COURSE TECHNOLOGY
CENGAGE Learning

Concepts in Enterprise Resource Planning

Fourth Edition

Chapter Four

Production and Supply Chain Management Information Systems

Objectives

After completing this chapter, you will be able to:

- Describe the steps in the production planning process of a high-volume manufacturer such as Fitter Snacker
- Describe Fitter Snacker's production and materials management problems
- Describe how a structured process for Supply Chain Management planning enhances efficiency and decision making
- Describe how production planning data in an ERP system can be shared with suppliers to increase supply chain efficiency

Introduction

- Supply Chain Management (SCM) in an ERP system
- Fitter Snacker is part of a supply chain
- FS’s SCM problems and how ERP can help fix them

Production Overview

- To meet customer demand efficiently, Fitter Snacker must:
  - Develop a forecast of customer demand
  - Develop a production schedule to meet the estimated demand
- ERP system is a good tool for developing and executing production plans
- Goal of production planning is to schedule production economically

Production Overview (cont'd.)

- Three general approaches to production
  - *Make-to-stock* items: made for inventory (the "stock") in anticipation of sales orders
  - *Make-to-order* items: produced to fill specific customer orders
  - *Assemble-to-order* items: produced using a combination of make-to-stock and make-to-order processes

Fitter Snacker's Manufacturing Process

- Fitter Snacker uses make-to-stock production

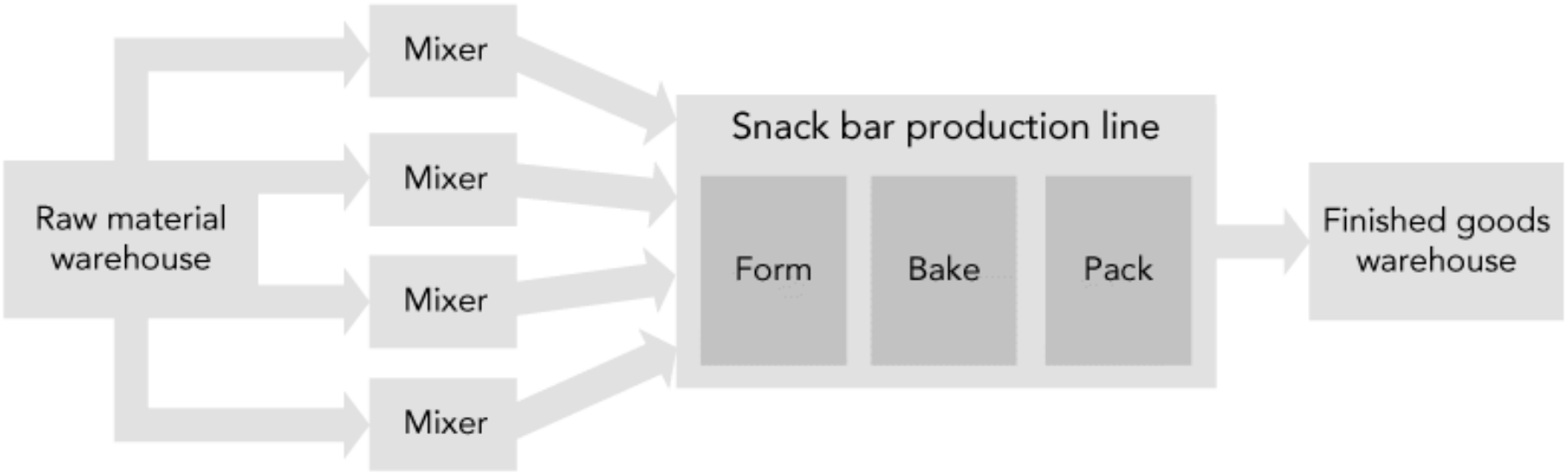

Figure 4-1 Fitter Snacker's manufacturing process

Fitter Snacker's Manufacturing Process (cont'd.)

- Snack bar line can produce 200 bars a minute, or 12,000 bars per hour
- Each bar weighs four ounces
- Product 48,000 ounces/hour, or 3,000 lbs/hour
- Entire production line operates on one shift a day
- Fitter Snacker's production sequence
  - **Capacity**: number of bars that can be produced

Fitter Snacker's Production Problems

- Fitter Snacker has problems deciding *how many* bars to make and *when* to make them
- Communication problems
  - FS's Marketing and Sales personnel do not share information with Production personnel
  - Production personnel find it hard to deal with sudden increases in demand
    - Might cause shortages or stockout

Fitter Snacker's Production Problems (cont'd.)

- Inventory problems
  - Production manager lacks systematic method for:
    - Meeting anticipated sales demand
    - Adjusting production to reflect actual sales
- Accounting and purchasing problems
  - **Standard costs**: normal costs of manufacturing a product
  - Production and Accounting must periodically compare standard costs with actual costs and then adjust the accounts for the inevitable differences

The Production Planning Process

- Three important principles for production planning:
  - Work from sales forecast and current inventory levels to create an “aggregate” (“combined”) production plan for all products
  - Break down aggregate plan into more specific production plans for individual products and smaller time intervals
  - Use production plan to determine raw material requirements

The SAP ERP Approach to Production Planning

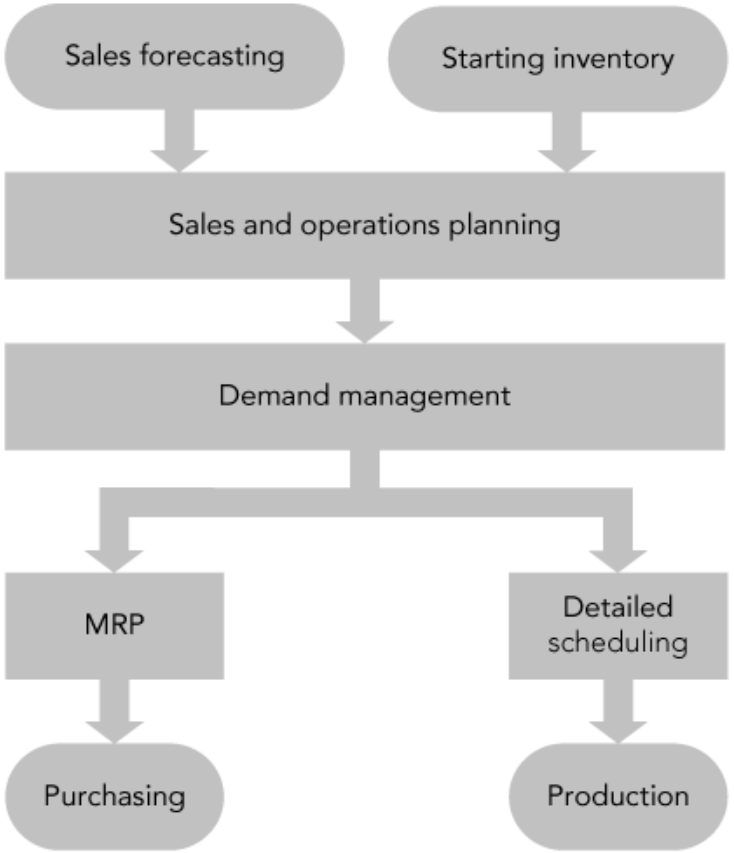

Figure 4-2 The production planning process

Sales Forecasting

- SAP's ERP system takes an integrated approach
  - Whenever a sale is recorded in Sales and Distribution (SD) module, quantity sold is recorded as a consumption value for that material
- Simple forecasting technique
  - Use a prior period's sales and then adjust those figures for current conditions
- To make a forecast for Fitter Snacker:
  - Use previous year's sales data in combination with marketing initiatives to increase sales

Sales Forecasting (cont'd.)

Sales forecasting		Jan.	Feb.	March	April	May	June
Previous year (cases)		5734	5823	5884	6134	6587	6735
Promotion sales (cases)						300	300
Previous year base (cases)		5734	5823	5884	6134	6287	6435
Growth:	3.0%	172	175	177	184	189	193
Base projection (cases)		5906	5998	6061	6318	6476	6628
Promotion (cases)							500
Sales forecast (cases)		5906	5998	6061	6318	6476	7128

Figure 4-3 Fitter Snacker's sales forecast for January through June

Sales and Operations Planning

- Sales and operations planning (SOP)
  - Input: sales forecast provided by Marketing
  - Output: production plan designed to balance market demand with production capacity
    - Production plan is the input to the next step, demand management

Sales and Operations Planning (cont'd.)

Sales and operations planning		Dec.	Jan.	Feb.	March	April	May	June
1) Sales forecast			5906	5998	6061	6318	6476	7128
2) Production plan			5906	5998	6061	6318	6650	6950
3) Inventory		100	100	100	100	100	274	96
4) Working days			21	20	23	21	21	22
5) Capacity (shipping cases)			6999	6666	7666	6999	6999	7333
6) Utilization			84%	90%	79%	90%	95%	95%
7) NRG-A (cases)	70.0%		4134	4199	4243	4423	4655	4865
8) NRG-B (cases)	30.0%		1772	1799	1818	1895	1995	2085

Figure 4-5 Fitter Snacker's sales and operations plan for January through June

Sales and Operations Planning (cont'd.)

- In SAP ERP, sales forecast can be made using:
  - Historical sales data from the Sales and Distribution (SD) module
  - Input from plans developed in Controlling (CO) module
- CO module
  - Profit goals for company can be set
  - Sales levels needed to meet the profit goals can be estimated

Sales and Operations Planning (cont'd.)

- **Rough-cut planning**: common term in manufacturing for aggregate planning
  - Disaggregated to generate detailed production schedules
- Once SAP ERP system generates a forecast, the planner can view the results graphically
- Rough-cut capacity planning applies simple capacity-estimating techniques to the production plan to see if the techniques are feasible

Sales and Operations Planning (cont'd.)

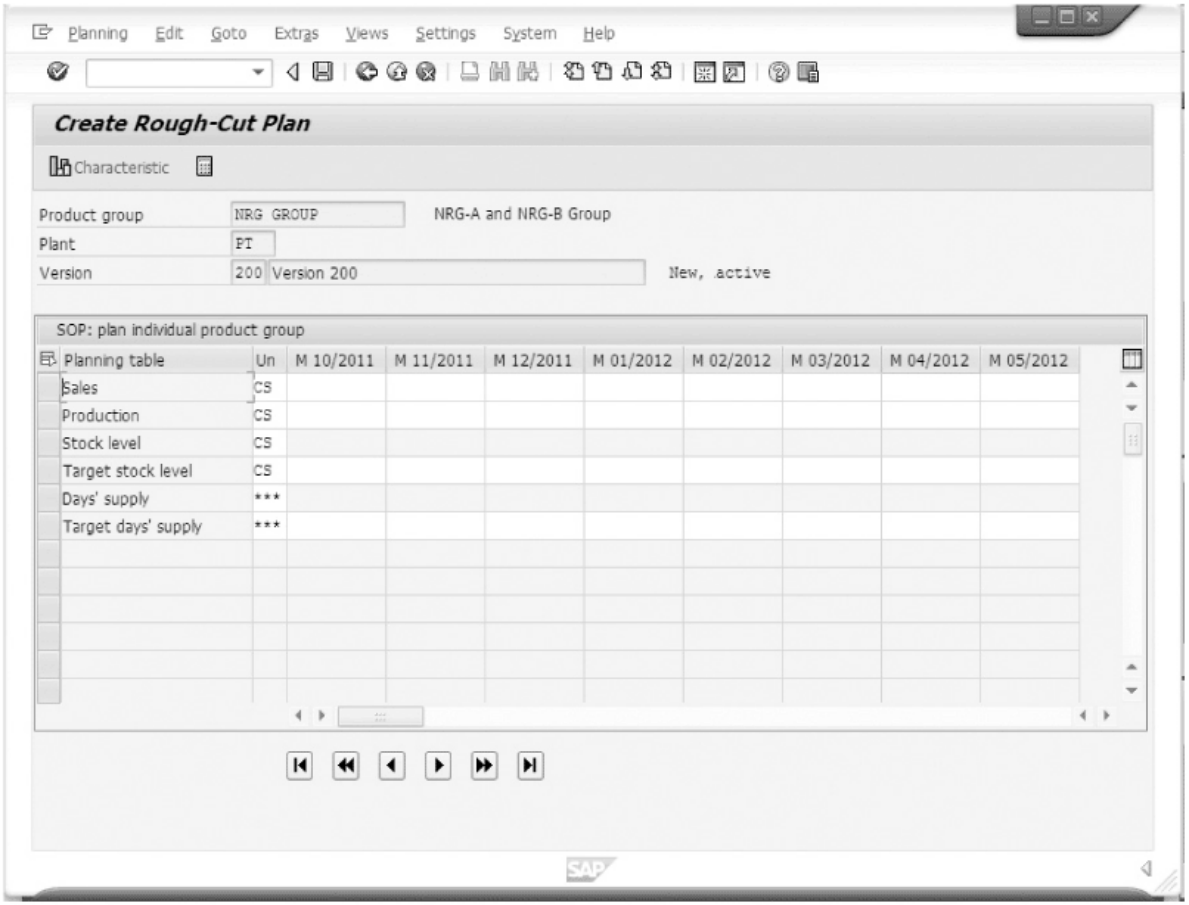

Figure 4-6 Sales and operations planning screen in SAP ERP

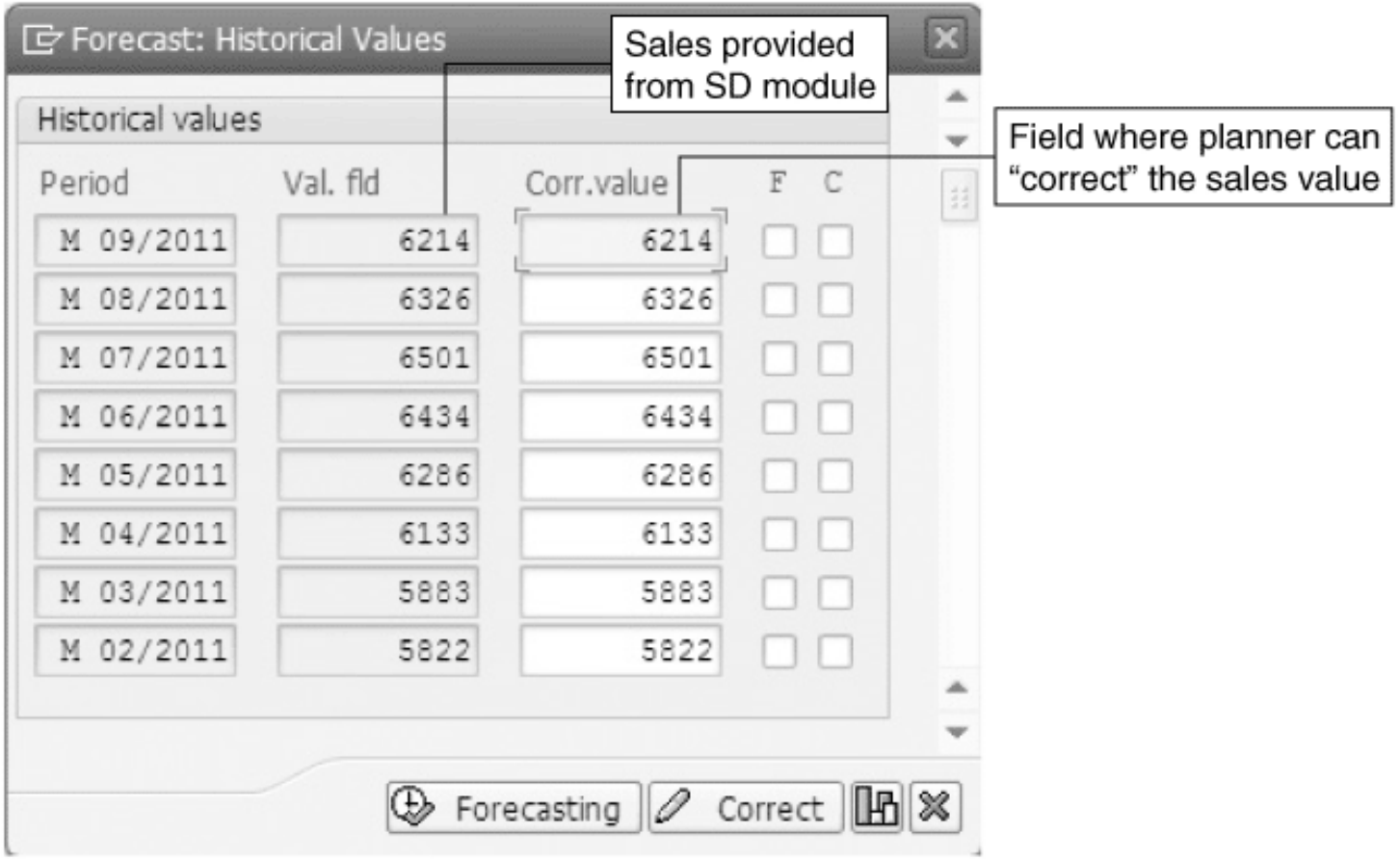

Figure 4-7 Historical sales figures in SAP

Sales and Operations Planning (cont'd.)

- Historical sales screen allow planner to correct sales values
- Do not account for external factors, such as unusual weather
- Sales figures forecasting represent best estimate of demand

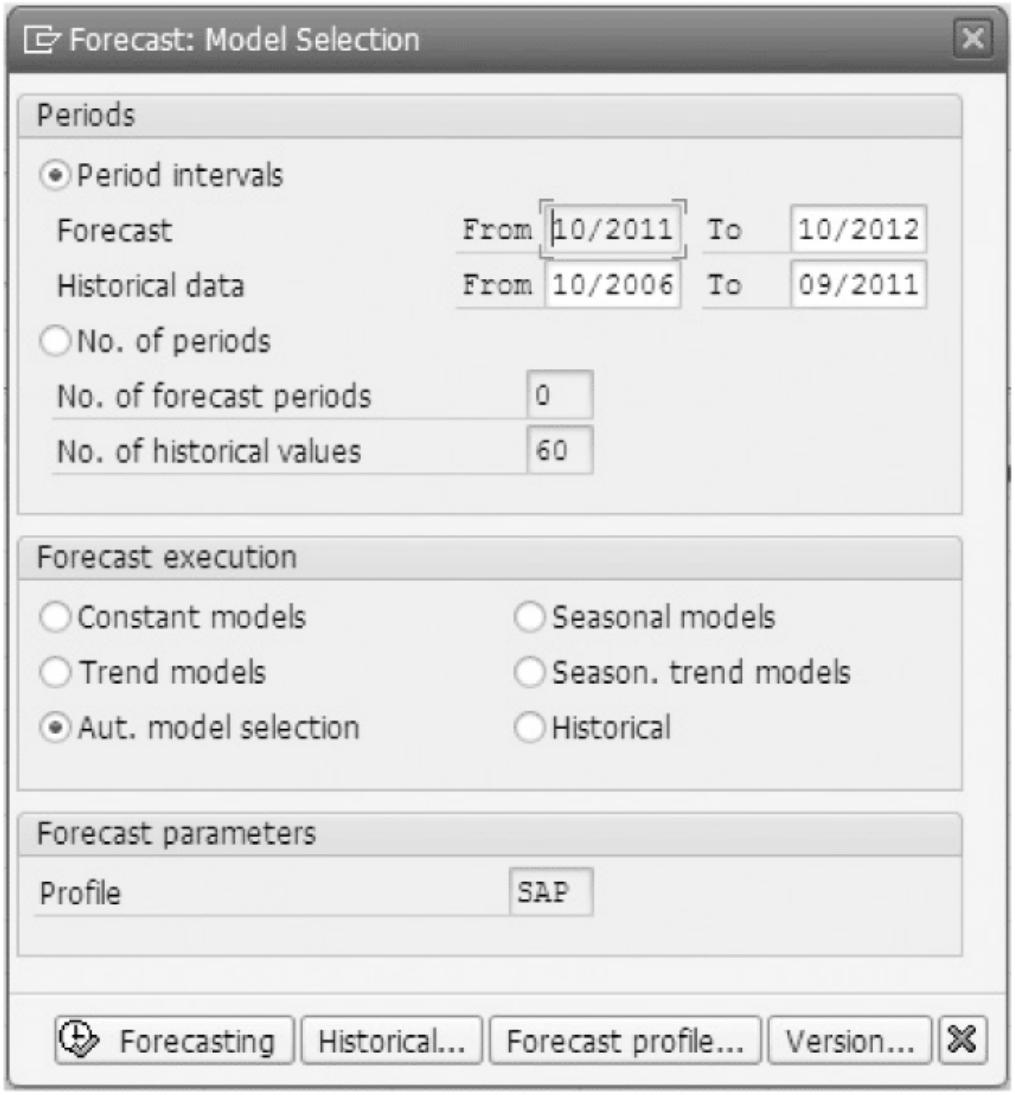

Figure 4-8 Forecasting model options in SAP ERP

Sales and Operations Planning (cont'd.)

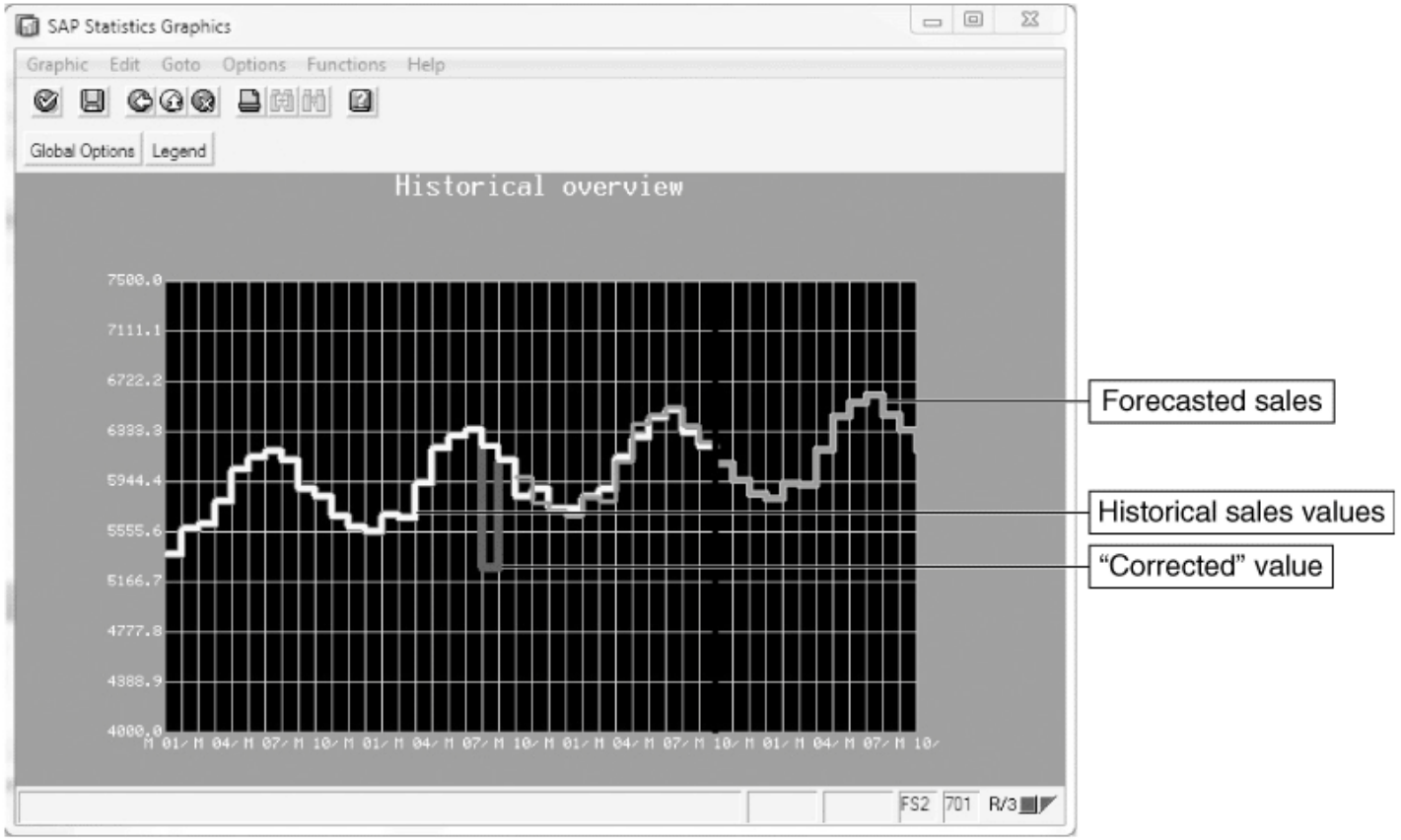

Figure 4-9 Forecasting results presented graphically in SAP ERP

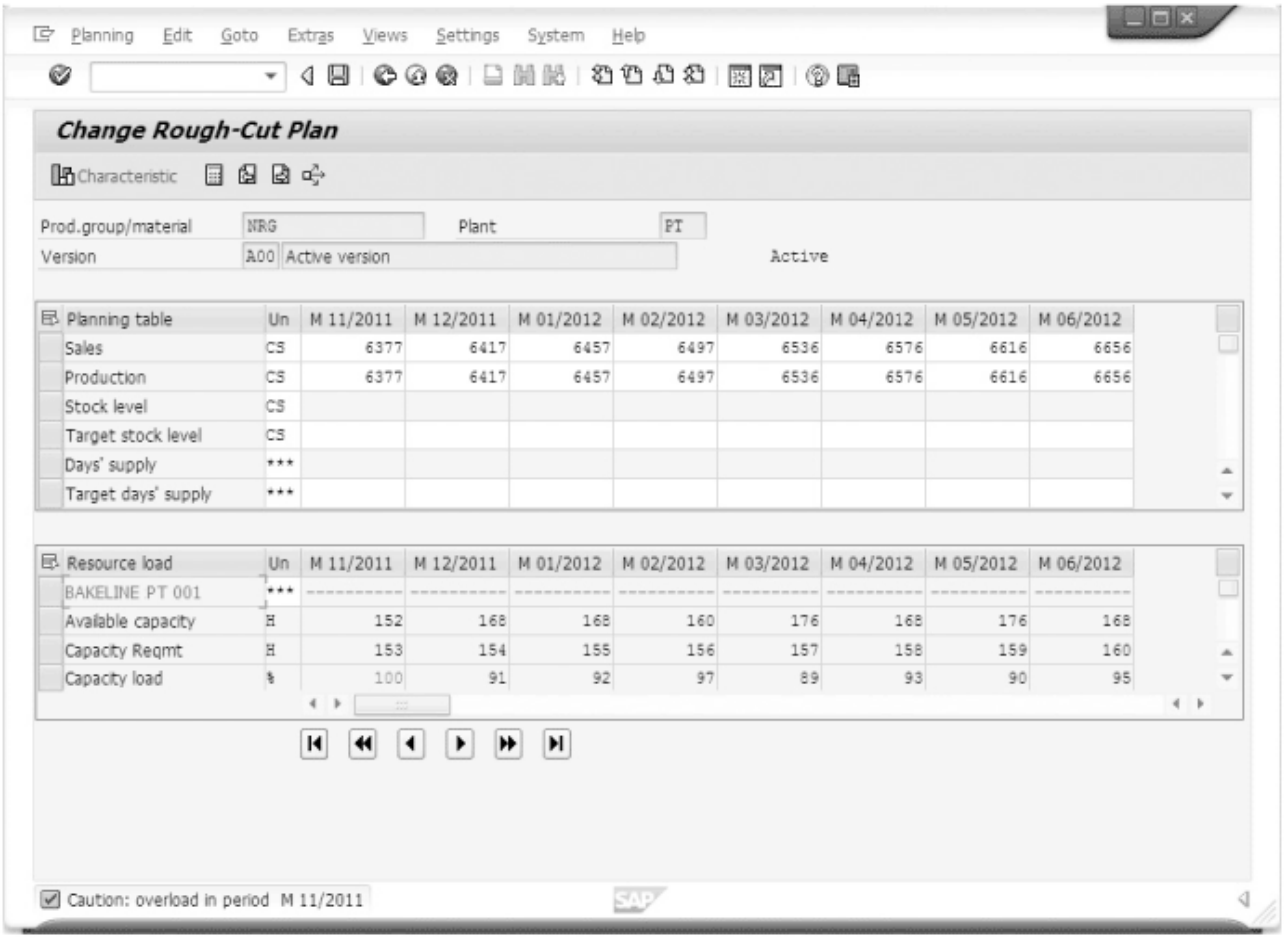

Figure 4.10 Sales and operation plan with rough-cut capacity calculation in SAP ERP

Sales and Operations Planning (cont'd.)

- Disaggregating the sales and operations plan
  - Companies typically develop sales and operations plans for product groups
  - SAP ERP system allows any number of products to be assigned to a product group
  - Sales and operation plan disaggregated
    - Production plan quantities specified for the group are transferred to the individual products that make up the group

Sales and Operations Planning (cont'd.)

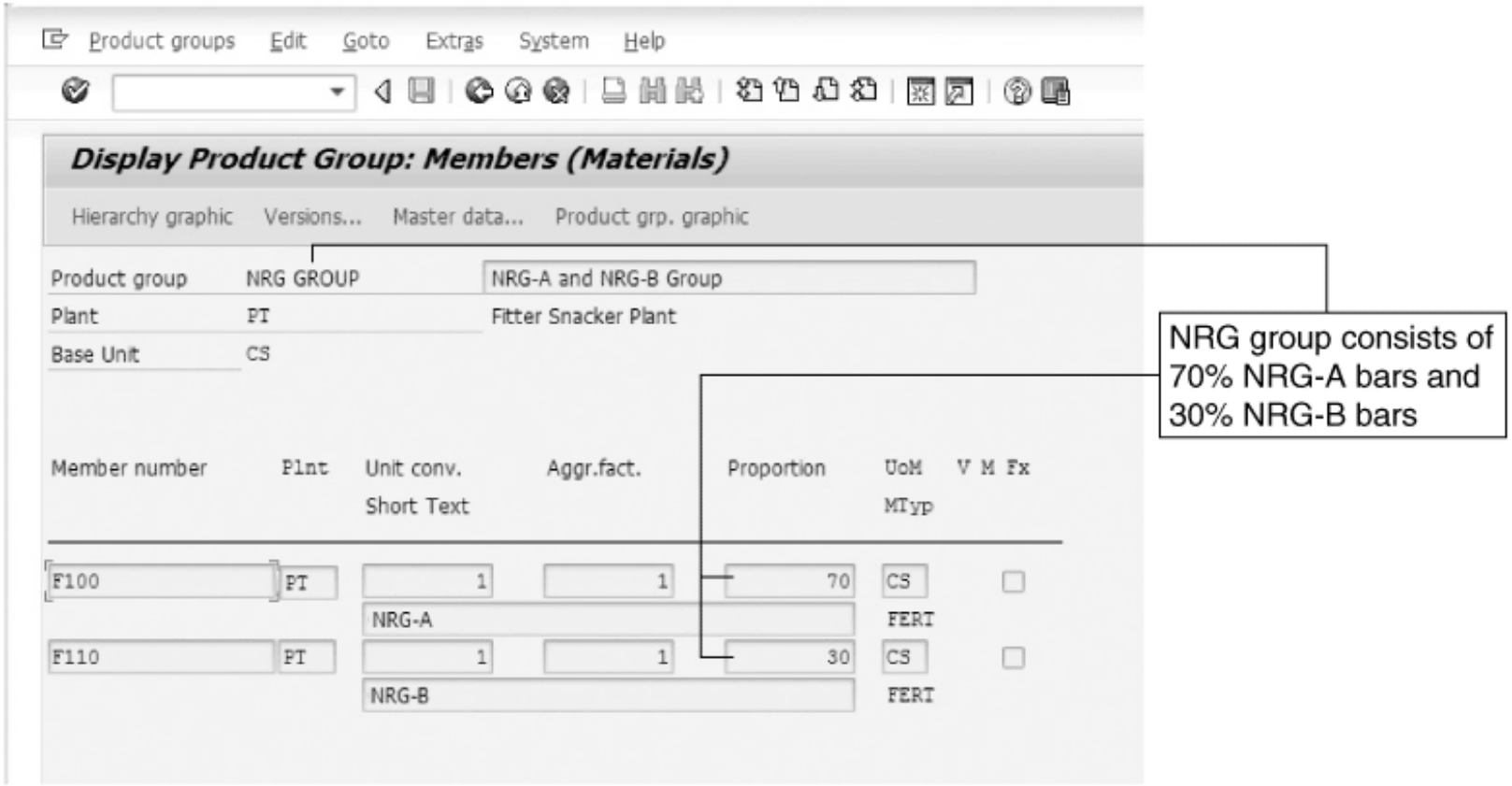

Figure 4-11 Product group structure in SAP ERP

Sales and Operations Planning (cont'd.)

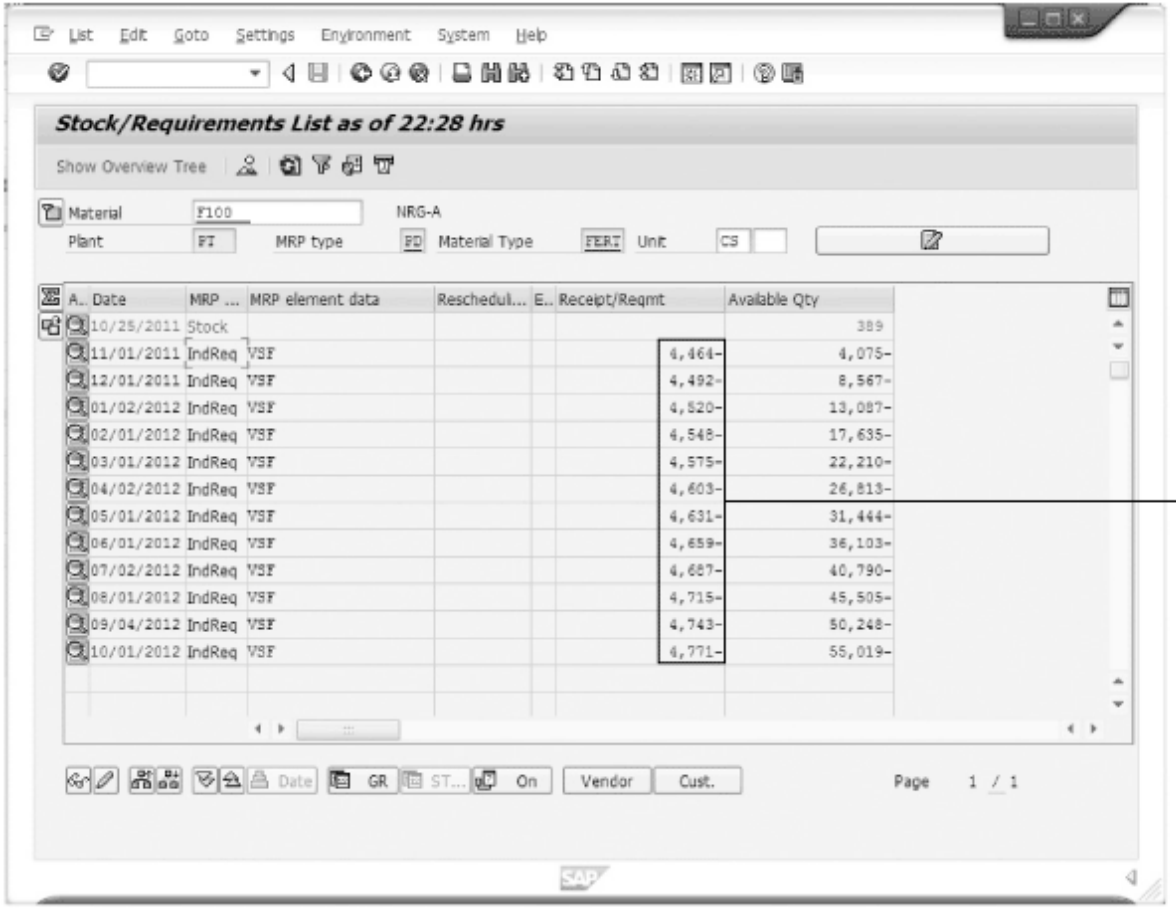

Figure 4-12 Stock/Requirements List for NRG-A bars after disaggregation

Demand Management

- Links the sales and operations planning process with detailed scheduling and materials requirements planning processes
- Output: **master production schedule (MPS)**
  - Production plan for all finished goods
- For Fitter Snacker, MPS is an input to detailed scheduling, which determines what bars to make and when to make them

Demand Management (cont'd.)

		Week 1	Week 2	Week 3	Week 4	Week 5	
Demand management		**1/3–1/7**	**1/10–1/14**	**1/17–1/21**	**1/24–1/28**	**1/31**	**2/1–2/4**
Monthly demand	**NRG-A**	4134	4134	4134	4134	4134	4199
	NRG-B	1772	1772	1772	1772	1772	1799
Working days in week		5	5	5	5	1	4
Working days in month		21	21	21	21	21	20
MPS	**NRG-A**	984	984	984	984	1037	
Weekly demand	**NRG-B**	422	422	422	422	444	

Demand management		**Jan 3**	**Jan 4**	**Jan 5**	**Jan 6**	**Jan 7**
Monthly Demand	**NRG-A**	4134	4134	4134	4134	4134
	NRG-B	1772	1772	1772	1772	1772
Working days in month		21	21	21	21	21
MPS	**NRG-A**	197	197	197	197	197
Daily demand	**NRG-B**	84	84	84	84	84

Figure 4-14 Fitter Snacker's production plan for January: The first five weeks of production are followed by a day-by-day disaggregation of week 1

Materials Requirements Planning (MRP)

- Determines required quantity and timing of the production or purchase of subassemblies and raw materials needed to support MPS
- **Bill of material (BOM)**: list of the materials (including quantities) needed to make a product

	Quantity	
Ingredient	NRG-A	NRG-B
Oats (lb.)	300	250
Wheat germ (lb.)	50	50
Cinnamon (lb.)	5	5
Nutmeg (lb.)	2	2
Cloves (lb.)	1	1
Honey (gal.)	10	10
Canola oil (gal.)	7	7
Vit./min. powder (lb.)	5	5
Carob chips (lb.)	50	
Raisins (lb.)	50	
Protein powder (lb.)		50
Hazelnuts (lb.)		30
Dates (lb.)		70

Figure 4-15 Fitter's factory calendar for August

Materials Requirements Planning (MRP) (cont'd.)

	Quantity	
Ingredient	**NRG-A**	**NRG-B**
Oats (lb.)	300	250
Wheat germ (lb.)	50	50
Cinnamon (lb.)	5	5
Nutmeg (lb.)	2	2
Cloves (lb.)	1	1
Honey (gal.)	10	10
Canola oil (gal.)	7	7
Vit./min. powder (lb.)	5	5
Carob chips (lb.)	50	
Raisins (lb.)	50	
Protein powder (lb.)		50
Hazelnuts (lb.)		30
Dates (lb.)		70

Figure 4-16 The bill of material (BOM) for Fitter Snacker's NRG bars

Materials Requirements Planning (MRP) (cont'd.)

- Lead times and lot sizing
  - **Lead time**: cumulative time required for the supplier to receive and process the order, take the material out of stock, package it, load it on a truck, and deliver it to the manufacturer
  - **Lot sizing**: determining production quantities and order quantities
- **MRP record**: standard way of viewing the MRP process on paper

Materials Requirements Planning (MRP) (cont'd.)

Oats Lead time = 2 weeks		Week 1	Week 2	Week 3	Week 4	Week 5
MPS (cases)	NRG-A	984	984	984	984	1037
	NRG-B	422	422	422	422	444
MPS (500 lb. batches)	NRG-A	142	142	142	142	149
	NRG-B	61	61	61	61	64
Gross requirements (lb)		57,850	57,850	57,850	57,850	60,700
Scheduled receipts		44,000	44,000			
Planned receipts				88,000	44,000	44,000
On hand	29,650	15,800	1,950	32,100	18,250	1,550
Planned orders		88,000	44,000	44,000		

Figure 4-17 The MRP record for oats in NRG bars, weeks 1 through 5

Materials Requirements Planning in SAP ERP

- MRP list shows results of MRP calculations
- MRP process creates planned orders to meet dependent requirements
- Stock/Requirements List shows:
  - Planned orders
  - Purchase requisitions (PurRqs)
  - Purchase orders (POitem)
- Planner can convert a planned order to a purchase order from Stock/Requirements List by double-clicking the planned order line

Materials Requirements Planning in SAP ERP (cont'd.)

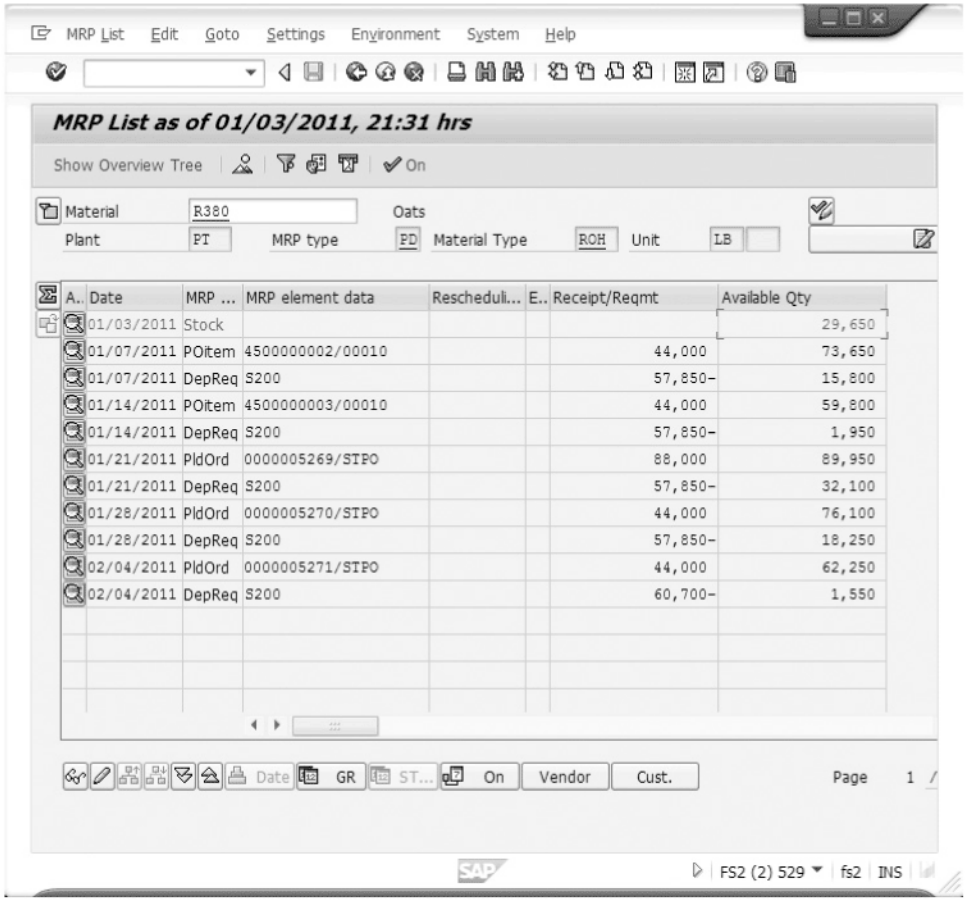

Figure 4-18 The MRP list in SAP ERP

Materials Requirements Planning in SAP ERP (cont'd.)

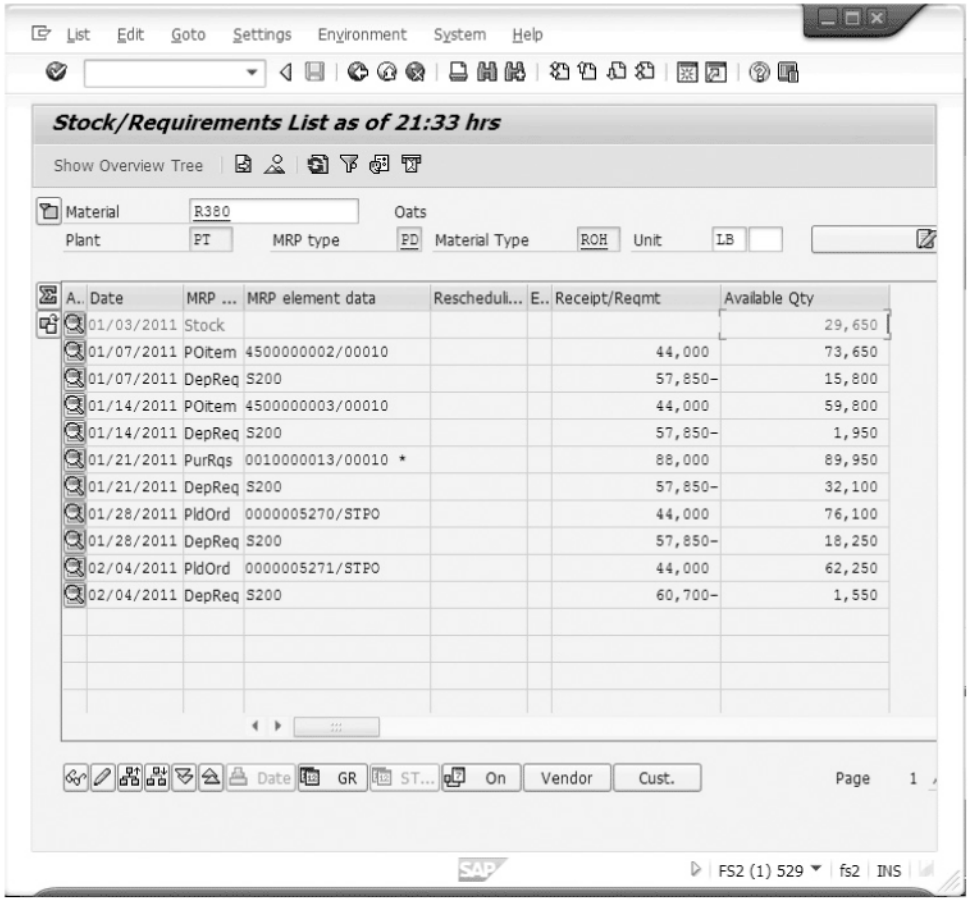

Figure 4-19 The Stock/Requirements List in SAP ERP

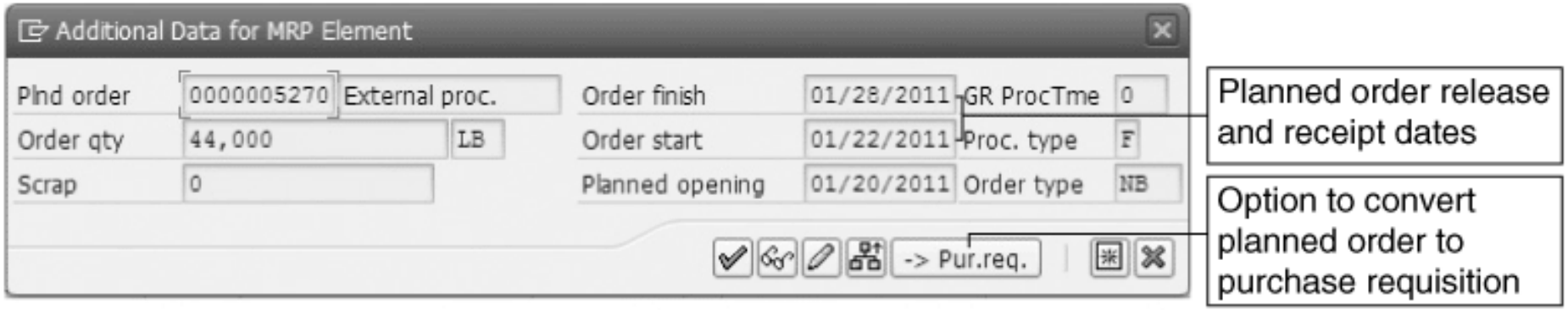

Figure 4-20 Conversion of a planned order to a requisition

Materials Requirements Planning in SAP ERP (cont'd.)

- Integrated information system allows Purchasing to make the best decision on a vendor based on relevant, up-to-date information
- Once Purchasing employee decides which vendor to use, the purchase order is transmitted to vendor
  - System can be configured to fax order to vendor, transmit it electronically through EDI (electronic data interchange), or send it over the Internet

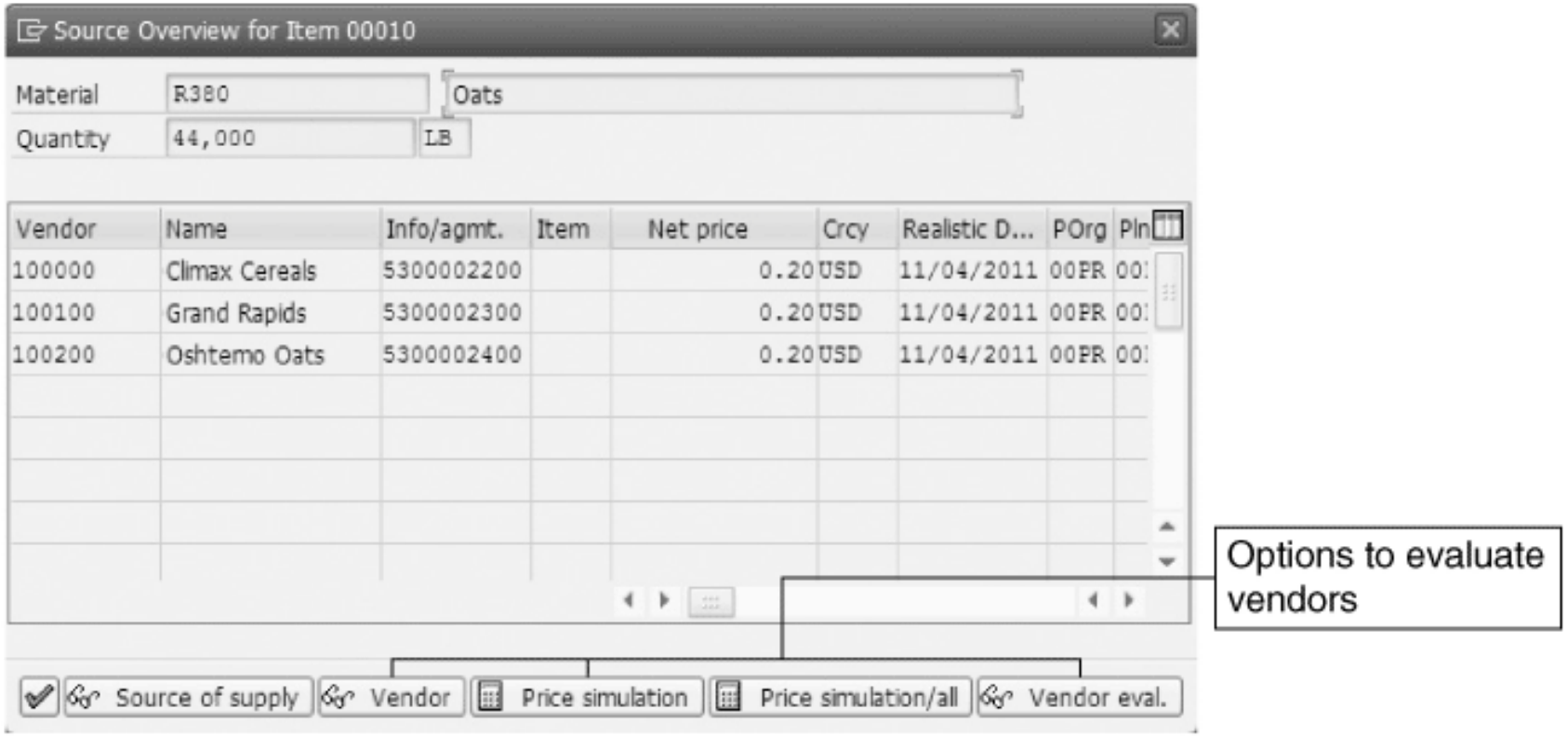

Figure 4-21 Source Overview screen for supplier selection

Detailed Scheduling

- Detailed plan of what is to be produced, considering machine capacity and available labor
- One key decision in detailed production scheduling
  - How long to make the production runs for each product
  - Production run length requires a balance between setup costs and holding costs to minimize total costs to the company

Detailed Scheduling (cont'd.)

- Fitter Snacker uses repetitive manufacturing
- **Repetitive manufacturing** environments usually involve production lines that are switched from one product to another similar product
  - Production lines are scheduled for a period of time, rather than for a specific number of items

Detailed Scheduling (cont'd.)

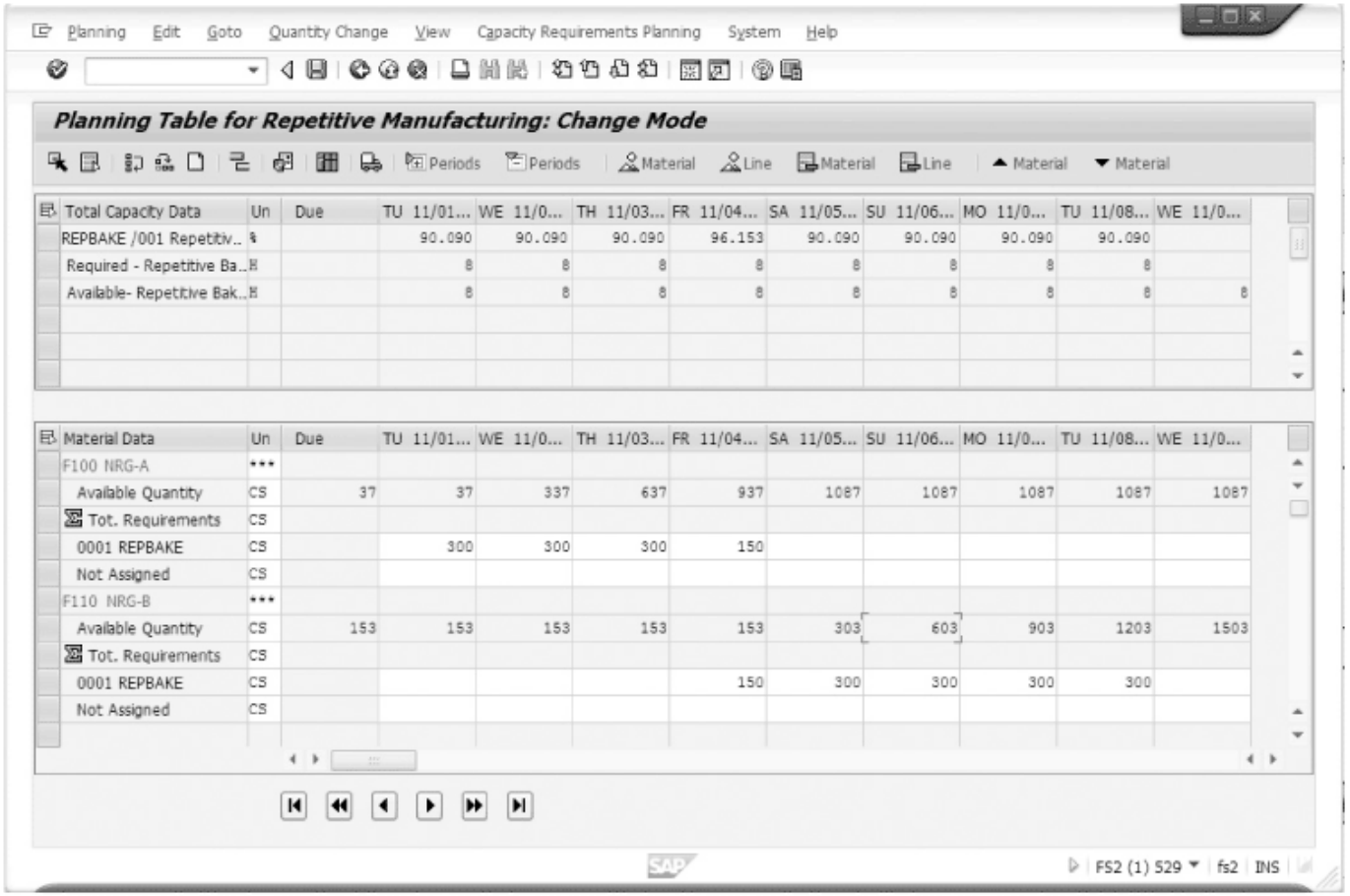

Figure 4-22 Repetitive manufacturing planning table in SAP ERP

Detailed Scheduling (cont'd.)

- Production runs should be decided by evaluating the cost of equipment setup and holding inventory
- Integrated information system simplifies this analysis
  - Automatically collects accounting information that allows managers to better evaluate schedule trade-offs in terms of costs to company

Providing Production Data to Accounting

- In the manufacturing plant, ERP packages do not directly connect with production machines
- Data can be entered into SAP ERP through a PC on the shop floor, scanned by a barcode reader or radio frequency identification (RFID) technology, or a mobile device
- In an integrated ERP system, the accounting impact of a material transaction can be recorded automatically

Providing Production Data to Accounting (cont'd.)

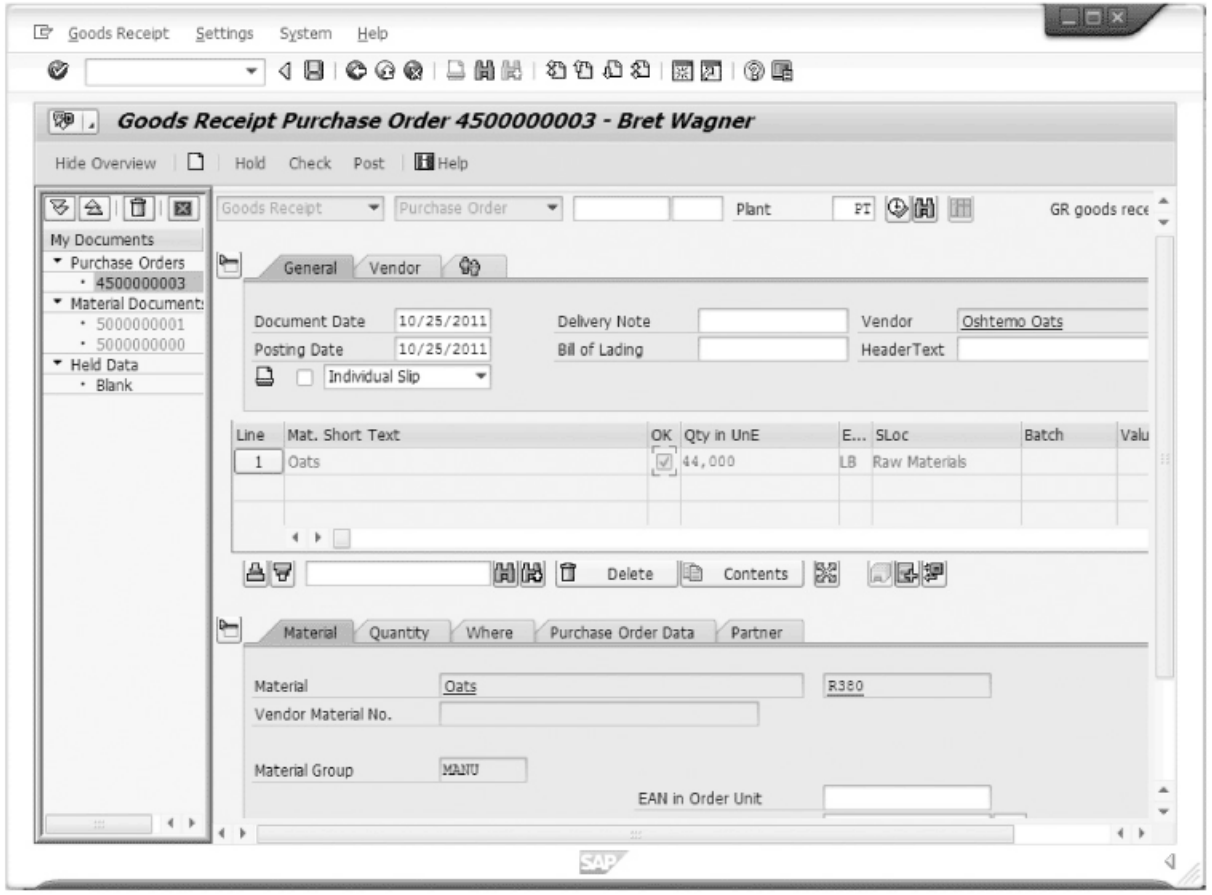

Figure 4-23 Goods receipt screen in SAP ERP

Providing Production Data to Accounting (cont'd.)

- Once FS accepts shipment, Receiving must notify SAP ERP system of the arrival and acceptance of the material
  - Goods receipt transaction
- Receiving department must match goods receipt with purchase order that initiated it
- When receipt is successfully recorded, SAP ERP system immediately records the increase in inventory levels for the material

ERP and Suppliers

- Fitter Snacker is part of a supply chain
  - Starts with farmers growing oats and wheat
  - Ends with a customer buying an NRG bar from a retail store
- ERP systems can play a key role in collaborative planning

ERP and Suppliers (cont'd.)

- Working with suppliers in a collaborative fashion requires trust among all parties
  - Company opens its records to its suppliers
  - Suppliers can read company's data because of common data formats
- Advantages
  - Reductions in paperwork
  - Savings in time
  - Other efficiency improvements

The Traditional Supply Chain

- **Supply chain**: all activities that occur between the growing or mining of raw materials and the appearance of finished products on the store shelf
- Traditional supply chain
  - Information is passed through the supply chain reactively as participants increase their product orders
  - Inherent time lags cause problems

The Traditional Supply Chain (cont'd.)

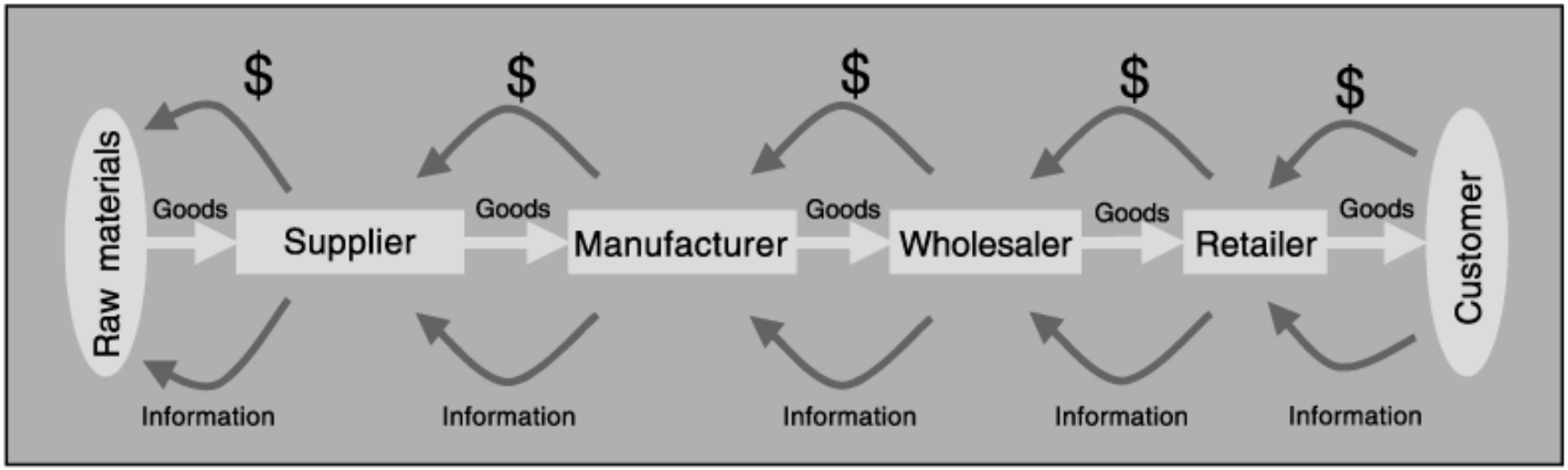

Figure 4-24 Supply chain management (SCM) from raw materials to consumer

The Traditional Supply Chain (cont'd.)

- EDI and ERP
  - Before ERP systems were available, companies could be linked with customers and suppliers through electronic data interchange (EDI) systems
  - Well-developed ERP system can facilitate SCM
    - Needed production planning and purchasing systems already in place
  - With ERP system, sharing production plans along the supply chain can occur in real time

The Measures of Success

- Performance measurements
  - **Metrics**
  - Show the effects of better supply chain management
- **Cash-to-cash cycle time**
  - Time between paying for raw materials and collecting cash from customer
- SCM costs
  - Include cost of buying and handling inventory, processing orders, and information systems support

The Measures of Success (cont'd.)

- **Initial fill rate**
  - Percentage of the order that the supplier provided in the first shipment
- **Initial order lead time**
  - Time needed for the supplier to fill the order
- **On-time performance**
  - If supplier agreed to requested delivery dates, tracks how often supplier actually met those dates

Summary

- ERP system can improve the efficiency of production and purchasing processes
  - Efficiency begins with Marketing sharing a sales forecast
  - Production plan is created based on sales forecast and shared with Purchasing so raw materials can be ordered properly

Summary (cont'd.)

- Companies can do production planning without an ERP system, but an ERP system increases company's efficiency
  - ERP system that contains materials requirements planning allows Production to be linked to Purchasing and Accounting
  - This data sharing increases a company's overall efficiency

Summary (cont'd.)

- Companies are building on their ERP systems and integrated systems philosophy to practice supply chain management (SCM)
  - SCM: company looks at itself as part of a larger process that includes customers and suppliers
  - Using information more efficiently along the entire chain can result in significant cost savings
  - Complexity of the global supply chain
    - Developing a planning system that effectively coordinates information technology and people is a considerable challenge