Project Management A Strategic Managerial Approach 10th edition Meredith Solutions Manual

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Chapter 2
Strategic Management and Project Selection

CHAPTER OVERVIEW

Overview – This chapter discusses the process for selecting which of the many projects an organization could pursue and it should pursue. It introduces techniques for evaluating and making the selection. The chapter also introduces concepts of risk and applies them to the analysis typically performed during the project selection process.

2.1 Organizational Project Management and Governance – Organizational Project Management (OPM) is a framework for executing strategies through projects by combining the systems of portfolio, program, and project management. It is becoming increasing used in industry. Governance is also covered in this section. This includes the role of oversight committees, project managers, and the project management office.

2.2 Project Selection Models – Organizations should use consistent and rational tools to select among the myriad of projects from which they have to choose. There are many models for the selection process to choose from as well. They can be broken down into two main types: numeric and nonnumeric.

Types of Project Selection Models

- Nonnumeric Models – These models do not attempt to reduce the evaluation process to numbers, but instead look at other factors that make for "obvious" choices for that organization. These models could include senior management mandates and regulatory necessities. Examples include *The Sacred Cow*, *The Operating Necessity*, *The Competitive Necessity*, *The Product Line Extension*, *Comparative Benefit Model*, and *Sustainability*.
- Numeric Models: Profit/Profitability – These models analyze the potential projects in terms of the single criteria of monetary return. The analysis may or may not include the time value of money. These include traditional measures such as *Payback Period* and *Discounted Cash Flow* (also referred to as Net Present Value).
- Numeric Models: Real Options – These models are based on the concept of an investment that leads to opportunities that would not have been available otherwise. This model chooses investments that may not be profitable or beneficial in the near future, but will lead to options for the future with a great promise.
- Numeric Models: Scoring – These models analyze the potential projects based on multiple criteria the organization selects. The models use numeric scales to rate the projects against the desired criteria. Then the ratings can

be analyzed using various techniques to determine the best choices. The example included in this text is the *Weighted Factor Scoring Model*.

- Numeric Models: Window-of-Opportunity Analysis – This model attempts to determine the cost, timing, and performance specifications of a new technology to understand whether it qualifies as useful and economic. Having thus estimated the economic impact of the innovation, the decision of whether or not to undertake the development project is much simpler.
- Numeric Models: Discovery-Driven Planning – Similar to window of opportunity analysis model, this model funds a portion of the project and tries to determine two important aspects about the project: the critical assumptions and the cost of testing each assumption. Analyzing the assumptions enables the management team to find out if a project continues to be as promising as was believed or a change of strategy is required.
- Choosing a Project Selection Model – The authors strongly favor using weighted scoring models.

2.3 Project Portfolio Management (PPM) – Project Portfolio Management is used to consistently and transparently select projects that match the organization's goals. The process has eight steps:

- Step 1: Establish a Project Council – The council is established to articulate strategic direction and allocate funds to projects it selects.
- Step 2: Identify Project Categories and Criteria – Categories are established by the Council to ensure that a variety of projects are pursued. Criteria for measuring prospective projects are established to form the framework for the selection process. Common categories used for classifying projects are:
  - Derivative projects – Projects that are only incrementally different from previous efforts.
  - Platform projects – Projects that impact organization outputs or the processes that create them.
  - Breakthrough projects – Projects that involve implementing new, sometimes "disruptive" technology.
  - R&D projects – Projects used to acquire new knowledge or create new technology.
- Step 3: Collect Project Data – Collect relevant data and assign scores to prospective projects.
- Step 4: Assess Resource Availability – Analyze the availability of resources to execute the prospective projects.
- Step 5: Reduce the Project and Criteria Set – Use multiple screens to narrow down the number of projects under consideration.
- Step 6: Prioritize the Projects within Categories – Using the analysis developed, prioritize the projects within the previously identified categories.
- Step 7: Select the Projects to be Funded and Held in Reserve – The first task in this step is determination of the mix of projects across the various categories and time periods. The next task is to leave some percent of the

organization's resource capacity free for new opportunities, crises in existing projects, errors in estimates, and so on. Then allocate the categorized projects in rank order to the categories according to the mix desired.

- Step 8: Implement the Process – The results of the process must be recorded, and then widely communicated within the organization.

TEACHING TIPS

Most students will benefit from in-class examples to make the material come alive. One area that will benefit from this approach is the use of Crystal Ball®. In spite of the hype of software makers, all students will not have the ability to sit down and use Crystal Ball® without some assistance. Demonstrating the example in the text with a computer and a projector will help students understand the process and generate a lot of good questions.

The other area that requires demonstration is the project selection process. Students need to see the criteria in action and see how a real scoring model would work. A good way to accomplish these goals is to use the Pan-Europa Case Study as an in-class exercise. There are a couple of ways to approach this. The simpler process would be to have the students read the case in advance. Then questions 1, 2, and 3 can be discussed with the class as a whole. Questions 4 and 5 can be addressed through pair-wise brainstorming (discussed in the Teaching Tips for Chapter 1). The student teams would take notes on their answers to these questions to then be discussed with the class as a whole. The result of this discussion would be used to come up with a class consensus view on the screens and criteria to be used for the project selection process. Then the students could go back to working in pairs (preferably the same ones as before) to apply the criteria and make their selections. Then another whole class discussion can be used to share each group's results and see if a class consensus emerges. This whole process, depending on the vigor of the class would take 2-3 hours. It is important for the instructor to circulate during the small group discussions to keep the students on track and answer their questions. This is particularly important as there are multiple questions embedded in Questions 4 and 5, and students will have a tendency to get hung up on one to the exclusion of the others. The instructor may wish to suggest a time budget for each question to assist the group's progress.

A more elaborate approach to this case would involve students role-playing the members of the Pan-Europa board. Then the "board members" would have the opportunity to advocate their own projects and try to influence the selection process in their favor. Depending on the size of the class, this technique may not keep enough of the students involved. One way to address this would be to assign a team of students to each board member to assist them in establishing their position. Then the board member becomes essentially a spokesman for the group. Again, it's important to alternate

between whole class and small group activities to ensure the maximum participation of each student. This could be accomplished by the groups meeting to discuss their position, a "presentation" to the whole class by each board member, then another group discussion of criteria, followed by presentations to the whole class of the recommended criteria with an undoubtedly vigorous discussion to follow.

A good reference case for this chapter follows:
9-305-101 **Boeing 787: The Dreamliner** (Harvard). This is an excellent strategy case and is so recent that it is reported in the papers and business magazines almost every week.

PROJECT MANAGEMENT IN PRACTICE

Taipei 101: Refitted as World's Tallest Sustainable Building

Question 1: Why did the owners pick such a big building for sustainability refitting?

The owners of the building wanted to show the world that it is possible to make an existing building sustainable by winning a LEED certification. By picking the tallest building in East Asia and succeeding in their endeavor they showed the world that it is possible to make an existing building sustainable rather than starting from scratch.

Question 2: What aspect of the tenant's habits and routines relates to sustainability, as opposed to "green?"

Sustainability does, of course, call for incorporating environmental concerns into project decision-making, like tenants in Taipei 101 incorporating healthy office environments (air-quality testing, environmental inspections), but it should cover social issues, like maintaining office etiquette, treating all employees fairly, helping fellow co-workers, etc. The social issues are the aspect of the tenant's habits and routines that relate to sustainability, as opposed to "green."

Question 3: In what ways does refitting the tower enhance long-term profitability?

Refitting the tower enhances long-term profitability by significantly cutting costs through strategies such as energy consumption and water usage.

Using a Project Portfolio to Achieve 100% On-Time Delivery at Decor Cabinets

Question 1: Might it not make sense to include a least a few of the more promising new product projects in their portfolio?

No. Special products divert management and workers' attention and either require a different process to produce the product or hinder the improvement of standard processes to produce the standard products. On the other hand, it might be a good idea to choose some of the projects with a higher potential payoff in order to diversify the project portfolio.

Question 2: If ROI isn't the big picture, what do you think is?
Part of the problem in this dilemma is defining what the investment is. Too often return on investment (ROI) is narrowly interpreted to mean physical facilities, ignoring the firm's investment in people, maintenance, research, development, skills, training, etc. Any manager can look good on short term ROI measures by quickly eliminating all these long term investments, but the firm will eventually wither and go bankrupt.

Implementing Strategy through Projects at Blue Cross/Blue Shield

Question 1: Do you think that all projects will be monitored by the CPAG or just the strategic projects?

Although there may be benefits from monitoring all projects by the CPAG, we might assume that only strategic projects will be monitored since they are the ones that relate to the goals of the CPAG. A second set of projects may be monitored though, and these would include those projects that are significant in terms of resources required. Although there might not be a strategic reason for the project, there might be strategic implications (for instance, if a large project went significantly over budget). The smaller, less significant projects may not be fully monitored by the CPAG due to cost-benefit reasons.

Question 2: Will all tactical projects be terminated in the future? Where might these be handled or tracked?

All tactical projects will not be terminated in the future. They might be handled or tracked by a group different than the CPAG such as the Project Management Office or within the business units. .

Question 3: Do you think the CPAG will substantially improve the achievement of BC/BS's strategic goals?

The CPAG will significantly improve the achievement of the BC/BS strategic goals. There is historical data that shows how increased executive support, more involvement of stakeholders, etc can significantly improve performance of projects and organizations as a whole.

MATERIAL REVIEW QUESTIONS

Question 1: Who in the governance structure has the longest serving role?

The project owner has the longest serving role. They begin work near the start of the project and continue just past project shutdown.

Question 2: Contrast the competitive necessity model with the operating necessity model. What are the advantages and disadvantages of each?

Both models are examples of nonnumeric models. Moreover, both models will tend to sustain an existing status quo and are subject to misuse in pursuit of hidden agendas of key stakeholders.

1) *Operating Necessity Model*: The operating necessity project is perceived as a necessity to maintain the status quo for operations. If the plant is flooded by a hurricane, it's an operating necessity to dry it out and restore production. The advantage of this model is that it involves little data and fairly obvious decisions. The disadvantage is that relying on it to solve problems may mask a long-term issue that needs to be solved in a manner other than firefighting. Perhaps, for example, the plant needs to be moved to a different location to prevent frequent flooding.

2) *Competitive Necessity Model*: The competitive necessity project is perceived as a necessity to keep from losing the current competitive position. For example, a video rental chain that operates in physical stores might decide to add an Internet based ordering facility to stay competitive with Internet only operations. The decision making process can seem simple, but the danger is similar to the operating necessity model. The "obvious" decision on what to do quickly to maintain a competitive position may, in fact, be the wrong thing to do in the long run.

Question 3: What is a sacred cow? Give some examples.
In the United States, the term "sacred cow" has become an idiom used to denote someone or something that is exempt from criticism. A senior manager's blind loyalty to an obsolete product or process they introduced to the company long ago is an example of a sacred cow. Another example would be a company's loyalty to a product line, like Hershey to chocolate, even if it were a money loser.

Question 4: Give an example of a Q-Sort process for project selection.
Q-Sort is a nonnumeric technique managers can use to evaluate comparative benefits associated with a list of potential projects. This type of selection model is useful when a goal has many potential alternatives for implementation. For example, what experiments should NASA engineers include in the next Mars Probe? What projects should be included in the company's R&D portfolio? Which archeology projects would best illustrate the lifestyle of the cave dwellers that inhabited Colorado in the first millennium AD?
A company may use this method to evaluate several projects to choose from. The potential projects could be grouped by the level of strategic importance, then by cost, then by time required to complete. By using this method, the "best" projects to start could be selected using these criteria.

Question 5: What are some of the limitations of project selection models?
Models, like projects, have characteristics that influence when a decision-maker should use the model.
Models cannot make decisions for its user. The user should understand the advantages and disadvantages of each model in reference to the goals associated with the scenario's reality. Each model will provide a limited viewpoint about the reality it represents. It may be beneficial to consider the model's appropriateness from different perspectives before actually using it to evaluate selection alternatives.
Although not specifically mentioned in the text, the following can be influenced as well:

1) The applicability of a model is one such characteristic that reflects the range of scenarios that the model can reasonably support.
2) The model should make a scenario more understandable by reducing its complexity. However, when a model reduces a scenario's complexity, an important distortion of the scenario may also be experienced. The distortion may happen because many important factors have been left out of the model in order to make it easier to use or more understandable to the user.

3) Models are only as good as the data they receive. Bad data will lead to a bad analysis.

Question 6: Contrast the real options selection approach with profitability models.
Profitability models analyze a potential project using a single criterion–monetary return. Time value of money may or may not be included in this analysis.
Real options models are based on the concept of investing now to create opportunities for the future. This model analyzes a potential project in terms of options it generates for a firm in the future. The investment may or may not be profitable or beneficial.

Question 7: How does the discounted cash flow method answer some of the criticisms of the payback period and average rate of return methods?
The models in this question fall into the general category of profitability models.

1) A payback-type model ignores cash flows beyond the payback period. Discounted cash flow method does not ignore cash flows beyond the payback period.
2) The payback-type model and rate of return model do not include discounting, ignores the timing of the cash flows and time–value of money. The discounted cash flow method is a model that includes discounting and does not ignore the timing of the cash flows and the time–value of money.

Question 8: What are some advantages and disadvantages of the profit/profitability numeric models?
A profitability model will assess the financial gain on the use of capital during a period of operations. Profitability models as a general class of models have advantages and disadvantages that include:
Advantages:

1) They are simple to use and understand.
2) Relevant data are available from the accounting system.
3) Business decision makers are familiar with the output formats.
4) With a few exceptions, model output is on an "absolute" profit/profitability scale and allows "absolute" go/no-go decisions.
5) Some profitability models can be amended to account for project risk.

Disadvantages:

1) Except for risk factors, these models ignore other nonmonetary factors.
2) Some of the profitability models do not evaluate the timing of cash flows.
3) Present value models have a short-term bias that tends to ignore long-run opportunities.
4) Payback-type models ignore cash flows beyond the payback period.
5) The internal rate return model can generate multiple solutions.
6) All models in this class are sensitive to data input errors, especially during the early periods of the project's planning horizon.

7) Discounting models are nonlinear. Hence, decision makers are seldom able to recognize the impact of changes (or errors) in the values of parameters used in the models.
8) All these models depend on input for the determination of cash flows, but it is not clear exactly how the concept of cash flow is properly defined for the purpose of evaluating projects.

Question 9: What is the desired result of applying project portfolio management? What do firms usually find happens?
The desired result is to evaluate each of the projects and continue with those that are closely related to the organization's mission, goals, and strategy. The project portfolio process also helps in monitoring and controlling the organization's strategic projects. Usually many firms find that only a few projects are checked for alignment with the organization's strategy before granting approval for a project. Thus, these kinds of projects neither add value nor help in gaining competitive advantage in accordance with the goals of a firm.

Question 10: Describe the discovery-driven planning approach.
The discovery driven planning approach model funds a portion of the project and tries to determine two important aspects about the project: the critical assumptions and the cost of testing each assumption. Analyzing the assumptions enables the management team to find out if a project continues to be as promising as was believed or a change of strategy is required.

Question 11: Describe the project portfolio management process.
A portfolio contains projects undertaken to support business goals. The eight-step project portfolio process of is as follows:
1) Establish a project council
2) Identify project categories and criteria
3) Collect project data
4) Assess resource availability
5) Reduce the project and criteria set
6) Prioritize the projects within categories
7) Select the projects to be funded and held in reserve
8) Implement the process

Question 12: Describe the various phases of governance for strategic projects and their purpose.
The four phases of governance for strategic projects are as follows:
1) Initiation of the project with a business case- The business case is used to describe the costs, benefits, justifications, etc for the proposed project. A clear set of goals and direction for the project are established here.

2) Planning- Planning consists of gathering more requirements, getting more people involved, and ultimately developing a plan of action that will be followed throughout the rest of the project.
3) Execution- After the plan is thoroughly created, the project leaders follow that plan as the execute the project. The purpose is to complete the project activities.
4) Benefits realization- This includes making sure that the benefits have been permanently achieved and operational responsibility is handed off to the functional manager and customers.
5) Routine use- This phase is when the users have full control of the deliverables and the project has come to fruition.

Question 13: Why do many researchers consider the first governance phase to be the most important?

Many researchers consider the first phase to be the most important because this is when the foundation of the proposed project is built and feasibility studies are conducted. At this point, project leaders investigate the costs and benefits of the project and ultimately decide whether to move forward or not. Without adequate analysis conducted at this point, projects may incorrectly be selected. This could waste time and money needlessly.

CLASS DISCUSSION QUESTIONS

Question 14: Which of the many purposes of project portfolio management are most important to a firm with a low project management maturity? Which to a firm with high maturity?

1) *Low project management maturity*:
   a) To make managers aware of the number of projects both proposed and underway.
   b) To identify proposed projects that are not really projects and that should be handled using other processes.
   c) To have managers achieve consensus on what criteria should be used to select projects.
   d) To limit the number of projects so the important projects can get the resources and attention they need for success.
   e) To eliminate projects that bypassed a formal selection process and may not provide benefits corresponding to their risks and/or costs.
   f) To keep from overloading the organization's available capacity.
   g) To balance short-, medium-, and long-term returns.
2) *High project management maturity*:
   a) To prioritize the list of available projects.
   b) To limit the number of projects so the important projects can get the resources and attention they need for success.
   c) To identify projects that best fit the organization's goals and strategy.

d) To identify projects that support multiple organizational goals and cross-reinforce other important projects.
e) To eliminate projects that incur excessive risk and/or cost.
f) To balance short-, medium-, and long-term returns.
g) To balance the resources with the needs of the organization.

Question 15: On what basis does the real options model select projects?
It attempts to estimate the opportunity cost of implementing the project now versus deferring its execution to sometime in the future. The decisions, once made, are often very expensive to reverse so caution should be exercised when making final decisions. The cost of the project reduced by deferring it.

Question 16: What is the difference between profitability and scoring models? Describe a model that could fit both categories.
Profitability models focus on financial considerations only. The scoring models evaluate multiple criteria by converting their values to a normalized scale that facilitates making a holistic decision capable of using both numeric and nonnumeric variables. Any scoring model can include profitability as a criterion, thus getting the best of both worlds.

Question 17: Contrast the window-of-opportunity approach with discovery-driven planning
The window of opportunity approach seeks to determine the cost, timing, and performance specification of a new technology in order to determine whether it can be useful to pursue development, while the discovery-driven planning approach funds a portion of the project and determines if the critical assumptions of the project come out to be true. The analysis of these results allows the team to identify flaws in its strategies and make necessary changes before heavy rework has to be done, thus increasing costs and time. The discovery-driven approach is often used in multiple phases of project development to keep the project on track and under control.

Question 18: Discuss how the following project selection models are used in real-world applications. (a) Capital investment with discounted cash flow. (b) Simulation models.
1) *Capital Investment with Discounted Cash flow*: For short-term capital projects, the impact of discounting rates may be insignificant to the overall project. Discounting is a nonlinear algorithm that increases its impact as the duration of a project increases. On long-term capital projects, the discounting models can be quite elaborate and may even drive work plans by delaying one or more expenditures to increase return on investment.
2) *Simulation Models*: Simulation models are easy to misuse, but when used properly can be very helpful. For most applications suitable for such an analysis, the project manager should seek competent advice from someone who has demonstrated expertise in creating and manipulating these models. Simulation models (discussed later) can also be used to estimate the probability of completing the project within a

given time frame at a given cost. Some organizations will require that such analysis be included in proposals they receive from prospective bidders.

Question 19: Why do you think managers underutilize project selection models?
There are several reasons why some managers may underutilize selection models:

1) In many organizations, the project managers are self-taught, so they may be unaware of these techniques.
2) Even if some of the managers are aware, their senior management may not be familiar or comfortable with selection models.
3) The managers may not think the models are worth the time and trouble. They believe that they get adequate results with the techniques they currently use.
4) Managers may believe that using analytic techniques will reduce their personal ability to influence the selection process. They may not want to give up their perceived power.

Question 20: Would uncertainty models be classified as profitability models, scoring models, or some other type of model?
Uncertainty models can be classified as one of the variety of models depending on how they are used. "Uncertainty" in this context means that the analyst has not estimated the probability of occurrence of something related to the project. This could be cost, cash flow, schedule, customer satisfaction, or environmental catastrophe. The list is endless. Since any of these factors could be part of a selection model, "uncertainty" and how it is handled could affect them all.

Question 21: Recent research on strategic projects has found that "scope" is much more important than either time or cost. Why do you think so**?**
Student answers will vary. Scope creep, or the tendency for projects to increase in size and complexity, is a common issue that project managers must deal with. In many cases, scope creep occurs because there isn't enough planning, especially related to requirements gathering from users, and it isn't until the project is underway that project team members realize that changes must be made to the plan.

Question 22: Are there certain types of projects that are better suited for nonnumeric selection methods as opposed to numeric ones?
When an organization can describe a project in terms of a compelling need for action, and when the called-for action will produce benefits in rough proportion to the costs of executing the project, nonnumeric selection models will often be adequate to approve the project. The compelling reason may be responding to an emergency situation like a flood. There isn't a lot of need to analyze the necessity for a response so nonnumeric criteria are fine. In other cases, numeric value may not be easily obtained to include in these models. In other cases, numeric methods may be more appropriate as in a case where cost estimates can be obtained.

Question 23: What important comparisons does the aggregate project plan in Figure 2-3 allow?
The size of the projects plotted on the array indicates the size/resource needs of the project and the shape may indicate another aspect of the project, e.g., internal/external, long/medium/ short term, or whatever aspect needs to be shown. The numbers indicate the order, or time frame, in which the projects are to be (or were) implemented, separated by category, if desired.
The aggregate project plan can be used for many purposes:

- To view the mix of projects within each illustrated aspect (shape)
- To analyze and adjust the mix of projects within each category or aspect
- To assess the resource demands on the organization, indicated by the size, timing, and number of projects shown
- To identify and adjust the gaps in the categories, aspects, sizes, and timing of the projects
- To identify potential career paths for developing project managers, such as team member of a derivative project, then team member of a platform project, manager of a derivative project, member of a breakthrough project, and so on

Question 24: Which roles in the governance structure do you think are the most well-defined and the least well-defined?
Student answers will vary. Some of the roles include: funder, champion, project owner, project manager, oversight (steering) committee, and PMO.

Question 25: If sustainability focuses on long-run profitability, why is it classified as a "non-numeric" model?
Sustainability not only covers profitability issues but also covers environmental issues and social issues. The metrics are yet to be developed to quantify the profits that sustainability achieves.

EXERCISES

Problem 1: Two new Internet site projects are proposed to a young start-up company. Project A will cost $250,000 to implement and is expected to have annual net cash flows of $75,000. Project B will cost $150,000 to implement and should generate annual net cash flows of $52,000. The company is very concerned about their cash flow. Using the payback period, which project is better, from a cash flow standpoint?
1) *Project A*: Payback Period = $250,000/$75,000 = 3.3 years.
2) *Project B*: Payback Period = $150,000/$52,000 = 2.9 years
Project B is better because it has a shorter payback period.

Problem 2: Sean, a new graduate at a telecommunications firm, faces the following problem his first day at the firm: What is the average rate of return for a

project that costs $200,000 to implement and has an average annual profit of $30,000?

Payback period = $200,000 / $30,000 = 6.7 years

Average rate of return = $30,000 / $200,000 = 15%

Problem 3: A four-year financial project has net cash flows of $20,000; $25,000; $30,000; and $50,000 in the next four years. It will cost $75,000 to implement the project. If the required rate of return is 0.2, conduct a discounted cash flow calculation to determine the NPV.

i = 20%					
	Investment	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**
Cashflow	$ (75,000)	$ 20,000	$ 25,000	$ 30,000	$ 50,000
PVIF	1.0000	1.2000	1.4400	1.7280	2.0736
PV $	$ (75,000)	$ 16,667	$ 17,361	$ 17,361	$ 24,113
NPV	$ 502				

Problem 4: What would happen to the NPV of the above project if the inflation rate was expected to be 4 percent in each of the next four years?

i = 24%					
	Investment	**Yr 1**	**Yr 2**	**Yr 3**	**Yr 4**
Cashflow	$ (75,000)	$ 20,000	$ 25,000	$ 30,000	$ 50,000
PVIF	1.0000	1.2400	1.5376	1.9066	2.3642
PV $	$ (75,000)	$ 16,129	$ 16,259	$ 15,735	$ 21,149
NPV	$ (5,729)				

The addition of 4% inflation makes the investment unfavorable at a hurdle rate of 24%.

Problem 5: A four-year financial project has estimates of net cash flows shown in the following table:

Year	Net Cash Flow
1	**$20,000**
2	**25,000**
3	**30,000**
4	**35,000**

It will cost $65,000 to implement the project, all of which must be invested at the beginning of the project. After the fourth year, the project will have no residual value.

Using the most likely estimates of cash flows, conduct a discounted cash flow calculation assuming a 20 percent hurdle rate with no inflation. (You may use either Excel® or a paper-and-pencil calculation.) What is the discounted profitability index of the project?

Year	Pessimistic	Most Likely	Optimistic	Used	PVIF	PV$
0	$(65,000)	$(65,000)	$(65,000)	$(65,000)	1	$(65,000)
1	$14,000	$20,000	$22,000	$20,000	1.200	$16,667
2	$19,000	$25,000	$30,000	$25,000	1.44	$17,361
3	$27,000	$30,000	$36,000	$30,000	1.728	$17,361
4	$32,000	$35,000	$39,000	$35,000	2.0736	$16,879
Rate	20%				**NPV**	$3,268

The column labeled "Used" indicates the cash flow value used to calculate the net present value.

The profitability index is the sum of the discounted cash flows divided by the initial investment. For this problem it is the sum of the PV's for years 1-4 divided by $65,000 or:

68,268/65,000 = 1.05

Since the value is greater than one, the project should be accepted (assuming everything else is equal).

Problem 6: Use a weighted score model to choose between three projects (A, B, C) for updating an important internal process. The relative weights for each criterion are shown in the following table as are the scores for each project on each criterion. A score of 1 represents unfavorable, 2 satisfactory, and 3 favorable.

		Project		
Category	**Weight**	**A**	**B**	**C**
Cost	**20**	**1**	**2**	**3**
Risk	**20**	**2**	**3**	**1**
Opportunity	**10**	**2**	**1**	**3**
Profitability	**10**	**3**	**3**	**2**
Sustainability	**10**	**2**	**1**	**1**
Safety	**25**	**1**	**2**	**3**
Competitiveness	**10**	**2**	**2**	**2**

In this example, Project C has the highest score, so the decision-maker would regard it as the best option. The instructor should emphasize that it is not necessary for the weights to sum to 100. It is only necessary that the model use the same scoring categories to evaluate each option.

		Project Options					
		Grade			*Score*		
Category	*Weight*	A	B	C	A	B	C
Cost	20	1	2	3	20	40	60
Risk	20	2	3	1	40	60	20
Opportunity	10	2	1	3	20	10	30
Profitability	10	3	3	2	30	30	20
Sustainability	10	2	1	1	20	10	10
Safety	25	1	2	3	25	50	75
Competitiveness	10	2	2	2	20	20	20
		Total Score			175	220	235

Problem 7: Develop a spreadsheet for Problem 6.

(a) What would your recommendation be if the weight for safety went down to 10 and the weight of profitability went up to 25?

		Project Options					
		Grade			*Score*		
Category	*Weight*	A	B	C	A	B	C
Cost	20	1	2	3	20	40	60
Risk	20	2	3	1	40	60	20
Opportunity	10	2	1	3	20	10	30
Profitability	25	3	3	2	75	75	50
Sustainability	10	2	1	1	20	10	10
Safety	10	1	2	3	10	20	30
Competitiveness	10	2	2	2	20	20	20
		Total Score			205	235	220

a) safety = 10 and profitability = 25
Due to the changes in weights, project B is now the best option.

(b) Suppose instead that project A received a score of 3 for safety. Would your recommendation change under these circumstances?

		Project Options					
		Grade			*Score*		
Category	*Weight*	A	B	C	A	B	C
Cost	20	1	2	3	20	40	60
Risk	20	2	3	1	40	60	20
Opportunity	10	2	1	3	20	10	30
Profitability	10	3	3	2	30	30	20
Sustainability	10	2	1	1	20	10	10
Safety	25	3	2	3	75	50	75
Competitiveness	10	2	2	2	20	20	20
		Total Score			225	220	235

The change in A's Safety grade was not sufficient to replace Project C as the best option.

c.) The vice president of finance has looked at your original scoring model and feels that tax considerations should be included in the model with a weight of 15. In addition, the VP has scored the methods on tax considerations as follows: project A received a score of 3, project B received a score of 2, and project C received a score of 1. How would this additional information affect your recommendation?

		Project Options					
		Grade			*Score*		
Category	*Weight*	A	B	C	A	B	C
Cost	20	1	2	3	20	40	60
Risk	20	2	3	1	40	60	20
Opportunity	10	2	1	3	20	10	30
Profitability	10	3	3	2	30	30	20
Sustainability	10	2	1	1	20	10	10
Safety	25	1	2	3	25	50	75
Competitiveness	10	2	2	2	20	20	20
Tax Considerations	15	3	2	1	45	30	15
		Total Score			220	250	250

Due to the insertion of tax considerations, Methods B and C are now the best options.

Problem 8: Nina is trying to decide in which of four shopping centers to locate her new boutique. Some locations attract a higher class of clientele than others, some are in an indoor mall, some have a much greater customer traffic volume than others, and, of course, rent varies considerably from one location to another. Because of the nature of her store, she has decided that the class of clientele is the most important consideration, the higher the better. Following this, however, she must pay attention to her expenses and rent is a major item, probably 90 percent as important as clientele. An indoor, temperature-controlled mall is a big help, however, for stores such as hers where 70 percent of sales are from passersby slowly strolling and window shopping. Thus, she rates this as about 95 percent as important as rent. Last, a higher traffic volume of shoppers means more potential sales; she thus rates this factor as 80 percent as important as rent. As an aid in visualizing her location alternatives, she has constructed the following table. A "good" is scored as 3, "fair" as 2, and "poor" as 1. Use a weighted score model to help Nina come to a decision.

	Location			
	1	**2**	**3**	**4**
Class of clientele	**Fair**	**Good**	**Poor**	**Good**
Rent	**Good**	**Fair**	**Poor**	**Good**
Indoor mall	**Good**	**Poor**	**Good**	**Poor**
Traffic volume	**Good**	**Fair**	**Good**	**Poor**

		Mall Options							
		Grade				***Score***			
Category	***Weight***	***1***	***2***	***3***	***4***	***1***	***2***	***3***	***4***
Class of clientele	1.000	2	3	1	3	2.000	3.000	1.000	3.000
Rent	0.900	3	2	1	3	2.700	1.800	0.900	2.700
Indoor mall	0.855	3	1	3	1	2.565	0.855	2.565	0.855
Traffic volume	0.720	3	2	3	1	2.160	1.440	2.160	0.720
		Total Score				9.425	7.095	6.625	7.275

Based upon the evaluation of categories, Nina should select Mall Option 1.

Problem 9: Referring to Problem 8, develop a spreadsheet to help Nina select a location for her boutique. Suppose Nina is able to negotiate a lower rent at location 3 and thus raise its ranking to "good." How does this affect the overall rankings of the four locations?

Change the grade for Location 3's rent to 3.

		Mall Options							
		Grade				*Score*			
Category	***Weight***	***1***	***2***	***3***	***4***	***1***	***2***	***3***	***4***
Class of clientele	1.000	2	3	1	3	2.000	3.000	1.000	3.000
Rent	0.900	3	2	3	3	2.700	1.800	2.700	2.700
Indoor mall	0.855	3	1	3	1	2.565	0.855	2.565	0.855
Traffic volume	0.720	3	2	3	1	2.160	1.440	2.160	0.720
		Total Score				9.425	7.095	8.425	7.275

Due to the rent change, Location 3 moves up from last place to second place based upon the grades assigned to the evaluated categories.

INCIDENTS FOR DISCUSSION

Portillo, Inc.

Questions: **How can Ms. Portillo find out if her suspicions are correct? What are her options if her idea is supported?**

This case is a good lead in to the whole subject of estimates. The students should, even at the college level, be able to share experiences of estimate being manipulated either up or down to support an agenda. This could be his or her own inflating of how long it will take to get something done, or a supervisor arbitrarily cutting budgets.

Ms. Portillo has discovered a fundamental truth about estimates, namely that they are always wrong. While the estimates that have been used to base the business decisions on may be technically wrong, she needs to ask whether they have still been useful. In other words, do the errors and biases cancel each other out enough to still lead to the right decision for the business? Nonetheless, she needs to share her findings with the committee. Here are some things to do to improve the accuracy of the estimates:

1. For the projects that are selected, compare the actual outcomes to the estimates to develop a database of estimating bias. The techniques for this are described in Chapter 7.
2. Train her managers on a consistent tool set and process for estimating and then follow it.
3. Allow the management team to challenge each other's estimates during the project selection process. An alternative would be to prohibit the sponsor from taking part in the decision for his or her product.
4. Bring in outside consultants to independently estimate selected projects.

L & M Power

Questions: **Would you use this model? Why or why not?**

This case is a good opportunity, particularly for college students, to try and put themselves in the place of a company promoting a high visibility project. What are all the factors that must be considered to have both the reality and perception of a successful

project? How should these factors be considered in the internal process of selecting a project?
These are expensive, high visibility projects dealing with politically sensitive issues. The financial model has some useful information, but using it by itself would lead to a woefully inadequate selection process. This simple financial model does not take into account legal, environmental, safety, or community issues. It says nothing about the risk of either project completing within cost and schedule, or the risk of problems in the subsequent operations. It's not clear how this project fits into the organization's long-term goals, and this model does nothing to further that knowledge.

CASE: Pan-Europa Foods S.A.

Question 1: Strategically, what must Pan-Europa do to keep from becoming the victim of a hostile takeover? What rows/categories in Exhibit 2 will thus become critically important this coming year? What should Pan-Europa do now that they have won the price war? Who should lead the way for Pan-Europa?

1) Pan-Europa is currently trading at a price below comparable companies. This is because of reduced profitability and a failure to gain sufficient market share for new products. As analysts are giving a "sell" signal, raiders are potentially buying up the stock. Clearly then they must pursue strategies that drive up their stock price. This includes increasing net income and gross sales.
2) Pan-Europa needs to capitalize on their hard earned increased market share.
3) Humbolt and Morin should be leading the charge on this strategy.

Question 2: Using NPV, conduct a straight financial analysis of the investment alternatives and rank the projects. Which NPV of the three should be used? Why? Suggest a way to evaluate the effluent project.

Exhibit 3 presents three different ways to look at the data. While the NPV at the minimum accepted ROR includes a risk premium, it doesn't correct for the varying durations of the project. Instead the best available data would be the Equivalent Annuity that corrects for the project durations. Using this analysis the preferred project would be 11, the Strategic Acquisition. Then following in order would be:

- Eastward Expansion
- Snack Foods
- Southward Expansion
- Inventory Control System
- Artificial Sweeteners
- New Plant
- Expanded Plant
- Automation and Conveyor System
- Expand Truck Fleet
- Effluent Treatment Program (which has no NPV)

While the Effluent Treatment Program has no formal NPV, it can be considered an investment of $4 million now to save a cost of $10 million in 4 years.

Question 3: What aspects of the projects might invalidate the ranking you just derived? How should we correct for each investment's time value of money, unequal lifetimes, riskiness, and size?

There are many aspects that could invalidate the simple NPV analysis of the projects. They include:

1) Risk
2) Political considerations
3) Regulatory issues including health, safety, and environmental
4) Incompatibility with the corporate strategy
5) Resource availability
6) Impact on brand or corporate image
7) Quality and certainty of the data used for analyzing the various projects
8) Synergies between the projects

Different analysis techniques and different assumptions can be used to correct for the various factors that affect each project differently. For example:

- The time value of money can be accounted for, by using discounting methods such as NPV or IRR.
- Unequal lifetimes of the projects can be accounted for by calculating the NPV to infinity or using Equivalent Annuities.
- Risk can be accounted for (at least financially) by increasing the hurdle rate.
- The different project sizes can be accounted for by multiplying the NPV by the ratio of the size of the projects or by using a profitability ratio.

Question 4: Reconsider the projects in terms of:

- **are any "must do" projects of the nonnumeric type?**
- **what elements of the projects might imply greater or lesser riskiness?**
- **might there be any synergies or conflicts between the projects?**
- **do any of the projects have nonquantitative benefits or costs that should be considered in an evaluation?**

1) Project 6, the effluent water treatment plants is a "must do" project to meet regulatory requirements; it's just a question of when. Project 5 is potentially one as well, depending on the regulatory environment in which Pan-Europa's safety record is measured. Both safety and environment may be significant issues to the corporation's image and stockholders, which would tend to elevate their importance.
2) Projects that involve small technology changes like expanding the truck fleet would have low risk. Increasing levels of technological sophistication, such as automation or introducing artificial sweeteners, into products would also increase implementation risks. Another risk area for any producer in a capitalist environment is attempting to increase markets with new products in new areas. The prospective customers may simply choose to not buy the product. Other elements of risk include project size, complexity, and length of the period of return.
3) There are real synergies between the plant expansion/additions, automation, truck upgrade, and geographic expansion projects. The potential exists as well for conflicts

arising from resource constraints. These include financial, human, and other due to the fact that there are limited resources.

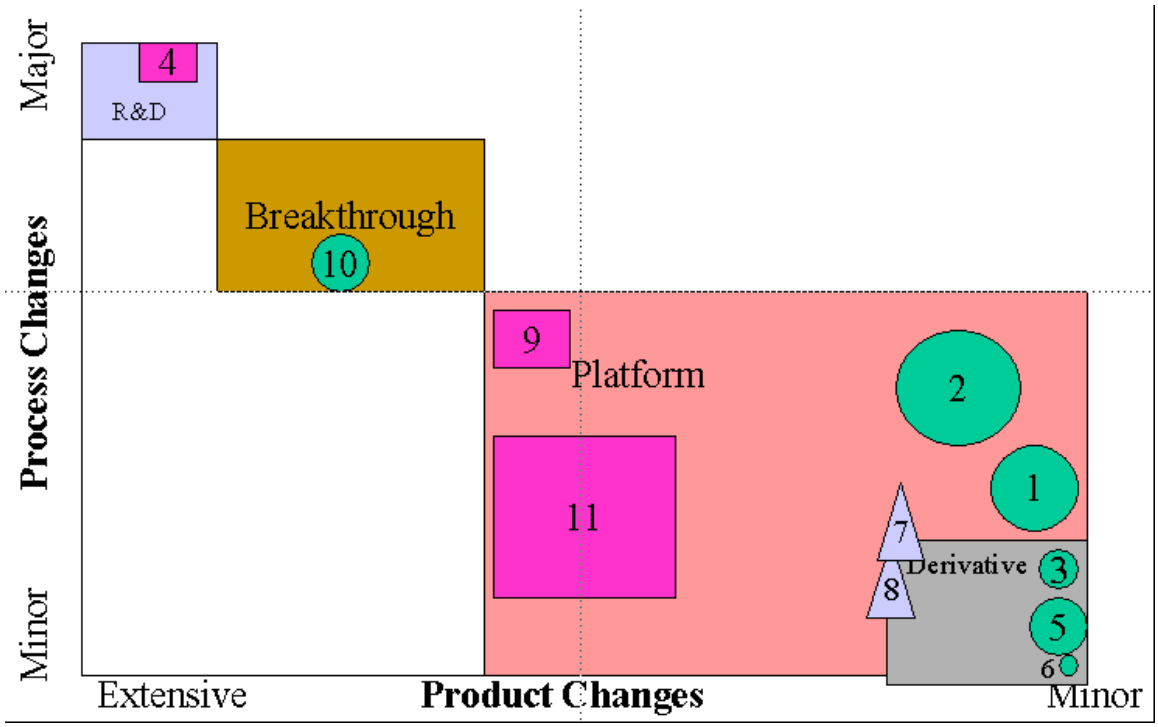
4) Projects that have nonquantitative costs and benefits would include:
   - Projects that impact the company's regulatory compliance such as effluent treatment (environment) and warehouse automation (safety) have nonquantitative costs and benefits.
   - Several of the projects could impact the company's image. For example, the snack food rollout could be positive because of its wholesome connotations, while the acquisition of the schnapps brand could be negative. The effluent project could be positive by showing the company's willingness to act on environmental concerns early. Similarly, the automation project could cast a positive step towards increased safety. The plant expansion project may be positive or negative, depending on whether the community reacts to new jobs or factory encroachment.

Question 5: Considering all the above, what screens/factors might you suggest to narrow down the set of most desirable projects? What criteria would you use to evaluate the projects on these various factors? Do any of the projects fail to pass these screens due to their extreme values on some of the factors?

1) I would recommend these five screens:
   - Is the project a "Must Do" for reasons outside of the company's control?
     - Criteria – Yes/No
   - Does the project meet the company policy for minimum IRR?
     - Criteria –Yes/No
   - Does the project meet the company policy for maximum payback period?
     - Criteria – Yes/No
   - Does the project incur excessive risk?
     - Criteria – Yes/No
   - Does the project meet the current corporate strategy?
     - Criteria – Yes/No
2) Using these screens and criteria the following projects would be eliminated outright:
   - Truck Fleet (1) because it does not meet the minimum IRR and exceeds the maximum payback period dictated by company policy.
   - New Plant (2), Plant Expansion (3), Artificial Sweetener (4), and Plant Automation (5) all because they exceed the maximum payback period dictated by the company policy.
   - Strategic Acquisition (11) and Artificial Sweetener (4) would both be eliminated due to excessive risk.
   - Strategic Acquisition (11) would also be eliminated because it does not match the current strategy.

Question 6: Divide the projects into the four project categories of derivative, platform, breakthrough, and R&D. Draw an aggregate project plan and array the projects on the chart.

The projects would be arrayed as follows using the categories:



Question 7: Based on all the above, which projects should the management committee recommend to the Board of Directors?

The following reading describes the approach Hewlett-Packard uses to select and monitor its projects for relevance to the firm's strategic goals. The article describes the behavioral aspects of the process as well as many of the technical tools, such as the aggregate project plan, the plan of record, and the software aids they employed. In addition, the authors give tips and identify pitfalls in the process so anyone else implementing their approach will know what problems to watch out for.

Applying the criteria to the projects would yield the following recommendations for the 1993 projects:

				Screen 1	Screen 2	Screen 3	Screen 4	Screen 5	1993 Selections
No.	Description	Categories	Cost	Must Do	IRR	Payback	Risk	Strategy	Investment
1	Expand Truck Fleet	Incremental	22	No	Not Ok	Not Ok	Ok	Ok	
2	New Plant	Incremental	30	No	Ok	Not Ok	Ok	Ok	
3	Expanded Plant	Incremental	10	No	Ok	Not Ok	Ok	Ok	
4	Artificial Sweetener	Breakthrough	15	No	Ok	Not Ok	Not Ok	Ok	
5	Automation and Conveyor	Platform	14	No	Ok	Not Ok	Ok	Ok	
6	Effluent Treatment	Incremental	4	Yes	Ok	Ok	Ok	Ok	4
7	Eastward Expansion	Platform	20	No	Ok	Ok	Ok	Ok	20
8	Southward Expansion	Platform	20	No	Ok	Ok	Ok	Ok	20
9	Snack Foods	Platform	18	No	Ok	Ok	Ok	Ok	18
10	Inventory Control	Incremental	15	No	Ok	Ok	Ok	Ok	15
11	Strategic Acquisition	Platform	40	No	Ok	Ok	Not Ok	Not Ok	
									77
	Investment Cap		80						

These projects would total 77 million ECU, leaving a prudent reserve for unforeseen circumstances.

READING: From Experience: Linking Projects to Strategy

Question 1: Why are successful projects so important to Hewlett-Packard?
Two thirds of the revenue at HP was derived from products introduced within the past two years. Projects are an important component of business strategy to sustain profitable products in a dynamic marketplace.

Question 2: How far should an evaluation team go in trying to quantify project contributions to the firm's mission or goals? What is the role of financial selection criteria in HP's project selection process?
The team should establish criteria that support business goals rather than personal agendas. The financial selection criteria are intended to ensure that the projects generate a sufficient return on investment within a defined time frame. They are also intended to recognize that financial success is reflected in the portfolio of projects rather than in the financial contributions of individual projects.
As suggested in Figure 3, financial criteria are an important but small part of the business value created by projects. Senior managers recognize the value of qualitative contributions to business value, so it is not always necessary to quantify a project's contributions to business value.

Question 3: Considerable attention is paid to the measures HP uses to evaluate its projects. Is the aim of carefully defining these measures to simplify the project selection process or something else?
The objective is to select the right mix of projects required to support business success. Prioritizing projects and selecting the vital few from the necessary may help to get more work done in support of business goals. By carefully defining criteria, people are aided in developing an understanding of the company's strategy and the types of projects required to achieve success. From the improved understanding, proposed projects will be better aligned with business objectives.

Question 4: What do the aggregate project plan and the plan of-record illustrate to upper management?
The Plan of Record records the results of the selection process. It shows the mix across categories with the priority and resource needs (headcount) of each project. The Plan of Record also shows "out-plan" projects, those that show promise but haven't yet made it through the decision process. This gives visibility to a pool of possible projects, if one of the chosen ones terminates early for some reason. It also displays the relative priority and the rough schedule of performance for the selected projects.
The aggregate project plan combines a number of important factors in an easy to understand visual format. As described in the text, this includes the number and type of projects, their relative size, timing, history and where they fall on the scales of innovation for both products and processes. It is possible to see gaps and excesses in each category as well as the mix among the categories and the degree of product and process change. This graphic allows comparison of the types of projects being conducted, the number of projects in each type with the relative size of the resources and investments. Different project portfolios' proposals can be readily compared for discussion purposes or with past years' selections.

Question 5: When should out-plan projects be reconsidered for inclusion?
They should be considered for inclusion when it is favorable for the company to do so. For example, if missing data becomes known, the project may be reconsidered. Alternatively, if another project is cancelled or completed, the freed-up funds could be applied to an out-plan project. Additionally, out-plan projects might be placed in the pipeline during a review of the portfolio of projects.

Question 6: What was your impression of the impact that HP's project selection process had on the number of projects underway? How do you expect HP would score on project management maturity?
It reduced the number of projects authorized for execution and probably changed the mix of projects approved for execution. In one case, the reported reduction decreased the pipeline projects from 120 to 30. In another area, the projects were decreased from 50 to 17. Part of the reason for this reduction was better focus.
HP would be more mature than organizations that lacked a project selection process attempting to link business success to project strategies. The discipline and focus provided by techniques described in the article are indicators of a high level of project management maturity.

Question 7: How did the new project selection process handle non-numeric type projects? Risk? How did this new process alter new project proposals at HP?
New proposals have been altered to address the measurable criteria used to select projects. This has helped to focus behavior on activities that win for the business. It also uses the portfolio approach to help manage risks inherent in generating revenues from outputs produced by projects. In addition to numeric criteria, nonnumeric projects are handled in a separate category of projects. Also refer to the answers for questions 2 and 3 of this reading assignment.

