CAPSTONE®

Student Guide 2009

REGISTRATION

Items to Remember

YOUR REGISTRATION NUMBER

If your professor or school did not give you a Registration Number, you will need to register online using a credit card or checking account.

YOUR INDUSTRY ID NUMBER

Write your Industry ID Number here:

Your professor may have given you this number. If not, don't worry. Just begin to register. You can obtain your Industry ID during registration if you know your school name and campus. You also need to know either the course name, number, professor's initials or start date.

YOUR LOGIN INFORMATION

When you register please note your User ID:

Password or hint to remember your Password:

You will need these every time you enter the simulation.

SUPPORT

Need Help? You've Got It.

A LIVE SUPPORT TEAM IS AVAILABLE TO ASSIST YOU.

THE SUPPORT TEAM

SUPPORT TICKETS:
Login at www.capsim.com.
Click on Capstone®,
and then select
Help > Support
in the left menu.

WE'RE YOUR SUPPORT TEAM. WE'VE PLAYED THE SIMULATION AS STUDENTS, IN A CLASS SIMILAR TO YOURS. SO WE CAN HELP EXPLAIN THE SIMULATION IN WAYS YOU TRULY WILL UNDERSTAND.

If you need assistance, please submit a support ticket.

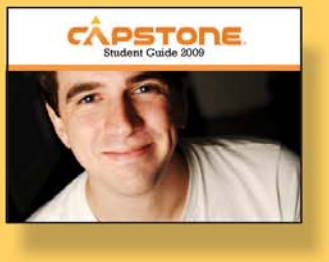
Support tickets are reviewed Monday-Friday, and on most weekends and holidays.

If you have problems registering, send an email to:
support@capsim.com.

The Course Road Map

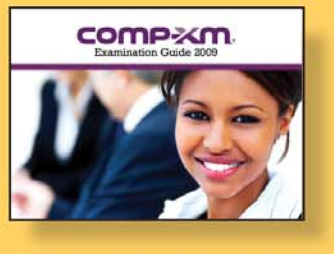
Student Guide

Have this guide available when you register. It may contain registration information you will need (see the column to the left).



The Student Guide gives you the basic information on how to use the Capstone® Business Simulation.

If you see the Comp-XM® logo on the Course Page when you login you will also need the Comp-XM® Examination Guide.



Registration

Go to **www.capsim.com**
Click "Register" then follow the onscreen instructions.
Establish and remember your User ID and Password.

CAPSTONE
Getting Started

Use your User ID and Password to login. Click on "Capstone®." Go to "Getting Started" and follow the steps that include:
- Downloading the **Capstone.xls** file
- Individual rehearsal rounds
- Forming your company
- and more

Practice Rounds
(if applicable)

Most professors include team practice rounds. When the practice is over the simulation will restart from the beginning.

Competition Rounds

When the Competition begins, your decisions will count! Other tasks might include:
- Optional Homework Assignments
- Peer Evaluations
- and more

COMP-XM
(if applicable)

Your professor may include a Comp-XM® exam. Go to the "Course Page" and choose "Comp-XM®." Follow the instructions on the "Dashboard" which include:
- Decision making - download the **CompXM.xls** file
- Board queries (quizzes)

TABLE OF CONTENTS

1 Executive Overview

In the next eight years, the sensor market will see a more than 200% increase in unit demand. Growth rates vary among the sub-markets, otherwise known as market segments.

Your customers manufacture a variety of products that need sensors to measure physical conditions such as speed, temperature and pressure.

Congratulations, you are now in charge of an electronic sensor manufacturing company. Your company was formed when a former monopoly was broken up into identical competitors. Although its financial results are respectable, your company markets an aging product line. To become a market leader, you must improve your products, increase productivity and remain profitable despite downward price pressure.

Your company needs you to coordinate strategy and tactics across all functional areas of your company:

- Research & Development or R&D
- Marketing
- Production
- Finance

Tip: Many simulations use additional modules: Human Resources, TQM (Total Quality Management)/Sustainability, Labor Negotiation and Advanced Marketing.

1.1 Research & Development (R&D)

The Research & Development Department controls the company's product line. The line currently has five sensor models and can grow to as many as eight.

Your customers are concerned with four product characteristics:

- Size: How much the sensor weighs and the amount of space it takes;
- Performance: How fast the sensor measures and reports physical conditions;
- Reliability: How long the sensor lasts before it fails;
- Age: The amount of time since the sensor was invented or revised.

As time goes by, customers want smaller, more powerful sensors. Keeping customer requirements in mind, the department updates existing sensor designs. R&D also invents new products by assigning a name (the first letter must be the same as the first letter of the company name), performance, size and reliability.

Tip: The Production Department must purchase capacity and automation for all new products one year prior to release.

The length of time required to revise a sensor varies. Slight revisions can complete in three or four months; more comprehensive projects, the better part of a year. Inventing a sensor always takes more than a year. The longer the project, the greater the cost: a six month project costs $500,000; a 12 month project costs $1,000,000. Products with production lines that have higher automation require more time to revise than products with lower automation.

1.2 Marketing

The Marketing Department controls each sensor's:

- Price: Customers want sensors priced within expected price ranges;
- Promotion Budget: The department sets a promotion budget for each sensor, which creates awareness– 100% awareness means every customer knows about your sensor;
- Sales Budget: The department sets a sales budget for each sensor, which builds accessibility via salespeople and distribution systems– 100% accessibility means every customer can locate your product.

Promotion and sales budgets for each sensor affect sales. In general, higher budgets increase demand. However, the department can choose to hold the line on these budgets and increase demand with lower prices.

Each sensor product is intended for a primary group of customers, also known as market segments. Demand and growth rates for each segment vary. For each product, Marketing needs to determine a sales forecast by assessing:

- Last year's sales
- The intended segment's growth rate
- The relative merits of other products competing in the segment

1.3 Production

Each product has its own manufacturing line. For each product, the Production Department:

- Schedules production runs to supply enough units for sale based on the Marketing Department's forecast minus inventory;
- Purchases or sells capacity based on demand and growth rates of the intended segment;
- Determines automation levels for each product.

Each line has a first shift capacity. The capacity reflects the number of sensors that can be produced each year with an eight hour shift. The company can schedule a second eight hour shift, which allows the company to manufacture up to twice first shift capacity, however second shift labor costs are 50% higher than first shift.

Each line has an automation rating. Labor costs for lines with higher ratings are less than those with lower ratings, however:

- Increasing automation is expensive, as machines must be purchased to replace workers;
- R&D projects for products with higher automation take longer relative to products with lower automation– this is because lines with higher automation have more machines to re-engineer.

Increases in capacity and changes in automation take a full year to implement. Sales of capacity are immediate. Selling all of an assembly line's capacity discontinues the associated sensor– it is no longer available for sale.

1.4 Finance

R&D, Marketing and Production decisions require money. The Finance Department must ensure all company activities are funded. While it is possible to fund activities entirely from cash flow, it is unlikely to happen in the early years. The company will need to turn to the capital markets. The company has three outside sources of money:

1. Stock: New stock issues are limited to 20% of the company's outstanding shares.
2. Current Debt: These are one year bank notes. The company can borrow year after year, but interest rates fluctuate. Banks are willing to lend amounts up to 75% of the company's account receivable, plus 50% of its inventory.
3. Bonds (Long Term Debt): These are 10 year notes. While bonds carry an interest rate 1.4% higher than the current debt rate in the year they are issued, the rate is locked in– it will not fluctuate. Bondholders are willing to lend amounts up to 80% of the value of the company's assembly lines.

Other Finance Department activities include:

- Dividend: The company can choose to issue dividends, which tend to (but do not always) increase the price per share;
- Retire Stock: The company can buy back stock to reduce shares outstanding;

- Retire Bonds: The company can choose to retire bonds before they come due.

If the company runs out of money during the year, emergency loans are issued by a lender of last resort, affectionately known as Big Al. Big Al will automatically keep the company afloat with a loan for whatever amount needed. Big Al charges a 7.5% penalty in addition to the company's current debt rate. Emergency loans convert to current debt at the beginning of the following year. Emergency loans have an adverse effect on stock price.

Accounts receivable and accounts payable finance decisions are made on the Marketing spreadsheet.

1.5 Company Success

Your company selected you and your fellow managers because of your strategic vision and tactical skills. During the next few years the company expects you to make it a market leader. Successful companies will:

- Create a strategy;
- Coordinate company activities;
- Analyze the market and its competing products.

Careful study of the rest of this booklet will help greatly with these efforts. Best of luck with running your company!

2 The Sensor Industry

Your company manufactures electronic sensors. Last year, global demand for sensors surged more than 13%. Unprecedented opportunities exist for companies that adopt a leadership role in the market, either through a superior product offering or aggressive pricing.

2.1 Sensor Customers

Your customers are Original Equipment Manufacturers. They put your sensors into a range of products, from bio hazard neutralization to security systems to manufacturing controls to consumer products. The sensor industry is growing and evolving fast. Even the oldest designs are less than eight years old.

Sensor customers fall into five groups called market segments:

- Traditional
- Low End
- High End
- Performance
- Size

2.2 Segment Buying Criteria

Customers within each market segment employ different standards as they evaluate the following sensor characteristics:

- Positioning (performance and size)
- Reliability
- Age
- Price

2.2.1 Positioning

Sensors vary in their dimensions (size) and the speed with which they respond to changes in physical conditions (performance). Combining size and performance creates a product attribute called positioning.

The Perceptual Map

Positioning is such an important concept that marketers developed a tool to track the position of their products and those of their competitors. This tool is called a perceptual map. Note the perceptual map in Figure 2.1. You will see this map quite often through the course of the simulation. The map measures size on the vertical axis and performance on the horizontal axis.

A Sensor's Position On The Perceptual Map

The arrow in Figure 2.1 points to a location on the perceptual map where a sensor with a performance of 8 and a size of 12 is located; this product is plotted at the point where the 8 and 12 lines intersect.

Tip: Your Research & Development department controls the performance and size, and therefore the positioning of your sensor products.

Market Segment Positions On The Perceptual Map

Each market segment has a different positioning preference. Therefore, each segment demands sensors that are positioned in different parts of the map. Low End customers want slow performing products that are large in size. They want products that fall inside the set of circles to the upper left in Figure 2.2. High End customers want products that are fast performing and small in size. They want products that fall within the set of circles to the lower right.

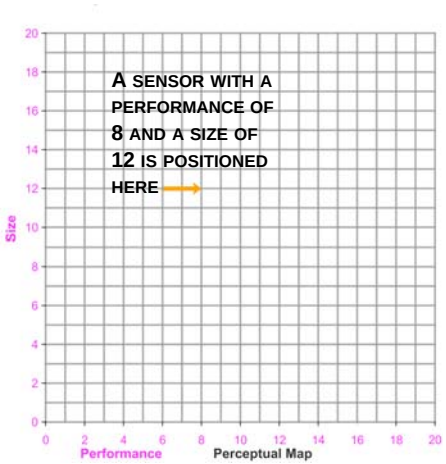


Figure 2.1 The Perceptual Map Used in the Simulation: The perceptual map plots sensor size and performance characteristics.

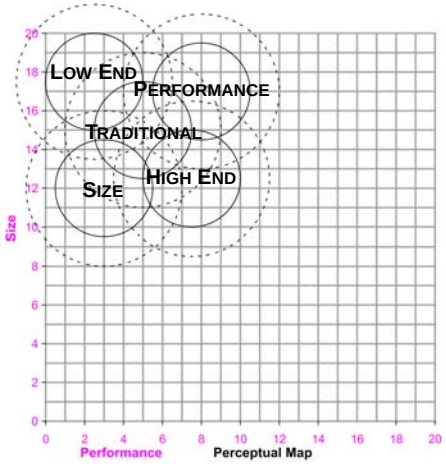


Figure 2.2 Beginning Segment Positions: As the years progress, the segments will move or *drift* apart at different speeds toward the lower right.

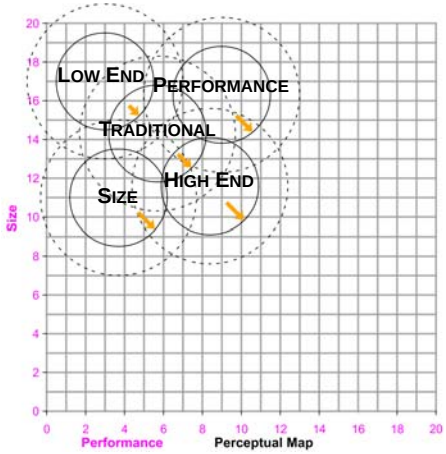


Figure 2.3 Segment Positions at the End of Year 1 and the Beginning of Year 2: The segments move each month. The arrow lengths indicate the distance each segment has drifted over a 12 month period.

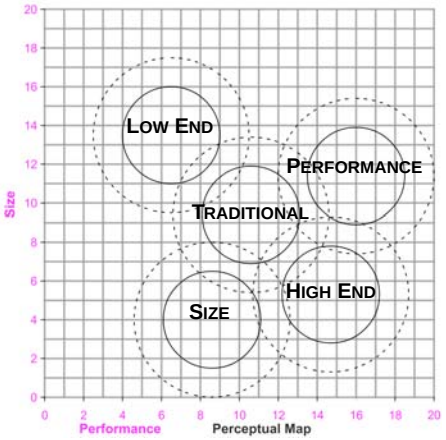


Figure 2.4 Segment Positions at the End of Year 8: Very little overlap remains.

Over time, customers want products that are smaller and faster. This causes the segments to move or *drift* a little each month. As the years progress, the drift becomes significant. Figure 2.3 shows the location of the market segments at the end of the first year; Figure 2.4, at the end of the eighth.

High End, Performance and Size customers demand greater product improvement than Traditional and Low End customers. Therefore, the High End, Performance and Size market segments drift at a faster rate**.** As time goes on, the overlap between the segments decreases.

Market segments will not move faster to catch up with a product that exceeds their expectations. For example, High End customers will refuse to buy a product to the lower right of the circles. Remember, customers are only interested in products that fall within the circles on the perceptual map!

Tip: There are zero customers interested in products positioned outside of the dashed circles.

You and your management team must ensure that your product line keeps up with changing customer demand. To do this, products must be repositioned to stay within the moving segment circles. Products must be redesigned so that they are smaller in size and faster in performance. See 6.1 Research & Development (R&D) on page 16 for more information.

2.2.2 Price, Age and Reliability (MTBF)

In addition to position, each segment has different criteria for:

- Price: The cost of the sensor;
- Age: The length of time since the sensor was invented or revised;
- Reliability or MTBF (Mean Time Between Failure): The number of hours the sensor is expected to operate.

2.2.3 Criteria By Segment

The criteria from the year prior to Round 1 (Round 0) display below. Price ranges in all segments drop $0.50 per year. For example, in Round 1 the Traditional price range will be $19.50-$29.50, in Round 2 it will be $19.00-$29.00. Positioning criteria also change each year (see 8.1 Perceptual Map on page 26). Age and reliability (MTBF) criteria remain the same year after year.

Traditional Segment Buying Criteria

Traditional customers seek proven products using current technology.

- Age, 2 years– 47% of decision
- Price, $20.00-$30.00– 23% of decision
- Ideal Position, performance 5.0 size 15.0– 21% of decision
- MTBF, 14,000-19,000– 9% of decision

Low End Segment Buying Criteria

Low End customers seek proven products, are indifferent to technological sophistication and are price motivated.

- Price, $15.00-$25.00– 53% of decision
- Age, 7 years– 24% of decision
- Ideal Position, performance 1.7 size 18.3– 16% of decision
- MTBF, 12,000-17,000– 7% of decision

High End Segment Buying Criteria

High End customers seek cutting-edge technology in both size and performance.

- Ideal Position, performance 8.9 size 11.1– 43% of decision
- Age, 0 years– 29% of decision
- MTBF, 20,000-25,000– 19% of decision
- Price, $30.00-$40.00– 9% of decision

Performance Segment Buying Criteria

Performance customers seek high reliability and cutting edge performance technology.

- MTBF, 22,000-27,000– 43% of decision
- Ideal Position, performance 9.4 size 16.0– 29% of decision
- Price, $25.00-$35.00– 19% of decision
- Age, 1 year– 9% of decision

Size Segment Buying Criteria

Size customers seek cutting edge size technology.

- Ideal Position, performance 4.0 size 10.6– 43% of decision
- Age, 1.5 years– 29% of decision
- MTBF, 16,000-21,000– 19% of decision
- Price, $25.00-$35.00– 9% of decision

A Real-world Perceptual Map

Beyond the simulation, perceptual maps can be used to plot almost any two product characteristics. Here's an example: Most new car dealers sell extended warranties. The arrow in the figure below points to a location on the perceptual map where a standard 36 month, 36,000 mile warranty ends. The green area indicates the locations where customers have the strongest interest in added month/mile combinations. Few customers want 12 month 100,000 mile warranties (not many people drive 100,000 miles in 12 months) or 60 month 15,000 mile warranties (most people drive farther than 15,000 miles over a five year period).

Each market segment expects different:

- Positioning
- Age range
- Price range
- Levels of reliability (Measured in hours as Mean Time Between Failure, or MTBF.)

3 The Capstone® Courier

Customer purchases and sensor company financial results are reported in an industry newsletter called *The Capstone® Courier*. The *Courier* is available from two locations:

- On the website, login to your simulation then click the Reports link;
- From Capstone.xls, click Courier in the menu bar.

Tip: The *Courier* displays "Last Year's Results," for example, the *Courier* available at the start of Round 2 will display the results for Round 1. The *Courier* available at the start of Round 1 displays Last Year's Results for Round 0, when all companies have equal standing.

Successful companies will study the *Courier* to understand the marketplace and find opportunities. As the simulation progresses and strategies are implemented, company results will begin to vary.

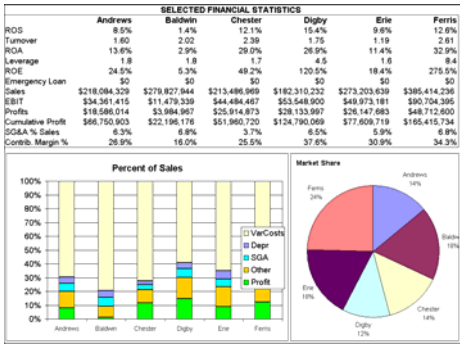


Figure 3.1 Front Page of the *Courier*: Includes Selected Financial Statistics.

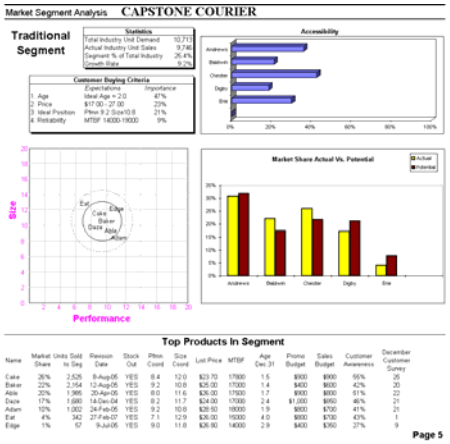


Figure 3.2 Traditional Market Segment Analysis: Segment Statistics and Buying Criteria display in the upper-left corner of each segment analysis.

3.1 Front Page, Stock & Bond Summaries, Financial Statements And Production Analysis

Use the Front Page of the *Courier* to see a snapshot of last year's results (Figure 3.1). Be sure to compare your company's sales, profits and cumulative profits with the competitions'. Page 2, Stock and Bond Summaries, reports stock prices and bond ratings for all companies.

Page 3, Financial Statements, surveys each company's cash flow, balance sheet and income statements. This will give you an idea of your competitors' financial health.

Page 4, The Production Analysis, reports detailed information about each product in the market, including sales and inventory levels, price, material cost and labor cost. Are you or your competitors building excess inventory? Excess inventory puts pressure on profits (see 9 Forecasting on page 32).

The Production Analysis also reports product revision dates. Does a competitor have a product with a revision date in the year after the year of the report? This indicates a long repositioning project that will possibly put that product into another segment.

Tip: If a revision date has yet to conclude, the *Courier* will report the product's current performance, size and MTBF. The new coordinates and MTBF will not be revealed until after the completion of the project.

Check your competitors' automation, capacity and plant utilization. Increases in automation reduce labor costs and this could indicate competitors might drop prices for those products. Did a competitor reduce capacity? Selling capacity reduces assets; running the remaining capacity at 150% to 200% can improve Return on Assets (ROA).

Tip: The Production Analysis will report the release date (but not the coordinates) of a new product if:

- Production capacity is purchased;
- A promotion budget is entered;
- A sales budget is entered.

Are your competitors investing in capacity and automation?

- The Financial Statements Survey reports the cost of plant improvements for all companies;
- The Production Analysis reports capacity and automation ratings for the upcoming round.

3.2 Segment Analyses

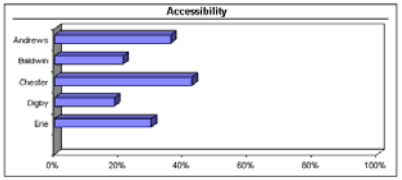
The Market Segment Analyses, pages 5 - 9 of the *Courier* (Figure 3.2), review each market segment in detail.

The Statistics table in the upper-left corner reports Total Industry Unit Demand, Actual Industry Unit Sales, Segment % of Total Industry and the segment's Growth Rate. The Customer Buying Criteria table ranks the customer criteria within each segment (these are the criteria listed in 2.2.3 Criteria By Segment on page 7):

- Ideal Position: The preferred product location as of December 31 of the previous year (the preferred location is also called the ideal spot– ideal spots drift with the segments, moving a little each month);
- Price: Every year on January 1, price ranges drop by $0.50;
- Age: Age preferences stay the same year after year;
- Reliability: MTBF requirements stay the same year after year.

Are your products meeting your buyers expectations?

The perceptual map shows the position of each product in the segment as of December 31 of the previous year.



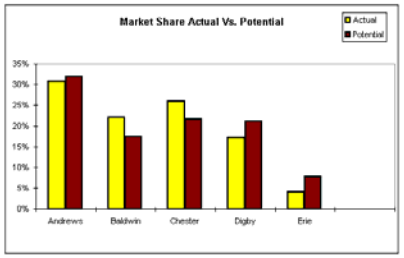


Figure 3.3 Segment Analysis Accessibility and Market Share Actual vs. Potential Charts

3.2.1 Accessibility, Market Share And Top Products In Segment

The Accessibility Chart (Figure 3.3) rates each company's level of accessibility. Accessibility is determined by the Marketing Department's sales budget– the higher the budget, the higher the accessibility. Accessibility is measured by percentage. 100% means every customer could locate your product.

The Market Share Actual vs. Potential Chart (Figure 3.3) displays two bars per company. The actual bar reports the market percentage each company attained in the segment. The potential bar indicates what the company deserved to sell in the segment. If the potential bar is higher than the actual, the company under produced and missed sales opportunities. If the potential is lower than the actual, the company picked up sales because other companies under produced and stocked out.

Top Products in Segment lists the products selling in the segment and reports:

- Market Share
- Units Sold to Segment
- Revision Date
- Stock Out (Whether the product ran out of inventory.)
- Performance and Size coordinates
- Price
- MTBF
- The product's Age on Dec. 31
- Promotion and Sales Budgets
- Awareness and Customer Survey (See below.)

Customer Awareness	December Customer Survey
55%	25
42%	20
51%	22
46%	21
41%	21
43%	1
27%	9

Figure 3.4 Customer Awareness and December Customer Survey: Customer Awareness reports the percentage of customers who knew about your product. The December Customer Survey reports what customers thought about your product; the higher the score, the better they liked it.

3.2.2 Awareness And Customer Survey

Customer Awareness (Figure 3.4) is determined by the Marketing Department's promotion budget– the higher the budget, the higher the awareness. Awareness is measured by percentage. 100% means every customer knew about your product.

The December Customer Survey (Figure 3.4) indicates how customers perceived the products in the segment. The survey evaluates the product against the buying criteria. Zero indicates the product met none of the criteria. A perfect score of 100 would result when the product:

- Was priced at the bottom of the expected range;
- Was perfectly positioned (because the segment moves each month, this can occur only once each year);

Perfect scores are almost impossible. Scores of 50 or above are considered good.

Accounts Receivable policy and, if the module is enabled, TQM/Sustainability initiatives can also affect the survey score.

- Had an MTBF specification at the top of the expected range;
- Had the ideal age for that segment (because the product ages each month, it can only have the ideal age once each year);
- Had 100% Awareness;
- Had 100% Accessibility.

Ages and distances from the ideal spots change throughout the year, therefore scores change month to month. If a repositioning project concludes late in the year, the survey score for December could be significantly higher than the scores for the previous months.

Tip: Use the Customer Survey as a quick comparison tool when conducting a competitive analysis.

3.3 Market Share Report And Perceptual Map

The Market Share Report details sales volume in all segments, reporting each product's actual and potential sales. Did your company under produce? If the actual percentage for your products is less than the potential, you missed sales opportunities. If your actual is greater than your potential, your competitors under produced and you picked up sales that otherwise would have gone to them.

The Perceptual Map (Figure 3.5) displays all five segments and every product in the industry. Are your products competitively positioned?

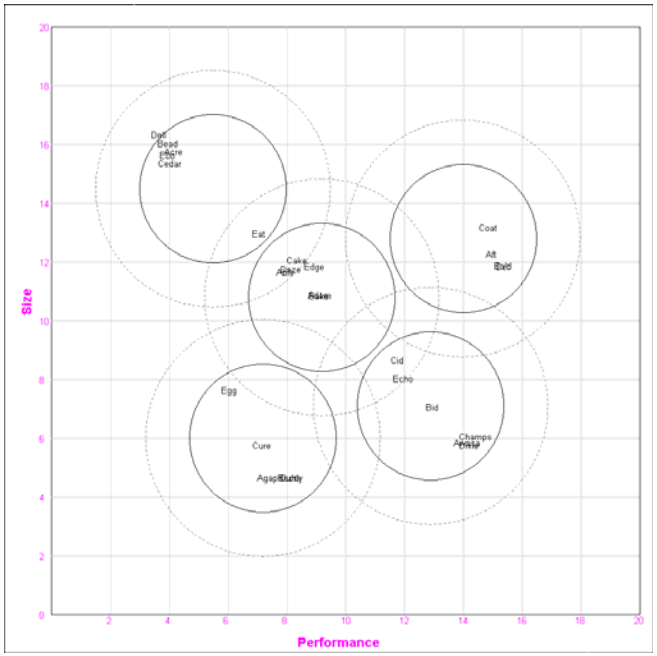


Figure 3.5 Perceptual Map: The Perceptual Map displays the positioning of all the products in every segment.

3.4 HR/TQM/Sustainability Report

The HR/TQM/Sustainability Report displays investments and results when the optional TQM/Sustainability, Human Resources and/or Labor Negotiation modules are activated (see 7 Additional Modules on page 24).

4 Proformas & Annual Reports

The proforma reports are only as accurate as the marketing sales forecasts. If you enter a forecast that is unrealistically high, the proformas will take that forecast and project unrealistic revenue. See 9 Forecasting on page 32 for more information.

Proformas and annual reports include:

- Balance Sheet
- Cash Flow Statement
- Income Statement

What's the difference between proformas and annual reports? Proformas are *projections* of results for the upcoming year, annual reports are the *results* from the previous year. The proformas allow you to assess the projected financial outcomes of the company decisions entered in Capstone.xls.

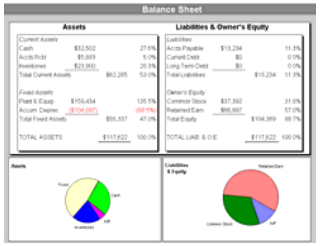


Figure 4.1 Proforma Balance Sheet: Projects the results for the upcoming round based upon the company's decisions.

Tip: To access proformas, click the Proformas menu in Capstone.xls; to access the annual reports, click the Courier menu in Capstone.xls or, on the website, login to your simulation then click the Reports link.

4.1 Balance Sheet

The balance sheet lists the dollar value of what the company owns (assets), what it owes to creditors (liabilities), and the amount contributed by investors (equity). Assets always equal liabilities and equity.

Assets = Liabilities + Equity

Assets are divided into two categories, current and fixed. Current assets are those that can be quickly converted, generally in less than a year. These include inventory, accounts receivable and cash. Fixed assets are those that cannot be easily converted. In the simulation, fixed assets are limited to the value of the plant and equipment, (called capacity and automation, see page 20).

Liabilities include accounts payable, current debt and long term debt. In the simulation, current debt is comprised of one year bank notes; long term debt is comprised of 10 year bond issues. Equity is divided into common stock and retained earnings. Common stock represents the money received from the sale of shares; retained earnings is the portion of the profits that was not distributed back to shareholders as dividends, but instead reinvested in the company.

Tip: The retained earnings value is not an asset; it is a liability owed to your shareholders.

Depreciation

Depreciation is an accounting principle that allows companies to reduce the value of their fixed assets. Each year some of the value is "used up." Depreciation decreases the firm's tax liability by reducing net profits while providing a more accurate picture of the company's plant and equipment value. Depreciation is expensed, product by product, on the income statement.

Total depreciation for the period is reflected as a gain on the cash flow statement. On the balance sheet, accumulated depreciation is subtracted from the value of the plant & equipment.

Capstone® uses a straight line depreciation method calculated over fifteen years.

4.2 Cash Flow Statement

The cash flow statement indicates the movement of cash through the organization, including operating, investing and financing activities. The annual report's cash flow statement shows the change in the amount of cash from the previous year. The proforma cash flow statement indicates the expected change at the end of the upcoming year.

4.3 Income Statement

Your company can use the income statement to diagnose problems on a product by product basis.

Sales for each product are reported in dollars (not the number of products). Subtracting variable costs from sales determines the contribution margin. Inventory carrying costs are driven by the number of products in the warehouse. If your company has $0 inventory carrying costs, you stocked out of the product and most likely missed sales opportunities. If your company has excessive inventory, your carrying costs will be high. Sound sales forecasts matched to reasonable production schedules will result in a modest inventory carrying costs (see 9 Forecasting on page 32).

Period costs are depreciation added to Sales, General and Administration (SG&A) costs, which include R&D, Promotion, Sales and Admin expenses. Period costs are subtracted from the contribution margin to determine the net margin.

The net margin for all products is totaled then subtracted from other expenses, which in the simulation include fees, write-offs and, if it is enabled, TQM/Sustainability costs. This determines earnings before interest and taxes, or EBIT. Finally, interest, taxes and profit sharing costs are subtracted to determine net profit.

Tip: After finalizing your decisions, use the printer icon in the spreadsheet to print your proforma income statement. When the simulation advances to the next year, compare the proforma income statement to the results in the annual report income statement.

The proforma menu also links to projected financial ratios and, if your instructor has enabled it, a projected Balanced Scorecard (see 11 Balanced Scorecard on page 36).

5 The Purchase Decision

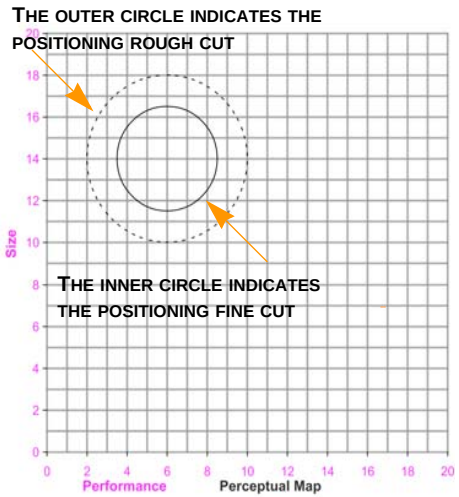


Figure 5.1 Positioning Rough Cut / Fine Cut Circles: The outer rough cut circle has a radius of 4 units. The inner fine cut circle has a radius of 2.5 units.

Customers go through two stages as they make their purchase decisions:

- The rough cut, which eliminates all sensors that will not fit the customer's needs; and
- The fine cut, which carefully weighs the relative merits of the remaining products.

5.1 The Rough Cut

In the rough cut, each segment sets its own standards for a sensor's:

- Positioning: The sensors size and performance coordinates must fall within the segment's circles on the perceptual map;
- Price: The sensor must be priced within the segment range;
- Reliability: The Mean Time Between Failure (MTBF) must meet the minimum requirements for the segment.

A product's age does not play a role in the rough cut.

5.1.1 Positioning In The Rough Cut

On the perceptual map, the circles represent the market segments (groups of customers with similar purchasing concerns). Products that plot within 4.0 units from the center of the segment circle are inside of the dashed lines (Figure 5.1). These products survive the positioning rough cut for that segment.

Products placed more than 4.0 units away from the center of the segment are outside of the dashed lines. These products fail the segment's rough cut and are not considered for purchase.

Tip: The location of each segment's rough cut circle as of December 31 of the previous year appears on page 11 of the *Courier*.

5.1.2 Price In The Rough Cut

Each segment sets price guidelines. For example, Low End customers will not pay High End prices. Segment price expectations correlate loosely with the segment's position on the perceptual map. Segments that demand higher performance levels and smaller sizes are willing to pay higher prices.

Sensors priced $5.00 above or below the segment guidelines will not be considered for purchase.

5.1.3 Reliability In The Rough Cut

Each segment sets guidelines for Mean Time Between Failure (MTBF), the number of hours a sensor is expected to operate before it malfunctions.

Sensors with MTBFs 5,000 hours or more beneath the segment's guidelines will not be considered for purchase.

Tip: The price criteria for the previous year and reliability criteria are listed in the *Courier's* segment analyses.

5.2 The Fine Cut

In the fine cut, a product's success is based on how appealing it is to the intended segment's customers. A product's appeal is driven by its monthly Customer Survey Score (the December survey score is published in the *Courier's* segment analyses). Each month, segment sales are determined by product survey scores. If a product is not available in sufficient numbers, other

products with lower scores may outsell it. A product's survey score starts with how well it satisfies the segment's buying criteria: Positioning, Price, MTBF and Age.

5.2.1 Positioning In The Fine Cut

In the fine cut, the product's relative position within the circle affects its appeal. Each segment's fine cut circle has an ideal spot. The ideal spot indicates the location where positioning demand is highest (darkest areas, Figures 5.2 - 5.6). Exact ideal spot locations relative to the segment centers can be found in Table 8.3 on page 28. Ideal spots drift with the segments, moving a little each month.

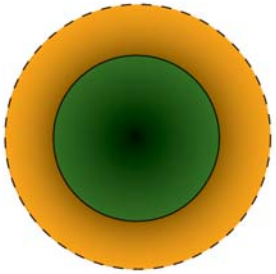


Figure 5.2 Traditional Preferred Position: Customers want products located in the center of the circle.

Customer positioning preferences are indicated by the darker areas of Figures 5.2 through 5.6. The darkest areas indicate the ideal spots.

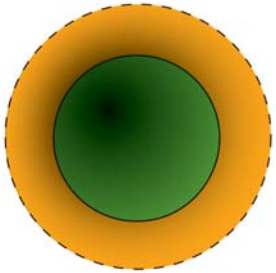


Figure 5.3 Low End Preferred Position: Customers want tried and true technology. They prefer products with slower performance and larger sizes.

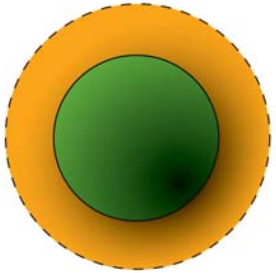


Figure 5.4 High End Preferred Position: Customers want high performance and small size.

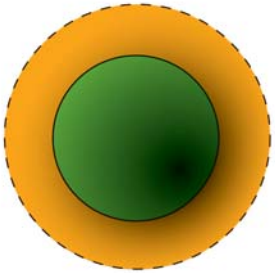


Figure 5.5 Performance Preferred Position: Customers prefer higher performance levels.

Customers in the high technology segments (High End, Performance and Size) want cutting-edge products. The ideal spots for these segments are located towards the lower-right edge of the circles, where size is smaller and performance is faster.

Low technology customers (Traditional and Low End) want proven technology. The Low End ideal spot is located towards the upper left, where products are bigger and slower. The Traditional ideal spot is in the center of the circle.

Ideal spots drift with the circles. The locations on December 31 of the previous year are reported in the Segment Analyses of *The Capstone® Courier*.

A sensor within the outer circle but outside the inner fine cut circle (orange areas, Figures 5.2 - 5.6) has reduced appeal. Appeal drops in a linear fashion. Just beyond the fine cut circle, appeal drops 1%; halfway between the fine and rough cut circles, appeal drops 50%; appeal drops 99% for products that are just inside the rough cut circle.

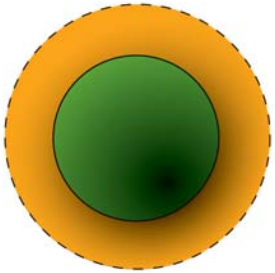


Figure 5.6 Size Preferred Position: Customers want smaller sizes.

5.2.2 Price In The Fine Cut

Within each segment's price guidelines, appeal for a product follows a classic economic demand curve: as price goes down, appeal goes up (Figure 5.7).

Figure 5.7 Classic Price Demand Curve: As price drops appeal rises.

Sensors priced $1.00 above or below the segment guideline lose about 20% of their appeal to customers. Products continue to lose approximately 20% of their appeal for each dollar above or below the guideline, on up to $5.00, at which point they lose all appeal.

5.2.3 Reliability In The Fine Cut

Customers prefer high MTBF ratings to low ones. However, if a product's MTBF is beyond the expected range, customers ignore the additional reliability.

Sensors with an MTBF 1,000 hours below the segment guideline lose about 20% of their appeal. Products continue to lose approximately 20% of their appeal for every 1,000 hours below the guideline, on up to 5,000 hours, at which point they lose all appeal to customers.

5.2.4 Age In The Fine Cut

In the fine cut, customers assess each product's age and award a score based upon their preferences. For example, Traditional customers prefer products that are 2 years old. Products with that age are given a score of 10 (see Figure 5.8). Age assessments vary from segment to segment (Figures 5.8 - 5.12). Within each segment, products with higher scores (green areas) generally outsell products with lower scores; products with ages in the orange areas can be revised by Research & Development (see 6.1.4 A Product's Age on page 18).

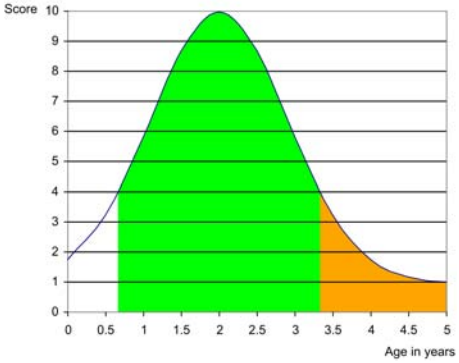


Figure 5.8 Traditional Preferred Age: Customers want products in the 2 year range (green area).

Tip: The Buying Criteria on the *Courier's* Segment Analyses report the age preference and its overall importance to the purchase decision.

Figure 5.9 Low End Preferred Age: Customers want products in the 7 year range (green area).

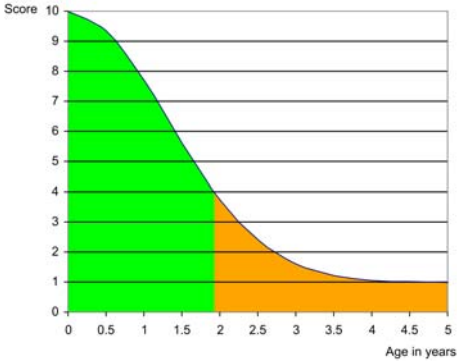


Figure 5.10 High End Preferred Age: Customers demand newer products (green area).

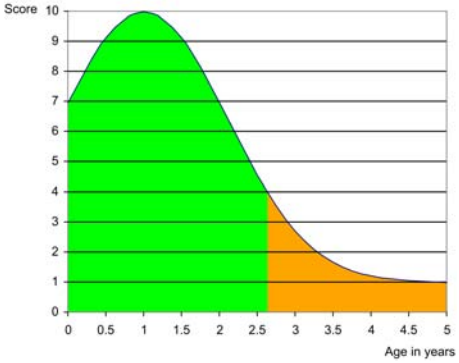


Figure 5.11 Performance Preferred Age: Customers want products in the 1 year range (green area).

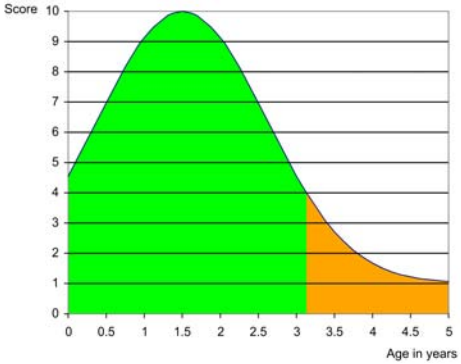


Figure 5.12 Size Preferred Age: Customers prefer products in the 1.5 year range (green area).

If the TQM/Sustainability module is enabled, some initiatives can increase appeal. See 7.2 TQM/Sustainability on page 24.

5.3 Marketing Factors

Product appeal is also affected by the Marketing Department's Promo and Sales Budgets (see 6.2 Marketing on page 18 for more information).

5.3.1 Awareness

Awareness is determined by each product's promotion budget. Promotion budgets are put towards advertising and public relations campaigns. Customers who are aware of a product always consider it. Of the customers who are not aware of a product, half discover it through their own research, and half miss it. A perfect product (with 100% accessibility) starts with a survey score of 100. If its awareness were 60%, then 40% of the customers do not know about it. Of those, half (20%) discover it. As a result, the survey score falls by 20%, from 100 to 80, reflecting the group of customers who do not know about the product and do not discover it through their own research.

5.3.2 Accessibility

Accessibility is determined by each product's sales budget. Sales budgets are put towards salespeople and distribution systems. An accessibility of 60% means that only 60% of customers have an easy time finding a product, talking to a salesperson and taking delivery. Of the customers who cannot easily locate the product, half will seek it out. A perfect product (with 100% awareness) starts with a survey score of 100. If its accessibility were 60%, then 40% of the customers do not have easy access to it. Of those, half (20%) would make an extra effort to acquire it through their own means. As a result, the survey score falls by 20%, from 100 to 80, reflecting the group of customers who do not have easy access to the product and are unwilling to make an extra effort to acquire it.

5.4 Seller's Market

How can a company be sure of a seller's market? It can't unless it concludes that industry capacity, including a second shift, cannot meet demand for the segment. In that case even very poor products will stock out as customers search for anything that can meet their needs.

See 8.2 Industry Demand Analysis and 8.3 Capacity Analysis on page 29 to learn more about demand and capacity.

Usually a product with very low appeal makes few sales. However, when all the "good" products stock out, what is known as a Seller's Market is created. In a Seller's Market, customers will accept marginal products as long as they fall within the rough cut limits. For example, desperate customers with no better alternatives will buy:

- A product positioned just inside the rough cut circle on the perceptual map– outside the circle they say "no" to the product;
- A product priced $4.99 above the price range– however, at $5.00 customers reach their tolerance limit and refuse to buy the product;
- A product with MTBF 4,999 hours below the range– at 5,000 hours below the range customers refuse to buy the product.

5.5 Market Sizes And Growth

5.5.1 Market Size By Unit

The low technology segments (Traditional and Low End) dominated the beginning (Round 0) sensor market in units sold (Table 5.1). However, the Traditional and Low End growth rates trail the growth rates for High End, Performance and Size (Table 5.2). By year five, High End, Performance and Size will command a greater percentage of the overall market (Table 5.3).

Table 5.1 Last Year's Unit Sales Percentage

Traditional	Low End	High End	Performance	Size
32.4%	39.3%	11.2%	8.4%	8.7%

Table 5.2 Segment Growth Rates

Traditional	Low End	High End	Performance	Size
9.2%	11.7%	16.2%	19.8%	18.3%

Table 5.3 5 Year Unit Sales Percentages

Traditional	Low End	High End	Performance	Size
27.5%	37.3%	12.9%	11.3%	11.0%

5.5.2 Market Size By Dollar

The low technology segments (Traditional and Low End) dominated the Round 0 sensor market in dollars (Table 5.4). Unlike unit demand, the five-year dollar value for each segment is impossible to predict due to downward price pressure. Table 5.5 uses the beginning (Round 0) price data to display the dollar percentage for each segment in five years if prices are not adjusted.

Table 5.4 Last Year's Dollar Percentages

Traditional	Low End	High End	Performance	Size
32.3%	31.0%	15.6%	10.4%	10.7%

Table 5.5 5 Year Dollar Forecast: If current prices will not change.

Traditional	Low End	High End	Performance	Size
27.6%	28.2%	17.7%	13.4%	13.1%

6 Operations

Each company starts the simulation with five products. Your company has one product for each segment. You have one assembly line per product. Products can be terminated or added. Your company must have at least one product and cannot have more than eight. You and your fellow managers make business decisions on January 1 of each year. They are then executed by your employees. Industry results are published in *The Capstone® Courier*, which can be viewed from the website and from the Courier menu in Capstone.xls.

6.1 Research & Development (R&D)

Your R&D decisions are fundamental to your marketing and production plans. In marketing, R&D addresses:

- The positioning of each product inside a market segment on the perceptual map
- The number of products in each segment
- The age of your products
- The reliability of each product (its MTBF rating)

In production, R&D affects or is affected by:

- The cost of material
- The purchase of new facilities to build new products
- Levels of automation for a product

The Research & Development (R&D) Department invents new products and changes specifications for existing products. Changing size and/or performance repositions a product on the perceptual map (see Figure 2.1 on page 6). Improving performance and shrinking size moves the product toward the lower right on the map.

Tip: Improving positioning and reliability will make a product more appealing to customers but doing so increases material cost. See 8.4.1 Margin Potential on page 31.

All R&D projects begin on January 1. If a product does not have a project already underway, you can launch a new project for that product. However, if a project begun in a previous year has not finished by December 31 of last year, you will not be able to launch a new project for that product (the decision entry cells on the R&D spreadsheet in Capstone.xls will be locked).

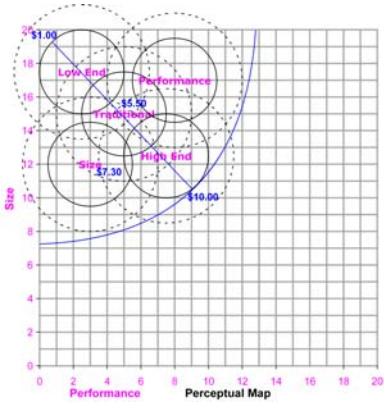


Figure 6.1 Material Positioning Costs: Material Positioning costs vary depending on the product's relative location on the perceptual map. Products placed at the trailing edge of the Low End segment have a positioning component cost of $1.00; products placed at the leading edge of the High End segment have a positioning component cost of $10.00. Positioning component cost locations for a Traditional product ($5.50) and a Size Product ($7.30) are also illustrated.

6.1.1 Changing Performance, Size And MTBF

A repositioning project moves an existing product from one location on the perceptual map to a new location, generally (but not always) down and to the right.

Repositioning requires a new size attribute and/or a new performance attribute. To keep up with segment drift, products must be made smaller (that is, decrease its size) and better performing (that is, increase its performance).

Positioning affects material costs (Figure 6.1). The higher the technology, the higher the cost. At the beginning of the simulation, the trailing edge of the Low End fine cut has the lowest cost, at $1.00; the leading edge of the High End fine cut has the highest cost, at $10.00.

The reliability rating, or MTBF, for existing products can be adjusted up or down. Each hour of reliability (MTBF) adds $0.0003 to the material cost. A product with 20,000 hours reliability includes $6.00 in reliability costs ($0.0003 X 20,000 = $6.00).

Tip: Material costs displayed in the spreadsheet and reports are the combined positioning and MTBF costs.

Tip: Unsold products built prior to the completion of an R&D project are reworked free of charge to match the new specifications.

Tip: Products will continue to produce and sell at the old performance, size and MTBF specifications up until the revision date.

6.1.2 Product Invention

New products are assigned a name (click in the first cell that reads NA in the name column), performance, size and MTBF. Of course, these specifications should conform to the criteria of the intended market segment. The name of all new products must have the same first letter of the company name. All new products require a production line. The Production Department must order equipment one year in advance. Invention projects take at least one year to complete.

Tip: When products are created or moved close to existing products, R&D completion times diminish. This is because your R&D Department can take advantage of existing technology. If the module is active, TQM/Sustainability investments can also decrease R&D times.

Tip: If you don't buy the production line the year prior to its introduction, you cannot manufacture your new product! See 6.3.1 Capacity on page 20.

All new products require capacity and automation, which should be purchased the year before the product's revision (release) date. It is not possible to produce products prior to the revision date– a new product with a revision date of July 1 will be produced in the second half of the year. The capacity and automation will stand idle for the first half of the year.

6.1.3 Project Management

Segment circles on the perceptual map move at speeds ranging from 0.7 to 1.3 units each year. You must plan to move your products (or retire them) as the simulation progresses. Generally, the longer the move on the perceptual map, the longer it takes the R&D Department to complete the project.

Project lengths can be as short as three months, or as long as three years. R&D project lengths will increase when the company puts two or more products into R&D at the same time– when this happens each R&D project takes longer. Production line automation levels also affect project lengths (see Figure 6.3 on page 20). R&D project costs are driven by the amount of time they take. A six-month project costs $500,000; a one-year project costs $1,000,000.

If the project length takes more than a year, the revision date will be reported in the next *Capstone® Courier*. However the new performance, size and MTBF will not appear; old product attributes are reported prior to project completion.

6.1.4 R&D Decision Entries

Before R&D entries

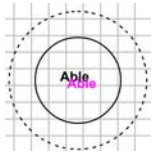
Name	New Pfmn	New Size	MTBF	Revision Date	Age at Revision	R&D Cost ($000)
Able	5.5	14.5	17,500		-	$0

After R&D entries

Name	New Pfmn	New Size	MTBF	Revision Date	Age at Revision	R&D Cost ($000)
Able	5.9	14.1	15,000	28-May-09	1.8	$410

Login to Capstone.xls and click the Decisions menu. Select Research & Development. To change a product's performance, enter a number in the New Pfmn cell; to change its size, enter a number in the New Size cell. To change the reliability rating, enter a number in the MTBF cell. The example above illustrates an increase in performance from 5.5 to 5.9, a decrease in size from 14.5 to 14.1 and a decrease in MTBF from 17,500 to 15,000. The project will complete on May 28, 2007, the product's age on that date will become 1.8 years (see 6.1.4 A Product's Age on page 18) and the project will cost $410,000.

After the changes are entered, the sensor displays twice on the perceptual map. The name in black indicates the original location (5.5 and 14.5). The name in magenta, indicates the position it will have after May 28, (5.9 and 14.1). The sensor will sell at the original position prior to the revision date and at the new position after the revision date.



Round 1 of the Rehearsal Simulation covers R&D decisions. See the website's Downloads section for complete information about Capstone.xls and the Rehearsal Simulation.

It is important to verify completion dates after all decisions have been entered. Usually you want repositioning projects to finish in less than a year. For example, consider breaking an 18 month project into two separate projects, with the first stage ending just before the end of the current year and the second ending halfway through the following year.

6.1.4 A Product's Age

It is possible for a product to go from an age of 4 years to 2 years. How can that be? When a product is moved on the perceptual map, customers do not perceive the modified product to be new, but they do not perceive the product to be the same age as it was prior to modification. As a compromise, customers *mentally* cut the age in half.

Age criteria vary from segment to segment. For example, Traditional customers prefer an age of 2 years. This accounts for 47% of the Traditional customers' purchase decision. If a Traditional product's age approaches 3 years, customers will begin to turn away (see Figure 5.8 on page 14). Repositioning the product drops the age from 3 to 1.5 years and customers become interested again.

6.2 Marketing

Marketing is concerned with pricing and promoting your products. The department is also responsible for sales forecasts.

6.2.1 Pricing Products

Price was discussed in 5.2.2 Price In The Fine Cut on page 13. To review, appeal falls to zero when prices go $5.00 above or below the expected price range. Price drives the product's contribution to profit margin. Dropping the price increases appeal but reduces profit per unit. Segment price ranges fall at a rate of $0.50 per year. For example, in Round 0 Traditional customers expected a price between $20.00 and $30.00. In Round 1, the Traditional price range will be $19.50-$29.50; Round 2, $19.00-$29.00, etc. This puts pressure on companies to improve their cost structures.

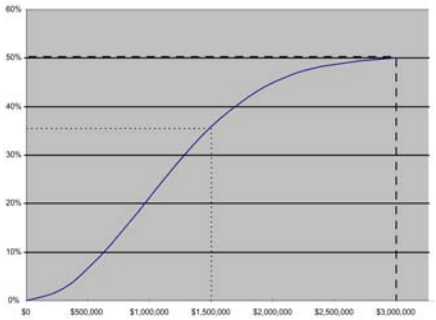


Figure 6.2 Promotion Budget: Increases in Promotion Budget have diminishing returns. The first $1,500,000 buys 36% awareness; Spending another $1,500,000 (for a total of $3,000,000) buys approximately 50%. The second $1,500,000 buys only 14% more awareness.

6.2.2 Promo And Sales Budgets

Promotion and Sales Budgets affect product appeal. See 5.3 Marketing Factors on page 14 for more information.

Tip: The *Courier's* Segment Analyses report accessibility and awareness. See 3.2 Segment Analyses on page 8.

Promotion

Each product's Promo Budget determines its level of awareness. A product's awareness percentage reflects the number of customers who know about the product. 50% awareness indicates half of the potential customers know it exists. From one year to the next, a third of those who knew about a product forget about it.

Last Year's Awareness - (33% X Last Year's Awareness) = Starting Awareness

If a product ended last year with an awareness of 50%, this year it will start with an awareness of approximately 33%. This year's promotion budget would build from a starting awareness of 33%.

Starting Awareness + Additional Awareness From Figure 6.2 = New Awareness

Figure 6.2 indicates a $1,500,000 promotion budget would add 36% to the starting awareness, for a total awareness of 69% (33% + 36% = 69%).

Figure 6.2 indicates a $3,000,000 budget would add 50% to the starting awareness, only 14% more than the $1,500,000 expenditure (33% + 50% = 83%). This is because further expenditures tend to reach customers who already know about the

product. Once your product achieves 100% awareness, you can scale back the product's promotion budget to around $1,400,000. This will maintain 100% awareness year after year.

New products are newsworthy events. The public relations buzz creates 25% awareness that is added to the additional awareness you create with your promotion budget.

Accessibility and Awareness numbers change if the Advanced Marketing module is active (see 7.4 Advanced Marketing on page 25.

Tip: The Segment Analyses report awareness. See Figure 3.4 on page 9.

SALES

Each product's Sales Budget contributes to segment accessibility. A segment's accessibility percentage is proportional to the number of customers who can easily purchase your products. Like awareness, if your sales budgets drop to zero, you lose one third of your accessibility each year. Unlike awareness, accessibility applies to the segment, not the product. If your product exits a segment, it leaves the old accessibility behind. When it enters a different segment, it inherits that segment's accessibility.

If you have two or more products that meet a segment's fine cut criteria, the sales budget for each product contributes to that segment's accessibility percentage. This has two important implications:

1. The more products you have in the segment's fine cut, the stronger your distribution channels, support systems, etc. This is because each product's sales budget contributes to the segment's accessibility.
2. Achieving 100% accessibility is difficult. Companies must have at least two products in the segment's fine cut. Each product experiences diminishing returns at a sales budget of $3,000,000. Diminishing returns for the overall segment is not reached until the budgets total $4,500,000 (for example, two products with sales budgets of $2,250,000 each). Once 100% accessibility is reached, you can scale back to around $3,300,000 to maintain 100%.

Tip: Products with prices, MTBFs or positioning in the segment's rough cut do not contribute to the segment's accessibility.

Tip: The Segment Analyses report accessibility. See Figure 3.3 on page 9.

6.2.3 Sales Forecasting

Accurate sales forecasting is a key element to company success. Manufacturing too many units results in extra time/material costs

Before And After The Sale

Think of awareness and accessibility as "before" and "after" the sale. The promo budget drives awareness, which persuades the customer to look at your product. The sales budget drives accessibility, which governs everything during and after the sale. The promo budget is spent on advertising and public relations. The sales budget is spent on distribution, order entry, sales budgets, customer service, etc. Awareness and accessibility go hand and hand in making the sale. The former is about encouraging the customer to choose your product, the latter about closing the deal via your salespeople and distribution channels.

6.2.4 Marketing Decision Entries

NAME	Price	Promo Budget	Sales Budget	Computer Prediction	Your Sales Forecast	Gross Revenue Forecast	Variable Costs	Contrib. Margin Forecast	Less Promo & Sales
Able	$28.00	$1,000	$1,000	896	1200	$25,078	$17,462	$7,616	$5,616

Login to Capstone.xls and click the Decisions menu. Select Marketing. Use this area to determine each product's Price, Promo Budget, Sales Budget and Sales Forecast.

What's the difference between the Computer Prediction and Your Sales Forecast? The Computer Prediction (in yellow) assumes your competition will not update their product line– not a good assumption. The Computer Prediction however will adjust as you revise your products in R&D, change prices and determine your Accounts Receivable policy. The adjustment, up or down, will give you an idea of the relative effect your decisions will have on product appeal.

The Your Sales Forecast column allows you to enter qualitative sales projections (see 9 Forecasting on page 32).

The remaining cells display the financial impacts of your decisions:

- Gross Revenue Forecast– Price multiplied by either the Computer Prediction or, if entered, Your Sales Forecast
- Variable Costs– Labor, Material and Inventory Carrying costs subtracted from the Gross Revenue Forecast
- Contribution Margin Forecast– Gross Revenue minus variable costs
- Less Promo & Sales– Contribution Margin Forecast minus the product's Promo Budget and Sales Budget

Customer and supplier credit policies are set in the Marketing area. See 6.4.5 Credit Policy on page 23.

Round 2 of the Rehearsal Simulation covers Marketing decisions. See the website's Downloads section for complete information about Capstone.xls and the Rehearsal Simulation.

and inventory carrying costs. Manufacturing too few units means stock outs and lost sales opportunities, which can cost even more. See 9 Forecasting on page 32.

6.3 Production

The Production Department schedules manufacturing runs for each sensor product. At the start of the simulation, your production plant has five lines with room for three more. Each assembly line is unique to the product it manufactures. You cannot move a product from one assembly line to another because automation levels vary and each product requires special tooling. Production schedules for each product should reflect Marketing's forecasts, less any inventory left over from the previous year.

6.3.1 Capacity

First shift capacity is defined as the number of products that can be produced on an assembly line (that is, without a second shift) in a single year. Assembly lines can produce up to twice their first shift capacity with 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 wages are 50% higher than the first shift.

Each new unit of capacity costs $6 for the floor space plus $4 times the automation rating. The Production spreadsheet in Capstone.xls displays the exact cost. 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 you sell capacity for more than its depreciated value, you make a gain on the sale. This will be reflected as a negative write-off on the income statement (see 4.3 Income Statement on page 11).

6.3.2 Discontinuing A Product

If you sell all the capacity on a production line, Capstone® interprets this as a liquidation instruction and will sell your remaining inventory for half the average cost of production. Capstone® writes off the loss on your income statement. If you sell all but one unit of capacity, your inventory will not be liquidated and it can be sold for full price.

6.3.3 Automation

Automation levels are given a scale of 1.0 to 10.0. 1.0 is the lowest automation, 10.0 the highest. At the start of the simulation, all assembly lines have an automation level between 3.0 and 5.0. As automation levels increase, the number of labor hours required to produce each unit falls.

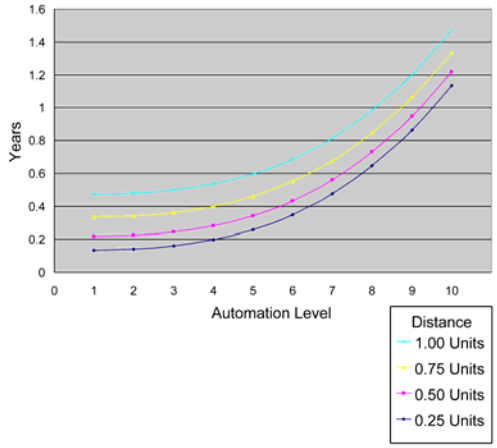


Figure 6.3 Time Required to Move a Product on the Perceptual Map at Automation Levels 1 Through 10: Note that at all automation levels, less time is required to move a product 0.25 units (dark blue line) than to move a product 1.0 units (light blue line). These times will increase when two or more R&D projects are underway.

Products in the High End, Performance and Size segments, where positioning is an important criteria, can be repositioned more quickly with lower automation.

The dollar value limit of capacity and automation purchases is largely determined by the maximum amount that can be raised through stock and bond issues minus the total amount of stock dividends to be paid in the current year.

See 6.4 Finance on page 21.

6.3.5 Production Decision Entries

Schedule	Able
Unit Sales Forecast	1200
Inventory On Hand	189
Production Schedule	1,200
Production After Adj.	1,188
Physical Plant	
1st Shift Capacity	1,800
Buy/Sell Capacity	0
Automation Rating	4.0
New Autom. Rating	4.0
Investment ($000)	$0

Login to Capstone.xls and click the Decisions menu. Select 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 Autom. Rating.)

Round 3 of the Rehearsal Simulation covers Production decisions. See the website's Downloads section for complete information about Capstone.xls and the Rehearsal Simulation.

If you reduce automation, you will incur a retooling cost. The net result is you will be paying 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.

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

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

- Automation is expensive: At $4 per point of automation, raising automation from 1.0 to 10.0 costs $36 per unit of capacity;
- As you raise automation, it becomes increasingly difficult for R&D to reposition products on the Perceptual Map because more machines must be redesigned (see Figure 6.3 on page 20). This does not apply to long moves. You can move a product a long distance at any automation level, but the project will take between 2.5 and 3.0 years.

Labor costs increase each year because of the Annual Raise in labor's contract. Optional Labor Negotiations, TQM/Sustainability and Human Resources modules can also affect labor costs.

The dollar value limit of capacity and automation purchases is largely determined by the maximum amount that can be raised through stock and bond issues minus the total amount of stock dividends to be paid in the current year.

See 6.4 Finance on this page.

6.3.4 Changing Automation

For each point of change, up or down, the company is charged $4 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 does not have the same effect as selling capacity. You will not receive cash for lowering your automation, but will be billed instead. Changes in automation require a full year to take effect– change it this year, use it next year.

6.4 Finance

Your Finance Department is primarily concerned with five issues:

1. Acquiring the capital needed for company activities. Capital can be acquired through:
   - Current Debt
   - Stock Issues
   - Bond Issues (Long Term Debt)
   - Profits
2. Establishing a dividend policy that maximizes the return to shareholders.
3. Setting accounts payable and accounts receivable policies (which are entered on the Marketing spreadsheet).
4. Driving the financial structure of the firm, its relationship between debt and equity.
5. Selecting and monitoring performance measures that support your strategy.

Tip: Finance decisions should be made after the other departments have entered their decisions. When the management team decides what the company needs to be successful, the Finance Department can decide how to pay for it.

Tip: One of the Finance Department's fiduciary duties is to verify that sales forecasts and product prices are realistic. If prices and forecasts are too high, the cash flow they predict might not materialize. The department should challenge Marketing to defend their forecasts and pricing decisions.

As a general rule, companies fund short term assets like accounts receivable and inventory with current debt offered by banks.

6.4.1 Current Debt

Your bank issues current debt in one year notes. The Finance spreadsheet in Capstone.xls displays the amount of current debt due from the previous year. The company can "roll" that debt by simply borrowing the same amount again. There are no brokerage fees for current debt. Interest rates are a function of your debt level. The more debt you have relative to your assets, the more risk you present to debt holders and the higher the current debt rates.

Bankers will loan current debt up to about 75% of your accounts receivable (found on last year's balance sheet) and 50% of this year's inventory. They estimate your inventory for the upcoming year by examining last year's income statement. Bankers assume your worst case will leave a three to four month inventory, and they will loan you up to 50% of that amount. This works out to be about 15% of the combined value of last year's total direct labor and total direct material, which display on the income statement. Because they know your industry is growing, as a final step bankers increase your borrowing limit by 20% to provide you with room for expansion in inventory and accounts receivable.

6.4.2 Bonds

As a general rule, bond issues are used to fund long term investments in capacity and automation.

All bonds are ten year notes. Your company pays a 5% brokerage fee for issuing bonds. The first three digits of the bond, the series number, reflect the interest rate. The last four digits indicate the year in which the bond is due. The numbers are separated by the letter S which stands for "series." For example, a bond with the number 12.6S2009 has an interest rate of 12.6% and is due December 31, 2009.

Bondholders will lend total amounts up to 80% of the value of your plant and equipment (the Production Department's capacity and automation). Each bond issue pays a coupon, the annual interest payment, to investors. If the face amount or principal of bond 12.6S2009 were $1,000,000, then the holder of the bond would receive a payment of $126,000 every year for ten years. The holder would also receive the $1,000,000 principal at the end of the tenth year. Each year your company is given a credit rating that ranges from AAA (best) to D (worst). In Capstone®, ratings are evaluated by comparing current debt interest rates with the prime rate.

When issuing new bonds, the interest rate will be 1.4% over the current debt interest rates. If your current debt interest rate were 12.1%, then the bond rate would be 13.5%.

You can buy back outstanding bonds before their due date. A 1.5% brokerage fee applies. These bonds are repurchased at their market value or street price on January 1 of the current year. The street price is determined by the amount of interest the bond pays and your credit worthiness. It is therefore different from the face amount of the bond. If you buy back bonds with a street price that is less than its face amount, you make a gain on the repurchase. This will be reflected as a negative write-off on the income statement (see 4.3 Income Statement on page 11).

Bonds are retired in the order they were issued, the oldest bonds retire first. There are no brokerage fees for bonds that are allowed to mature to their due date.

If a bond remains on December 31 of the year it becomes due, your banker lends you current debt to pay off the bond principal. This, in effect, converts the bond to current debt. This amount is combined with any other current debt due at the beginning of the next year.

When Bonds Come Due

If the face amount of bond 12.6S2009 were $1,000,000, the $1,000,000 repayment is acknowledged in your reports and spreadsheets in the following manner: Your annual reports from December 31, 2009 would reflect an increase in current debt of $1,000,000 offset by a decrease in long term debt of $1,000,000.

The 2009 spreadsheet will list the bond because you are making decisions on January 1, 2009, when the bond still exists. Your 2010 spreadsheet would show a $1,000,000 increase in current debt and the bond no longer appears.

Bond Ratings

If your company has no debt at all, your company is awarded a AAA bond rating. As your debt-to-assets ratio increases, your current debt interest rates increase. Your bond rating slips one category for each additional 0.5% in current debt interest. For example, if the prime rate is 10%, and your current debt interest rate is 10.5%, then you would be given a AA bond rating instead of a AAA.

When Bonds Are Retired Early

A bond with a face amount $10,000,000 could cost $11,000,000 to repurchase early because of fluctuations in interest rates and your credit worthiness. A 1.5% brokerage fee applies. The difference between the face value and the repurchase price will reflect as a gain or loss in the Income Statement's Fees and Write-offs.

6.4.3 Stock

As a general rule, stock issues are used to fund long term investments in capacity and automation.

Stock issue transactions take place at the current market price. Your company pays a 5% brokerage fee for issuing stock. New stock issues are limited to 20% of your company's outstanding shares in that year.

Stock price is a function of:

- Book Value
- Earnings Per Share (EPS)
- Annual Dividend

Book value is equity divided by shares outstanding. Equity equals the common stock and retained earnings values listed on the balance sheet. Shares outstanding is the number of shares that have been issued. For example, if equity is $50,000,000 and there are 2,000,000 shares outstanding, book value is $25 per share.

EPS is calculated by dividing net profit by shares outstanding.

The dividend is the amount of money paid per share to stockholders each year. Stockholders do not respond to dividends beyond the EPS, they consider them unsustainable. For example, if your EPS is $1.50 per share, and your dividend is $2.00 per share, stockholders would ignore anything above $1.50 per share as a driver of stock price.

All of these factors are profit dependent. You need to make sufficient profit to increase the book value of your company and pay a dividend. Improving profit also improves EPS.

You can retire stock. The amount cannot exceed the lesser of either:

- 5% of your Market Capitalization, listed on page 2 of last year's *Courier*; or
- Your Total Equity listed on Page 3 of last year's *Courier*.

You are charged a 1.5% brokerage fee to retire stock.

6.4.6 Finance Decision Entries

Login to Capstone.xls and click the Decisions menu. Select Finance. Use this area to raise money:

- Current Debt (These are one year loans.)
- Long Term Debt (These are 10 year bonds.)
- Issue Stock

As resources permit, companies can:

- Retire Stock
- Retire Bonds
- Issue a Dividend

Round 4 of the Rehearsal Simulation covers Finance decisions. See the website's Downloads section for complete information about Capstone.xls and the Rehearsal Simulation.

Emergency loans depress stock prices, even when you are profitable. Stockholders take a dim view of your performance when they witness a liquidity crisis.

Capstone.xls combines Emergency Loans with any Current Debt from last year. The total amount displays in the Due This Year cell under Current Debt.

Emergency loans are often encountered when last year's sales forecasts were higher than actual sales or when the Finance Department fails to raise funds needed for expenditures like capacity and automation purchases.

6.4.4 Emergency Loans

Financial transactions are carried on throughout the year directly from your cash account. If you manage your cash position poorly, Capstone® will give you an Emergency Loan to cover the shortfall. The loan comes from a gentleman named Big Al, who arrives at your door with a checkbook and a smile. Big Al gives you a loan exactly equal to the shortfall. You pay one year's worth of current debt interest on the loan and Big Al adds a 7.5% penalty fee on top to make it worth his while.

For example, suppose the current debt interest rate is 10%, and you are short $10,000,000 on December 31. You pay one year's worth of interest on the $10,000,000 ($1,000,000) plus an additional 7.5% or $750,000 penalty. The emergency loan is combined with any other current debt due at the beginning of the next year. You do not need to do anything special to repay it. However, you need to decide what to do with the current debt (pay it off, re-borrow it, etc.). The interest penalty only applies to the year in which the emergency loan is taken, not to future years.

Customer and supplier credit policies are set on the Marketing spreadsheet in Capstone.xls.

6.4.5 Credit Policy

Your company determines the number of days between transactions and payments. For example, your company could give customers 30 days to pay their bills (accounts receivable) while holding up payment to suppliers for 60 days (accounts payable).

Shortening A/R (accounts receivable) lag from 30 to 15 days in effect recovers a loan made to customers. Similarly, extending the A/P (accounts payable) lag from 30 to 45 days extracts a loan from your suppliers.

The accounts receivable lag impacts sales. If your company offers no credit terms, your product line's appeal falls to about 65% of maximum. At 30 days, appeal is 92%. At 60 days, appeal is 98.5%. At 120 days there is no reduction. The longer the lag, the more cash is tied up in receivables.

The accounts payable lag has implications for production. Suppliers become concerned as the lag grows and they start to withhold material for production. At 30 days, they withhold 1%. At 60 days, they withhold 8%. At 90 days, they withhold 26%. At 120 days, they withhold 63%. At 150 days, they withhold all material. Withholding material creates shortages on the production line, workers stand idle and per-unit labor costs rise.

7 Additional Modules

Instructors have the option of activating up to four additional modules: Human Resources, TQM (Total Quality Management)/Sustainability, Labor Negotiations and Advanced Marketing. Instructors set the round in which the modules will begin. On the website, your Dashboard will notify you if the modules are scheduled. Descriptions of the modules appear below. Complete instructions can be found online in the website's Manager Guide.

7.1 Human Resources

When the Human Resources module is activated, three areas must be addressed:

1. Complement (the number of workers in the workforce): Needed Complement is the number of workers required to fill the production schedule without Overtime.
2. Caliber (the talent of the workforce): If companies spend the money, they can recruit a higher caliber worker. This results in higher Productivity and lower Turnover. Companies can enter a Recruiting Spend budget up to an additional $5,000 per worker. If they spend nothing extra, their recruitment cost per worker remains at $1,000 and they get an average person off the street. The more they spend, the higher the caliber of the worker.
3. Training (the amount of time workers spend in training each year): Training leads to higher Productivity and lower Turnover, but takes people off the job while they are in the classroom. Each training hour costs $20 per worker.

7.1.1 Human Resources Decision Entries

Workforce Complement	Last Year	Needed	This Year	1st Shift	2nd Shift	Overtime
	700	701	**700**	640	60	0.2%

Login to Capstone.xls and click the Decisions menu. Select Production to enter the This Year's workforce complement. Select Human Resources to enter Training Hours and Recruitment Budgets.

STAFFING	Last Year	This Year
Needed Complement	701	701
Complement	700	700
1st Shift Complement	640	640
2nd Shift Complement	60	60
Overtime%	0.2%	0.2%
Turnover Rate	10.0%	10.0%
New Employees	70	70
Separated Employees	0	0
Recruiting Spend	$0	**$0**
Training Hours	0	**0**
Productivity Index	100.0%	100.0%

Recruiting Cost	$70
Separation Cost	$0
Training Cost	$0
Total HR Admin Costs	$70

Assuming you have sufficient workers (Complement), investments in Recruiting and Training raise your Productivity Index, which in turn lowers your per unit labor costs. Scheduling overtime reduces any gains to the Productivity Index. The Productivity Index cannot go below 100%.

7.2 TQM/Sustainability

When the TQM (Total Quality Management)/Sustainability module is activated, companies can invest in initiatives that will:

- Produce administrative savings;

- Improve production efficiency by lowering labor and/or material costs;
- Increase demand;
- Reduce R&D times.

For each initiative, yearly investments less than $500,000 will create little improvement; yearly investments above $2,000,000 push well into diminishing returns. Investing more than $5,000,000 in the same initiative over a two or three year period creates little or no additional improvement.

7.2.1 TQM/Sustainability Decision Entries

Login to Capstone.xls and click the Decisions menu. Select TQM/Sustainability. Investments are entered in the green cells. Projected impacts also display.

As companies make decisions, a worst-case/best-case set of outcomes is predicted. These are also carried into the proforma financial reports. The spreadsheet can only offer a range of possible savings. Actual results appear the following round on Page 12 of *The Capstone® Courier* in the HR/TQM/Sustainability Report (see 3 The Capstone® Courier on page 8).

7.3 Labor Negotiations

Labor Negotiations are entered on the Human Resources spreadsheet. Negotiations can be viewed as exception events–sudden changes in the operating environment. Labor opens the contract offers from all of the companies, picks the most favorable terms, and uses those as a standard for negotiation with every company. This creates an opportunity for a low labor-cost company (due to automation and other investments) to impose higher labor costs upon other firms.

Management enters Starting Positions in four separate categories:

- Hourly Wage
- Benefits
- Profit Sharing %
- Annual Raise

The spreadsheet automatically enters a Negotiation Ceiling that is 10% above each Starting Position. If the Negotiation Ceiling is beneath labor's demands, labor will strike. Strike lengths depend on the spread between positions. The maximum length of a strike is 84 days. Workers will strike approximately 7 days for every:

- $1 difference in wages
- $300 difference in benefit package
- Every percentage point difference in Profit Sharing
- Every percentage point difference in Annual Raise

Tip: Low wage and benefit offers can erode Productivity Index gains attained by Human Resources investments.

7.3.1 Labor Negotiation Decision Entries

LABOR NEGOTIATION

	Current Contract	Labor Demands	Negotiation Position Starting	Negotiation Position Ceiling
Hourly Wage	$21.00	$23.10	**$20.00**	$22.00
Benefits	$2,500	$2,750	**$2,500**	$2,750
Profit Sharing %	2.0%	2.2%	**2.0%**	2.2%
Annual Raise	5.0%	5.5%	**5.0%**	5.5%

Login to Capstone.xls and click the Decisions menu. Select Human Resources to enter Negotiation Starting Positions.

7.4 Advanced Marketing

The Advanced Marketing module allows companies to have greater control over their Marketing Budgets. Each product can be promoted via:

- Print Media
- Direct Mail
- Web Media

- Email
- Trade Shows

Sales budgets for each segment can be split among:

- Outside Sales
- Inside Sales
- Distributors

Tip: When the module is on, the awareness and accessibility numbers outlined on page 18 do not apply.

7.4.1 Advanced Marketing Decision Entries

Login to Capstone.xls and click the Decisions menu. When the Marketing module is activated an arrow appears to the right of Marketing. A sub-menu expands when the cursor passes over the arrow. Prices and Sales Forecasts for each product are entered on the Pricing & Forecasting spreadsheet. Selecting Promo Sales in the Marketing submenu opens the Marketing Budget Detail spreadsheet (alternatively, click the gray Promo Budget or Sales Budget buttons from the Pricing & Forecasting screen).

8 Situation Analysis

The Situation Analysis will help your company understand the current market conditions and how the industry will evolve over the next eight years.

Tip: An interactive version of the Situation Analysis is available online in the Manager Guide.

The analysis can be done as a group or you can assign parts to individuals and then report back to the rest of the company. These exercises require *The Capstone® Courier* industry newsletter for Round 0. The *Courier* is available from two locations:

- On the website, login to your simulation then click the Reports link;
- From Capstone.xls, click Courier in the menu bar.

Tip: The *Courier* displays "Last Years Results," for example, the *Courier* available at the start of Round 2 will display the results for Round 1. The *Courier* available at the start of Round 1 displays the results for Round 0, when all companies have equal standing (if you access the report from the website, use the Round 0 *Courier* to complete the Situation Analysis).

The Situation Analysis has five parts:

- Perceptual Map
- Industry Demand Analysis
- Capacity Analysis
- Margin Analysis
- Consumer Report

8.1 Perceptual Map

The Research & Development Department can use the Perceptual Map exercise to plan revision and invention projects that meet customers' shifting size and performance expectations. The Marketing Department can use the results during forecasting as they compare competing products and when determining prices (in general, better positioned products can command higher prices).

Each segment has a set of circles. The inner fine cut circles have a radius of 2.5 units. They represent the heart of the segments where demand is strong. In addition, each inner circle has an ideal spot, a location where demand is strongest. The larger outer rough cut circles have a radius of 4.0 units. They represent the outer fringe of the segments where demand is weak (see Figure 5.1 on page 12).

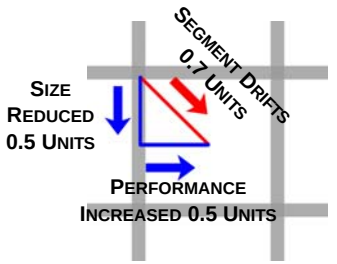
Table 8.1 Segment Circle Drift Rates: Every year, customers prefer increased performance and decreased size.

Segment	Performance	Size
Traditional	+0.7	-0.7
Low End	+0.5	-0.5
High End	+0.9	-0.9
Performance	+1.0	-0.7
Size	+0.7	-1.0

8.1.1 Segment Centers and Segment Drift

Table 8.1 shows the yearly drift rates for each segment. For example, the center of the Traditional segment ends Round 0 (that is, the year before the start of the simulation) with a performance of 5.0 and a size of 15.0. To these coordinates, add the performance coordinate drift rate of +0.7 (customers want better performing products) and subtract the size coordinate drift rate of -0.7 (customers want smaller products). The result, at the end of Round 1 the center of the Traditional segment will have a performance of 5.7 and a size of 14.3.

The center of the High End segment ends Round 0 (last year) with a performance of 7.5 and a size of 12.5. The High End performance drift rate is +0.9 and the size drift rate is -0.9. At the end of Round 1, the center of the High End segment will have a performance of 8.4 and a size of 11.6 (7.5 + 0.9 = 8.4 and 12.5 - 0.9 = 11.6). The segment center locations at the end of each round display in Table 8.2 on page 28.



Each year, the segments drift the length of the hypotenuse of the triangle formed by customers' desire for smaller and faster sensors.

In the Low End segment, size decreases and performance increases by 0.5 units, moving the segment center 0.7 units across the map.

Tip: The information in Table 8.2 reflects the segment centers at the *end* of the round. Therefore, the Round 0 positions can be seen as the Round 1 *starting* positions, Round 2 positions can be seen as the Round 3 starting position, etc. Each month during the simulation year, the segment drifts 1/12th of the distance from the starting position to the ending position.

On Form 1 on page 28, for each segment, use the information in Table 8.2 on page 28 and mark the location of each segment center for Round 8.

Next, sketch approximate fine cut circles (they do not have to be perfect) with radiuses of 2.5 units around each Round 8 segment center.

On Form 1, draw a line connecting the Round 0 High End segment center with the Round 8 High End segment center. Draw a line connecting the Round 0 Performance segment center with the Round 8 Performance segment center. Draw a line connecting the Round 0 Size segment center with the Round 8 Size segment center.

8.1.2 Ideal Spots

Customer positioning preferences are reported in the Segment Analyses of *The Capstone® Courier*. Within each analysis, the Buying Criteria box displays the ideal performance and size as of December 31 of the previous year. This ideal position is also called the ideal spot. If all other criteria are equal, a customer will prefer a product that is located nearer the ideal spot over a product that is located farther from it.

Tip: Some segments place a higher level of importance on positioning than others (see 2.2.3 Criteria By Segment on page 7). For example, positioning is the most important buying criteria for High End customers, but it is less important to Traditional and Low End customers.

Within each segment, the ideal spot is at a location relative to the center of the circle. These locations display in Table 8.3 on page 28 and are illustrated in Figures 5.2 through 5.6 on page 13.

For example, High End customers prefer products that have a performance that is 1.4 units bigger and a size that is 1.4 units smaller than the center of the segment circle. The center of the High End segment at the end of Round 1 has a performance of 8.4 and a size of 11.6. Therefore, the High End ideal spot at the end of Round 1 has a performance of 9.8 (8.4 + 1.4 = 9.8) and a size of 10.2 (11.6 - 1.4 = 10.2).

Table 8.2 Segment Centers at the End of Each Round: Note the drift rates vary for each segment. For example, the Performance segment is more interested in improved performance than decreased size and the Size segment is more interested in decreased size than improved performance.

Traditional		
Round	Pfmn	Size
0	5.0	15.0
1	5.7	14.3
2	6.4	13.6
3	7.1	12.9
4	7.8	12.2
5	8.5	11.5
6	9.2	10.8
7	9.9	10.1
8	10.6	9.4

Low End		
Round	Pfmn	Size
0	2.5	17.5
1	3.0	17.0
2	3.5	16.5
3	4.0	16.0
4	4.5	15.5
5	5.0	15.0
6	5.5	14.5
7	6.0	14.0
8	6.5	13.5

High End		
Round	Pfmn	Size
0	7.5	12.5
1	8.4	11.6
2	9.3	10.7
3	10.2	9.8
4	11.1	8.9
5	12.0	8.0
6	12.9	7.1
7	13.8	6.2
8	14.7	5.3

Performance		
Round	Pfmn	Size
0	8.0	17.0
1	9.0	16.3
2	10.0	15.6
3	11.0	14.9
4	12.0	14.2
5	13.0	13.5
6	14.0	12.8
7	15.0	12.1
8	16.0	11.4

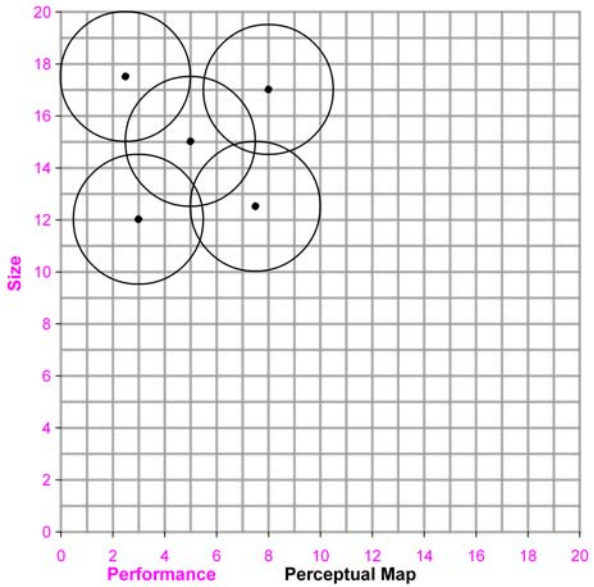
Size		
Round	Pfmn	Size
0	3.0	12.0
1	3.7	11.0
2	4.4	10.0
3	5.1	9.0
4	5.8	8.0
5	6.5	7.0
6	7.2	6.0
7	7.9	5.0
8	8.6	4.0

Remember, these are the centers of the segment circles, not product positions. Product positions are reported on page 4 of *The Capstone® Courier.*

Table 8.3 Ideal Spot Offsets: Customers prefer products located this distance from the center of the segment circle.

Segment	Performance	Size
Traditional	0.0	0.0
Low End	-0.8	+0.8
High End	+1.4	-1.4
Performance	+1.4	-1.0
Size	+1.0	-1.4

Form 1 Segment Drift: The segment fine cut circles and centers for Round 0 are shown below. Using the information in Table 8.2, mark the Round 8 centers for each segment. Next, sketch fine cut circles with radiuses of 2.5 units around the Round 8 segment centers. See 8.1.1 Segment Centers and Segment Drift on page 27 for complete instructions.



Use Table 8.2 and Table 8.3 to determine each segment's ideal spot for Rounds 2 through 8. Enter the results in Form 2.

On Form 1, mark the Round 8 ideal spot for each segment.

Form 2 Segment Ideal Spot Locations

Traditional		
Round	Pfmn	Size
0	5.0	15.0
1	5.7	14.3
2		
3		
4		
5		
6		
7		
8		

Low End		
Round	Pfmn	Size
0	1.7	18.3
1	2.2	17.8
2		
3		
4		
5		
6		
7		
8		

High End		
Round	Pfmn	Size
0	8.9	11.1
1	9.8	10.2
2		
3		
4		
5		
6		
7		
8		

Performance		
Round	Pfmn	Size
0	9.4	16.0
1	10.4	15.3
2		
3		
4		
5		
6		
7		
8		

Size		
Round	Pfmn	Size
0	4.0	10.6
1	4.7	9.6
2		
3		
4		
5		
6		
7		
8		

8.2 Industry Demand Analysis

The Industry Demand Analysis will help the Marketing and Production Departments anticipate future demand. Marketing can use the total demand for each segment as it creates its forecasts. This will provide a starting point for a sales forecast (see 9 Forecasting on page 32). Production can use the results when making capacity buy and sell decisions.

You will need the Segment Analysis pages (pages 5 - 9) of *The Capstone® Courier* for Round 0.To analyze the demand for each segment, find the demand at the start of the simulation (Round 0), then calculate demand for Rounds 1 through 8.

At the top of each Segment Analysis page you will find a box called Statistics. Copy the Total Industry Unit Demand number into the Round 0 column of Form 3. Next, for each segment, multiply the Round 0 demand by the growth rate and add the result to the Round 0 demand. This will give you a close approximation of Round 1 demand. Repeat this process for all eight rounds and enter the information in Form 3.

Tip: If you prefer, you can use the following shortcut. First, convert the growth rate percentage to a decimal:

Traditional Segment Growth Rate = 9.2% = 0.092

Add 1 to the decimal:

1 + 0.092 = 1.092

Multiply the Round 0 Traditional demand by 1.092. This will give you a close approximation of Total Industry Demand for Round 1. Multiplying the Round 1 demand by 1.092 will give the Round 2 Total Industry Unit Demand, etc.

Form 3 Industry Demand Analysis

Segment	Round 0	Growth Rate	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Round 7	Round 8
Traditional		9.2%								
Low End		11.7%								
High End		16.2%								
Pfmn		19.8%								
Size		18.3%								

Remember, the demand numbers are in thousands! For example, if the Round 0 Total Industry Unit Demand for the Traditional segment reads 7,387, the Traditional Segment demanded 7,387,000 units.

8.3 Capacity Analysis

The Industry Demand Analysis indicates the sensor market is growing. The Capacity Analysis will help the Production and Finance Departments anticipate the cost of adding capacity and automation.

Increases in capacity and changes in automation require a year to implement.

Enter the name of your company's product for each segment in the Product Name column of Form 4 on page 30. You will find this information in the Production Analysis, page 4 of *The Capstone® Courier* for Round 0. The names of your products start with the first letter of your company's name. If you are not yet assigned to a company use the Andrews Company information.

Next, find each product's First Shift Capacity in the Capacity Next Round column of the Production Analysis. This number (in thousands) indicates the amount of sensors that can be built over the course of a year using a single, eight-hour shift. In Form 4 on page 30, enter the Capacity Next Round into the column under First Shift Capacity, Company.

- Multiply the First Shift Capacity, Company by the number of active companies in your simulation (page 1 of the *Courier* displays each company name). This indicates the amount of sensors that can be built for the segment by the entire industry using a single shift over the course of a year. Place the result in the First Shift Capacity, Industry column.
- Production schedules that exceed the First Shift Capacity require hiring a second shift. Multiply the First Shift Capacity, Company by 2 and place the result in the First & Second Shift, Company column.
- Multiply the First Shift Capacity, Industry by 2 and place the result in the First & Second Shift, Industry column. Copy the value for Automation Next Round from the Production Analysis into the Automation Level column.
- Use the formulas below to calculate the Cost to Double Capacity and the Cost to Raise Automation to 10.0.

Cost to Double Capacity = **First Shift Capacity X [$6 + ($4 X Automation Level)]**

Cost to Increase Automation to 10.0 = **First Shift Capacity X [$4 X (10 - Automation Level)]**

Form 4 Capacity Analysis

Segment	Product Name	First Shift Capacity		First & Second Shift Capacity		Automation Level	Cost to Double Capacity	Cost to Raise Automation to 10.0
		Company	Industry	Company	Industry			
Traditional		1,800		3,600		4.0	$39,600,000	$43,200,000
Low End								
High End								
Pfmn								
Size								

Remember, these numbers are in thousands!

8.4 Margin Analysis

Healthy margins, the difference between a product's manufacturing cost and its price, are critical to company success. The Margin Analysis will help the Research & Development Department understand the cost of material, and the Production Department understand the effect automation has on labor costs. It will also demonstrate to the Marketing Department the importance of adequate pricing, and to the Finance Department the upper limits of profitability.

- Enter the name of your company's product for each segment in the Product Name column in the top part of Form 5 on page 31. You will find this information in the Production Analysis, page 4 of *The Capstone® Courier* for Round 0. The names of your products start with the first letter of your company's name. If you are not yet assigned to a company use the Andrews Company information.
- Next, enter each product's price, material cost, labor cost, and note whether or not (Y/N) a second shift was used.
- Calculate the Contribution Margin:

Contribution Margin = **Price - (Material Cost + Labor Cost)**

- Calculate the Margin Percentage:

Margin Percentage = **Contribution Margin / Price**

- Enter the results from the equations above into the top part of Form 5.

8.4.1 Margin Potential

Use the bottom part of Form 5 to determine the margin potential. Go to the Buying Criteria on the Segment Analysis pages of *The Capstone® Courier* for Round 0 to find the maximum permitted price and the minimum acceptable Mean Time Between Failure (MTBF) for each segment (lowering the MTBF decreases material cost).

Determine the minimum Material Cost per segment using the following equation (see Table 8.5 for an example):

Minimum Material Cost = ($0.0003 X Minimum Acceptable MTBF) + Trailing Edge Positioning Cost in Table 8.4

Determine the minimum Labor Cost for each segment. Assume a base labor cost of $11.20 ($11.20 is a rough estimate of the labor cost, it is used solely to illustrate the Margin Potential concept):

Minimum Labor Cost = [$11.20 - (1.12 X Automation Ratings below)] + 1.12

Traditional Automation: 8.0
Low End Automation: 10.0
High End Automation: 5.0
Performance Automation: 6.0
Size Automation: 6.0

Find the Contribution Margin dollars and Contribution Margin percent:

Contribution Margin = Price - (Material Cost + Labor Cost)
Margin Percentage = Contribution Margin / Price

The Trailing Edge Positioning Cost indicates the cost of material for products placed in the upper-left quadrant of the fine cut circle, where products are larger in size and slower in performance. Consequently, the material cost is less than for products at the Leading Edge (the lower-right quadrant), where size is smaller and performance is faster. These costs drift with the segments. See Figure 6.1 on page 16.

Form 5 Margin Analysis

	Product Name	Price	Material Cost	Labor Cost	Second Shift (Y/N)	Contribution Margin $	Contribution Margin %
Traditional					N		
Low End					Y		
High End					N		
Performance					N		
Size					N		
Margin Potential		Maximum Price	Minimum Material	Minimum Labor		Contribution Margin $	Contribution Margin %
Traditional		$30.00	$8.00	$3.36	N	$18.64	62%
Low End					N		
High End					N		
Performance					N		
Size					N		

Table 8.4 Material Positioning Component Costs: These costs are for the beginning of Round 1, they are used solely to illustrate the Margin Potential concept.

	Trailing Edge Cost	Leading Edge Cost
Traditional	$3.80	$7.80
Low End	$1.00	$5.00
High End	$6.00	$10.00
Performance	$4.50	$8.50
Size	$4.50	$8.50

Table 8.5 Minimum Material Costs For The Traditional Segment

Minimum Reliability Component Cost	$0.0003 x 14,000 = $4.20
Trailing Edge Positioning Component Cost	$3.80
Total	$8.00

8.5 Consumer Report

The Consumer Report will help the Research & Development Department understand the need to design quality products and the Marketing Department the importance of adequate pricing, sales budget and promotion budget decisions.

You will need the Buying Criteria from the Segment Analyses in the Round 0 *Courier* and the Production Analysis in the Round 0 *Courier.*

Enter your ratings to the categories below in Form 6.

Form 6 Consumer Report

Traditional		Low End		High End		Performance		Size	
Price	C	Price	B	Price	C	Price	C	Price	C
Reliability		Reliability		Reliability		Reliability		Reliability	
Age		Age		Age		Age		Age	
Positioning		Positioning		Positioning		Positioning		Positioning	
Awareness		Awareness		Awareness		Awareness		Awareness	
Accessibility		Accessibility		Accessibility		Accessibility		Accessibility	
Overall		Overall		Overall		Overall		Overall	

Price: Award an A if your product's price is in the bottom third of the expected price range, B if it is in the middle third and C if it is in the top third. You can find the price in the Production Analysis.

Reliability: Award an A if the MTBF specification is in the top third of the range, B if it is in the middle third and C if it is in the bottom third.

Age: Award an A if the age on December 31 is within 0.5 years of the ideal age, B if the age is 0.6 to 1 year and C if the age is beyond 1 year.

Positioning: Award an A if your product is within 0.5 units of the segment's ideal spot, B if it is 0.6 to 1.5 units away and C if it is beyond 1.5 units.

Awareness: Award an A if your product's awareness exceeds 80%, B if it is 50% to 80% and C if it is below 50%.

Accessibility: Award an A if your product's accessibility exceeds 80%, B if it is 50% to 80% and C if it is below 50%.

In the Overall row, give your products an A only if the top two attributes in the Buying Criteria were rated A, and if the awareness and accessibility were rated at least a B.

Tip: The December Customer Survey scores are driven by the criteria in Form 6 (see 3.2.2 Awareness And Customer Survey on page 9).

9 Forecasting

The Statistic boxes on the Segment Analysis pages (pages 5 - 9) of *The Capstone® Courier* publish last year's demand and the segment growth rate. Multiplying last year's demand by the growth rate then adding the result to last year's demand will determine this year's demand.

Forecasting requires a little math and a little logic. For example, does your forecast predict your product will take half a segment's sales when there are four or five products in the segment? Unless your product's positioning, age and MTBF are significantly superior to the other products – and your price is at the low end of the range – it is not likely that you will take half the sales. Does your forecast predict you will take only one tenth of the sales when there are four or five products in the segment? Unless your product's positioning, age and MTBF are significantly inferior – and your price is at the high end of the range or above – chances are you can sell more.

9.1 Basic Forecasting Method

Last year's sales can be a good starting point for this year's forecasts. For example, if in the previous year your Traditional product sold 1,100,000 units without stocking out, you can look at the segment's growth rate and say "all things being equal, we can expect to sell 9.2% more units this year than last year."

1,100,000 X 0.092 = 101,200

At the beginning of Round 1, the sale numbers from the previous year (Round 0) are equal for all companies. At the beginning of Round 2, the sale numbers from Round 1 will not be equal due to differences in product positioning, revision dates, prices, etc.

Adding 101,200 to last year's sales of 1,100,000 units gives you a starting forecast for the upcoming year of 1,201,200 units.

If your product stocked out, calculate what it could have sold by multiplying the segment demand by the potential sales percentage reported on page 10 of the *Courier*, the Market Share Report. Next, multiply that by the segment growth rate.

Is this number valid? It is highly unlikely that the market in the upcoming year will be identical to the previous. Prices will adjust, revision projects will complete– the playing field will change. Still, this number can be a good departure point as you assess your product offer and speculate what your competitors will offer.

Keep in mind the possibility that your products sold because competitors who otherwise would have made sales under produced and stocked out. Page 10 of the *Courier* displays actual and potential sales as a percentage for each product. If your actual far exceeded your potential because your competitors under produced, you cannot count on them making the same mistake again.

9.2 Qualitative Assessment

Compare your product to others competing within the segment and decide whether it is better or worse than the competition. Start with the *Courier* Perceptual Map (page 11). It shows where products are currently placed. The Revision Dates at the bottom of the page reveal the timing of any future repositionings. Continue the comparison using the *Courier's* Segment Analyses (pages 5 - 9). These report each product's:

- Age– does the product satisfy customer age demands?
- MTBF– is reliability near the top of the range?
- Price– will price trends continue, or will new automation (displayed on page 4 of the *Courier*) facilitate a price reduction? (Remember, price ranges drop $0.50 per year.)
- Awareness and Accessibility– are these percentages leading, keeping pace with or falling behind other products?

All these elements contribute to the monthly customer survey.

9.2.1 December Customer Survey

Will your product be better or worse than average? As an estimate, look at the December Customer Survey score in the lower part of each Segment Analysis. The Customer Survey drives demand each month. For example, if there are four products in December scoring 32, 28, 22, and 14 (for a total of 96), then the top product's December demand would be 32/96 or 33%.

Top Product in Segment's Score / Sum of All Scores = 32 / 32 +28 +22 + 14 = 32 / 96 = 33%

What monthly Customer Survey scores will your product have during the year? The score will change from month to month because the segments drift, your product ages and it might be revised. Each monthly score is driven by how well your product satisfies the segment buying criteria, plus its awareness and accessibility levels. If the TQM/Sustainability module is on, some initiatives could increase the score. See "How is the Customer Survey Score Calculated?" in the FAQ|Reports section of the website's Manager Guide for more information on assessing your product.

Tip: Any new products about to come to market must have a plant. Plant purchases are reported on the Production Analysis (*Courier*, page 4).

Tip: Consider whether or not the top products in the segment can meet customer demand. On the Production Analysis, examine the top products' capacities. Can they manufacture sufficient units? If not, you could have an opportunity to exploit.

Tip: 8.2 Industry Demand Analysis on page 29 provides close approximations of segment demand for each round. Products can enter or leave the segments, however the demand projections will not change.

Entering Forecasts

Log into Capstone.xls and select Marketing under the Decisions menu. There are two forecasts per product. The Computer Prediction assumes your competition has mediocre products, and therefore is not reliable. The Your Sales Forecast column allows you to enter forecasts of your own.

Computer Prediction	Your Sales Forecast
896	1200

If you do not enter values in the Your Sales Forecast cells, the proformas will use the Computer Prediction to project financial results.

9.3 Forecasts, Proformas And The December 31 Cash Position

On the proforma income statement, sales revenue for each product is based on its price multiplied by the lesser of either:

- The Your Sales Forecast entry (or, if none is entered, the Computer Prediction); or
- The total number of units available for sale (that is, the Production Schedule added to inventory).

Forecasts are used by the proformas to calculate financial projections (see Proformas & Annual Reports on page 10). If you enter a forecast that is unrealistically high, the proformas will take that forecast and project unrealistic revenue.

When a forecast is less than the total number of units available for sale, the proforma income statement will display an inventory carrying cost. When a forecast is equal to or greater than the number of units available, which predicts every unit will be sold, the carrying cost will be zero.

Tip: The simulation charges a 12% inventory carrying cost.

On the proforma balance sheet, under current assets, inventory reflects the dollar value of all unsold units. Cash reflects the amount left after all company payments are subtracted from the sum of:

- Total sales revenue reported on the proforma income statement;
- Stock, current debt and long term debt entries on the Finance spreadsheet.

The proforma balance sheet's cash position also displays as the Finance spreadsheet's December 31 Cash Position. Therefore, unrealistically high forecasts (or prices) will create cash predictions that are not likely to come true.

9.4 Worst Case / Best Case

If you wish, you can enter sales forecasts and production schedules that develop worst case / best case scenarios. Here is an example:

You generate a pessimistic forecast of 1,200,000 for your Traditional product, which predicts in the worst case monthly sales of 100,000 units. As a matter of policy, your management team might decide that manufacturing an additional three months worth of inventory, or 300,000 units, is an acceptable risk when compared to the potential reward of making extra sales.

On the Marketing spreadsheet, enter the worst case forecast of 1,200 in the Your Sales Forecast cell. On the Production spreadsheet, enter the best case of 1,500 in the Production Schedule cell (if inventory remains from the previous year, be sure to subtract that from the 1,500). At the end of the year, in the worst case you will have sold 1,200,000 units and have 300,000 units in inventory. In the best case you will have sold 1,500,000 units and have zero inventory.

The spread between the positions will show up as inventory on your proforma balance sheet. Your proforma income statement will also reflect the worst case for sales. On the Finance spreadsheet, if the December 31 Cash Position is negative, adjust current debt, long term debt and stock issue entries until the December 31 Cash Position becomes positive. This will help ensure against an Emergency Loan.

To see your best case, return to the Marketing spreadsheet and enter 1,500 in the Your Sales Forecast cell then review the December 31 Cash Position. The actual results should lie somewhere between the worst and best cases.

10 Six Basic Strategies

These six basic strategies can be the starting point for your own custom strategy.

10.1Cost Leader With Product Lifecycle Focus

A Cost Leader with a Product Lifecycle Focus centers on the High End, Traditional and Low End segments. We will gain a competitive advantage by keeping R&D costs, production costs and material costs to a minimum, enabling us to compete on the basis of price. Our product lifecycle focus will allow us to reap sales for many years on each new product we introduce into the High End segment. Products will begin their lives in the High End, mature into Traditional and finish as Low End products.

Sample Vision Statement

Reliable products for mainstream customers: Our brands offer value. Our primary stakeholders are bondholders, stockholders, customers and management.

10.2 Differentiation With Product Lifecycle Focus

A Differentiation with a Product Lifecycle Focus strategy concentrates on the High End, Traditional and Low End segments. We will gain a competitive advantage by distinguishing our products with excellent design, high awareness, easy accessibility and new products. We will develop an R&D competency that keeps our designs fresh and exciting. Our products will keep pace with the market, offering improved size and performance. We will price above average. We will expand capacity as we generate higher demand.

Sample Vision Statement

Premium products for mainstream customers: Our brands withstand the tests of time. Our primary stakeholders are customers, stockholders, management and employees.

10.3 Broad Cost Leader

A Broad Cost Leader strategy maintains a presence in all segments of the market. We will gain a competitive advantage by keeping R&D costs, production costs and material costs to a minimum, enabling the company to compete on the basis of price. Prices will be below average. Automation levels will be increased to improve margins and to offset second shift/overtime costs.

Sample Vision Statement

Low-priced products for the industry: Our brands offer solid value. Our primary stakeholders are bondholders, customers, stockholders and management.

10.4 Broad Differentiation

A Broad Differentiation strategy maintains a presence in every segment of the market. We will gain a competitive advantage by distinguishing products with an excellent design, high awareness and easy accessibility. R&D competency is developed that keeps designs fresh and exciting. Products keep pace with the market, offering improved size and performance. Prices will be above average. Capacity is expanded as higher demand is generated.

Sample Vision Statement

Premium products for the industry: Our brands withstand the tests of time. Our primary stakeholders are customers, stockholders, management and employees.

10.5 Niche Cost Leader (Low Technology)

A Niche Cost Leader Strategy concentrates primarily on the Traditional and Low End segments of the market.We will gain a competitive advantage by keeping R&D costs, production costs and material costs to a minimum, enabling the company to compete on the basis of price. Prices will be below average. Automation levels will be increased to improve margins and to offset second shift/overtime costs.

Sample Vision Statement

Reliable products for low technology customers: Our brands offer value. Our primary stakeholders are bondholders, stockholders, customers and management.

10.6 Niche Differentiator (High Technology)

A Niche Differentiation strategy focuses on the High technology segments (High End, Performance and Size). We will gain a competitive advantage by distinguishing our products with an excellent design, high awareness, easy accessibility and new products. We will develop an R&D competency that keeps our designs fresh and exciting. Our products will keep pace with the market, offering improved size and performance. We will price above average. We will expand capacity as we generate higher demand.

Sample Vision Statement

Premium products for technology oriented customers: Our brands define the cutting edge. Our primary stakeholders are customers, stockholders, management and employees.

11 BALANCED SCORECARD

Instructors can activate a performance measurement tool called The Balanced Scorecard. Balanced scorecards allow companies to gauge their performance by assessing measures in four categories:

- Financial– includes profitability, leverage and stock price;
- Internal Business Process– ranks, among other measures, contribution margin, plant utilization and days of working capital;
- Customer– examines the company's product line, including how well it satisfies buying criteria and awareness/ accessibility levels;
- Learning and Growth– evaluates employee productivity.

As you enter decisions in Capstone.xls, projections of the Balanced Scorecard results for the upcoming year are available via the proforma menu. Scores from previous years are available on the website; login to your simulation then click the Reports link.

11.1 GUIDING YOUR COMPANY

The Internal Business Process and Customer perspectives can serve as cross checks for company performance. For example, under Internal Business Process, a low score for Contribution Margin generally indicates the company is unprofitable– the company should look at its cost and pricing structures. Under the Customer perspective, a poor Buying Criteria score suggests the company should consider R&D projects to improve the product line.

Complete information about The Balanced Scorecard, including a round by round breakdown of your points and total possible points, is available from the Reports link.