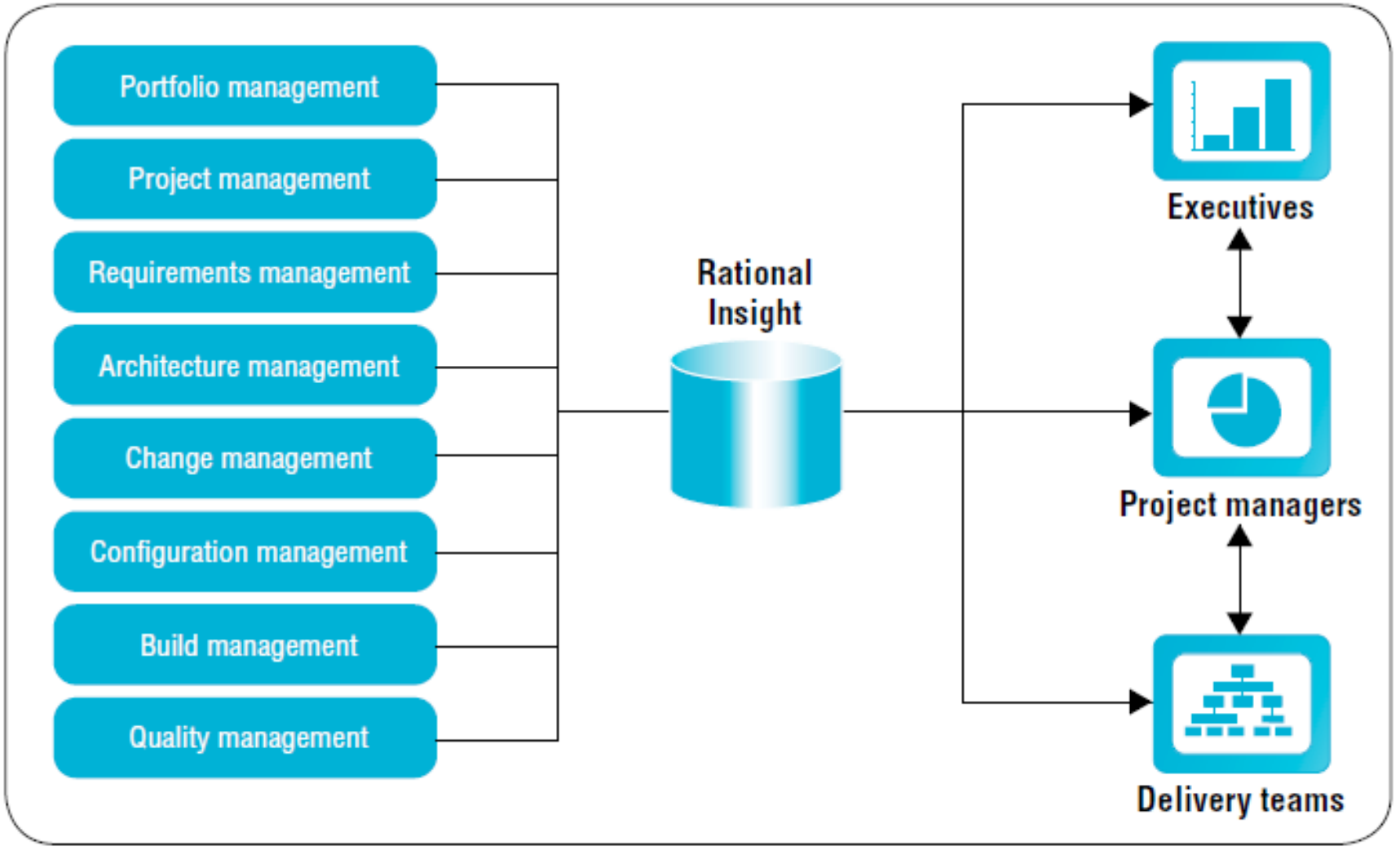


# Measured Capability Improvement Framework (MCIF)

- Strukturovaný přístup ke zlepšování softwarových týmů skrze soustavné a měřitelné zlepšování procesu
- Optimalizováné pro agilní týmy a metodiky
- První krok je assesment

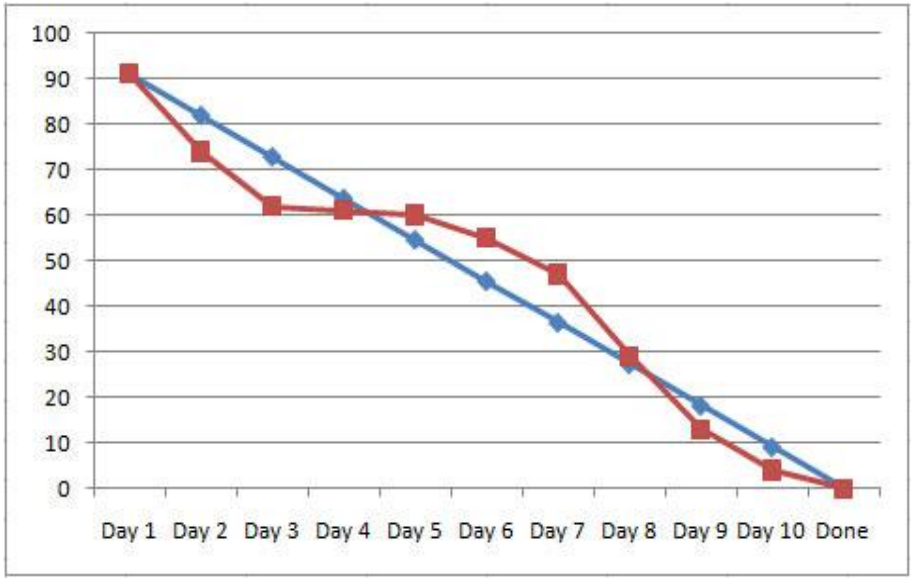


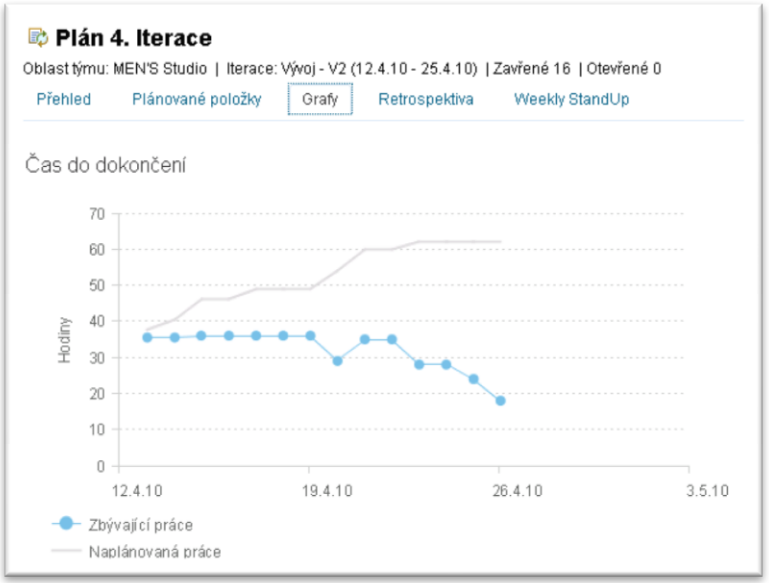
# Rational Insight – velké „BI“ řešení

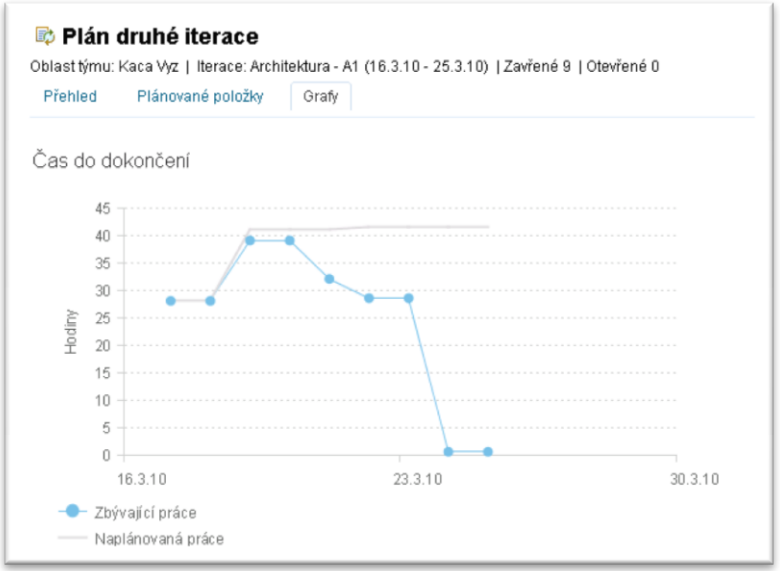


# Burndown Chart

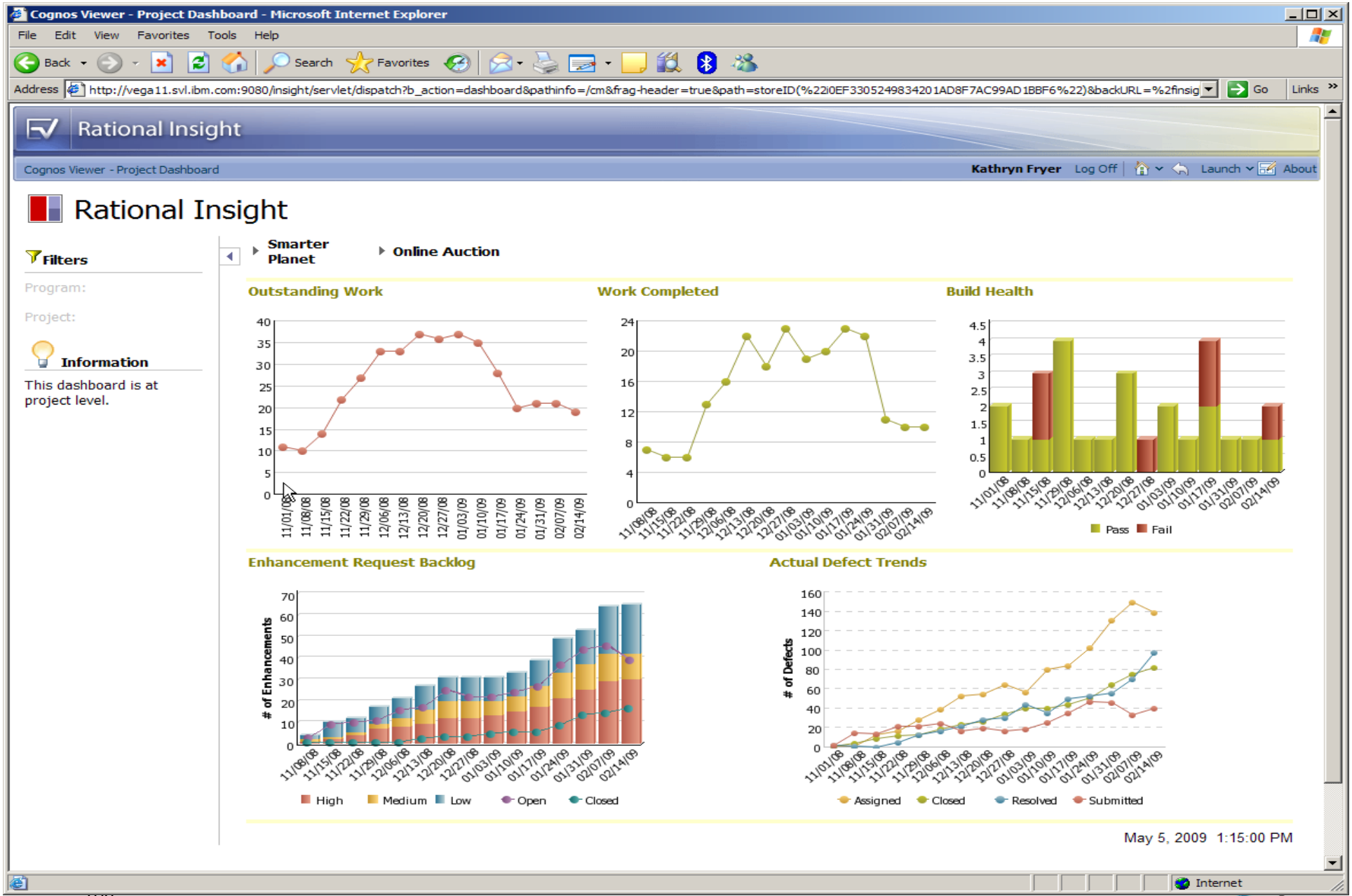
- Celková indikace postupu prací v projektu
- Rychlý přehled o zbývající práci v iteraci



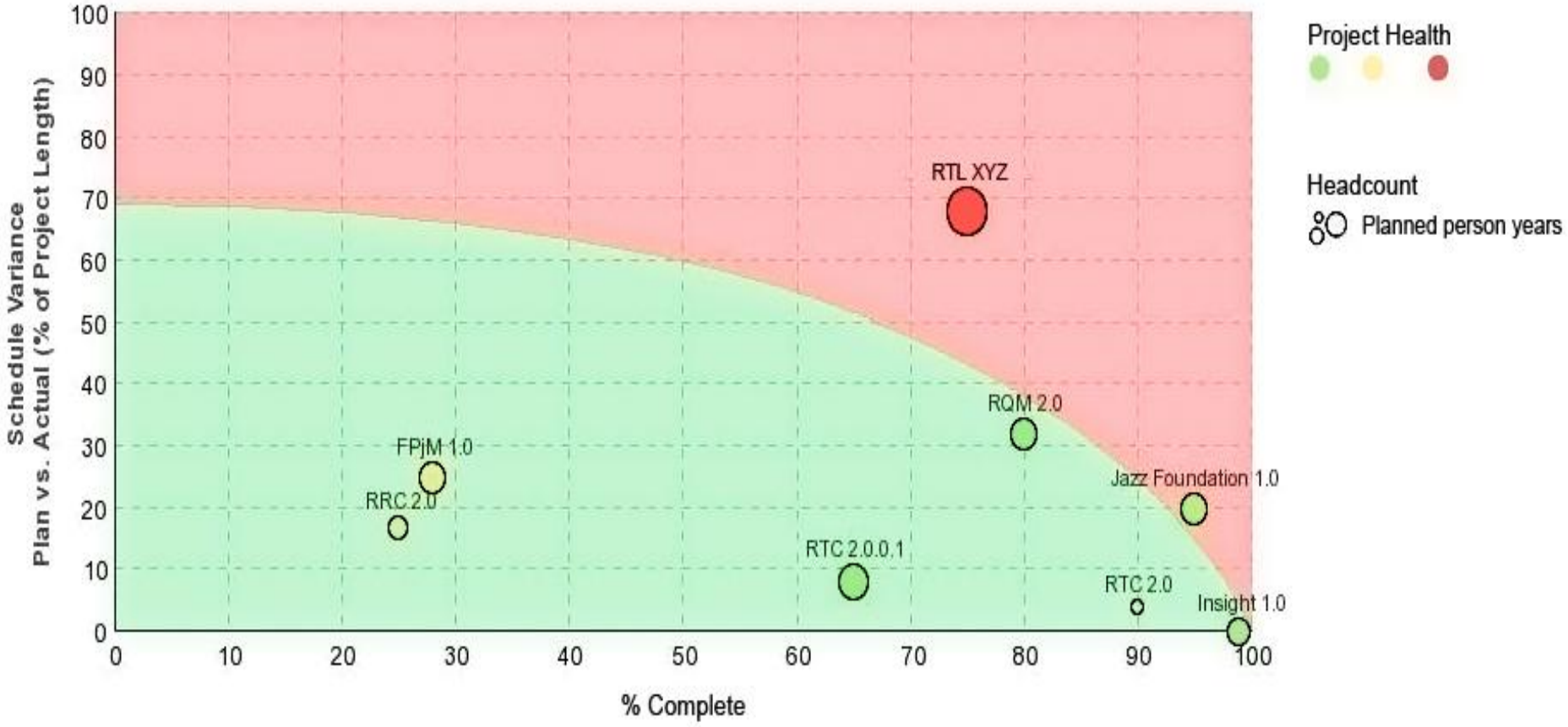



Rational Insight
Cognos Viewer - Project Dashboard
Tack Tong
Log On
About
Keep this version
Add this report
Watch new versions
Add comments
Filters
Program:
Project:
Information
This dashboard is at project level.
Smarter Planet
Online Auction
CPI & SPI
CPI
SPI
CV & SV
CV (Million)
SV (Million)
Headcount - Actual vs. Planned
Architect
Developer
Marketing
Product Manager
Project Manager
Sales
Support
Technical Writer
Tester
Actual
Planned
Requirements with no Test Case by Priority
Must
Should
Could
Won't
Test Execution Status
Exec Rate
Pass Rate
Plan Exec Rate
Open Critical Defects by Age
# of Open Critical Defects
Less than 1 month
1 month
2 months
Post-Ship Defect Arrival by Severity - Actual vs.Planned
Critical
Major
Average
Minor
Post-Ship RFE Turnaround Time
5
1
Within 10 Days
Within 20 Days
Beyond 20 Days
# of Enhancements
Post-Ship Open Critical Defects by Component & State
Business Logic
Client
Database
GUI
Server Infrastructure
Web Services
# of Post-Ship Open Critical Defects
Assigned
Submitted


Cognos Viewer - Project Dashboard - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://vega11.svl.ibm.com:9080/insight/servlet/dispatch?b_action=dashboard&pathinfo=/cm&frag-header=true&path=storeID(%22i0EF3305249834201AD8F7AC99AD1BBF6%22)&backURL=%2finsig
Go Links
Rational Insight
Cognos Viewer - Project Dashboard
Kathryn Fryer Log Off Launch About
Rational Insight
Filters
Program:
Project:
Information
This dashboard is at project level.
Smarter Planet
Online Auction
Outstanding Work
Work Completed
Build Health
Pass Fail
Enhancement Request Backlog
# of Enhancements
High Medium Low Open Closed
Actual Defect Trends
# of Defects
Assigned Closed Resolved Submitted
May 5, 2009 1:15:00 PM
Internet

# Example: Providing a single view of project health

***Quickly identify delivery issues that need immediate attention***




Sample of actual IBM project health report

Rational Insight

dns

Rational Insight

Cognos Viewer - Executive Dashboard Portal

Stephanie L. Trunzo Log On | Launch | About

Welcome | Executive Dashboard | Project Development Portal | Performance Measurement Practice | Collaborate

- Executive Dashboard
- Headcount
- Improve Project Health
- Achieve Profit Margin Objective
- Improve Market Share

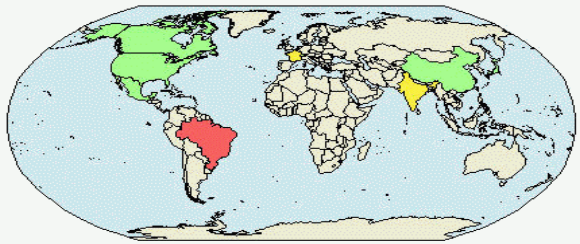
Segment: All Segments

Data is for presentation purposes only

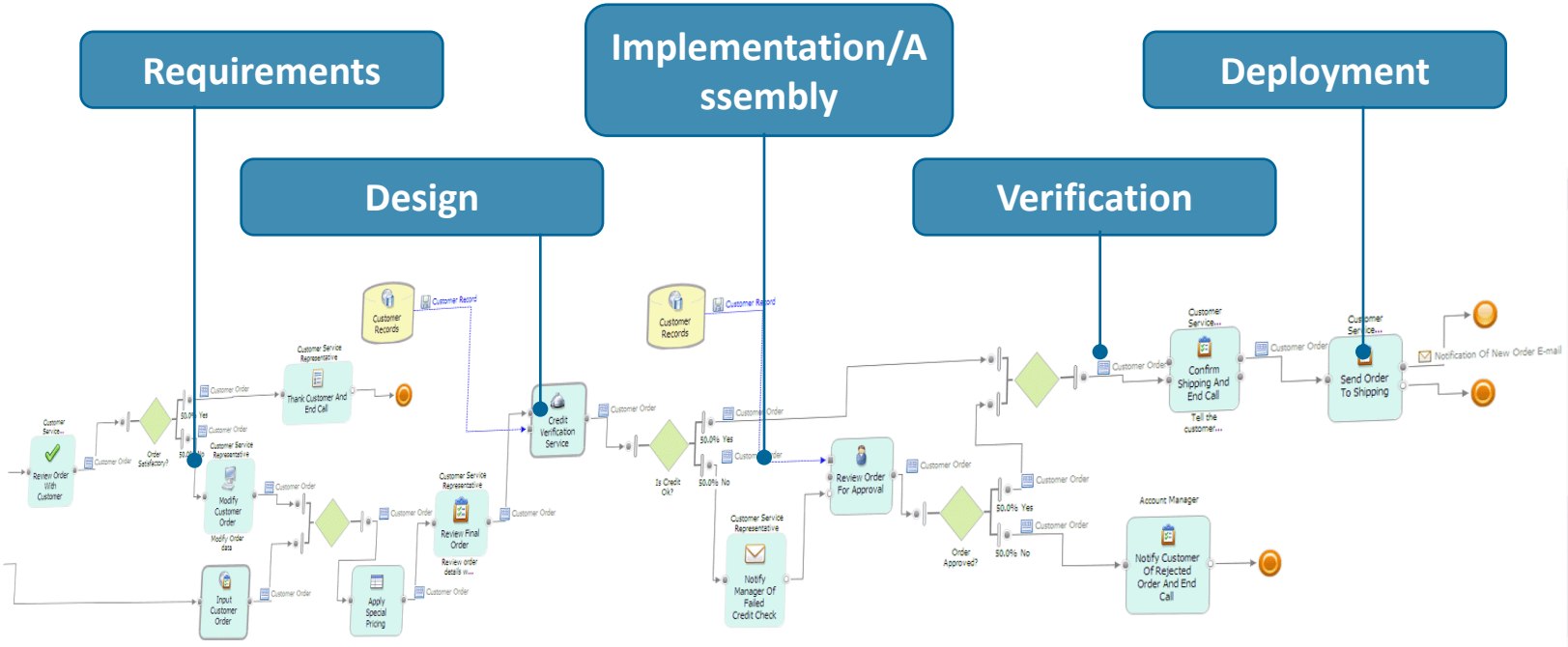
Hide Table

| Segment | Product | Revenue Year-To-Date (M) | Revenue % of Plan | Pipeline (M) | Release | eGA Plan | eGA Outlook | eGA Plan-Outlook | Headcount (PY) | Project Health | Overall Profit Margin | Overall Market Share |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Application Lifecycle Management (ALM) | Jazz Foundation | 75.7 ▼ | 96% ▼ | 87.9 ▼ | Jazz Foundation 1.0 | May 28, 2009 | Jun 12, 2009 | 15 days | 52 ◆ | 71% ◆ | ◆ | ▲ |
| | | | | | Online Auction | Mar 31, 2009 | Jul 7, 2009 | 98 days | 118 ▼ | 50% ▼ | ▼ | ▼ |
| | RTC | 115.2 ▲ | 99% ◆ | 109.6 ◆ | RTC 2.0 | Jun 15, 2009 | Jun 19, 2009 | 4 days | 12 ◆ | 90% ◆ | ◆ | ▲ |
| | | | | | RTC 2.0.0.1 | Sep 22, 2009 | Sep 30, 2009 | 8 days | 72 ▼ | 86% ◆ | ◆ | ◆ |
| Governance Solution | Focal Point for Project Management | 29.1 ◆ | 93% ◆ | 84.2 ▲ | FPjM 1.0 | Oct 15, 2009 | Nov 17, 2009 | 33 days | 60 ◆ | 74% ▲ | ◆ | ◆ |
| | Rational Insight | 108.7 ▼ | 98% ▼ | 162.7 ▼ | Insight 1.0 | May 26, 2009 | May 26, 2009 | 0 days | 40 ◆ | 83% ▼ | ▼ | ◆ |
| Quality Management (QM) Solution | RQM | 35.2 ▲ | 112% ▲ | 79.6 ▲ | RQM 2.0 | Jun 15, 2009 | Jul 31, 2009 | 46 days | 56 ◆ | 89% ▲ | ◆ | ▲ |
| | RRC | 28.1 ◆ | 83% ▲ | 45.1 ▼ | RRC 2.0 | Nov 4, 2009 | Nov 24, 2009 | 20 days | 32 ▲ | 85% ◆ | ◆ | ▼ |

Project Health by Country



# Software delivery is a business process that must be continuously improved




**CIO's top priority on behalf of the CEO**
over last three years:
**"Improving Business Processes"**

Source: Gartner, "Making the Difference: The 2008 CIO Agenda," Jan. 2008

dns

# Problém týmů – sdílená bolest, ne vize

CIO / IT Director

Nejednoznačná vize

Project Manager

Zpoždění a změny

Analyst

Omezený koncezus

**Neproduktivní: 10% rozpočtu**

**Předělávky: 20% překročení rozpočtu**

**ROI očekávání: 41% projektů nesplní očekávání**

Stakeholder

Nepřijatelný výsledek

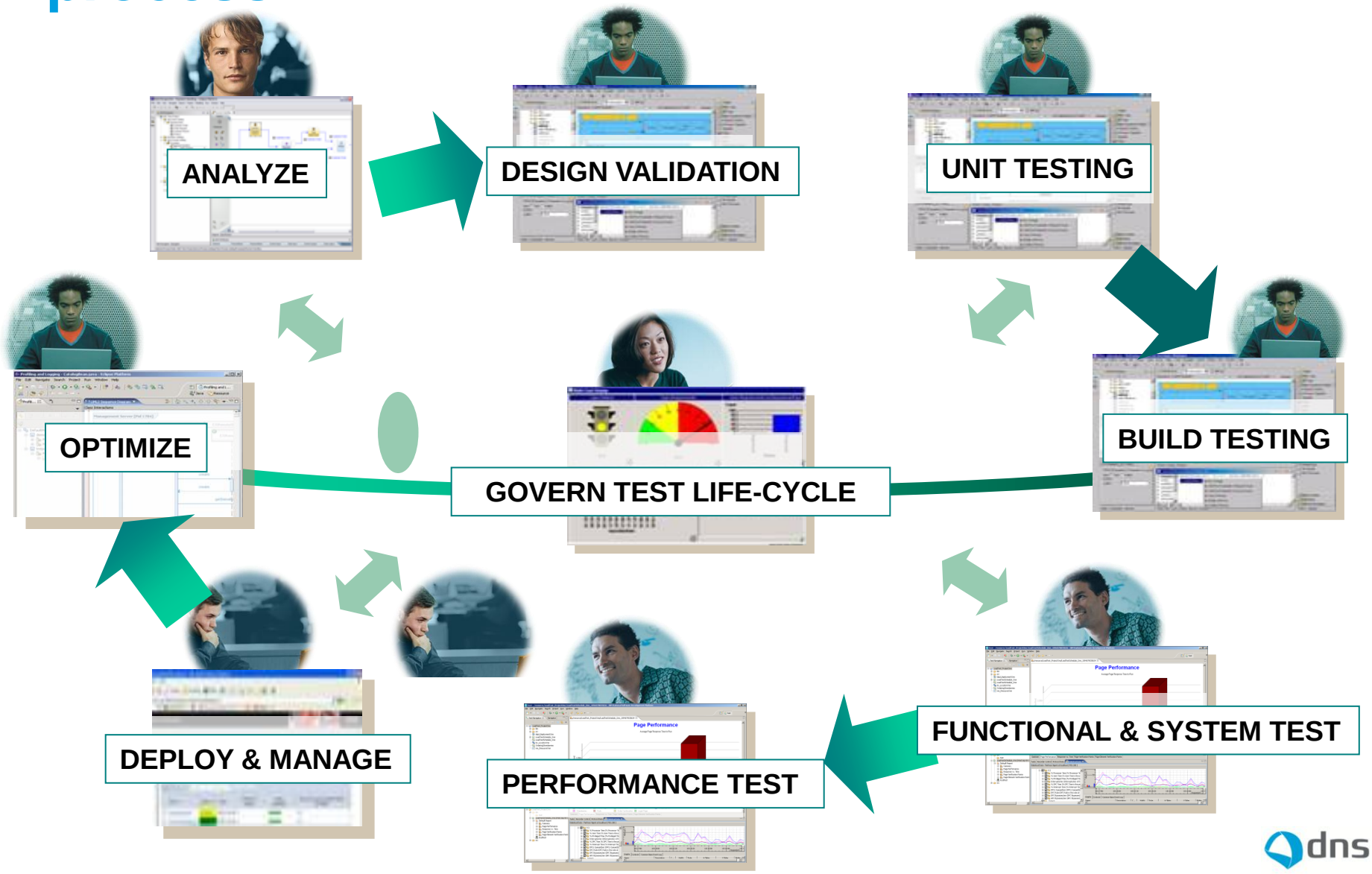
Tester

Množství defektů

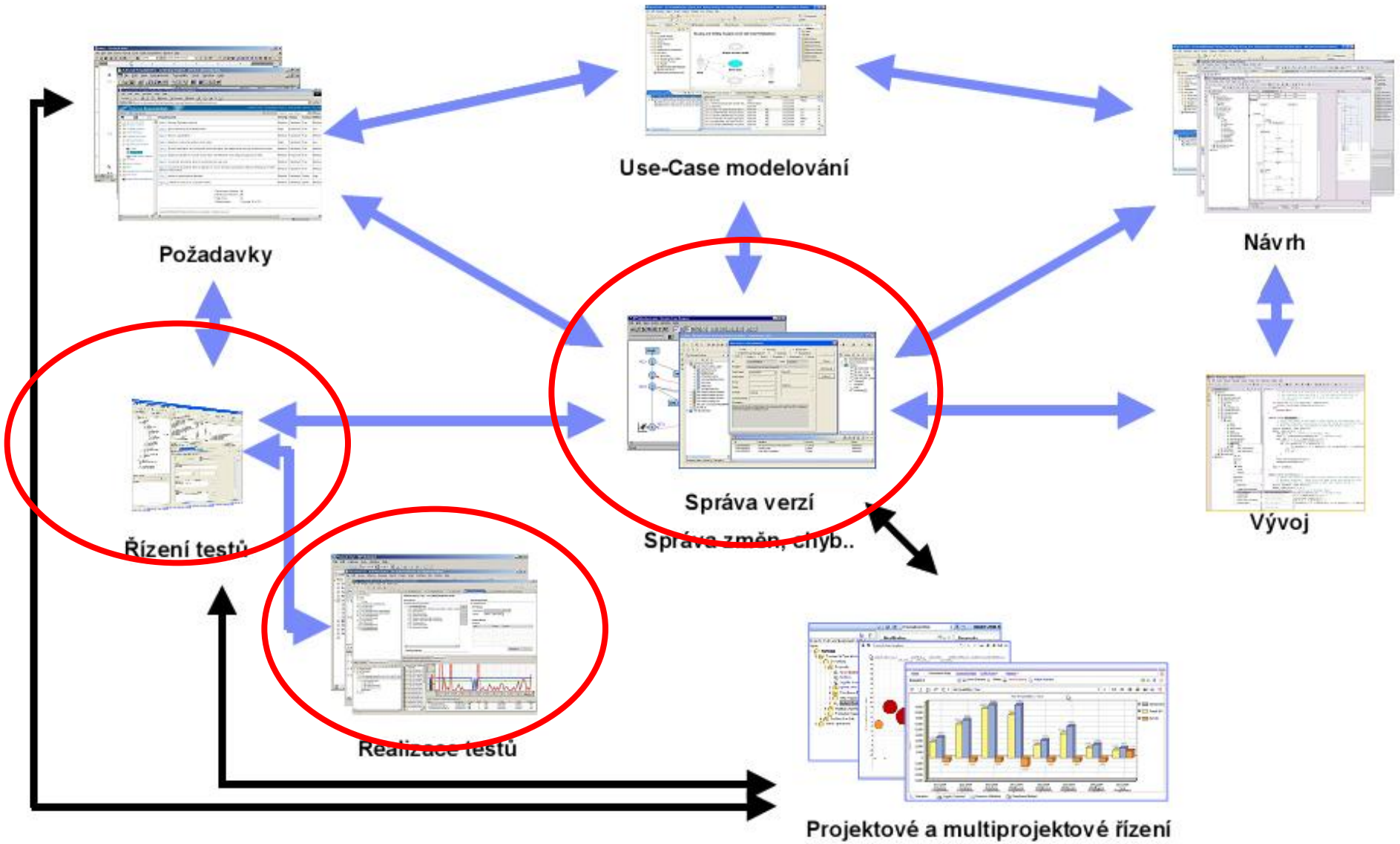
Developer

Neustálé předělávky

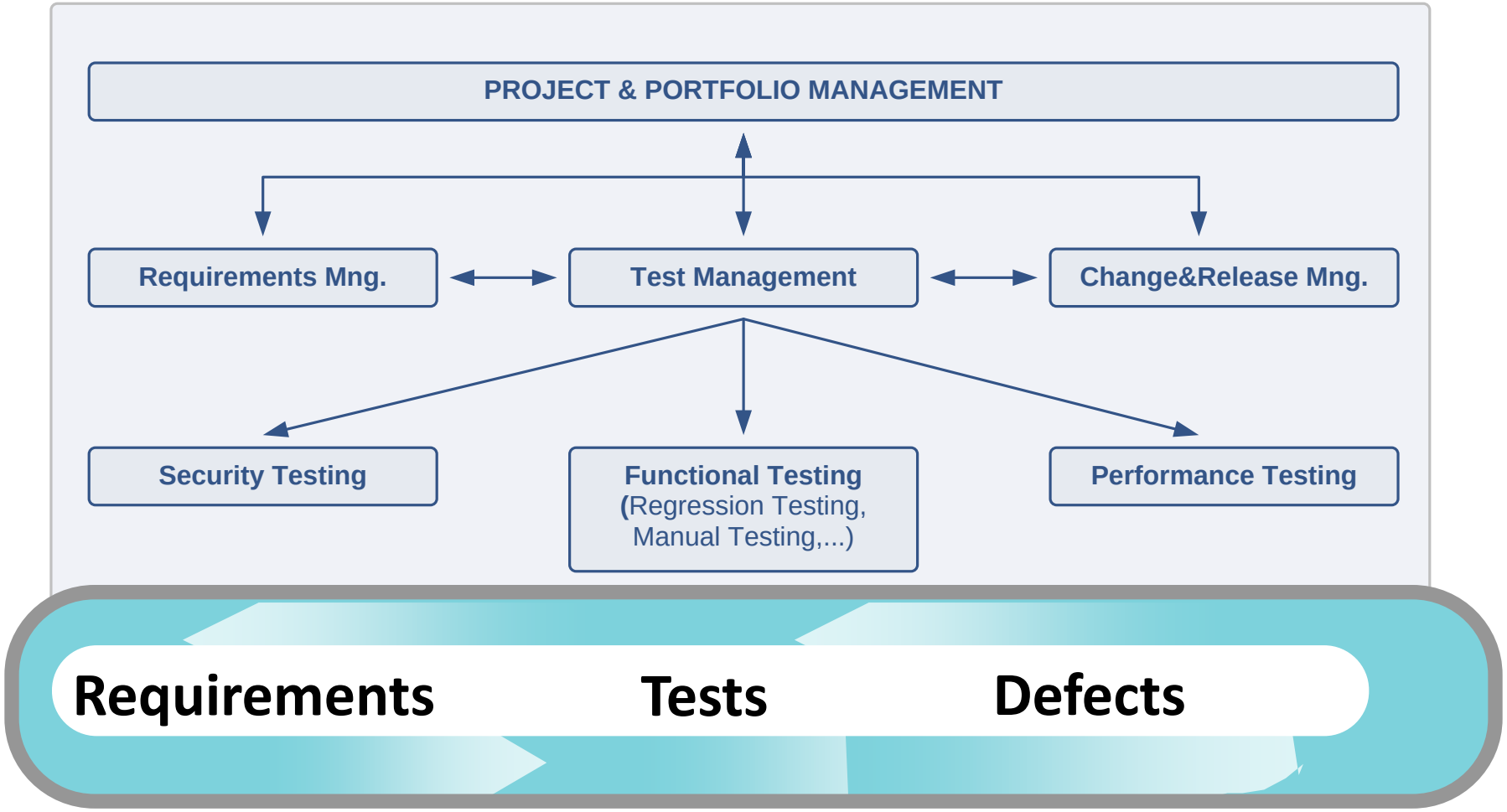
# Quality is a continuous, iterative, integrated process



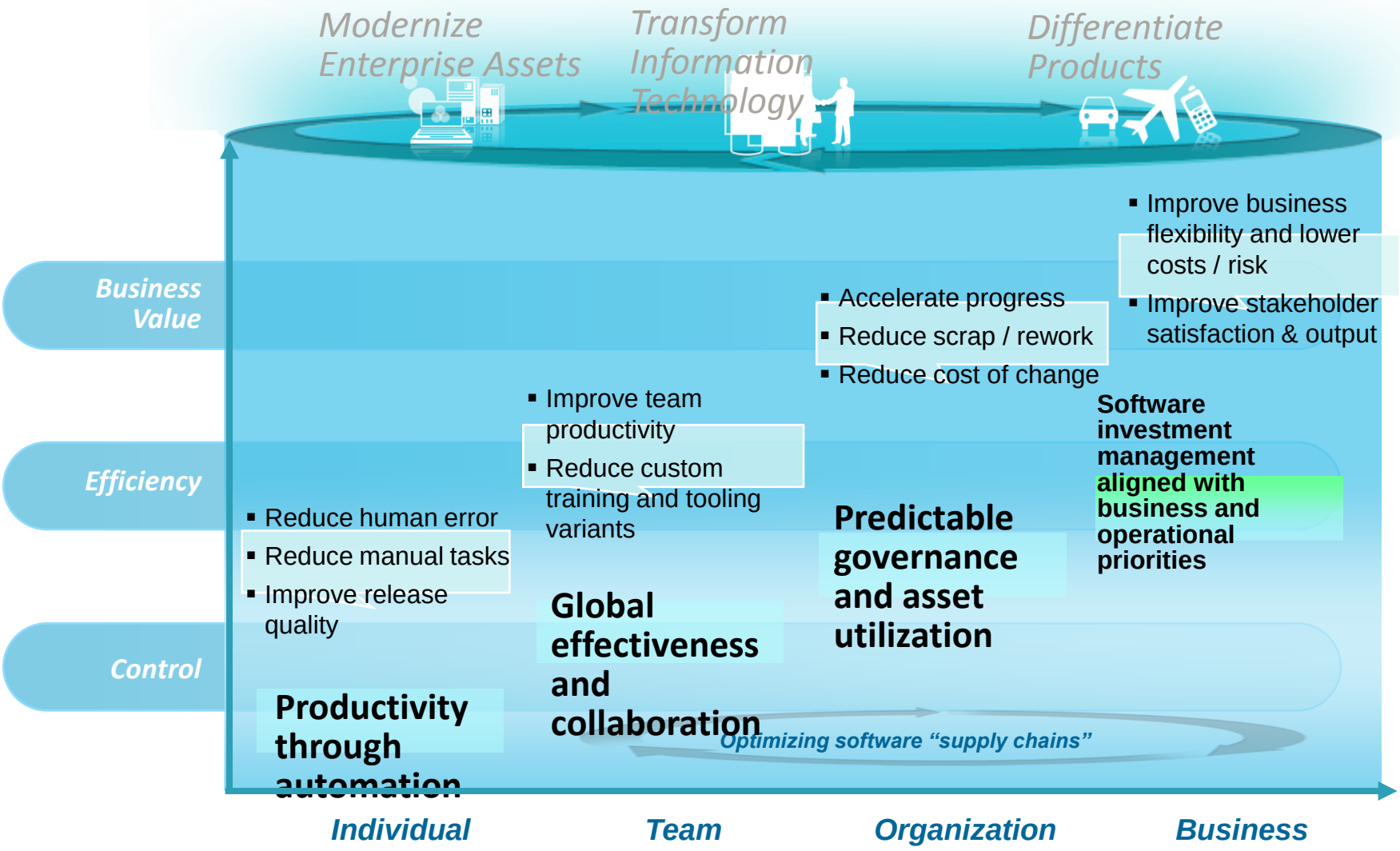
# IBM Rational – testování v kontextu



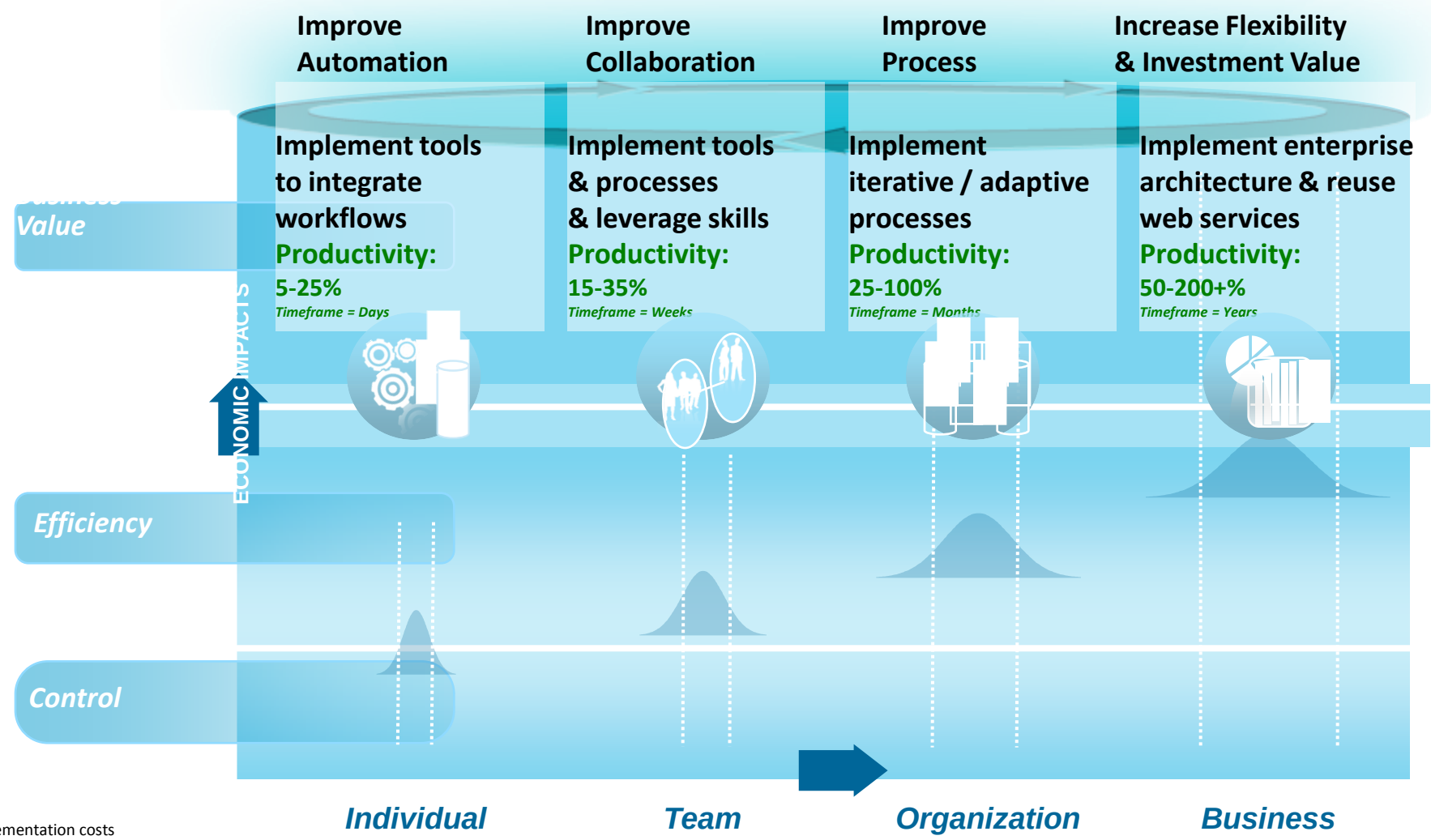
# What Does Test Management Mean to Project



# Effective software delivery realized by continuous improvement



# Achieve continuous improvement by measuring cost against business outcomes




Implementation costs are per person per year

# Project HR Management

# What is Project Human Resource Management?

- Making the most effective use of the people involved with a project.
- Processes include:
  - Human resource planning: Identifying and documenting project roles, responsibilities, and reporting relationships.
  - Acquiring the project team: Getting the needed personnel assigned to and working on the project.
  - Developing the project team: Building individual and group skills to enhance project performance.
  - Managing the project team: Tracking team member performance, motivating team members, providing timely feedback, resolving issues and conflicts, and coordinating changes to help enhance project performance.

# Keys to Managing People

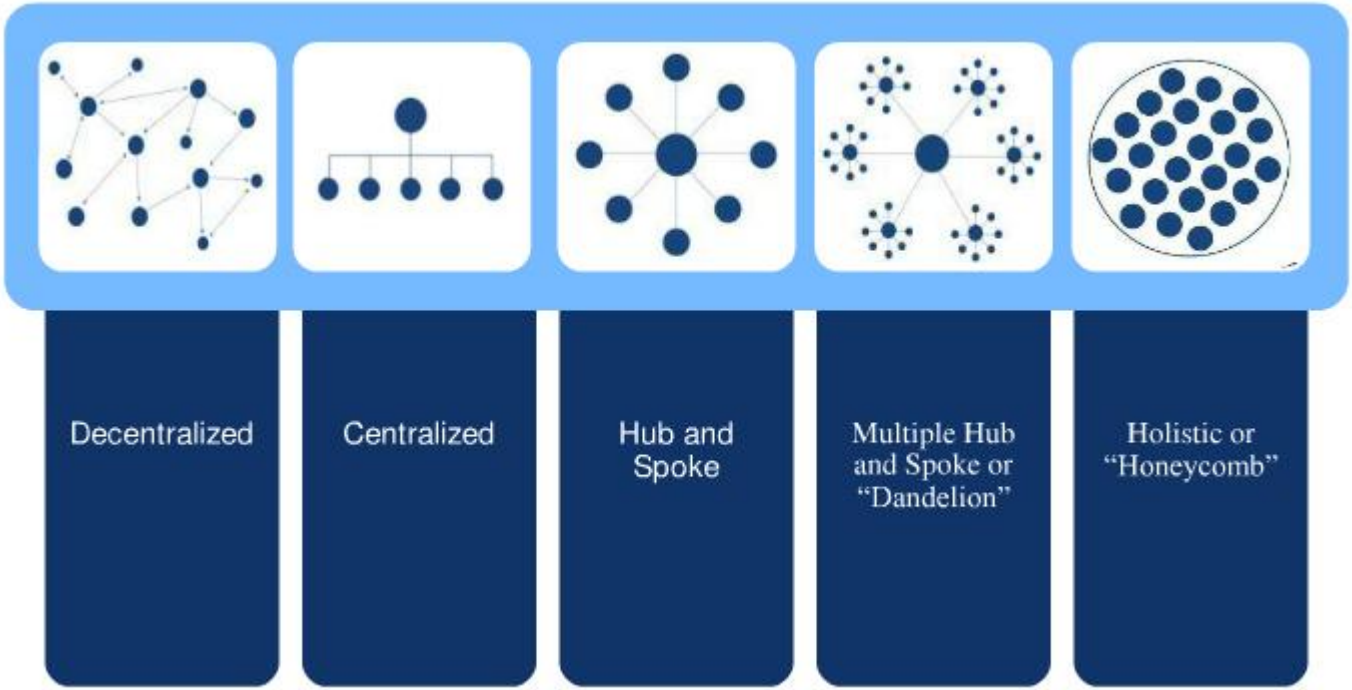
- Psychologists and management theorists have devoted much research and thought to the field of managing people at work
- Important areas related to project management include
  - motivation theories
  - influence and power
  - effectiveness

# Intrinsic and Extrinsic Motivation

- **Intrinsic motivation** causes people to participate in an activity for their own enjoyment.
- **Extrinsic motivation** causes people to do something for a reward or to avoid a penalty.
- For example, some children take piano lessons for intrinsic motivation (they enjoy it) while others take them for extrinsic motivation (to get a reward or avoid punishment).

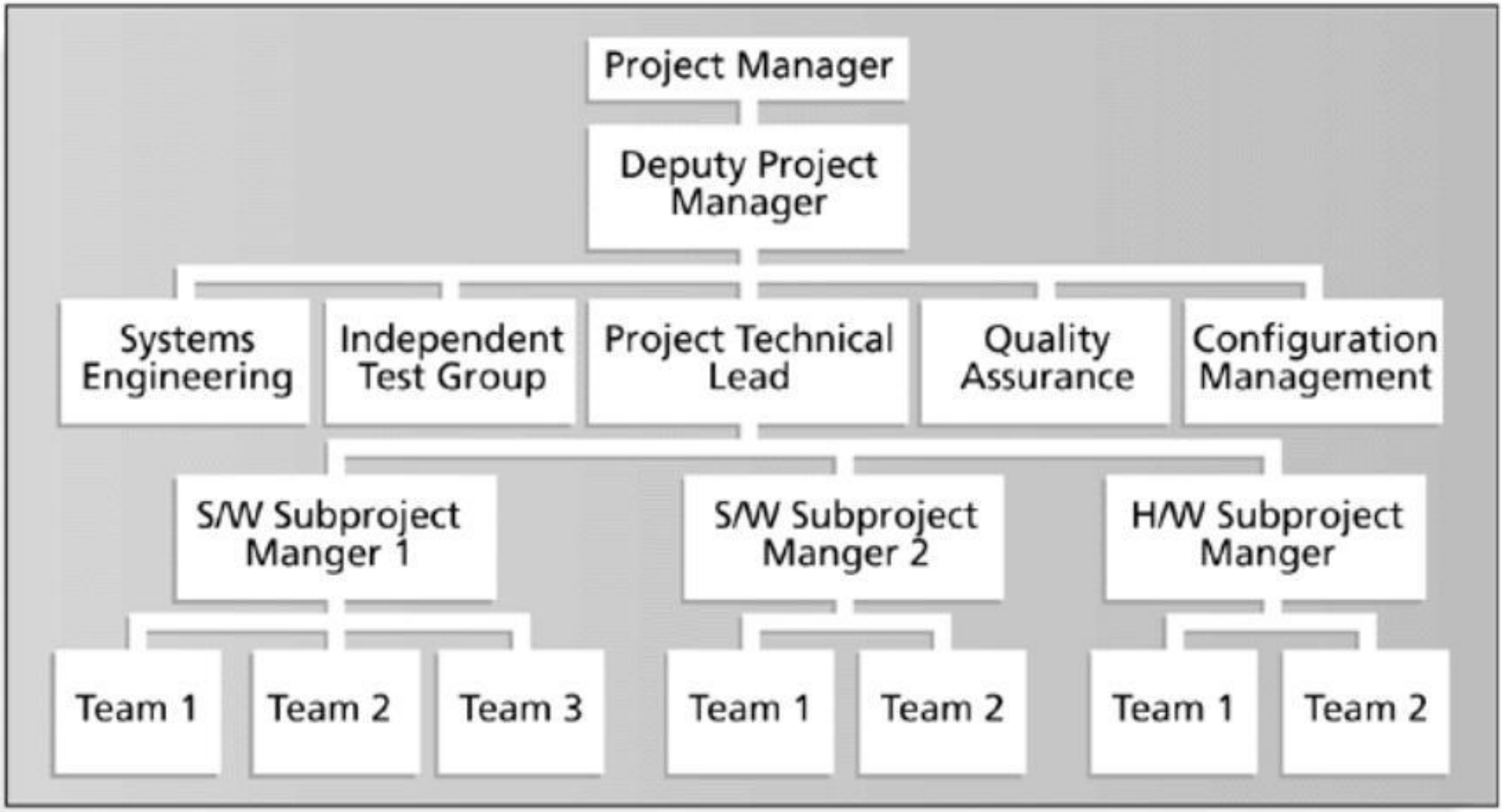
# Jak firmy fungují?

| 11 % | 29 % | 41 % | 18 % | 1 % |
|---|---|---|---|---|

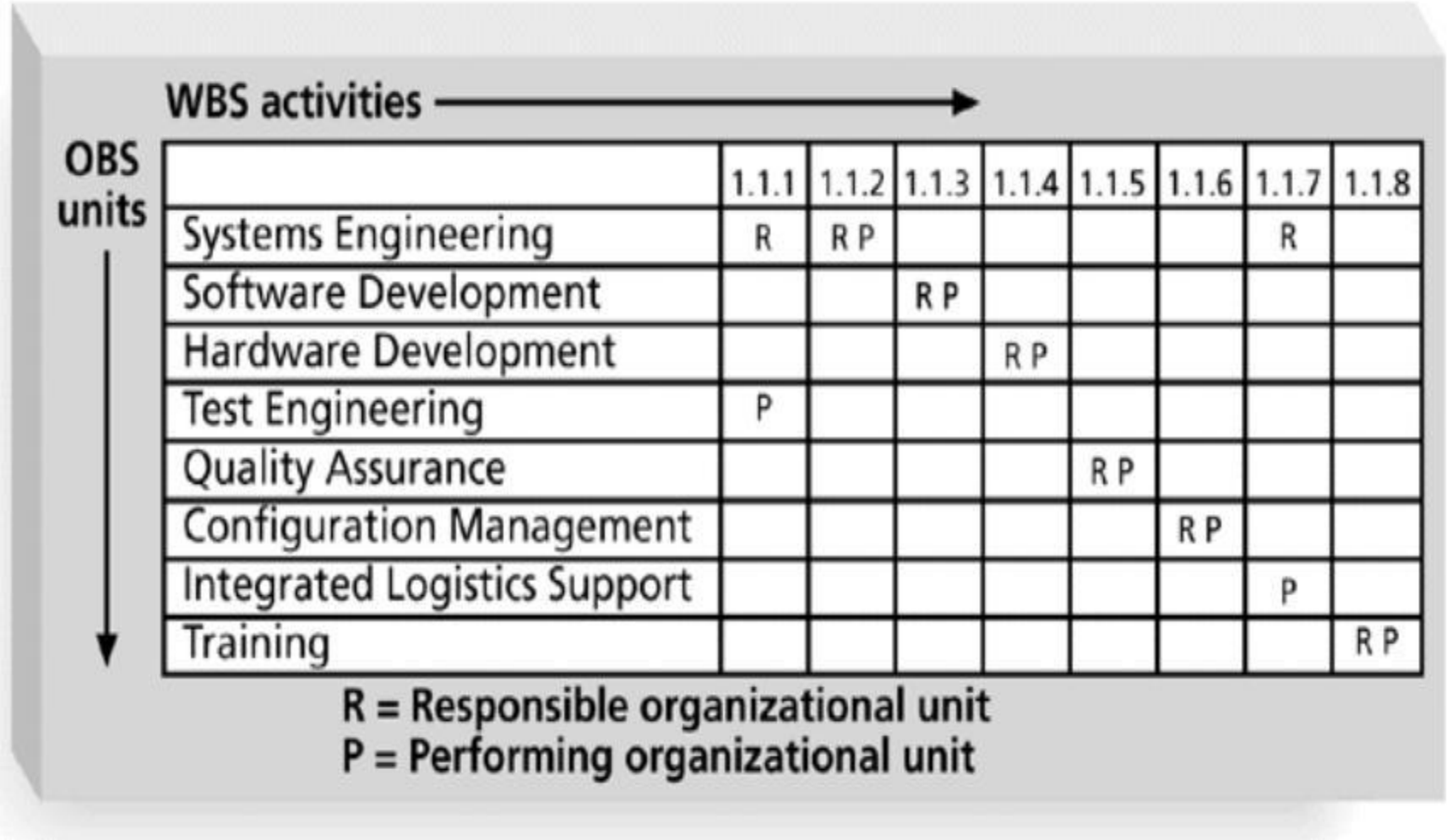



Podle Jeremiah Owyang (Altimeter group)

# Sample Organizational Chart for a Large IT Project



# Sample Responsibility Assignment Matrix (RAM)



WBS activities →

OBS units ↓

| | 1.1.1 | 1.1.2 | 1.1.3 | 1.1.4 | 1.1.5 | 1.1.6 | 1.1.7 | 1.1.8 |
|---|---|---|---|---|---|---|---|---|
| Systems Engineering | R | R P | | | | | R | |
| Software Development | | | R P | | | | | |
| Hardware Development | | | | R P | | | | |
| Test Engineering | P | | | | | | | |
| Quality Assurance | | | | | R P | | | |
| Configuration Management | | | | | | R P | | |
| Integrated Logistics Support | | | | | | | P | |
| Training | | | | | | | | R P |

R = Responsible organizational unit
P = Performing organizational unit

# RAM Showing Stakeholder Roles

| | Stakeholders | | | | |
|---|---|---|---|---|---|
| **Items** | **A** | **B** | **C** | **D** | **E** |
| Unit Test | S | A | I | I | R |
| Integration Test | S | P | A | I | R |
| System Test | S | P | A | I | R |
| User Acceptance Test | S | P | I | A | R |

A = Accountable
P = Participant
R = Review Required
I = Input Required
S = Sign-off Required

# Sample Resource Histogram

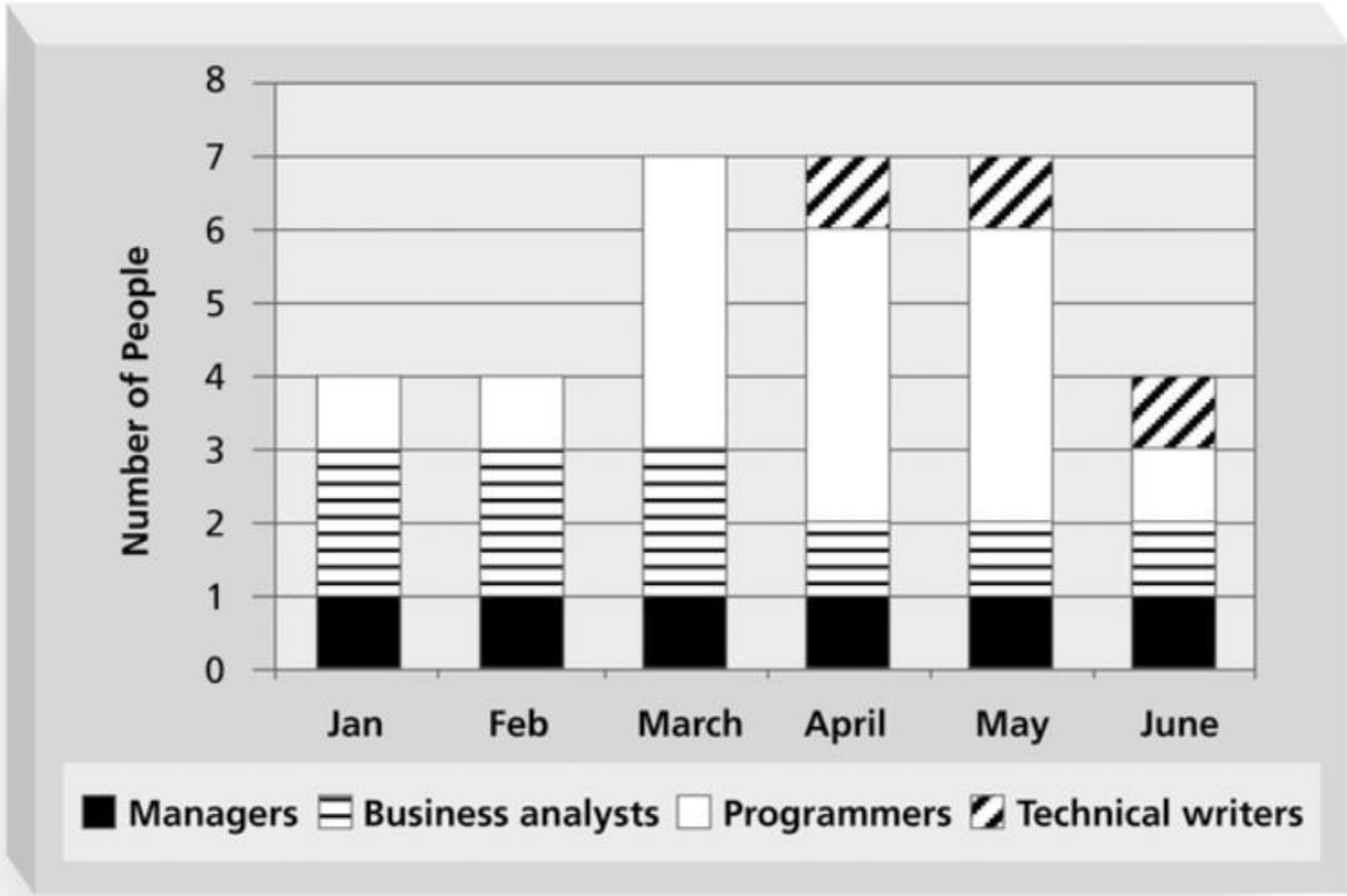



*Figure 9-6. Sample Resource Histogram*

# Acquiring the Project Team

- Acquiring qualified people for teams is crucial.
- The project manager who is the smartest person on the team has done a poor job of recruiting!
- Staffing plans and good hiring procedures are important, as are incentives for recruiting and retention.
  - Some companies give their employees one dollar for every hour that a new person who they helped hire works.
  - Some organizations allow people to work from home as an incentive.

# Belbínovské týmové role

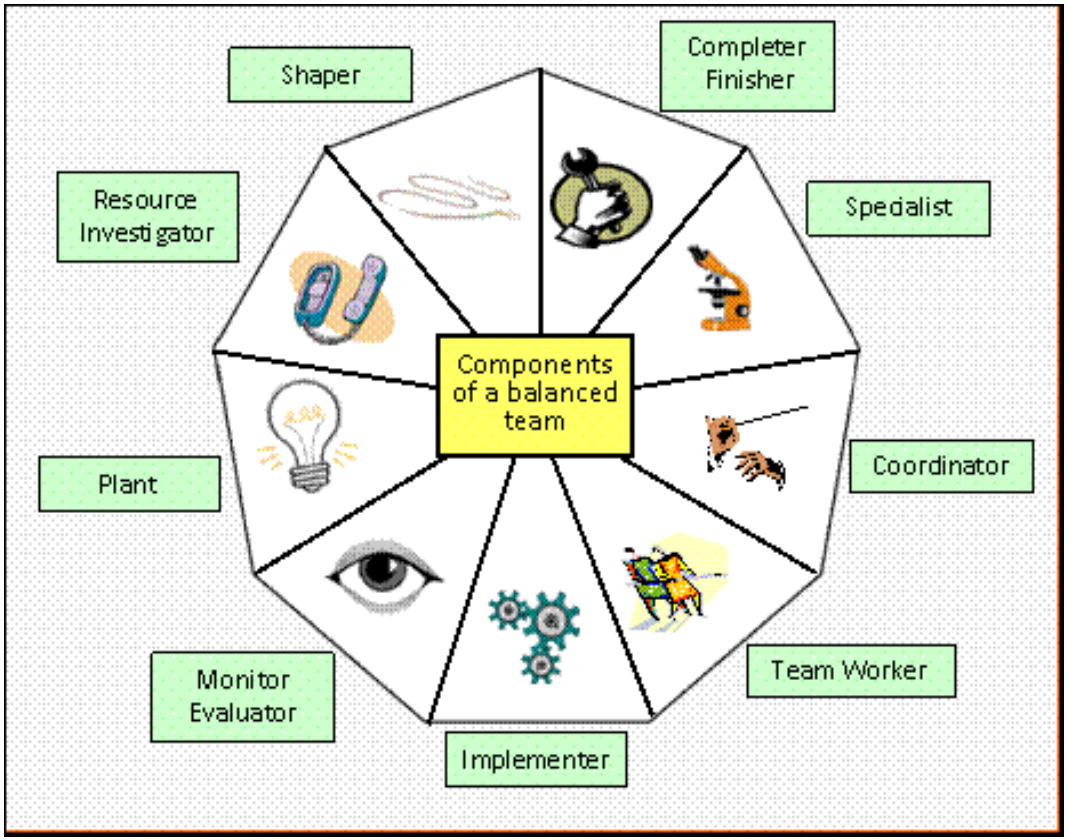
SCAC Partner

## SEBEHODNOCENÍ - PROFIL TÝMOVÝCH ROLÍ

e-INTERPLACE

Jméno Pavel Chalupa
Organizace Present Company
Oddělení

| BELBIN | Nejméně vhodné role | | | Zvládnutelné role | | | | Vhodné role | | | | Role a popisy | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 | Přínosy týmové role | | | Přípustné slabiny |
| IN | . | . | . | . | . | . | . | . | X | . | . | | Inovátor | Je tvůrčí, nápaditý a neortodoxní. Dokáže řešit náročné problémy. | Ignoruje podružnosti. Je velmi zaujatý vlastními myšlenkami na úkor efektivní komunikace. |
| VZ | . | . | . | . | X | . | . | . | . | . | . | | Vyhledávač zdrojů | Je nadšený a komunikativní extrovert. Objevuje příležitosti. Rozvíjí kontakty. | Je nadmíru optimistický. Může ztratit zájem po opadnutí počátečního nadšení. |
| KO | . | X | . | . | . | . | . | . | . | . | . | | Koordinátor | Je vyzrálý a sebejistý. Vyjasňuje cíle. Dává lidi dohromady, aby podpořil týmovou diskuzi. | Může se zdát, že manipuluje. Usnadňuje si osobní práci. |
| US | . | . | X | . | . | . | . | . | . | . | . | | Usměrňovač | Vyzývá k výkonu, je dynamický, prospívá mu tlak. Má průbojnost a odvahu překonávat překážky. | Má sklony provokovat. Může urážet ostatní. |
| MV | . | . | . | . | X | . | . | . | . | . | . | | Monitor vyhodnocovač | Je vážně založený, je stratég a má vysoké nároky. Vidí všechny možnosti. Má přesný úsudek. | Může mu chybět hnací síla a schopnost inspirovat ostatní. |
| TP | . | . | . | . | . | X | . | . | . | . | . | | Týmový pracovník | Spolupracuje, je mírný, vnímavý a diplomatický. Naslouchá, buduje a odvrací třenice. | Je nerozhodný v klíčových situacích. |
| RE | . | . | . | . | . | . | X | . | . | . | . | | Realizátor | Je disciplinovaný, spolehlivý, konzervativní v návycích. Má schopnost činit praktické kroky a akce. | Je poněkud nepružný. Může pomalu reagovat na nové možnosti. |
| KF | . | . | . | X | . | . | . | . | . | . | . | | Kompletovač finišer | Je pečlivý, svědomitý, dělá si starosti. Hledá chyby a přehlédnutí. Plní termíny. | Má sklony přehnaně se strachovat. Neochotně nechává ostatní podílet se na své práci. |
| SP | . | . | . | . | . | . | . | . | . | . | X | | Specialista | Je cílevědomý, iniciativní a oddaný své profesi. Poskytuje vědomosti a dovednosti, které jsou vzácné. | Přispívá pouze v úzké oblasti. Zaobírá se osobními speciálními zájmy. |




| Overall | Belbin roles |
|---|---|
| Doing / acting | Implementer ✗ |
| | Shaper ✓ ✓ |
| | Completer/Finisher ✗ |
| Thinking / problem-solving | Plant ✗ |
| | Monitor/Evaluator ✓ |
| | Specialist ✗ |
| People / feelings | Coordinator ✓ |
| | Team worker ✓ |
| ✓ | Resource/investigator |