Profitability index (PI) Method or Desirability factor:-

This is a refinement of NPV method. It is not easy to rank projects on the basis of NPV particularly when the cost of projects differ significantly. This method has the merit of placing the present value of each investment project on a relative basis so that projects of different sizes of capital outlays can be compared. Therefore, it is the ratio of the PV of cash inflows, at the required rate of return, to the initial cash outflow of the investment.

Since PV of streams of future cash inflow is divided by the PV of the investment outlay, this method is also called as a Discounted Benefit-cost Ratio (BCR). This can be defined with the help of following formula;-

$$PI = \frac{\text{present value of cash inflows}}{\text{present value of cash outflows}}$$

Symbolically,

$$PI = \frac{\sum_{t=1}^{n} \left[\frac{CI_t}{(1+k)^t} + \frac{S_{n+m}}{(1+k)^n} \right]}{CO_0} \quad \ldots$$

[For conventional cash flows]

OR

$$= \frac{\sum_{t=1}^{n} \left[\frac{CI_t}{(1+k)} + \cdots + \frac{S_n + w_n}{(1+k)^n} \right]}{\sum_{t=0}^{n} \frac{CO_t}{(1+k)t}}$$

(For non-conventional cash flows)

Decision criterion:-

If PI > 1, Accept the proposal

If PI < 1, Reject " "

If PI = 1, the firm is indifferent.

For MB projects, the proposal with highest +ve PI will be given highest rank while the proposal with the lowest PI will be assigned the lowest rank. The proposals having PI of less than 1 are naturally rejected as the benefit is less than the cost. The scheme with larger profitability index (PI) would be recommended.

T Profitability Index Method

The ratio of present value of inflows of cash and present value of initial investment is called Gross Profitability Index **(GPI)** or Gross Benefit Cost Ratio **(GBCR)** i.e.,

$$\textbf{GPI} = \frac{\textbf{Present value of cash inflows}}{\textbf{Present value of initial investment}}$$

The ratio of NPV and present value of initial investment of a project is called Net Profitibility Index **(NPI)** or Net Benefit Cost Ratio **(NBCR)** i.e.,

$$\textbf{NPI} = \frac{\textbf{NPV}}{\textbf{Present value of initial investment}} \quad \textbf{or, NPI = GPI – 1.}$$

❑ **Example 30 :** A project requires an initial outlay of ₹ 60,000 with a working life of 4 years. The annual cash inflows that will be occurred from the project during the first year through four years are expected to be ₹ 15,000, ₹ 24,000, ₹ 24,000 and ₹ 30,000 respectively. If the rate of discount is 12%, calculate the profitability index of the project.

• **Solution ⇒** **Statement showing Present Value of Cash Inflows**

Year	*Cash inflows (₹)*	*PV of Re. 1 at a discount @ 12% (₹)*	*Present value (₹)*
1	15,000	0.893	13,395
2	24,000	0.797	19,128
3	24,000	0.712	17,088
4	30,000	0.636	19,080
	Total present value of cash inflows		68,691
Less :	Initial investment		60,000
	Net Present Value (NPV)		8,691

$$\therefore \text{ Gross Profitability Index} = \frac{\text{Present value of cash inflows}}{\text{Initial investment}} = \frac{68,691}{60,000} = 1.145 \text{ (Approx.)}$$

$$\text{Net Profitability Index} = \frac{\text{Net present value}}{\text{Initial investment}} = \frac{8,691}{60,000} = 0.145 \text{ (Approx.)}$$

or, Net Profitability Index = Gross profitability index – 1

= 1.145 – 1 = 0.145.