Chapter 3
Project Selection and Portfolio Management

By

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Objectives

1. Project Selection
2. Approaches to Project Screening and Selection
3. Financial Models
4. Project Portfolio Management

Good Projects

Discover or create something new:

- Technology evaluation.
- Applied Research.
- Fundamental Research

Project Selection

- Project selection is the process of evaluating individual projects or groups of projects, and then choosing to implement some set of them so that the objectives of the parent organization will be achieved

- Managers often use *decision-aiding models* to extract the relevant issues of a problem from the details in which the problem is embedded

- Models represent the problem's structure and can be useful in selecting and evaluating projects

Project Selection

- What are you trying to do? Articulate your goals using absolutely no jargon.
- How is it done today, and what are the limitations of current practice?
- What is new in your approach, and why do you think it will be successful?
- Who cares? If you are successful, what difference will it make?
- What are the risks and payoffs?
- How much will it cost? How long will it take?
- What are the midterm and final exams' to check for success?

Criteria of Project Selection Models

- **Realism** - reality of manager's decision
- **Capability**- able to simulate different scenarios and optimize the decision
- **Flexibility** - provide valid results within the range of conditions
- **Ease of Use** - reasonably convenient, easy execution, and easily understood
- **Cost** - Data gathering and modeling costs should be low relative to the cost of the project
- **Easy Computerization** - must be easy and convenient to gather, store and manipulate data in the model

Nature of Project Selection Models

- Models do not give any decision
- Partially represent the reality

Screening & Selection Issues

- The list of factors that can be considered when evaluating project alternatives is enormous.
  1. Risk – unpredictability to the firm
  2. Commercial – market potential
  3. Internal operating – changes in firm operations
  4. Additional – image, patent, fit, etc.

- ***All models*** only ***partially reflect reality*** and have ***both objective and subjective*** factors imbedded

Project Selection Models

1. Scoring Models

- ❑Unweighted 0-1 Factor Model
- ❑Unweighted Factor Scoring Model

} **Checklist model**

- ❑Weighted Factor Scoring Model ➡ **Simplified scoring models**

2. Analytic hierarchy process

3. Profile models

4. Financial models

Checklist Model: Unweighted 0-1 Factor Model

- A set of relevant factors is selected by management and then usually listed in a preprinted form.
- One or more raters score the project on each factor, depending whether or not it qualifies for an individual criterion.

- The criteria for choices are:
  - A clear understanding of organizational goals
  - A good knowledge of the firm's potential project *portfolio*
- Advantage of this model is that it uses several criteria.
- Disadvantages are that it assumes all criteria are of equal importance and it allows for no gradation of the degree to which a specific project meets the various criteria.

Checklist Model: Unweighted 0-1 Factor Model

Project Criteria	Qualifies	Not Qualifies
A Payoff Potential	x	
Lack of Risk	x	
Safety		x
Competitive Advantage	x	
Total Score	3	1

Checklist Model: Unweighted 0-1 Factor Model

		Performance on Criteria		
Project	**Criteria**	**High**	**Medium**	**Low**
Project Alpha	Cost	X		
	Profit potential			X
	Time to market		X	
	Development risks			X
Project Beta	Cost		X	
	Profit potential		X	
	Time to market	X		
	Development risks		X	
Project Gamma	Cost	X		
	Profit potential	X		
	Time to market			X
	Development risks	X		
Project Delta	Cost			X
	Profit potential			X
	Time to market	X		
	Development risks		X	

Simplified Checklist Model for Project Selection

Checklist Model: Unweighted Factor Scoring Model

- This model is used by constructing a simple linear measure of the degree to which the project being evaluated meets each of the criteria.
- Often a five-point scale is used to evaluate the project.
- A variant of this selection process might choose the highest scoring project.
- The criteria are all assumed to be of equal importance.

Checklist Model: Unweighted Factor Scoring Model

Project Criteria	Project A	Project B	Project C	Project D
A Payoff Potential	High	Low	Medium	High
Lack of Risk	Low	Medium	Medium	High
Safety	High	Medium	Low	Medium
Competitive Advantage	Medium	Medium	Low	Medium

High = 3
Medium = 2
Low = 1

Checklist Model: Unweighted Factor Scoring Model

Project Criteria	Project A	Project B	Project C	Project D
A Payoff Potential	3	1	2	3
Lack of Risk	1	2	2	3
Safety	3	2	1	2
Competitive Advantage	2	2	1	2
Total	**9**	**7**	**6**	**10**

Simplified Scoring Models
(Weighted Factor Scoring Model)

- In the simplified scoring model, each criterion is ranked according to its relative importance.
- Our choice of projects will thus reflect our desire to maximize the impact of certain criteria on our decision.

Criterion	Importance Weight
Time to market	3
Profit potential	2
Development risks	2
Cost	1

Simplified Scoring Models

Each project receives a score that is the weighted sum of its grade on a list of criteria. Scoring models require:

1. agreement on *criteria*
2. agreement on *weights* for criteria
3. a *score* assigned for each criteria

$$Score = \sum (Weight \times Score)$$

Relative scores can be misleading!

Simplified Scoring Models

Project	Criteria	(A) Importance Weight	(B) Score	(A) × (B) Weighted Score
Project Alpha				
	Cost	1	3	3
	Profit potential	2	1	2
	Development risk	2	1	2
	Time to market	3	2	6
	Total Score			13
Project Beta				
	Cost	1	2	2
	Profit potential	2	2	4
	Development risk	2	2	4
	Time to market	3	3	9
	Total Score			19
Project Gamma				
	Cost	1	3	3
	Profit potential	2	3	6
	Development risk	2	3	6
	Time to market	3	1	3
	Total Score			18
Project Delta				
	Cost	1	1	1
	Profit potential	2	1	2
	Development risk	2	2	4
	Time to market	3	3	9
	Total Score			16

Analytic Hierarchy Process (AHP)

The AHP is a four step process:

1. Construct a hierarchy of *criteria and subcriteria*
2. *Allocate weights* to criteria
3. Assign *numerical values* to evaluation dimensions
4. *Scores determined* by summing the products of numeric evaluations and weights

Unlike the simple scoring model, these scores can be compared!

Analytic Hierarchy Process (AHP)

- Determine the selection criteria
  - Your interests; technical complexity; creativity; innovation; marketing potential; etc.
- Determine the weighting for each criteria
- Create the AHP
- Review the scores and adjust as needed!

Analytical Hierarchy Process

Car Selection

- Selection Criteria
  - Cost
  - Safety
  - Design
  - Brand name
- Possible Selections
  - Honda CRV ($21)
  - Hyundai Tucson ($18K)
  - Toyota RAV4 ($22K)

Analytical Hierarchy Process

Car Selection

- Scaling for comparing selection criteria:
  - 1 = equal
  - 3 = Moderate
  - 5 = Strong
  - 7 = Very Strong
  - 9 = Extreme
- Comparison of the selection criteria

Cost is three times more important than design

	Purchase cost	Safety	Design	Brand name
Purchase cost	1	1	3	7
Safety	1	1	5	9
Design	1/3	1/5	1	3
Brand name	1/7	1/9	1/3	1

Analytical Hierarchy Process

Car Selection

- Scaling for comparing selection criteria:
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  - 5 = Strong
  - 7 = Very Strong
  - 9 = Extreme
- Comparison of the selection criteria

$$\text{Geometric mean} = \sqrt[n]{a_1 a_2 \cdots a_n}.$$

$$\sum_i \omega_i = 1.$$

	Purchase cost	Safety	Design	Brand name	Geometri Mean	Weights
Purchase cost	1	1	3	7	2.1	0.37
Safety	1	1	5	9	2.6	0.46
Design	1/3	1/5	1	3	0.7	0.12
Brand name	1/7	1/9	1/3	1	0.3	0.05

Power(21,1/4)

2.1/5.7=0.37

Analytical Hierarchy Process

Car Selection

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Design	1/3	1/5	1	3	0.7	0.12
Brand name	1/7	1/9	1/3	1	0.3	0.05

Power(21,1/4)

Total=5.7

2.1/5.7=0.37

Total=1

Profile Models

Profile models allow managers to plot **risk/return** options for various alternatives and then select the project that maximizes return while staying within a certain range of minimum acceptable risk.

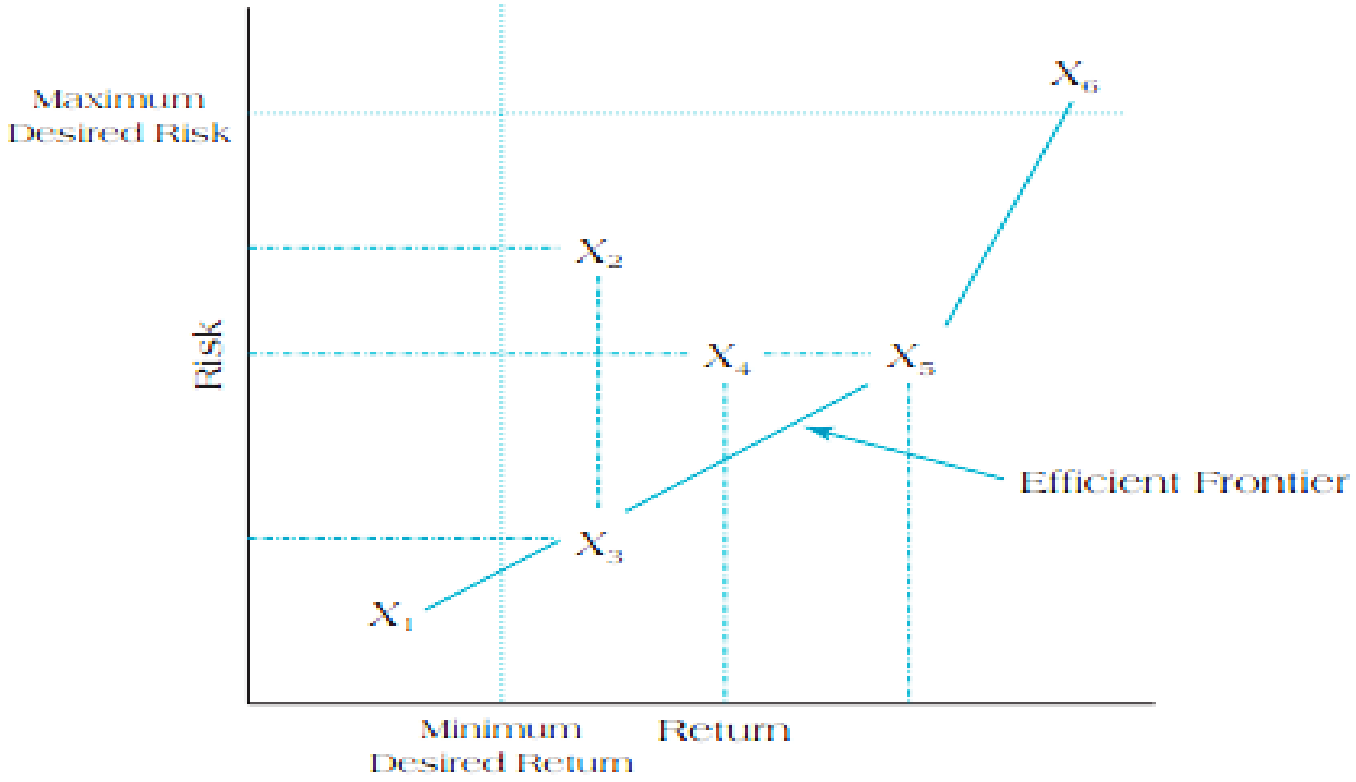
Profile Models

- Profile models are another method for visually representing and comparing project alternatives.

- Profile models allow the organization to plot risk/return options for various project alternatives, and then select the project that maximizes return while staying within minimum acceptable risk.

Profile Models

Show risk/return options for projects.



Profile Models

Profile models also have disadvantages:

1. They limit decision criteria to just two—risk and return. (i.e. safety, quality, and reliability)

2. Expected return is a measure that is naturally given to numerical estimate. But because risk may not be readily quantified, it may be misleading to designate “risk” artificially as a value for comparison among project choices.

Financial Models

Based on the time value of money principal

- Payback period
- Net present value
- Internal rate of return
- Options models

All of these models use discounted cash flows

Payback Period

Determines *how long* it takes for a project to reach a breakeven point

$$Payback\ Period = \frac{Investment}{Annual\ Cash\ Savings}$$

Cash flows should be discounted

Lower numbers are better ***(faster payback)***

Payback Period Example

- if we invested $150,000 and would receive $30,000 a year in annual savings, the payback period is straightforward:

Payback period = $150,000/$30,000 = 5 years

Net Present Value (NPV)

- Projects the change in the firm's stock value if a project is undertaken.

- Positive NPV means attractive financial return, and larger NPV means more attractive project alternative.

$$NPV = I_o + \sum \frac{F_t}{(1 + r + p_t)^t}$$

where

F_t = *net cash flow for period* t

R = *required rate of return*

I = *initial cash investment*

P_t = *inflation rate during period* t

Net Present Value Example

Should you invest $60,000 in a project that will return $15,000 per year for five years? You have a minimum return of 8% and expect inflation to hold steady at 3% over the next five years.

Year	Net flow	Discount	NPV
0	-$60,000	1.0000	-$60,000.00
1	$15,000	0.9009	$13,513.51
2	$15,000	0.8116	$12,174.34
3	$15,000	0.7312	$10,967.87
4	$15,000	0.6587	$9,880.96
5	$15,000	0.5935	$8,901.77
			-$4,561.54

The NPV column total is negative, so don't invest!

Internal Rate of Return

A project must meet a *minimum rate of return* before it is worthy of consideration.

$$IO = \sum_{n=1}^{t} \frac{ACF_t}{(1+IRR)t}$$

Higher IRR values are better!

where

ACF_t = *annual after tax cash flow for time period t*

IO = *initial cash outlay*

n = *project's expected life*

IRR = *the project's internal rate of return*

Internal Rate of Return Example

A project that costs $40,000 will generate cash flows of $14,000 for the next four years. You have a rate of return requirement of 17%; does this project meet the threshold?

Year	Net flow	Discount	NPV
0	-$40,000	1.0000	-$40,000.00
1	$14,000	0.9009	$12,173.91
2	$14,000	0.8116	$10,586.01
3	$14,000	0.7312	$9,205.23
4	$14,000	0.6587	$8,004.55
			-$30.30

This table has been calculated using a discount rate of 15%

The project doesn't meet our 17% requirement and *should not be considered further*.

Options Models

NPV and IRR methods don't account for failure to make a positive return on investment. Options models allow for this possibility.

Options models address:

1. *Can the project be postponed?*
2. *Will future information help decide?*

Project Portfolio Management

The systematic process of selecting, supporting, and managing the firm's collection of projects.

Portfolio management requires:

decision making,

prioritization,

review,

realignment, and

reprioritization of a firm's projects.

Keys to Successful Project Portfolio Management

1. **Flexible structure** and freedom of communication
   - Multiple-project environments cannot operate effectively when they are constrained by restrictive layers of bureaucracy, narrow communication channels, and rigid development processes.
   - Successful portfolios emerge from environments that foster flexibility and open communication.

Keys to Successful Project Portfolio Management

2. Low-cost environmental scanning

- Successful project portfolio strategies call for launching a number of low-cost probes into the future.

- The idea behind environmental scanning—developing and market-testing a number of experimental product prototypes, sometimes by entering strategic alliances with potential partners.

Keys to Successful Project Portfolio Management

3. Time-paced transition

- Successful portfolio management requires a sense of timing, especially as firms make transitions from one product to the next.

- Successful firms use project portfolio planning routinely to develop long lead times and plan ahead in order to make the smoothest possible transition from one product to another, whether the product lines are diverse or constitute creating a follow-on upgrade.

Problems in Implementing Portfolio Management

- Conservative technical communities
- Out of sync projects and portfolios
- Unpromising projects
- Scarce resources