Appendix B

Lecture Notes

Main theme: Perhaps more than any other information, managers would like to know the profitability of their products, customers, and other business segments. Accordingly, this appendix provides **a coherent framework for measuring profitability**. It distinguishes between **absolute profitability** and **relative profitability**.

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1. **Absolute profitability**
   1. **Key concepts**
      1. **Absolute profitability** measures the impact on the organization’s overall profits of **adding or dropping a particular segment** such as a product or customer – without making any other changes. For example:

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* + - 1. If Coca Cola were considering closing down its operations in the African country of Zimbabwe, managers would be interested in the **absolute profitability** of those operations.
    1. **Computing absolute profitability**
       1. For an **existing segment**, compare the revenues that would be lost from dropping the segment to the costs that would be avoided.

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* + - 1. For a potential **new segment**, compare the additional revenues from adding the segment to the additional costs that would be incurred.
      2. In practice, figuring out what costs would change and what costs would not change if a segment were dropped or added **can be very difficult**.
         1. **Activity-based costing** can be helpful in this regard, but care must be exercised to ensure that a given cost **will really change**.

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* + - 1. For examples of the measurement of absolute profitability see:
         1. **Segment Reporting** in Chapter 6.
         2. ABC Action Analysis in Appendix 7A.
         3. **Adding and Dropping Product Lines and Other Segments** in Chapter 12.

1. **Relative profitability**

*Learning Objective 1: Compute the profitability index and use it to select from among possible actions.*

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#### Key concepts

* + 1. **Relative profitability** is concerned with **ranking** products, customers, and other business segments to determine **which should be emphasized**.

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* + 1. Managers are interested in ranking segments if a **constraint** forces them to make **trade-offs** among the segments.

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* + - 1. In the absence of a constraint, all segments that are absolutely profitable should be pursued.
    1. In general, the profitability of segments should be measured by the **profitability index** as shown. Notice:

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* + - 1. The term “incremental profit from the segment” in the numerator of this equation is **synonymous** with the **absolute profitability** of the segment.

#### Relative profitability: an example

* + 1. Assume that **Segments A and B** earn the **incremental profit** and have the **constraint requirements** as shown.

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* + - 1. The profitability indexes for Segments A (**$1,000 per hour**) and B (**$500 per hour**) suggest that Segment A makes a more profitable use of the constraining resource than Segment B.

#### The project profitability index

* + 1. We have already encountered examples of the profitability index in previous chapters. For example, in **Chapter 13**, the **project profitability index** was defined as shown.

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* + - 1. The project profitability index is used when a company has **more long-term projects with positive net present values than it can fund**.

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* + - 1. The **net present value** of the project goes in the **numerator** since it represents the incremental profit from the segment.

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* + - 1. The **investment funds are the constraint**, so the amount of investment required by a project goes in the **denominator**.

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* + 1. **Quality Kitchen Design: an example**
       1. Assume that management is considering **ten short-term projects** with **incremental profits**, **constraint requirements**, and **profitability indexes** as shown. Notice:

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* + - * 1. If all ten projects were **accepted**, they would require a total of **100 hours**.
      1. **If management only has 46 hours available, which projects should be accepted**?

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* + - * 1. The projects should be **ranked** as shown using the project profitability index. Notice:

The line drawn beneath Project A signifies that **46 cumulative constraint hours have been used**.

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* + - * 1. The optimal profit of **$32,930** would be computed as shown.

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1. Volume trade-off decisions

*Learning Objective 2: Compute and use the profitability index in volume trade-off decisions.*

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#### Key concepts

* + 1. **Volume trade-off decisions** need to be made when a company must produce **less** **than the market demands** of some products due to the existence of a **constraint**.

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* + 1. In volume trade-off decisions **where** **fixed costs are irrelevant**, the profitability index takes the special form as shown. Notice:

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* + - 1. This equation mirrors the “**contribution margin per unit of the constrained resource**” concept that was introduced in **Chapter 12**.

#### Volume trade-off decisions: an example

* + 1. Assume that a company makes **three products** with **unit contribution margins**, **weekly demand**, and **machine constraint requirements** as shown.

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* + 1. Given these assumptions, satisfying demand for all three products would require **2,700 minutes of constraint time** as shown.

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* + 1. **If only 2,200 minutes of machine constraint time are available, which products should be produced in what quantities**?

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* + - 1. The **first step** is to compute the profitability index for each product as shown. Notice:

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* + - * 1. Product VB30 should be produced first (**$5 per minute**), followed by SQ500 (**$4 per minute**), and RX200 (**$3 per minute**).
      1. The **second step** is to compute the optimal production plan as shown. Notice:
         1. There are only enough minutes available (e.g., **1,000 minutes**) to make **200 units** of RX200 even though weekly demand is **300 units**.

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* + - 1. The **third step** is to compute the total contribution margin earned under the optimal plan (**$8,600**) as shown. Notice:

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* + - * 1. There is **no other combination** of production that will earn a higher total contribution.

1. **Managerial implications**

*Learning Objective 3: Compute and use the profitability index in other business decisions.*

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#### Other applications of the profitability index

* + 1. **Sales commissions**
       1. Assume the selling prices, unit contribution margins, and constraint requirements as shown for products RX200, VB30, and SQ500.

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* + - * 1. If salespersons are paid commissions based on **sales**, they will try hardest to sell **RX200 (unit selling price = $40)**.

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* + - * 1. However, RX200 is the **least profitable** product **given the current constraint ($3 per minute)**.
        2. This suggests that salespersons should be paid commissions based on the **profitability index and the amount of constraint time sold** rather than on sales revenue.

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* + 1. **Pricing new products**
       1. The price of a new product should at least cover **the variable cost** of producing it plus **the opportunity cost** of displacing the production of existing products to make it (this approach assumes that fixed cost remain unchanged).

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* + - * 1. In **equation form**, the minimum selling price is computed as shown.
      1. For purposes of illustration, assume that the company mentioned in the prior example has designed a new product, WR6000, with a variable cost per unit and constraint requirements as shown. **What is the minimum price that should be charged for this new product?**

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* + - * 1. The **first step** is to recognize that the price of WR6000 must cover its **$30 variable cost per unit**.

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* + - * 1. The **second step** is to recognize that producing WR6000 will require **displacing production** of RX200, VB30, or SQ500.

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Since RX200 has the lowest profitability index of **$3 per minute** it should be displaced first.

* + - * 1. The **third step** is to compute the **opportunity cost per unit** associated with displacing production of RX200 (**$18 per unit**).

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* + - * 1. The **fourth step** is to add the variable cost per unit (**$30**) to the opportunity cost per unit (**$18**) to arrive at the minimum selling price (**$48**).

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