

## Production

For manufacturers, Production literally puts everything together. The department coordinates and plans manufacturing runs, making sure that products get out the door. In your Production department, each product has its own assembly line. You cannot move a product from one line to another because automation levels vary and each product requires special tooling.

As it determines the number of units to produce for the upcoming year, Production needs to consider the Sales Forecast developed by Marketing minus any inventory left unsold from the previous year (Inventory on Hand).

Your Production Department determines how many units will be manufactured during the year. It is also responsible for buying and selling production lines.

## Capacity

First-shift Capacity is defined as the number of units that can be produced on an assembly line in a single year with a daily eight-hour shift. An assembly line can produce up to twice its first-shift Capacity by using a second shift. An assembly line with a Capacity of 2,000,000 units per year could produce 4,000,000 units with a second shift. However, second-shift labor costs are 50% higher than the first shift.

Each new unit of capacity costs \$6.00 for the floor space plus \$4.00 multiplied by the Automation rating. The simulation automatically calculates the cost and displays it for you. Increases in capacity require a full year to take effect – increase it this year, use it next year.

Capacity can be sold at the beginning of the year for \$0.65 on the dollar value of the original investment. You can replace the capacity in later years, but you have to pay full price. If you sell capacity for less than its depreciated value, you lose money, which is reflected as a write-off on your income statement. If your capacity has depreciated to lower than 65% of its original value, you will make a gain on the sale. This will be reflected as a negative write-off on the income statement.

The dollar value limit of capacity and automation purchases is largely determined by the maximum amount of capital that can be raised through stock and bond issues plus excess working capital. The decision area displays this amount.

## Discontinuing a Sensor

If you decide to retire a product in the R&D page, Capstone interprets this as a liquidation instruction and will sell your remaining inventory for half the average cost of production, which is written off as a loss on your income statement. If you want to sell your inventory at full price, sell all but one unit of capacity (then once inventory is sold through, sell the last unit).

## Automation

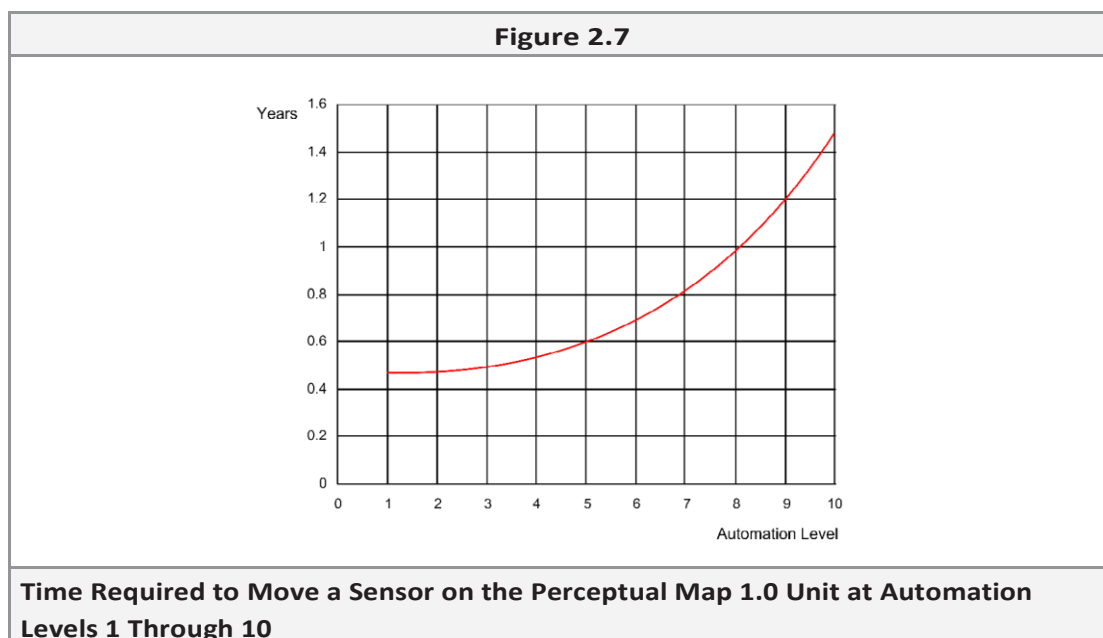
As automation levels increase, the number of labor hours required to produce each unit falls. The lowest automation rating is 1.0; the highest rating is 10.0.

At an automation rating of 1.0, labor costs are highest. Each additional point of automation decreases labor costs approximately 10%. At a rating of 10.0, labor costs fall about 90%.

Labor costs increase each year because of an annual raise in the workers' contract.

Despite its attractiveness, two factors should be considered before raising automation:

- Automation is expensive: At \$4.00 per point of automation, raising Automation from 1.0 to 10.0 costs \$36.00 per unit of capacity;
- As you raise Automation, it becomes increasingly difficult for R&D to reposition products short distances on the Perceptual Map. For example, a project that moves a product 1.0 on the map takes significantly longer at an automation level of 8.0 than at 5.0 (Figure 2.7). Long moves are less affected. You can move a product a long distance at any automation level, but the project will take between 2.5 and 3 years to complete.



## Changing Automation

For each point of change in automation, up or down, the company is charged \$4.00 per unit of capacity. For example, if a line has a Capacity of 1,000,000 units, the cost of changing the automation level from 5.0 to 6.0 would be \$4,000,000.

Reducing Automation costs money. If you reduce Automation, you will be billed for a retooling cost. The net result is you will be spending money to make your plant less efficient. While reduced Automation will speed R&D redesigns, by and large it is not wise to reduce an automation level.

When considering Automation and its impact on cost, it is useful to consider the production process as a series of 10 tasks. If you were planning on making a cell phone, you could complete all 10 tasks yourself. This equates to an automation level of 1, as you (the labor unit) would be doing all the work, and there would be a very low level of automation (maybe an electric screwdriver).

If you bought a machine that automated the first 5 tasks, this is represented by an automation level of 5.

The higher your automation level, the longer it takes to retool your plant for product upgrades. This is especially important in high tech segments, where positioning near the cutting edge of technology is critical. Automate too much and the product designs cannot keep up with the evolving market.

Changes in Automation require a full year to take effect – change it this year, use it next year.

### To recap:

Log into the simulation and click Production. Use this area to enter for each product:

- A Production Schedule
- Increases in first-shift Capacity (Put a positive number in Buy/Sell Capacity.)
- Decreases in first-shift Capacity (Put a negative number in Buy/Sell Capacity.)
- Changes in automation level (Enter a number in New Automation Rating.)