Midterm Assignment

Software Project Management

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1. Explain Cost benefit analysis with an example solved

Answer:

A cost-benefit analysis is a process businesses use to analyze decisions.Before building a new plant or taking on a new project, prudent managers conduct a cost-benefit analysis to evaluate all the potential costs and revenues that a company might generate from the project. The outcome of the analysis will determine whether the project is financially feasible or if the company should pursue another project.

A cost-benefit analysis (CBA) is the process used to measure the benefits of a decision or taking action minus the costs associated with taking that action.

The costs involved in a CBA might include the following:

- Direct costs would be direct labor involved in manufacturing, inventory, raw materials, manufacturing expenses.
- Indirect costs might include electricity, overhead costs from management, rent, utilities.
- project, delivery delays of product, employee impact.
- Opportunity costs such as alternative investments, or buying a plant versus building one.
- Cost of potential risks such as regulatory risks, competition, and environmental impacts.

Two steps:

1. Identify and estimate all the costs and benefits of carrying out the project
2. Express the costs and benefits in a common unit for easy comparison

Benefits might include the following:

- Revenue and sales increases from increased production or new product.
- Intangible benefits, such as improved employee safety and morale, as well as customer satisfaction due to enhanced product offerings or faster delivery.

- Competitive advantage or market share gained as a result of the decision.

Example: (where negative values represent net expenses, positive values represent net incomes)

Assumptions:

- 1. Cash flow take place at the end of each year.

- 2. The year 0 figure represents the initial investment made at the start of the project.

Year	Project 1	Project 2	Project 3	Project 4
0	-100,000	-1,000,000	-100,000	-120,000
1	10,000	200,000	30,000	30,000
2	10,000	200,000	30,000	30,000
3	20,000	200,000	30,000	30,000
4	20,000	200,000	20,000	25,000
5	100,000	350,000	20,000	50,000
Net Profit	60,000	150,000	30,000	45,000
Payback	5	5	4	4
ROI	12%	4%	6%	7.5%

Cost-benefit Evaluation Techniques

1. Net present value (NPV)

    It is the sum of the present values of all future amounts

    $$NPV = \sum_{t=0}^{n} \frac{C_t}{(1+i)^t}$$

2. Internal Rate of Return (IRR)

    The percentage discount rate that would produce a NPV of zero

    $$0 = CF_0 + \frac{CF_1}{(1 + IRR)} + \frac{CF_2}{(1 + IRR)^2} + \frac{CF_3}{(1 + IRR)^3} + \dots + \frac{CF_n}{(1 + IRR)^n}$$

    Or

    $$0 = NPV = \sum_{n=0}^{N} \frac{CF_n}{(1 + IRR)^n}$$

Where:
CF_0 = Initial Investment / Outlay
$CF_1, CF_2, CF_3 \dots CF_n$ = Cash flows
n = Each Period
N = Holding Period
NPV = Net Present Value
IRR = Internal Rate of Return

2.What is FPA and OPA, Solve an example

FPA is a top-down approach.

Developed by Albrecht (1979) and later refined by Albrecht and Gaffney (1983)

Used in development with 3GL (3rd Generation Language)

LOC means Line of Code (programming statement)

For COBOL, the LOC per FP is 91.

For C, the LOC per FP is 128

Software system consists of five major components (or, *external user types*)

- External input types
- External output types
- Logical internal file types
- External interface file types
- External inquiry types

Identify each instance of each external user type in the proposed system

Classify each instance as having high, medium or low complexity

Assign the FP of each instance

FP of the system = sum of FP of individual components

Function Point Analysis

Number of FPs	Complexity		
External user type	Low	Average	High
External input type	3	4	6
External output type	4	5	7
Logical internal file type	7	10	15
External interface file type	5	7	10
External inquiry type	3	4	6

Function   Point Analysis–

Example

A component of an inventory system consisting of 'Add a record', 'Delete a record', 'Display a record', 'Edit a record', and 'Print a record' will have

- ◦ 3 external input types

- ◦ 1 external output type

- ◦ 1 external inquiry type

Then, assign FPs based on the complexity of each type

Object Point Analysis

Similar to function point analysis

Used on 4GL development projects

	Number and source of data tables		
Number of views contained	Total < 4 (<2 server, <2 client)	Total < 8 (2-3 server, 3-5 client)	Total 8+ (>3 server, >5 client)
< 3	Simple	Simple	Medium
3 – 7	Simple	Medium	Difficult
8+	Medium	Difficult	Difficult

Takes account of features that may be more readily identifiable if the system is built on high-level application building tools

Steps:

   Identify the number of screens, reports and 3GL components

   Classify each object as Simple, Medium and Difficult

   Assign the weight accordingly

   Calculate the total object points

Total OP = sum of individual OP × weighting

   Deduct the reused objects (r% reused)

NOP = OP × (1 − r%)

   Identify the productivity rate of both developer and CASE

   Productivity rate = average of the two PRs

   Calculate the effort

Effort = NOP / Productivity Rate

Object Point Analysis –Screens

Object Point Analysis –Reports

	Number and source of data tables		
Number of sections contained	Total < 4 (<2 server, <2 client)	Total < 8 (2-3 server, 3-5 client)	Total 8+ (>3 server, >5 client)
< 2	Simple	Simple	Medium
2 or 3	Simple	Medium	Difficult
> 3	Medium	Difficult	Difficult

Object Point Analysis – Complexity Weightings

Type of object	Complexity		
	Simple	Medium	Difficult
Screen	1	2	3
Report	2	5	8
3GL component	N/A	N/A	10

Object Point Analysis –Productivity Rate

	Very low	Low	Nominal	High	Very High
Developer's experience and capability	4	7	13	25	50
CASE maturity and capability	4	7	13	25	50

3.Perform Cocomo II estimation on any scenario from google.

Answer:

COCOMO-II takes into account different approaches to software development, reuse, etc.

Long history – initially published in 1981 (COCOMO-81) and last in 1999 (COCOMO-II)

The basic model equation

$$\text{Effort} = \text{Constant} \times (\text{Size})^{\text{scale factor}} \times \text{Effort Multiplier}$$

- ◦ Effort in terms of person-months
- ◦ Constant: 2.45 in 1998
- ◦ Size: Estimated Size in KSLOC
- ◦ Scale Factor: combined process factors
- ◦ Effort Multiplier (EM): combined effort factors

Basic cocomo Example:

An airline sales system is to be built in C:

Back-end database server has already been built. We will use object point estimation technique for high level estimates and FP for detailed estimates

Needs 3 data tables (customer info, customer history table, available seats) – Only 1 view of the screen is enough. So, the booking screen is classified as simple.

Name	Objects	Complexity	Weight
Booking	Screen	Simple	1
Pricing	Screen	Simple	1
Availability	Screen	Medium	2
Sales	Report	Medium	5
		Total	9

Similarly, the levels of difficulty of the pricing screen, the availability screen and the sales report are classified as simple, simple and medium, respectively. There is no 3GL component.

Assessment of the developers and the environment shows:

- The developers' experience is very low (4)

- The CASE tool is low (7).

- So, we have a productivity rate of 5.5.

According to COCOMO II, the project requires approx.

1.64 (= 9/5.5) person-months.

Function Point Estimation

(FP->KLOC)

Name	External user types	Complexity	FP
Booking	External output type	Low	4
Pricing	External inquiry type	Low	3
Availability	External inquiry type	Medium	4
Sales	External output type	Medium	5
		Total	16

FP->LOC

Total function points = 16

Published figures for C show that:

    –   1 FP = 128 LOC in C

Estimated Size

    16 * 128 = 2048 = 2 KLOC

Note:

- Every student must do it yourself; Plagiarized assignment will not be acceptable.
- Make a Proper Word Document/ PDF or PowerPoint Presentation of this assignment, Picture will not be acceptable.
- Must submit before deadline.