UNIVERSITY OF WOLLONGONG IN DUBAI

ECTE250

ENGINEERING DESIGN AND MANAGEMENT 2

Winter 2025 / Spring 2025

Project Management I

Textbook and Readings

Textbook

- Project Management: the Managerial Process, 6th Edition, by Erik W Larson & Clifford F Gray, McGraw Hill
  - Chapter 1
  - Chapter 2

Acknowledgement

- Slides from Project Management: the Managerial Process, by Erik W Larson & Clifford F Gray

Ch. 1

Modern Project Management

What is a Project?

- Project Defined
  - A complex, nonroutine, one-time effort limited by time, budget, resources, and performance specifications designed to meet customer needs.
  - *A project is a temporary endeavor undertaken to create a unique service, produce or result (pmi.org definition) endeavor = attempt top achieve something*
- Major Characteristics of a Project
  - Has an established objective.
  - Has a defined life span with a beginning and an end.
  - Requires across-the-organizational participation.
  - Involves doing something never been done before.
  - Has specific time, cost, and performance requirements.

Comparison of Routine Work with Projects

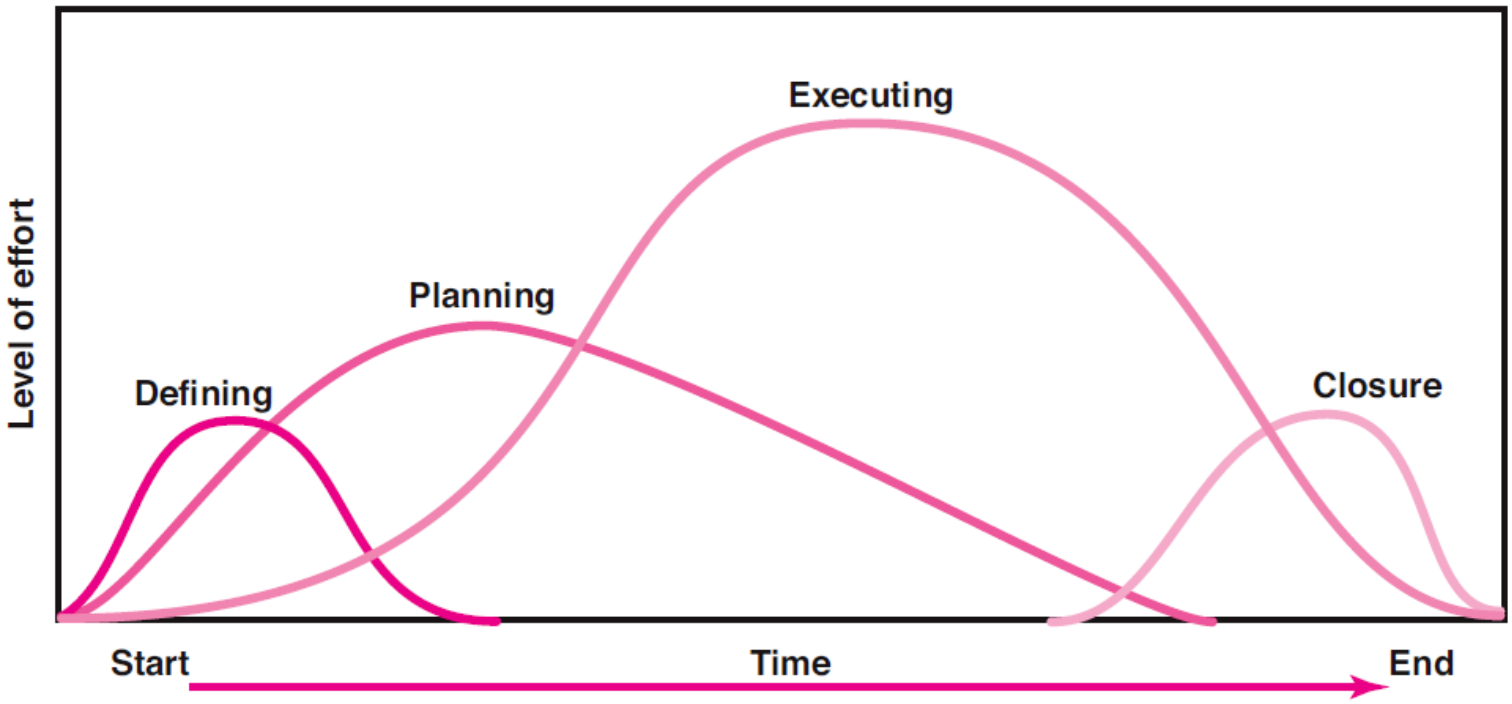
Routine, Repetitive Work	Projects
Taking class notes	Writing a term paper
Daily entering sales receipts into the accounting ledger	Setting up a sales kiosk for a professional accounting meeting
Responding to a supply-chain request	Developing a supply-chain information system
Practicing scales on the piano	Writing a new piano piece
Routine manufacture of an Apple iPod	Designing an iPod that is approximately 2 X 4 inches, interfaces with PC, and stores 10,000 songs
Attaching tags on a manufactured product	Wire-tag projects for GE and Wal-Mart

TABLE 1.1

Programs versus Projects

- Program Defined
  - A set of coordinated, related, multiple projects that continue over an extended period time and are intended to achieve a goal.
  - A higher level group of projects targeted at a common goal.
  - Example:
    - Project: completion of a required course in project management.
    - Program: completion of all courses required for a business major.

Project Life Cycle



Defining	Planning	Executing	Closure
1. Goals	1. Schedules	1. Status reports	1. Train customer
2. Specifications	2. Budgets	2. Changes	2. Transfer documents
3. Tasks	3. Resources	3. Quality	3. Release resources
4. Responsibilities	4. Risks	4. Forecasts	4. Evaluation
	5. Staffing		5. Lessons learned

FIGURE 1.1

The Challenge of Project Management

- The Project Manager (PM)
  - Other Managers: plan, schedule, motivate, control
  - PM manages temporary, non-repetitive activities and frequently acts independently of the formal organization.
    - Organizer and guide resources for the project.
    - Is linked directly to the customer interface.
    - Provides direction, coordination, and integration to the project team.
    - Is responsible for performance and success of the project.
  - *Must induce the right people at the right time to address the right issues and make the right decisions.*

The Importance of Project Management

- Factors leading to the increased use of project management:
  - Compression of the product life cycle
  - Knowledge explosion (complexity of projects)
  - Triple bottom line (planet, people, profit)
  - Corporate downsizing (flat and outsource)
  - Increased customer focus (competition, customization)
  - Small projects represent big problems (multiproject)

Benefits of an Integrative Approach to Project Management

- Integration (or centralization) of project management provides *senior management* with:
  - An overview of all project management activities
  - A big picture of how organizational resources are used
  - A risk assessment of their portfolio of projects
  - A rough metric of the firm's improvement in managing projects relative to others in the industry
  - Linkages of senior management with actual project execution management

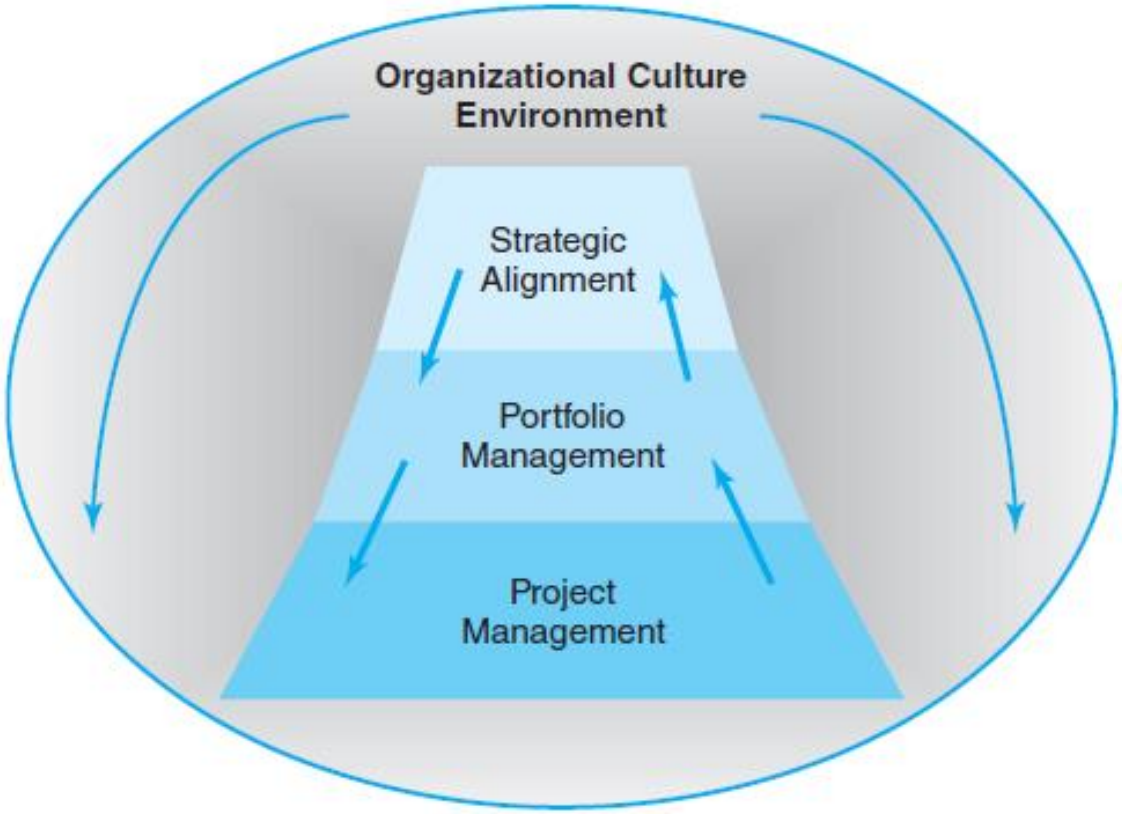
Full insight of all components of the organization is crucial for aligning internal business resources with the requirement of changing environment

Integrated Project Management Systems

- Problems resulting from the use of piecemeal (fragmentary, disjoined) project management systems:
  - Do not tie together the overall strategies of the firm.
  - Fail to prioritize selection of projects by their importance of their contribution to the firm.
  - Are not integrated throughout the project life cycle.
  - Do not match project planning and controls with organizational culture to make appropriate adjustments in support of project endeavors.

Integrated Management of Projects

FIGURE 1.2
Integrated Management of Projects

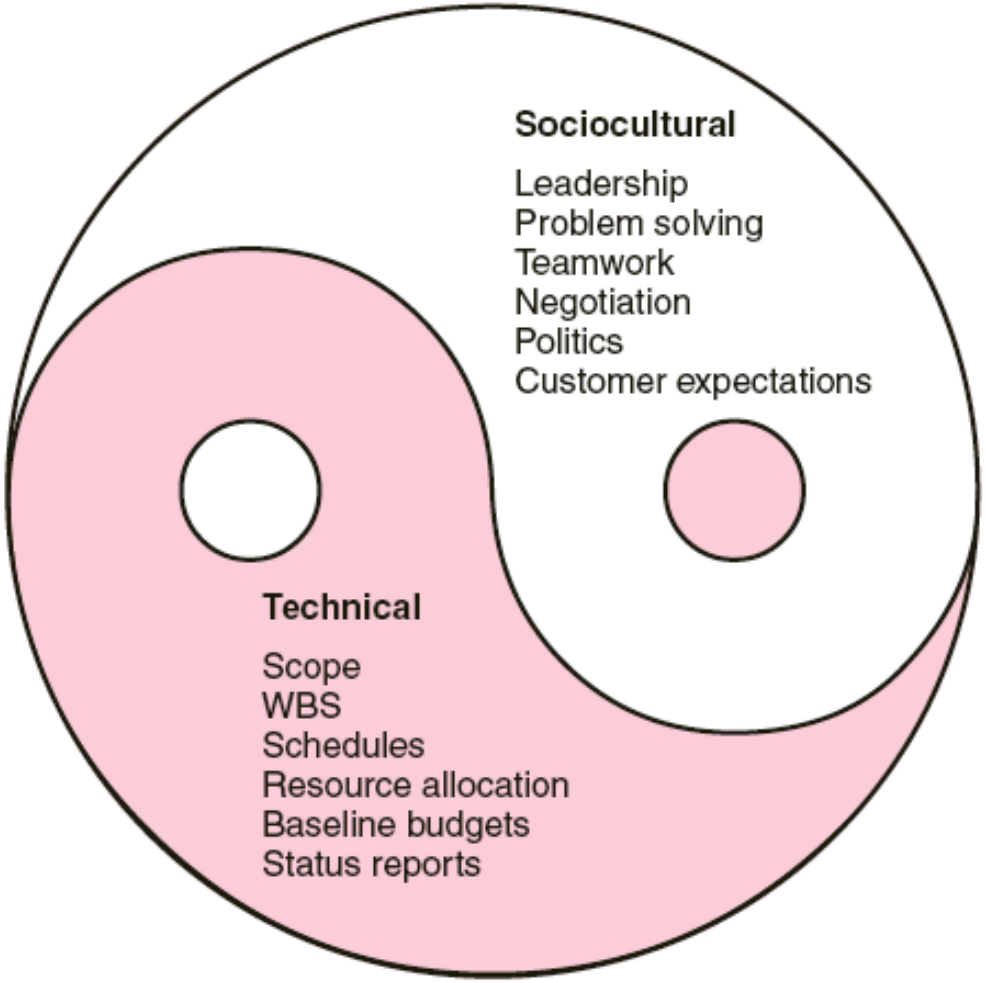


Major Functions of Portfolio Management

- Oversee project selection.
- Monitor aggregate resource levels and skills.
- Encourage use of best practices.
- Balance projects in the portfolio in order to represent a risk level appropriate to the organization.
- Improve communication among all stakeholders.
- Create a total organization perspective that goes beyond silo thinking.
- Improve overall management of projects over time.

The Technical and Sociocultural Dimensions of the Project Management Process

Art of PM



Science of PM

Research Highlight

Works Well with Others*

The phrase "works well with others" has long been a staple on grade school report cards; now, in the IT world, it's the No. 1 criterion for management candidates. In a nationwide survey conducted in 1999, 27 percent of chief information officers (CIOs) cited strong interpersonal skills as the single most important quality for reaching management levels. Advanced technical skills came in second, receiving 23 percent of the response.

The project was sponsored by RHI Consulting, which provides information technology professionals on a project basis. An independent research firm was hired to administer the survey. Over 1,400 CIOs responded to the questionnaire.

Survey respondents were also asked:

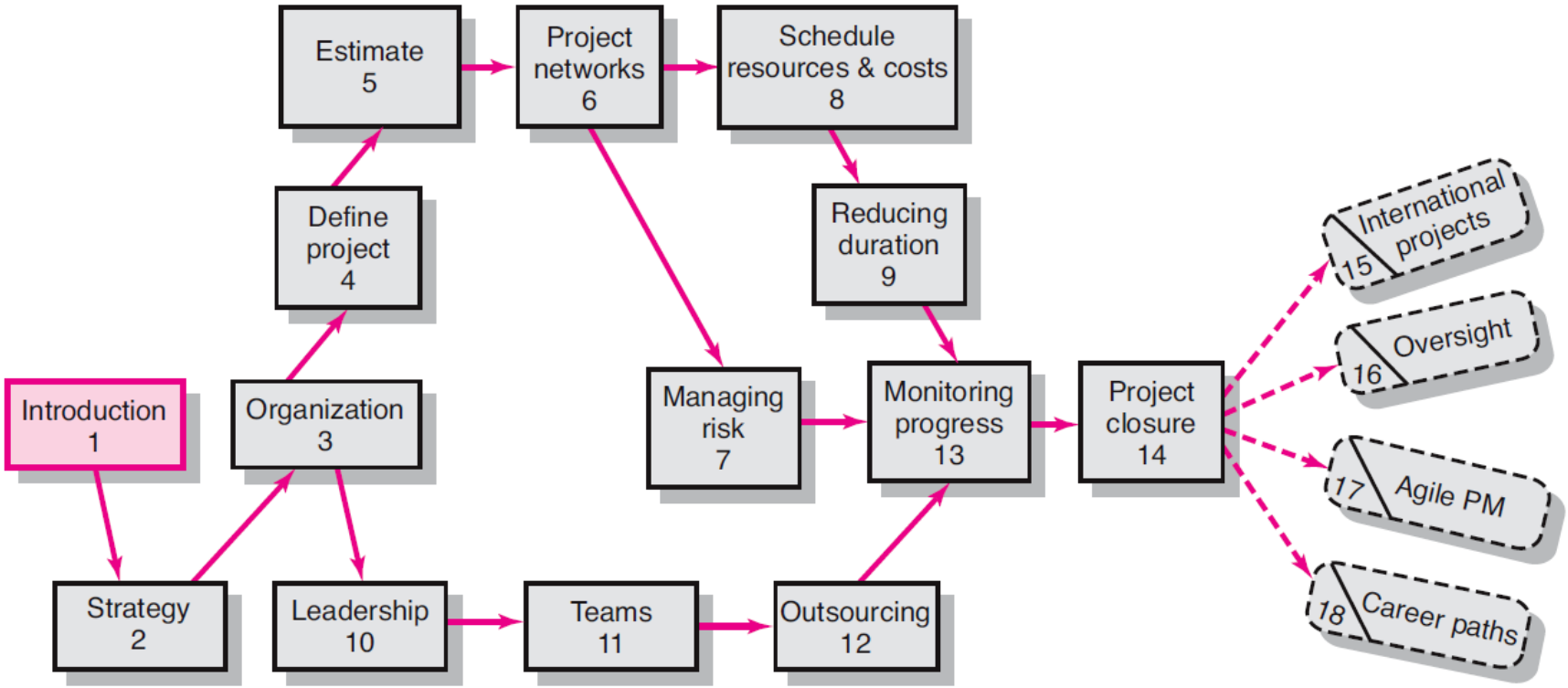
In 2005, how frequently will employees in your IT department work on project-based teams with members of other departments throughout the company?

Their responses:	Very frequently	57%
	Somewhat frequently	26%
	Somewhat infrequently	10%
	Very infrequently	6%
	Never	1%

Greg Scileppi, RHI Consulting's executive director, recommends that IT professionals develop their interpersonal skills. "The predominance of project teams has created a corresponding need for strong communication and team-player abilities. Technical staff put these skills to test daily as they work with employees at all levels to create and implement IT solutions ranging from simple troubleshooting to corporate web initiatives and system wide upgrades."

* Joanita M. Nellenbach, "People Skills Top Technical Knowledge, CIOs Insist," *PMNetwork* (August 1999), pp. 7–8.

An Overview of Project Management



Key Terms

Program

Project

Project life cycle

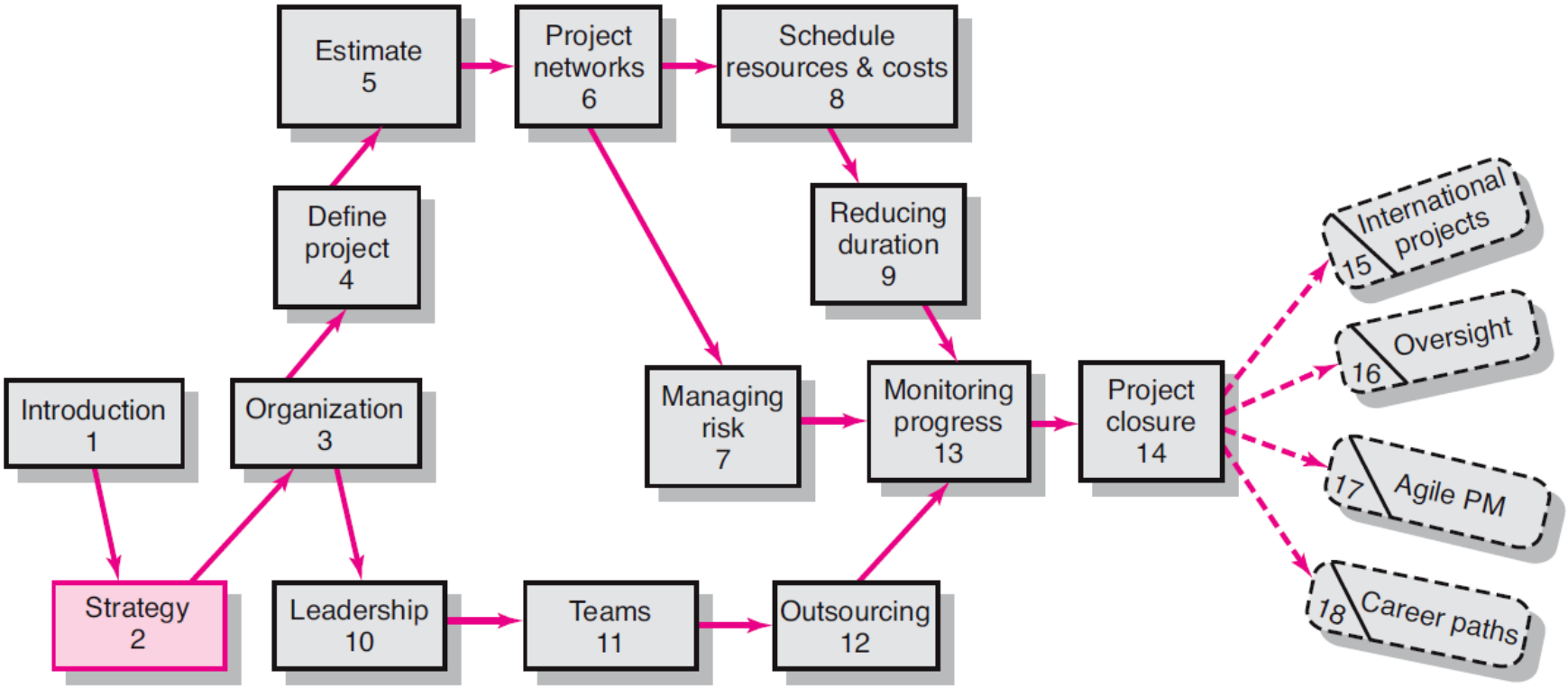
Project Management Professional (PMP)

Sociotechnical perspective

Ch. 2

Organization Strategy and Project Selection

Where We Are Now



Why Project Managers Need to Understand the Strategic Management Process

- Changes in the organization's mission and strategy
  - Project managers must respond to changes with appropriate decisions about future projects and adjustments to current projects.
  - Project managers who understand their organization's strategy can become effective advocates of projects aligned with the firm's mission.

Projects and Strategy

- Mistakes caused by not understanding the role of projects in accomplishing strategy:
  - Focusing on problems or solutions with low strategic priority.
  - Focusing on the immediate customer rather than the whole market place and value chain.
  - Overemphasizing technology that results in projects that pursue exotic technology that does not fit the strategy or customer need
  - Trying to solve customer issues with a product or service rather than focusing on the 20% with 80% of the value (Pareto's Law).
  - Engaging in a never-ending search for perfection only the project team really cares about.

The Strategic Management Process: An Overview

- Strategic Management
  - Requires every project to be clearly linked to strategy.
  - Provides theme and focus of firm's future direction.
    - **Responding to changes** in the external environment—environmental scanning
    - **Allocating scarce resources** of the firm to improve its competitive position—internal responses to new programs
  - Requires strong links among mission, goals, objectives, strategy, and implementation.

Strategic Management Process Activities

1. Review and define the organizational mission (*what we want to become, scope of organization*).

2. Analyze and formulate strategies (*what needs to be done to reach objectives – who are the customers and what are their needs, opportunities*).

3. Set objectives (concrete, measurable) to achieve strategies (*exactly where the firm is heading and when is going to get there*)

4. Implement strategies through projects (*mission critical tasks/projects, allocation of resources, organization support, planning & control*)

Strategic Management Process

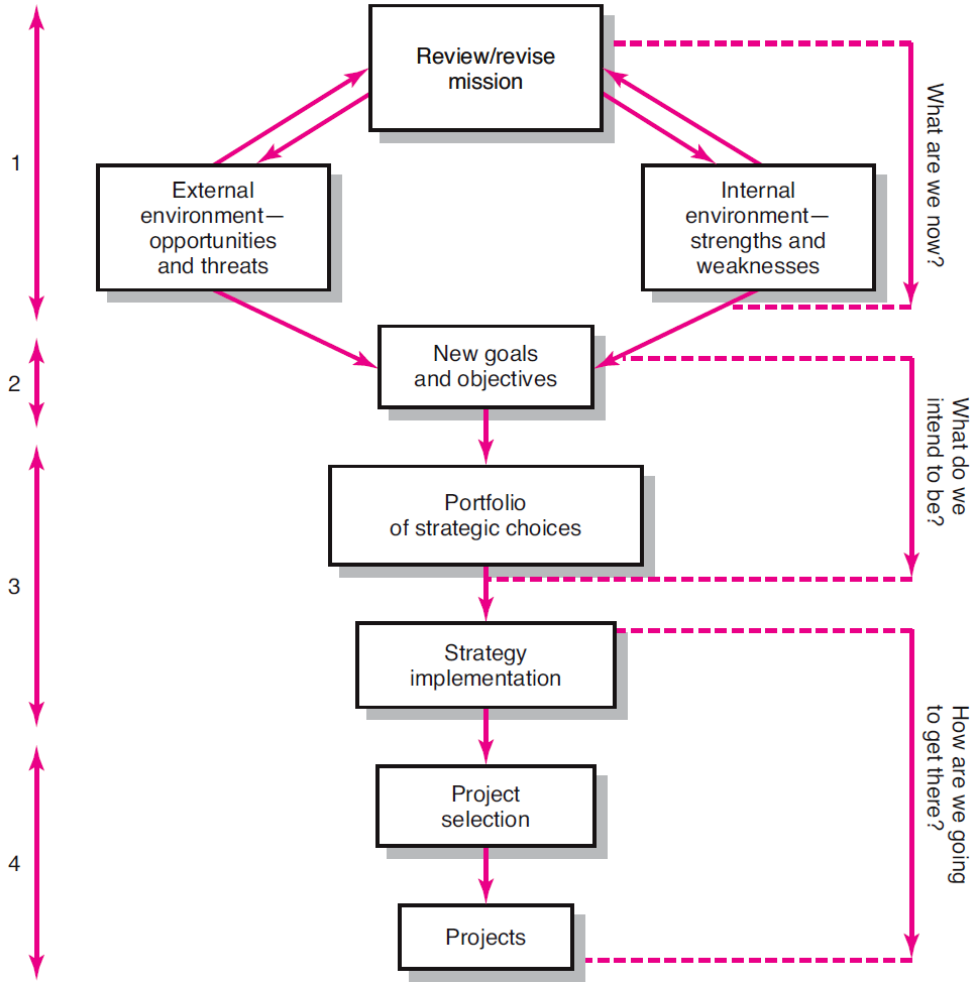


FIGURE 2.1

Characteristics of Objectives

S	**Specific**	Be specific in targeting an objective
M	**Measurable**	Establish a measurable indicator(s) of progress
A	**Assignable**	Make the objective assignable to one person for completion
R	**Realistic**	State what can realistically be done with available resources
T	**Time related**	State when the objective can be achieved, that is, duration

Project Portfolio Management Problems

- The Implementation Gap (unclear priorities)
  - The lack of understanding and consensus on strategy among top management and middle-level (functional) managers who independently implement the strategy.
- Organization Politics
  - Project selection is based on the persuasiveness and power of people advocating the projects.
- Resource Conflicts and Multitasking
  - Multiproject environment creates interdependency relationships of shared resources which results in the starting, stopping, and restarting projects.

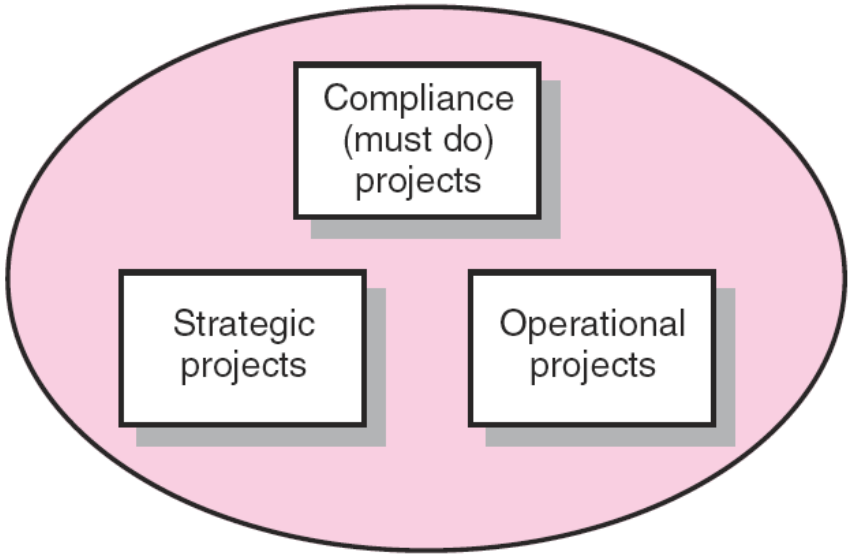
Benefits of Project Portfolio Management

- Builds discipline into the project selection process.
- Links project selection to strategic metrics.
- Prioritizes project proposals across a common set of criteria, rather than on politics or emotion.
- Allocates resources to projects that align with strategic direction.
- Balances risk across all projects.
- Justifies killing projects that do not support strategy.
- Improves communication and supports agreement on project goals.

A Portfolio Management System

- Design of a project portfolio system:
  - Classification of a project
  - Selection criteria depending upon classification
  - Sources of proposals
  - Evaluating proposals
  - Managing the portfolio of projects.

Portfolio of Projects by Type



- Compliance (meet regulations, emergency)
- Operational (support current operations)
- Strategic (support organization long-term mission)

Further classification by product type, division, etc.

A Portfolio Management System

- Selection Criteria
  - **Financial:** payback, net present value (NPV), internal rate of return (IRR)
    - Preferred when confidence on future cash flow
  - **Non-financial:** projects of strategic importance to the firm.

- Multi-Weighted Scoring Models
  - Use several weighted selection criteria to evaluate project proposals.

Financial Models

- The Payback Model
  - Measures the time the project will take to recover the project investment.
  - Uses more desirable shorter paybacks.
  - Emphasizes cash flows, a key factor in business.
- Limitations of Payback:
  - Ignores the time value of money.
  - Assumes cash inflows for the investment period (and not beyond).
  - Does not consider profitability.

Financial Models (cont'd)

- The Net Present Value (NPV) model
  - Uses management's minimum desired rate-of-return (discount rate) to compute the present value of all net cash inflows.
    - Positive NPV: project meets minimum desired rate of return and is eligible for further consideration.
    - Negative NPV: project is rejected.

$$\text{Project NPV} = I_0 + \sum_{t=1}^{n} \frac{F_t}{(1+k)^t} \quad \text{where}$$

I_0 = Initial investment (since it is an outflow, the number will be negative)
F_t = net cash inflow for period t
k = required rate of return

Example Comparing Two Projects Using Payback Method

	A	B	C	D	E	F	G	H	I	J	K	L	M
1					Exhibit 2.3 A								
2													
3				Example Comparing Two Projects Using the Payback Method									
4													
5				Project A		Project B							
6													
7													
8		Investment		$700,000		$400,000				Project A: Payback = (D8/D9)			
9		Annual savings		$225,000		$110,000				Project B: Payback = (F8/F 9)			
10													
11		Payback period*		3.1 years		3.6 years							
12													
13		Rate of return **		32.1%		27.5				Project A: Rate of return = D9/D8)			
14										Project B: Rate of return = (F9/F8)			
15	Project A: Accept. Less than 5 years and exceeds 15% desired rate												
16													
17	Project B: Accept. Less than 5 years.												
18													
19	* Note: Payback does not use the time value of money												
20	** Note: Rate of return is reciprocal of Payback												
21													
22													

Example Comparing Two Projects Using Net Present Value Method

	A	B	C	D	E	F	G	H	I	J	K	L	M
1													
2					Exhibit 2.3B								
3													
4				Example Comparing Two Projects Using NPV									
5	Project A		Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Formulas			
6	Required	15%											
7	Outflows		-$700,000						-$700,000				
8	Inflows			$225,000	$225,000	$225,000	$225,000	$225,000	$1,125,000				
9	Net inflows			$225,000	$225,000	$225,000	$225,000	$225,000	$425,000	Project A:	=C7+NPV(B6,D9:H9)		
10	NPV	$54,235											
11													
12													
13	Project B												
14	Required	15%											
15	Outflows		-$400,000						-$400,000				
16	Inflows			$110,000	$110,000	$110,000	$110,000	$110,000	$550,000				
17	Net inflows			$110,000	$110,000	$110,000	$110,000	$110,000	$150,000	Project B:	=C15+NPV(B14,D17:H17)		
18	NPV	-$31,263											
19													
20													
21													
22	NPV comparison: Accept Project A---NPV is positive												
23	Reject Project B---NPV is negative												

Nonfinancial Strategic Criteria

- To capture larger market share
- To make it difficult for competitors to enter the market
- To develop an enabler product, which by its introduction will increase sales in more profitable products
- To develop core technology that will be used in next-generation products
- To reduce dependency on unreliable suppliers
- To prevent government intervention and regulation

Multi-Criteria Selection Models

- Checklist Model
  - Uses a list of questions to review potential projects and to determine their acceptance or rejection.
  - Fails to answer the relative importance or value of a potential project and doesn't to allow for comparison with other potential projects.
- Multi-Weighted Scoring Model
  - Uses several weighted qualitative and/or quantitative selection criteria to evaluate project proposals.
  - Allows for comparison of projects with other potential projects

Sample Selection Questions Used in Practice

Topic	Question
Strategy/alignment	What specific strategy does this project align with?
Driver	What business problem does the project solve?
Success metrics	How will we measure success?
Sponsorship	Who is the project sponsor?
Risk	What is the impact of not doing this project?
Risk	What is the project risk to our organization?
Risk	Where does the proposed project fit in our risk profile?
Benefits, value, ROI	What is the value of the project to this organization?
Benefits, value, ROI	When will the project show results?
Objectives	What are the project objectives?

Sample Selection Questions Used in Practice

Topic	Question
Organization culture	Is our organization culture right for this type of project?
Resources	Will internal resources be available for this project?
Approach	Will we build or buy?
Schedule	How long will this project take?
Schedule	Is the time line realistic?
Training/resources	Will staff training be required?
Finance/portfolio	What is the estimated cost of the project?
Portfolio	Is this a new initiative or part of an existing initiative?
Portfolio	How does this project interact with current projects?
Technology	Is the technology available or new?

EXHIBIT 2.4 cont'd

Project Screening Matrix

Criteria / Weight	Stay within core competencies	Strategic fit	Urgency	25% of sales from new products	Reduce defects to less than 1%	Improve customer loyalty	ROI of 18% plus	Weighted total
	2.0	3.0	2.0	2.5	1.0	1.0	3.0	
Project 1	1	8	2	6	0	6	5	66
Project 2	3	3	2	0	0	5	1	27
Project 3	9	5	2	0	2	2	5	56
Project 4	3	0	10	0	0	6	0	32
Project 5	1	10	5	10	0	8	9	102
Project 6	6	5	0	2	0	2	7	55
⋮								
Project *n*	5	5	7	0	10	10	8	83

(1x2)+(8x3)
+(2x2)
+(6x
2.5)
+0(1)
+6(1)
+5(3)

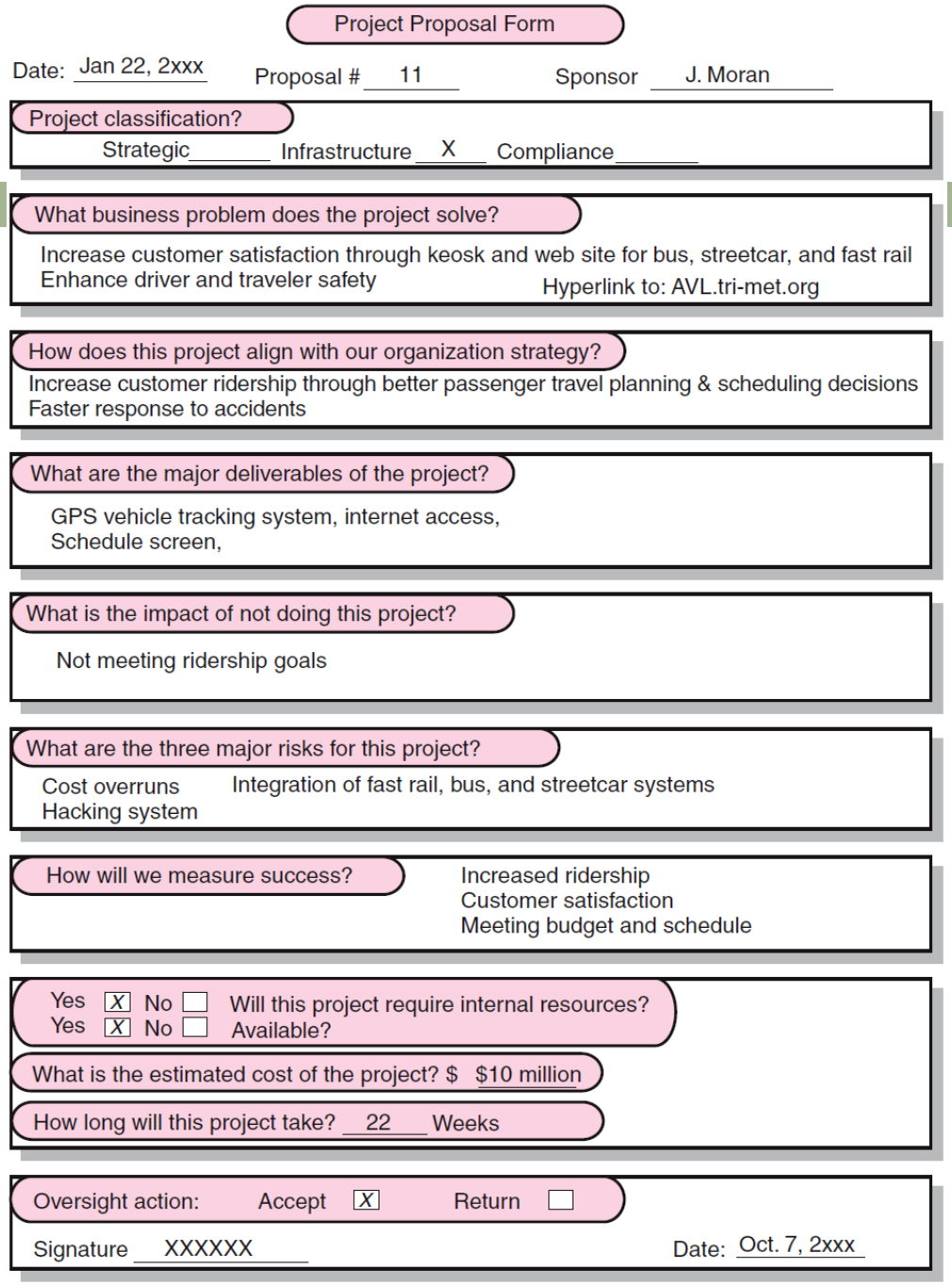
FIGURE 2.3

Applying a Selection Model

- Project Classification
  - Deciding how well a strategic or operations project fits the organization's strategy.
- Selecting a Model
  - Applying a weighted scoring model to bring projects to closer with the organization's strategic goals.
    - Reduces the number of wasteful projects
    - Helps identify proper goals for projects
    - Helps everyone involved understand how and why a project is selected

Project Proposals

- Sources and Solicitation of Project Proposals
  - Within the organization
  - Request for proposal (RFP) from external sources (contractors and vendors)
- Ranking Proposals and Selection of Projects
  - Prioritizing requires discipline, accountability, responsibility, constraints, reduced flexibility, and loss of power.
- Managing the Portfolio
  - Senior management input
  - The priority team (project office) responsibilities



Project Proposal Form

Date: Jan 22, 2xxx Proposal # 11 Sponsor J. Moran

Project classification?
Strategic _____ Infrastructure X Compliance _____

What business problem does the project solve?
Increase customer satisfaction through keosk and web site for bus, streetcar, and fast rail
Enhance driver and traveler safety
Hyperlink to: AVL.tri-met.org

How does this project align with our organization strategy?
Increase customer ridership through better passenger travel planning & scheduling decisions
Faster response to accidents

What are the major deliverables of the project?
GPS vehicle tracking system, internet access,
Schedule screen,

What is the impact of not doing this project?
Not meeting ridership goals

What are the three major risks for this project?
Cost overruns
Integration of fast rail, bus, and streetcar systems
Hacking system

How will we measure success?
Increased ridership
Customer satisfaction
Meeting budget and schedule

Yes [X] No [ ] Will this project require internal resources?
Yes [X] No [ ] Available?

What is the estimated cost of the project? $ $10 million

How long will this project take? 22 Weeks

Oversight action: Accept [X] Return [ ]

Signature XXXXXX Date: Oct. 7, 2xxx

A Proposal Form for an Automatic vehicular tracking (AVL) Public Transportation Project

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FIGURE 2.4B
Risk Analysis for a 500-Acre Wind Farm

Brief Risk Assessment

Purpose: To draw attention to apparent project risks that will need management attention.

What are the four major risks of this project?
1. *Government incentives curtailed*
2. *Land use injunction*
3. *Energy price decrease*
4. *New import tax*

Rank risks above by "probability" and "impact" on the chart below by High, Medium or Low.

Risk Intensity Rating

Risk	Probability	Impact
1. *Government incentives curtailed*	*High*	*High*
2. *Land use injunction*	*Medium*	*High*
3. *Energy price decrease*	*Medium*	*Medium*
4. *New import tax*	*Low*	*High*

Check other project risk factors:

Complexity	Low	☐	Average	☒	High ☐
Resource skills	Good	☒	Okay	☐	Lacking ☐
Technology	Low	☐	Average	☒	High ☐

Reviewed by *Rachel* **Date** *April 1, 2xxx*

Managing the Portfolio

- Senior Management Input
  - Provide guidance in selecting criteria that are aligned with the organization's goals
  - Decide how to balance available resources among current projects
- The Priority Team Responsibilities
  - Publish the priority of every project
  - Ensure that the project selection process is open and free of power politics.
  - Reassess the organization's goals and priorities
  - Evaluate the progress of current projects

Project Screening Process

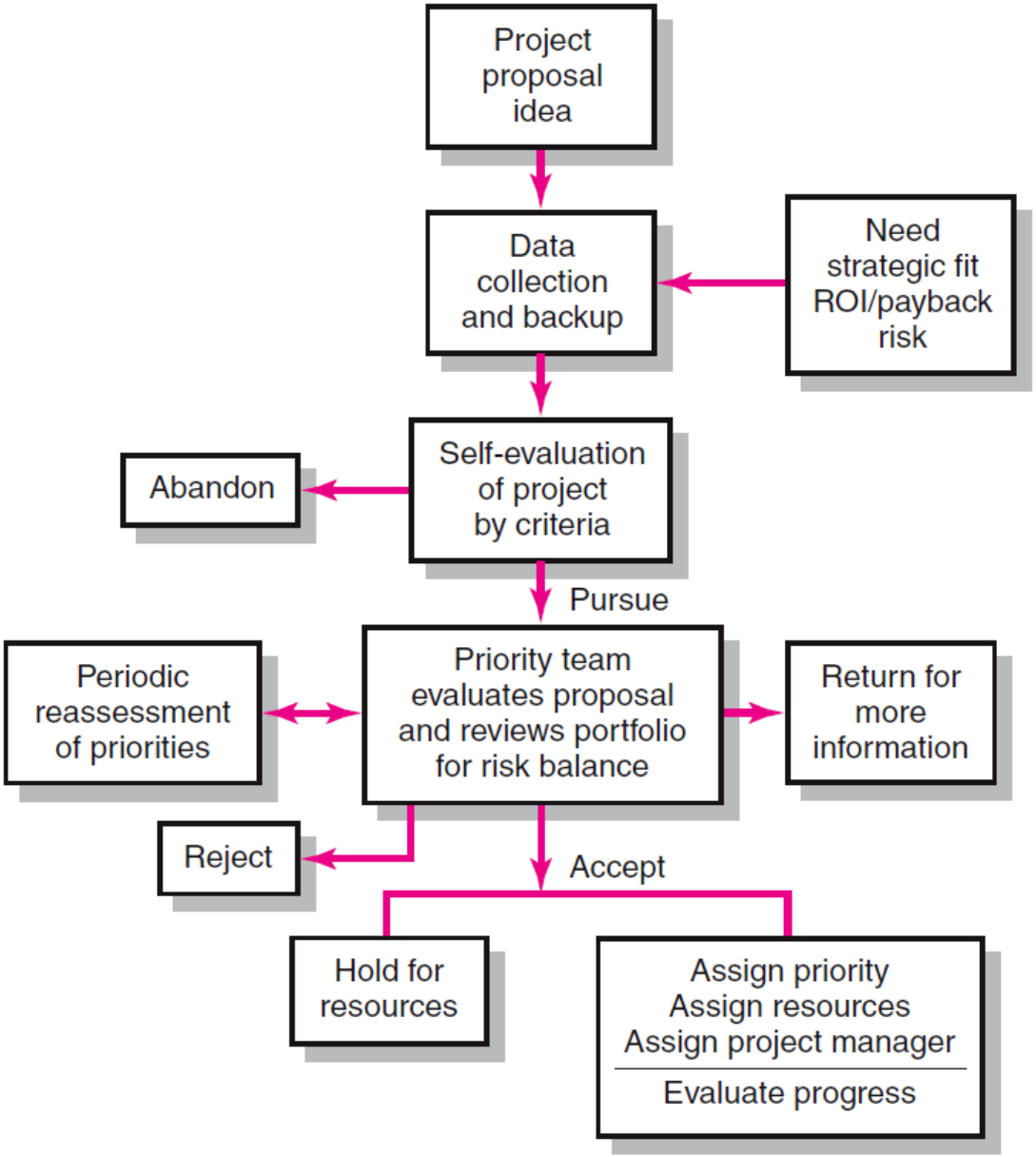

FIGURE 2.5

Priority Analysis

			Project number			
Must objectives		**Must meet if impacts**	**...26**	**27**	**28**	**29**
All activities meet current legal, safety, and environmental standards		Yes-Meets objective No-Does not meet obj N/A-No impact	**n/a**			
All new products will have a complete market analysis		Yes-Meets objective No-Does not meet obj N/A-No impact	**yes**			
Want objectives	**Relative Importance 1-100**	**Single project impact definitions**	**Weighted score**	**Weighted score**	**Weighted score**	**Weighted score**
Provides immediate response to field problems	**99**	0 ≤ Does not address ① = Opportunity to fix 2 ≥ Urgent problem	**99**			
Create $5 million in new sales by 20xx	**88**	⓪ < $100,000 1 = $100,000–500,000 2 > $500,000	**0**			
Improve external customer service	**83**	0 ≤ Minor impact 1 = Significant impact ② ≥ Major impact	**166**			
Total weighted score						
Priority						

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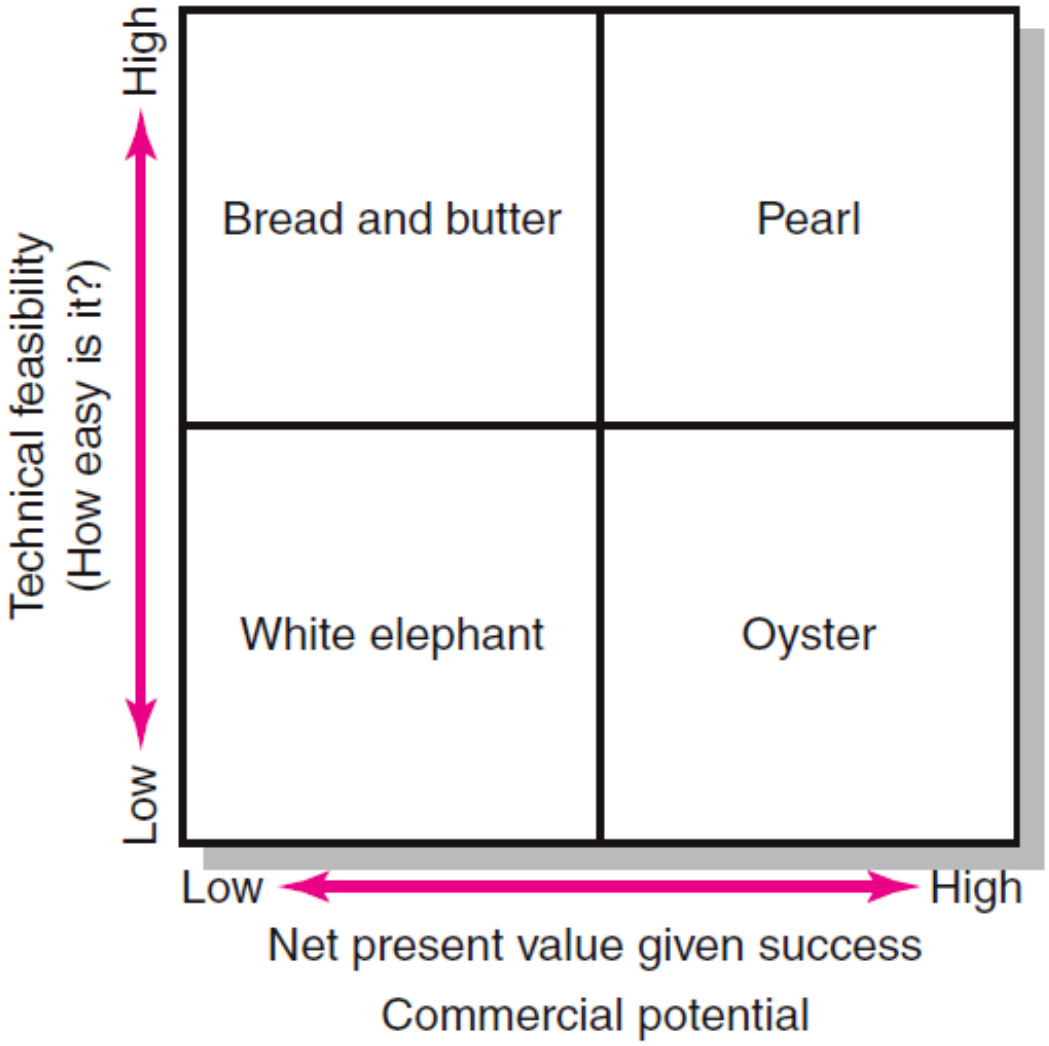
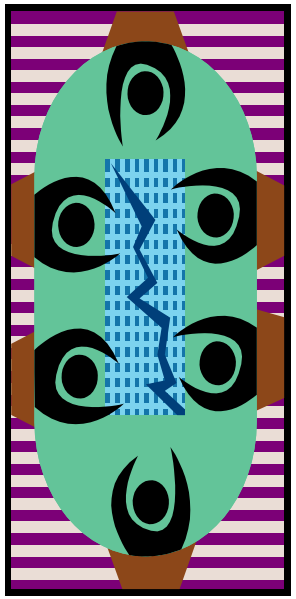
Project Portfolio Matrix



Project Portfolio Matrix Dimensions

- Bread-and-butter Projects
  - Involve evolutionary improvements to current products and services.
- Pearls
  - Represent revolutionary commercial opportunities using proven technical advances.
- Oysters
  - Involve technological breakthroughs with high commercial payoffs.
- White Elephants
  - Showed promise at one time but are no longer viable.



Key Terms

Implementation gap

Net present value

Organizational politics

Payback

Priority system

Priority team

Project portfolio

Project screening matrix

Project sponsor

Sacred cow

Strategic management process