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1. Explain Cost benefit analysis with an example solved

ANSWER:

The process used by the companies to analyze the decisions is known as the Cost-Benefit Analysis where the analyst in the company's work over the costs and benefits of a particular action with the help of the different models namely net present value and cost-benefit ratio for decision making.

DESCRIPTION: whenever we talk about costs and benefits there always comes some questions in our mind and those questions can also be solved. The purpose of cost benefit analysis is to tell us about the certainty and uncertainty of any decision and provide a background or a stage for comparing it with similar things. Firstly the merits and demerits of the given proposal are solved in monetary terms and then are adjusted for their time - value to obtain the accurate cost benefit analysis. While identifying and categorizing the costs, many of the people or economist also includes opportunity cost. This refers to the loss occurred while sacrificing the next outcome

USES OF COST ANALYSIS:

1. Determining the feasibility of an opportunity
2. To provide a basis for comparing projects.

EXAMPLE OF COST BENEFIT ANALYSIS:

Sports International limited is planning to expand its business and for that, it will require four new employees in the organization. In order to analyze whether the expansion is beneficial or not, the management of the company decides to use the

cost-benefit analysis. The following are the information available related to benefits and costs related to expansion:

- Within the time frame of one year, it is expected that if the company hires four employees for the expansion then the revenue of the company will increase by 50 % i.e., the revenue benefit will be around \$ 250,000.
- Along with this due to the new hiring company value of the business will increase which would result in an additional revenue of \$ 30,000.
- The salary of the new employees is estimated to be \$ 160,000.
- The additional cost of hiring is estimated to be \$ 15,000.
- The cost of additional hardware and software required will come at around \$ 25,000

Analyze using cost benefit analysis

- Total benefit from the project = Increase in revenue from expansion
- Total benefit from the project = \$ 250,000 + \$ 30,000 = \$ 280,000
- Total Cost from expansion = Salary of new employees + Cost of hiring + Cost of additional hardware and software
- Total Cost from expansion = \$ 160,000 + \$15,000 + \$25,000
- Total Cost from expansion = \$ 200,000

Now benefit-cost ratio will be calculated for the expansion.

$$= \$280,000 / \$ 200,000$$

Benefit-Cost Ratio = 1.40

1. As the expansion has a positive benefit-cost ratio (the total benefits due to expansion is greater than total cost) the company should go ahead with the expansion of the project and hire new employees as that will be beneficial for the company.

Question 2: What is FPA and OPA, Solve an example?

ANSWER:

FPA stands for functional point analysis. In software engineering it is the most widely used estimation technique. FPA uses to make the testing of a software project, functionality or function size of the project. In software engineering FPA can also be used for testing estimation of product.

FPA is decomposed into five functional units are

2. Inputs: Information entering in the system
3. Outputs: Information leaving in the system

4. Inquiries: Request to access information
5. Internal logical files: Information which are held within the system
6. External interface files: Information held by other systems that is used by the system being analyzed.

Two categories of functional units

- **Data Function Types:**

Internal logical files (ILF): It is a user identifiable group of logically related data which control information within the system.

External Interface files (EIF): It is a user identifiable group of logically related data which control the system ,but it is maintained within another system .

- **Transactional function Types:**

External Input (EI): It is the Process of data which control the information which comes from the outside of the system.

External output (EO): It is that which generates data or control information which is to be sent outside the system.

External Enquiry (EQ): That process which is made up of input output combination.

EXAMPLE:

Inputs:

3 simple X 2 = 6

4 average X 4 = 16

1 complex X 6 = 6

outputs:

6 average X 5 = 30

2 complex X 7 = 14

files :

5 complex X 15 = 75

Inquiries:

8 average X 4 = 32

interfaces:

3 average X 7 = 21

4 complex X 10 = 40

Unadjusted function points 240

Complex internal processing = 3

Code to be reusable = 2

High performance = 4

Multiple sites = 3

Distributed processing = 5

Project adjustment factor = 17

Adjustment calculation:

Adjusted FP = Unadjusted FP X [0.65 + (adjustment factor X 0.01)] = 240 X [0.65 + (17 X 0.01)]

= 240 X [0.82]

= 197 Adjusted function points

Object Point Analysis (OPA):

Object points are a method used in software development effort estimation under some models such as COCOMO II. Object points are a way of estimating effort size, similar to Source Lines Of Code (SLOC) or Function Points. the objects referred to include :

1: number of screens and classify them as simple, medium, complex

2: number of reports and classify them as simple, medium, complex

3: number of modules that have to be developed

4: Use weight matrices to sum the values above, taking into account reused code

5: A formula translates OPS into productivity measures

Screen and Report Classification

Object point complexity levels for screens

	Number and sources of data tables		
Number of Views Contained	Total < 4	Total < 8	Total 8+
<3	simple	simple	medium
3-7	simple	medium	difficult
8+	medium	difficult	difficult

Object point complexity levels for reports

	Number and source of data tables		
Number of Sections Contained	Total < 4	Total < 8	Total 8+
0-1	simple	simple	medium
2-3	simple	medium	difficult
4+	medium	difficult	difficult

Object Points Computation

	Weight		
Type	Simple	Medium	Difficult
Screen	1	2	3
Report	2	5	7
Modules	10	10	10

$$NOP = \sum_{i=1}^3 [k_i^s \quad k_i^m \quad k_i^d] \cdot \begin{bmatrix} n_i^s \\ n_i^m \\ n_i^d \end{bmatrix} \cdot \frac{(100 - r)}{100}$$

$$EFFORT = \frac{NOP}{PROD}$$

Where:

r = percentage of components reused

PROD = productivity

Productivity Estimates

Productivity between 4 and 50 object points/month, depending on tool support and developer capability

Developer Experience	Very Low	Low	Nominal	High	Very High
PROD	4	7	13	25	50

Question 3:

Perform Cocomo II estimation on any scenario from Google.

Answer:

COCOMO was developed with the assumption that a waterfall process would be used and that all software would be developed from scratch. Since its formulation there has been many changes in software engineering practice and COCOMO 2 is designed to accommodate different approaches to software development. COCOMO 2 incorporates a range of sub -models that produce increasingly detailed software estimates.

The sub-models in COCOMO 2 are:

1: Application composition model :

This models the effort required to develop the system that are created for reusable components, used during early stages of software engineering, when prototyping of user interfaces, consideration of software and system interaction, assessment of performance are paramount.

2: Early design stage model:

Used once requirements have been stabilized and basic software architecture has been established.

3: Post architecture stage model:

Used during the construction of software

SCENARIO TAKEN FROM GOOGLE:

Consider a database application project with the following characteristics:

- The application has 4 screens with 4 views each and 7 data tables for 3 servers and 4 clients.
- The application may generate two report of 6 sections each from 07 data tables for two server and 3 clients. There is 10% reuse of object points.

The developer's experience and capability in the similar environment is low. The maturity of organization in terms of capability is also low. Calculate the object point count, New object points and effort to develop such a project.

No. Of Views Contained in a screen	Total<4 (<2 servers <3 clients)	Total<8 (2-3 servers 3-5 clients)	Total 8+ (>3 servers >5 clients)
<3	Simple	Simple	Medium
3-7	Simple	Medium	Difficult
>8	Medium	Difficult	Difficult

No. Of Sections Contained in a report	Total<4 (<2 servers <3 clients)	Total<8 (2-3 servers 3-5 clients)	Total 8+ (>3 servers >5 clients)
0 or 1	Simple	Simple	Medium
2 or 3	Simple	Medium	Difficult
4+	Medium	Difficult	Difficult

Object Type	Simple Complexity	Medium Complexity	Difficult Complexity
Screen	1	2	3
Report	2	5	8
3GL	-	-	10

This project comes under the category of application composition estimation model.

Number of screens = 4 with 4 views each

Number of reports = 2 with 6 sections each

From table we know that each screen will be of medium complexity and each report will be difficult complexity .

using table of complexity weights , we may calculate object point count = $4 \times 2 + 2 \times 8 = 24$

Developer's Experience And Capability	PROD (NOP/PM)
Very low	4
Low	7
Nominal	13
High	25
Very high	50

Using the formula NOP is calculated as:

$$24 * (100-10) / 100 = 21.6$$

Low value of productivity is given in above productivity table = 7

$$\text{Efforts in PM} = \text{NOP} / \text{PROD} = 21.6 / 7 = 3.086 \text{ PM}$$