Systematic Pedagogy for Net Present Value (NPV) with Profitability Index (PI) Using Excel

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Abstract: Industrial engineers and operations managers may be faced with selecting the best of several alternatives for a capital investment. One of the more common selection models is the net present value (NPV). However, the NPV model has several major shortcomings in that results can be biased or results can be difficult to defend. The major shortcomings are that the model is complex, difficult to understand, and is heavily biased by the initial capital investment. Over the past ten years, simple and inexpensive operations research software that will allow depreciation, salvage value, or other factors to be considered and that is user friendly to the mentor, student, and instructor is becoming difficult to obtain. The profitability index (PI) is a technique that attempts to minimize the first cost basis. This paper presents pedagogy from a systems approach using Microsoft Excel. The objective is to prepare a step-by-step systematic approach which allows data entry on the main worksheet for each procurement alternative. The NPV and PI results are then displayed on the main worksheet. The results were compared to other textbook models and were satisfactorily tested in a production operations class. The major advantages are twofold and are as follows: each element of the analysis can be addressed and easily understood, and, for the practitioner, engineer, instructor, and student, Excel is readily available on all personal computers internationally. Students with very little exposure to NPV other than an economic theoretical approach were able to master the method within the first hour of exposure.

Keywords: Net Present Value, NPV, Profitability Index, Excel