A **Serious Game** for **Learning**
Enterprise Resource Planning Concepts

HEC MONTRĒAL
ERP SIMULATION GAME
Manufacturing Game

Participant's Guide

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FOREWORD BY PIERRE-MAJORIQUE LÉGER

When hired as a young professor at HEC Montréal, I was given the responsibility to teach ERP systems to undergraduate and MBA students. I was looking for new ways to teach ERP Systems using SAP® when I attended a training seminar led by Dirk-Jan Schenk and Casper Draijer, organized by SAP Canada in Halifax. These two professors from HES Amsterdam had developed a role playing game and it turned out to be truly inspirational. It convinced me then that this was the way to go.

After returning to Montréal, I spent the summer developing an ERP Simulation game. It was first used in October 2004. While it generated much enthusiasm from the participating students, the simulation game lacked a well developed and realistic economic story line. To address these issues, I invited Professor Jacques Robert, a friend and colleague at HEC Montréal, to participate in the development of this market game. Professor Robert is an economist and a trained game theorist. He developed a very challenging market algorithm to support the game. Since then, he has been instrumental in the development of most aspects of the actual game version.

Building on this market model, a first prototype of the simulation software was developed in Excel. The simulation engine generated text files that were uploaded and executed using a CATT script in SAP®. The simulation software created customer orders per quarter, but it had two problems. First, it required far too much human intervention to operate the simulation game, and second, orders could only be created in batches once per quarter.

This is when Professors Gilbert Babin and Robert Pellerin came into play. Professor Babin, also a friend and colleague at HEC Montréal, is a computer scientist specializing in distributed systems. Professor Pellerin is an industrial engineer from École Polytechnique de Montréal and a former doctoral colleague. Thanks to both of these researchers, ERPsim was developed. ERPsim is a Java-based application that supports almost every aspect of the simulation game. Sales orders are now automatically recorded in the system in real time. Both Professors Babin and Pellerin have significantly contributed in the development of the simulation game. Finally, Professor Bret Wagner from Western Michigan University joined our team in December 2006. With his help, a dedicated simulation client was developed to support the simulation game. Our team is a truly interdisciplinary team.

We have also benefited from the assistance and insightful comments of many faculty members of the SAP University Alliance. The ERP Simulation Game is now used in more than 100 universities worldwide. We would like to thank all these collegues for their comments that have helped to improve the software and streamline the simulation game.

Moreover, we would like to thank all the professionals and assistants who were involved in the development of all aspects

of this simulation game for their great work: Olivier Dressler, Éric Provost, Jean-François Dubois, Louis Quach, Carl St-Pierre, Virginie Boulay, Cynthia Binette, Nicholas Bourgon, Mona Yazbech, Jonathan Grimaudo, Lesley-Anne Salès, Nicolas Bergeron, Derick Lyle, Jean-François Millaire, Marc-Antoine Boucher, Alexandre Rimthong, Simon Leblanc, Jonathan Fredette, Jean-François Michon, William Ha, Marc-André Paré, Julien Perret, Sebastien Rothlisberger, Tristan Grebot, Jonathan Dahan and Stéphanie Bourgault-Mongeau.

Since September 2008, the ERP Simulation Game is used commercially by Baton Simulations (www.batonsimulations.com). Professionals at many Fortune 1000 organizations are now introduced to SAP by playing the simulation game. We would like to thank Harvey Feldstein for his invaluable insight in the recent development of ERPsim. The SAP ERP Simulation game by Baton Simulations is the latest offering from SAP Education. This immersive business simulation helps to drive awareness and understanding, promote cross team integration, increase adoption, and deliver real improvements in productivity. In small teams, participants run the full business cycle of a small company. The teams interact with suppliers, customers, and internal groups. They use SAP reports and dashboards to make and execute business decisions. The goal is to ensure efficiency, effectiveness, and profitability. For more information about SAP Education offering, please visit th following website, http://www.sap.com/services/education/softwareproducts/erp-simulation/index.epx.

Finally, we would like to thank SAP University Alliance for the continuous support for the development and diffusion of this game.

As of June 2010, the game has been played in 5 continents. Annually, more than 3000 graduate and undergraduate students are introduced to ERP system using our simulation game. We believe that this is only the beginning. Much can be done using simulation to teach ERP Systems. Our team still has a lot of new ideas to refine and improve on the different aspects of the game. Some of these ideas are already under development and new versions of the software will be released in the future. We are open to your suggestions or ideas, so do not hesitate to contact us with your comments. at erpsim@hec.ca. We believe in the premise that learning should be fun… Enjoy !

Pierre-Majorique Léger, Ph.D.
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(Beta version on the web)

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ABOUT ERPSIM

This book can only be used if your university or college is part of the SAP University Alliance and that your instructor has access to an education version of ERPsim.

ERPsim is a unique business simulation technology developed at HEC Montréal that enables the simulation of near-real-life business contexts of large corporate information systems. There are other simulation games which allow you to take a strategic view of an enterprise, but ERPsim is closely couple with ERP technologies so participants have to use a real ERP system like they would in a real context.

So what exactly does ERPsim do if it is entangled with an ERP system such as SAP? ERPsim serves three functions. First, it provides the simulation of a market for buyers so that the participants playing the game have a reasonable market that responds just like one in the real world would.

Secondly, ERPsim automates some of the business functions that are more administrative to make the game a little easier to play so that participants focus on the decision making processes in the real world system while experiencing the full value of reports and decision support tools that exist in the system. Participants are put in a situation where they have to run their business using a real life ERP system similar to those used by the world's largest companies. The essential feature of the simulation is that the only interface between the simulator and the participants is a real ERP system. All decisions made by the participants must be introduced into the system; all information about the evolution of the game must be retrieved from standard or customized reports from the system. For the participant, this is like using a flight simulator, but in a real plane cockpit. This creates a unique learning environment where participants can learn hands-on about the integrated business system.

The third and final aspect that ERPsim provides is the simulation of the passing of time. ERPsim compresses time into a short space but still creates the appearance of time evolving so that the impact of the decisions taken overtime can be evaluated. In this virtual time, participants of the game are able to adjust their decision making processes and take better business decisions over time as their learn to play the game and see the results of the decisions they have taken.

ERPsim is built on a standard technology platform: Java. It uses a set of connectors and integrators to connect with real world ERP systems, for example the BAPI architecture of SAP. In addition to the Java technology, custom reports have been developed inside the ERP application as well as a specific configuration environment to provide the actual game context in SAP.

The simulation is a make to stock manufacturing company where participants must operate the full business cycle (plan, procure, produce and sell) to experience the value of up and downstream information flows through this real world system,

process integration across functional silos to understand the impact of not making a decision in time or how a poor decision can impact the follow on of a business cycle. By experiencing the simulation, participants get to understand what it really takes to operate a real company in an integrated system as opposed to a simulated environment that only focuses on strategy.

ERPsim is a propriatory technology developed by Prof. Pierre-Majorique Léger, Ph.D., Prof. Jacques Robert, Ph.D., Prof. Gilbert Babin, Ph.D, Prof Robert Pellerin, Ph.D. and Prof Bret Wagner, Ph.D. Free of charge licences for the use of ERPsim in the academic world has been granted to the UCCs and the SAP University Alliance. In the non-academic world, Baton Simulations has the exclusive rights to use the ERPsim technology and all related intellectual property in all countries for commercial use.

DISTRIBUTION OF THIS PARTICIPANT GUIDE

Purchase of this electronic book through the ERPSIM Learning portal website grants you the right to use it for the purpose of playing the simulation game.

HOW TO USE THIS BOOK

We chose to avoid screenshots in this book to facilitate its use during the simulation game. This avoids creating a voluminous book that would render it difficult to flip from one section to the other rapidly during the game. Furthermore, our objective, when we designed the book was not to have you change pages when processing a transaction in the system. Yet, we have reproduced the SAP® icons whenever appropriate to facilitate the navigation in the SAP® screens.

Whenever you need to process a transaction in SAP®, the following box will appear on the left hand side of the page. This box is threefold. First, on the top, you have the transaction code that you may key in the transaction field of SAP® to access directly a function in the system. Then, the navigation path is provided. This path will direct you in the SAP® Easy Access Menu to the same transaction. Finally, at the bottom, there is a number that corresponds to a flash animation tutorial that will provide you a step-by-step explanation about this transaction. The flash animations are available on the website of the learning portal (http://erpsim.hec.ca/learning).

TRANSACTION CODE →	XK01
NAVIGATION PATH →	Logistics / Materials Management / Purchasing / Master Data / Vendor / Central / Create
FLASH TUTORIAL →	205

INTRODUCTION

Teaching the concepts underlying an Enterprise Resource Planning (ERP) system is a difficult task. Many students have very little IT experience to which they can relate these concepts. They may have acquired business experience in one or two functional areas, but many of them have only a limited understanding of the operational aspects supporting the value creation process in modern firms. Moreover, they usually have had no firsthand experience with the functional non-integrated software that the ERP system was designed to replace. For these students, the horizontal integration of the firm, one of the greatest benefits of implementing an ERP system, can be very abstract due to their lack of hands-on experience with legacy systems.

Yet business students are very computer-literate these days. Born after the first personal computers came onto the market, many of them have never experienced life without a keyboard or a mouse. Therefore, if they get hands-on experience with an ERP system, undergraduate and graduate students can learn the system and its core concepts very quickly.

The ERP Simulation game is an innovative "learning-by-doing" approach to teaching ERP concepts. During this game, students have to run a business with a real-life ERP (SAP®). Groups of five to six students each operate a firm in a make-to-stock manufacturing supply chain and must interact with suppliers and customers by sending and receiving orders, delivering their products and completing the whole cash-to-cash cycle. A simulation software program was developed to automate the sales process, so that every firm receives a large number of orders in each quarter of the simulation. Using standard and customized reports of the ERP, students have to analyze these transactions and make business decisions to ensure the profitability of their operations. The pedagogical objectives of this game are fivefold: i) to develop a hands-on understanding of the concepts underlying enterprise systems, ii) to experience the benefits of enterprise integration firsthand, iii) to develop technical skills at using an ERP software, iv) to learn how to work in a team, and v) to learn how to strategize in a realtime business environnent.

The book is organized in four parts. Part 1 contains one chapter. The chapter offers an introduction to the Muesli business game. It provides a short introduction to full cash-to-cash business processes of the Muesli make-to-stock company. It presents the market environment for the business game. It lists the main decision that the teams will need to perform within the simulation. Ideally, the students should read the introduction chapter before the first class.

The second part introduces the SAP transactions required to play the full cash-to-cash business process. This part is structured so that students can get a quick introduction to the system and the business process. Rather than presenting all the transactions beginning with planning and procurement then to production and sales. we propose the reverse order. In the "Introduction Game" or "Counter-clock-wise game", each team begin the simulation with enough inventory of finished prod-

ucts and raw material for at least two quarters. In quarter 1, teams only have to focus on selling their stocks of finished products. In Quarter 2, we introduce production teams use their available stock of raw materials in order to produce and keep on selling. Finally, in Quarter 3, procurement and planning are introduce. By end of Quarter 3, teams have learned the basic transactions of the Muesli game.

In part three, all the transactions required to run the Muesli company are presented and documented in more detail. The first chapter of part three present all the financial transactions necessary. The second chapter presents, from planning to sales, all the SAP transactions required to process the full cash-to-cash cycle. These include the transactions presented in the second part but also transactions that are automated in the simulation and that are not necessarily performed by participants in the business simulation. The chapter highlights how all the different elements of the business process are integrated together into the system. The third chapter of part 3 focuses on reporting and analytic. The final chapter review the made decisions required in order to run the Muesli company.

The final part covers the more technical aspect of ERPs. It focuses on the work that must be done on the system before it could actually be used. This include the configuration of the different modules, the creation of the organizational elements and the creation of the master data. These are covered in detailed in Part 4. The various chapters offer a large list of exercises that together enable the full configuration of the Muesli client.
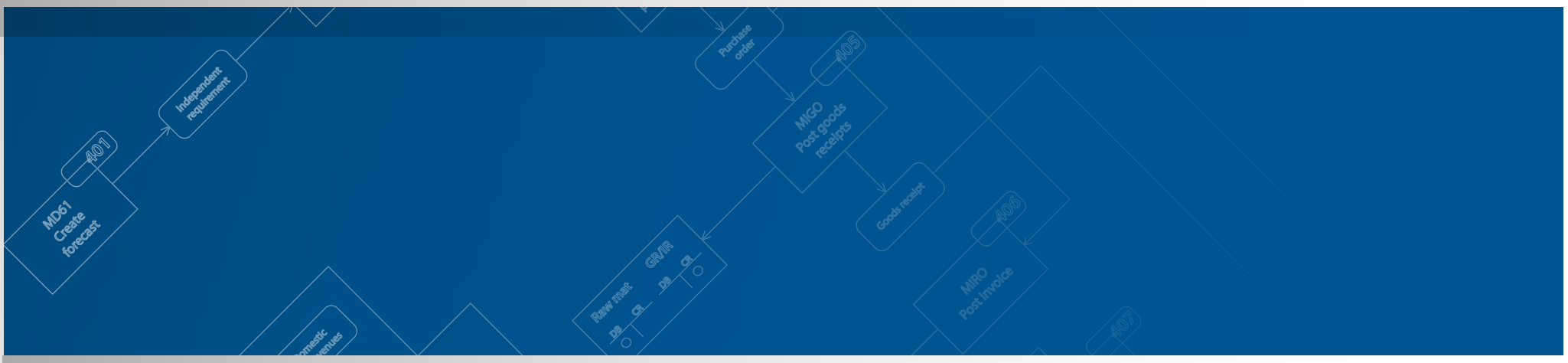
Participant's Guide

HEC MONTRĒAL
ERP SIMULATION GAME
powered by ERPsim

Part 1
Welcome to your new job!

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HEC MONTRÉAL
ERP SIMULATION GAME

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CHAPTER 1 – INTRODUCTION: MUESLI AG

1.1 Description of our new company

1.1.1 Introduction

As a participant in the HEC Montréal ERP Simulation game, you've just accepted a new job in the industry of pre-packaged muesli cereal at Muesli AG.

Muesli is a popular breakfast dish. Dry muesli is primarily a mixture of rolled oats and wheat flakes, with nuts and pieces of dried fruit. According to Wikipedia, "Muesli was invented in 1900 by Swiss doctor Maximilian Bircher-Benner for patients in his hospital". Muesli was first popularized in Germany and Switzerland. In the late 1980s, the company Kellogg® marketed its brand Mueslix® in North America. Since then, an interest in Germany 's local brand of muesli has developed. Today, dry muesli is widely available in the form of pre-packaged mixes. It can be stored for many months and served mixed with yogurt or milk, and pieces of fresh fruit. Some like it in hot milk. Muesli provides an excellent source of essential ingredients as it is rich in fiber and essential trace elements. In the local market, about 18,000 boxes of local brands of muesli per company per day were produced on average in 2006.

Your new company produces pre-packaged muesli boxes. The market is surprisingly fragmented. This could be explained by the fact that entry costs in the industry are relatively small. In 2006, there were eight local companies competing in this relatively small but competitive market. Each firm is located in a different city in Germany (Figure 1.1).

Figure 1.1: Location of the 26 companies in Germany

You are part of a small executive team leading one of these companies. As a member of the executive team, you will have to make strategic decisions for a number of years. You will have to select the recipe for your products, forecast sales, plan production, make pricing decisions and determine the advertising budget. Your team will also be responsible for accounting functions, including reporting quarterly profits. Unethical behavior, such as falsifying financial reports, not paying suppliers or the bank loan on time, or violating industry regulations are unacceptable and will be severely punished. Otherwise, the name of the game is to make the most profit.

1.1.2 Make-to-stock business processes

Your muesli company, Muesli AG, is a make-to-stock manufacturer. It can only sell products that are held in inventory. Therefore, cereal boxes have to be manufactured in advance. This determines some of the business processes that your company will need to perform.

Your executive team will need to forecast the number of products the firm intends to sell in the next period. Based on this forecast, production is planned. Material requirements are met by purchasing raw materials from the appropriate supplier. Production is done in batches. Purchasing raw materials requires cash flow. If you choose to produce a large number of boxes in advance, you will have to borrow the necessary funds from the bank on which you will have to pay interest.

Because this is a small company, your team will have to supervise almost all of the operations of the company and take an active part in some of the day-to-day processes. There are tasks that you simply cannot delegate and the success of your company depends on your team. Your responsibilities in operations could include some of the following processes within the full cash-to-cash cycle (Table 1.1).

More importantly, there is a list of managerial and strategic activities that you will have to undertake. The strategic decisions involve setting the price, allocating advertising expenditures, and choosing the recipes for your product. You will also have to manage your cash flow. This is hard and challenging work but this is why you accepted the job.

Table 1.1: Operations in the cash-to-cash cycle

Operations	Description
Forecasting	All plants in the simulation are using a make-to-stock approach. Therefore, the sales manager needs to forecast demand to create independent requirements.
Production Planning	Based on the forecasted sales unit for the next period, represented by independent requirements, the planner then runs the materials requirements plan (MRP), which automatically generates the raw materials purchase requisitions.
Purchase Order Creation	When a purchase requisition is received, the purchasing manager contacts the suppliers of the products required. After assigning the chosen vendor to the purchase requisition, a formal purchase order is created.
Goods Receipt	When the goods are received, the receiving clerk checks that the goods delivered correspond to the purchase order and records the goods receipt in the system.
Invoice Receipt	The invoice sent with the product is forwarded to accounting and posted by an accounting clerk.
Payment	Since the goods are payable upon an agreed term of payment, the accounting clerk carries out the transaction required to pay the vendor. A check for the amount owed is issued and sent to the vendor.
Production Order Release	Once all raw materials required for production are available, a production order is created and released.
Production Order Execution	The raw materials required are transferred from the warehouse to the production line. Confirmation of this transfer is recorded in the system. At the end of the production process, the production order is confirmed and the finished products are transferred from the production line to the warehouse. This transfer is again confirmed in the system.
Sales Order Creation	Regularly, retailers ask the manufacturers for a quotation. The retailer sends the order to the manufacturer whose products best meet their needs. The sales representative records this order.
Shipping	The finished products are shipped to the customers and the inventory of finished products is adjusted (goods issue).
Invoicing	Accounting sends an invoice to the customer.
Incoming Payment Reception	Upon receipt of payment from the customer, the accounting clerk clears the customer account and records the deposit of the payment.

1.1.3 The ERP system

Considering all your responsibilities, your team will be kept pretty busy. Fortunately, the company has acquired a new ERP system: SAP™ ERP. Presumably, none of you has any practical experience with SAP™ ERP or another ERP system, but you are entrepreneurial and resourceful, so you are looking forward to fully exploiting the possibilities of the ERP system. You will quickly have to:

- Become familiar with the Enterprise Resource Planning (ERP) software,
- Develop a practical understanding of the main concepts underlying an ERP software, and
- Identify the benefits of intra-company integration.

ERP software is an integrated information system that manages enterprise data, helps integrate business processes and provides data for business intelligence. One of your first tasks is to learn how to perform the various operational tasks to plan production, order raw materials, produce goods, enter prices and advertising budgets, etc. As the system stores all relevant information on your company, you must learn to use the system to exploit that information. You will need to track purchasing orders, follow the evolution of production and inventory levels, draw financial reports, and acquire market business intelligence.

1.1.4 Physical layout and logistics

On your first day at your new job, the administrative assistant, Ms. Christie, kindly proposes a tour of the factory. The main entrance leads to the reception area and to the offices of the executive team, which in turn, leads you to a large shop floor.

As you enter the shop floor, you begin to get a better understanding of your new business. Mr. Jack, the production manager, comes to greet you and begins to explain how the machines work. You listen carefully. On the shop floor, the production machines are lined up. On the right of the shop floor, a door leads to the raw material warehouse. About twice a day, the raw materials are distributed in large receptacles. The raw materials are then mixed by a calibrated machine that processes the programmed recipe. Another machine makes plastic bags, fills them with muesli, and seals the boxes. A final machine packs the boxes into cardboard shipping cases. Each case is identified with the product name and stored in the finished product warehouse, which can be accessed at the left of the shop. Adjacent to the shop floor are more offices. These offices belong to the salespeople, who are in charge of receiving and processing the sales orders, billing and payments.

Further in the back, you visit the two warehouses. The one at the right is the raw materials warehouse. The delivery trucks stop at the reception dock located at the back of the factory, where they unload the raw materials. On the left side is the finished product warehouse. Cases of finished cereal are stored in this warehouse. There are six different sections, one for each of the company's product lines. When an order is received from a customer, the salespeople prepare a shipment order

and a delivery truck comes to the loading dock to load the cases of finished product boxes.

 "Clearly," Mr. Jack says, "you do not want to have a delivery truck come in when there is no product in stock, so as a rule we never produce a shipment order if the desired product is out of stock. It happens from time to time. When it does, we lose a sale. Once, an employee had forgotten to put the finished products in the finished product warehouse and we lost a lot of money. The boss was not very happy."

1.1.5 Assembly lines

Muesli AG produces muesli on a single production line. This line operates 24 hours a day. The assembly line capacity is 21,000 boxes per day.

The assembly line will process production orders in the order that they were released. Whenever a new production order is processed for a different recipe the machines must be reconfigured and an allergen cleanup is required, which takes 12 hours. During the simulation game, you can invest in process improvement activities that will reduce the time to perform this cleanup.

The simulation will process the released production orders automatically and will confirm production daily. The confirmed production quantities are then available for sale.

The standard production order size is 50,000 units per order. When you plan your production, the MRP (Material Requirement Planning) will create as many planned order of 50,000 units as needed. The last planned order may be less that 50,000 if your production needs are not a multiple of this number.

A critical strategic decision is how long to make production campaigns. A campaign corresponds to a series of consecutive production orders of the same product. Long production campaigns will reduce the average setup time (there is no setup time between production orders of the same product). On the other hand, producing in small campaigns will allow a wider offering to the customer but reduce total output because of the capacity lost to machine setup. Finding the right balance between small production campaigns that allow you to respond to changing markets and long production campaigns that reduce production costs is a key element of the simulation game. Note : Automated setup, therefore setup time, is an optional feature. Check with your instructor to see if automated production is implemented. Also note that production orders cannot be cancelled once they are released.

1.1.6 Automated procurement functions

The simulator can perform the goods receipt, invoice receipt, and payment. When the goods receipt function is automated, a goods receipt for a purchase order will be created automatically in three to five days after the purchase order is created. It is important to keep this delay in mind, as production orders cannot be released (and therefore, boxes of muesli cereal cannot be produced) until all raw materials are in stock.

When the invoice receipt function is automated, the invoice receipt is recorded immediately after the goods receipt. The payment terms that you agreed to with your vendors allows you to pay them up to 15 days after receiving the invoice. When you automate the vendor payment, the payment will be automatically posted 15 days after receiving the raw materials. Thanks to your vendor's generous payment terms, you have extra working capital to use to pay other expenses for 15 days!

1.2 Description of the marketplace

1.2.1 Supply of raw materials and inputs

To produce a box of muesli cereal, one can use up to six different ingredients: wheat, oats, nuts, raisins, strawberries, and blueberries. Each firm must determine the proportion of each ingredient; therefore each firm must select the composition (recipe) of each of its products.

Table 1.2: Muesli Manufacturing Association Label Regulation

Ingredients						
Labels	**Wheat**	**Oats**	**Blueberries**	**Strawberries**	**Raisins**	**Nuts**
Original	Min 20%	Min 30%	No	No	No	No
Blueberries	Min 20%	Min 20%	Min 20%	No	No	No
Strawberries	Min 20%	Min 20%	No	Min 20%	No	No
Raisins	Min 20%	Min 20%	No	No	Min 20%	No
Nuts	Min 20%	Min 20%	No	No	No	Min 20%
Mixed fruits	Min 20%	Min 20%	Min 30% (All fruits included)			

It is customary in the muesli industry to classify muesli cereal into six different categories depending on the composition of the product: original, raisins, nuts, blueberries, strawberries, and mixed fruits. In fact, every muesli company belongs to

the Muesli Manufacturing Association (MMA) which has developed a set of product categories with recipe regulations. As consumers are looking for products with specific ingredients, the regulations require that a product referred to as "Blueberry Müesli" contains only blueberries, wheat and oats with a minimum of 20% for each. The same applies for Nuts, Strawberry, and Raisin Müesli. Products labeled as "Original recipe" must contain only oats and wheat with a minimum of 20% wheat and 30% oats. Products labeled "Mixed fruit" must contain all six ingredients with a total of at least 30% non-cereal ingredients. The Table 1.2 summarizes the labeling regulations. Your firm is a member of the MMA and has agreed to follow the MMA labeling regulations.

Boxes come in two sizes: 500 g (small) and 1 kg (large). Some distribution channels will sell only small boxes; others, only the larger boxes (see the retail section). Packaging is comprised of two components: plastic bags and cardboard boxes.

All the ingredients going into the production of muesli cereals are produced within highly competitive markets. Wheat, oats, raisins, strawberries, blueberries, and nuts are all commodities whose prices are determined by the Global Commodities Market. Each individual firm in the local muesli industry is too small to have any impact on the commodity market prices. Distribution of these commodities (i.e., raw material) is provided by a single firm: FoodBrokers Inc.

The product cost includes the cost of the raw materials and packaging. Raisins, blueberries, and strawberries are typically the most expensive ingredients while wheat and oats are the cheapest. Prices of raw materials vary with the market conditions, the quality of the harvests and the seasons.

Table 1.3: Input Cost (at low seasonal price)

Cost of inputs	2006	2007
Wheat	0.95	0.97
Oats	0.92	0.90
Raisins	1.02	1.07
Strawberries	3.86	3.94
Blueberries	3.74	3.92
Nuts	1.60	2.19
Packaging 0.5 kg	0.29	0.29
Packaging 1 kg	0.38	0.39

A study has shown that, except for packaging, the raw materials exhibit seasonal variation. Strawberries and blueberries are particularly seasonal. The prices during the off season periods may be much higher than what they are during the harvest season. In 2006, the price of raisins was at an all time low due to a price war between producing countries. In 2006, the price of nuts sharply increased because of the coup d'état and subsequent civil war in Dementia, the world's largest producer of nuts.

Depending on how the game is set, the buyers need to track the raw material prices using the simulation viewer page.

The plastic bags and the cardboard boxes used for packaging are produced mainly by specialized printing companies. The companies purchase the boxes from the cardboard producers and then print the brand logos according to specifications. The plastic bags are typically sold by the same companies. The only source for packaging material for your firm is Continental Printing Co.

1.2.2 Retail

There are three distribution channels for muesli cereal in the local market: independent grocers, traditional grocery stores, and hypermarkets (large discount outlets).

Grocery stores

Grocery stores are still the main distribution channel for the muesli industry. In 2006, 37.0% of total sales were through the traditional grocery stores. Grocery stores offer their customers more variety than the other types of stores. A typical store would carry 4 different labels of muesli on their shelves and would sell both small and large boxes. In 2006, there were 59 grocery stores in the local market. Grocery stores are reliable and they will pay their bill between 10 and 15 days.

Independent grocers

Independent grocers or convenience stores are small proximity stores. They sell a small variety of products: beverages, beer, dairy products, candies and chips, newspapers and magazines, and some everyday non-perishable food products including muesli cereals. Convenience stores will only sell 0.5 kg boxes. Their consumers are less sensitive to prices. Convenience stores will typically order in small quantities and will stock the shelves with only one or two labels. In 2006, the estimated market share of convenience stores was 33.6%. Prices are on average 10% to 15% higher in convenience stores than in traditional grocery stores. In 2006, there were 123 convenience stores in the local market. Because their internal process is mainly manual, the payment delay of the independent grocer will vary: they will pay you within 5 to 10 days.

Hypermarkets

Large discount stores or hypermarkets are a growing phenomenon. They not only sell food, they also sell books, CDs, clothing, and electronic appliances. These stores have managed to attract a large number of consumers looking for cheaper prices. In 2006, 29.3% of sales were at hypermarkets, a major increase from the previous decade. Hypermarkets will only sell 1.0 kg boxes and will offer a more limited variety than the grocery stores. Many studies have shown that outlet consumers are highly sensitive to price. Typically, the products are sold at prices 5% to 10% lower than in traditional grocery stores. In 2006, there were 12 outlets in the local market. Hypermarkets will tend to strech the payment terms to their limits: they will pay you in exactly 20 days after receiving your invoice.

Also, retail stores are not distributed evenly through Germany. Germany is divided into 16 states or Länders. The following table provides an economic overview of each of the 16 German regions as well as the number of retailers located in each state.

Table 1.4: *Number of stores by geographical area*

Credit ratings	Hypermarkets	Grocery stores	Independent grocers	Total
West	3	17	40	60
South	7	23	38	68
North	2	19	45	66
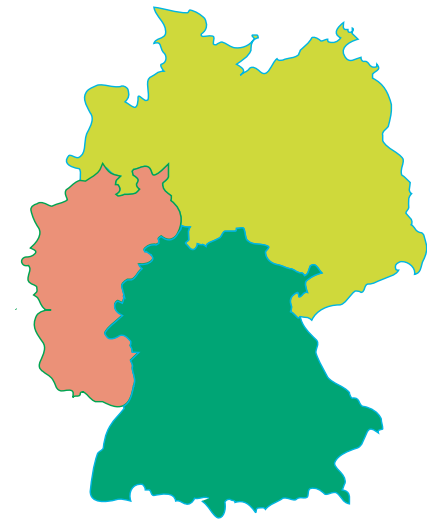
Table 1.5: Number of retailers per Länders

Länders	GDP in 2003*	Population in 2003**	Grocery chains	Hypermarkets	Independent grocers	Area
Baden-Württemberg	314,940	10,693	8	2	14	South
Bavaria	371,256	12,423	10	3	10	South
Berlin	77,274	3,388	2	1	6	North
Brandenburg	45,010	2,575	2		2	North
Bremen	23,366	663	1		1	North
Hamburg	77,080	1,734	2		5	North
Hesse	193,673	6,089	5	2	11	South
Mecklenburg-Western	29,700	1,732	1		2	North
Lower Saxony	183,094	7,993	6	1	9	North
North Rhine-Westphalia	466,878	18,080	15	3	33	West
Rhineland-Palatinate	92,733	4,059	2		6	West
Saarland	25,783	1,061			1	West
Saxony	77,098	4,321	2		8	North
Saxony-Anhalt	44,221	2,523	1		5	North
Schleswig-Holstein	65,923	2,823	2		7	North
Thuringia	41,832	2,373			3	South
			Total **59**	**12**	**123**	

* M euros ** In thousands

1.2.3 Consumers

In 2006, consumer spending on muesli averaged 90,000 euros per company per day. While the total demand for ready-to-eat cereal was relatively stable throughout the year (except for a minor increase during the winter) the net sale of local brands of muesli cereal was not. Traditional ready-to-eat cereal seems to offer genuine competition to the local muesli brands. During the second quarter of 2006, a strike in one of the local muesli plants substantially reduced the supply of muesli cereal, as a result many consumers switched to ready-to-eat cereal, and a significant proportion of these customers have not returned to muesli cereal.

1.2.4 Banks

It may not come as a surprise to you, but your company needs money to make money. You have to purchase and hold inventory of raw materials and produce finished goods ahead of demand. To pay for the raw materials and production you will need cash. Your company has had a good relationship with the Weizen Bank. The Bank currently offers you a good credit rate and extends a sufficiently large credit line. After each quarter, your company will have to produce a full financial statement to your banker.

Your total bank loan is 12 million euros. Your shareholders have invested an additional 8 million euros. Of this 20 million euros, 17 are invested in assets. This leaves you with 3 million euros in liquidity. Your responsibility is to effectively manage this money and obtain the highest possible return for your shareholders and, if possible, begin to pay back your bank loan. The payment of the interest on your loan is automated so you will not have to do it manually. The interest is accrued on a daily basis and posted every 5 days. However, be aware that your firm must have positive cash balance at all time.

Your banker, a smart but rigid fellow named Mathias, does not like amateurs and risk-takers. Your banker will continue ti extend you favorable credit only if your company makes interest payments on time. He does not like companies that take too many risks and have excessive unsold merchandise. He dislikes managers that fail to pay bills on time – to their bank or suppliers. But most of all, he dislikes managers that do not respect the law or fail to respect elementary ethical rules. He will not hesitate to reduce credit ratings, refuse to increase credit lines or simply recall your bank loan. As your boss often says: "I have worked hard to build my company's reputation, do not damage it by bad management." Your bank loan bears a flexible interest rate.

Table 1.6: Risk premium on credit ratings

Credit ratings	Risk Premium
AAA	–
AA+	+0.5%
AA-	+0.75%
A	+1.25%
BBB+	+2.25%
BBB	+3.0%
BBB-	+3.5%
BB+	+5.25%
BB	+6.25%
CC	+8%

The prime interest rate has been relatively stable during the last decade. A sound monetary and fiscal policy has kept inflation down and the interest rates (namely, the business prime rates of the chartered banks) were between 5% – 6%. For most companies what really matters is their credit rating. The difference between a good credit rating and a bad one can lead up to an 8-point difference in the interest rate charged by the bank. The following chart lists the risk premium for each credit rating.

Currently your company has an A credit rating. This is the highest rating given for companies of your size. If you run out of cash, the banker will automatically extend your credit line in order to cover your credit needs. However, if the bank must do so, it will immediately decrease your credit rating and increase your interest rate. To regain your previous credit rating, you will need to stay out of the "red" for one entire quarter.

You are free to repay your loan at anytime. Since the interest is calculated every day, a reduction in the loan balance will immediately reduce your interest payment. Hence, making payments on your loan is a smart move if you have enough cash. Doing so bears some risks, however, if you miscalculate your future cash requirements, you will not be able to extend your loan until you actually run out of cash and, consequently, you will suffer the credit rating penalty.

1.3 Decision areas

1.3.1 Products and recipes

In the simulation game, firms can produce up to six different types of muesli cereal For each of these types, the firm must specify its recipe (composition) and the size of the box (large or small).

Each team must define, according to its own strategy, the recipes that it wishes to produce and market. One of the strategic objectives is to try to find niches, i.e. recipes that are unique in the market and which are desired by a sufficiently large number of consumers. Another objective is to appropriately target the various distribution channels. One must recall that small boxes are only ordered by convenience stores and grocery chains while large boxes are sold only to hypermarkets and grocery chains. Also, cost must be considered for the more price sensitive markets.

HERE IS A TIP: The market for muesli cereal is relatively segmented. Consumers have different preferences about muesli cereal and shop in different distribution channels. The key to success is to find the right niches. If you are the only firm serving a particular niche (say, small boxes of mixed fruit in grocery stores) you will be able to sell your product to this segment without fearing competition from alternative local brands.

While a firm may choose to change the recipe of one of its products, it cannot do so while there are still units of that product in stock. To introduce a "new recipe", one must first sell out the inventory of the old product. The retailers use the description of your product to make their purchase decision. If you advertise one recipe but instead deliver some old boxes based on another recipe, not only is it unethical but also illegal. If your company ever does so, you will be sued and it will seriously damage your reputation.

Technically, a recipe must be specified in the Bill Of Materials (BOM) in your ERP system. You define the bill of material by entering into the ERP system the quantity of each ingredient: wheat, oats, strawberries, blueberries, raisins, and nuts, used in your box of muesli. It is very important that the quantities of all the ingredients sum up to the package weight. Also the percentage of each ingredient must respect the labeling guidelines presented in Table 1.1. The Muesli Manufacturing Association is a serious organization and it monitors product labeling carefully. As your boss often says, "If you cannot add a few numbers and adhere to simple arithmetical rules, you should not be here."

HERE IS A TIP: Failure to sell a given product may be caused by inconsistencies in your bills of materials. If the box and bag sizes are not consistent with the amount of food products, retailers will not order your product. A customized transaction in the system verifies that the numbers are correct and match one of the six labels of the MMA.

1.3.2 Forecasting, procurement

The next decision your executive team will have to make is how much and when to produce each product.

A manufacturer can only sell products that are in inventory. Therefore, boxes of cereal have to be manufactured according to a make-to-stock manufacturing strategy. Your executive team will need to forecast the number of units of each product you plan to sell in the next period. Muesli production is done in batches, but before producing a batch you need to have all of the required raw materials in inventory. Recall that your executive team has many operational responsibilities: you must forecast demand and develop production plans, create purchase orders for raw materials, receive the raw materials into inventory, post invoices and pay the suppliers, and finally release the production orders. Further, purchasing raw materials requires liquidity. If you choose to produce a large number of boxes in advance, you will have to borrow the necessary funds from the bank on which you will have to pay interest. All this requires careful planning.

As mentioned previously, the price of some raw materials (in particular, blueberries and strawberries) is highly seasonal. For those products it is preferable to buy the raw materials for future production when the price is low. Planning becomes even more important in these cases.

Delivery time: This is an optional feature because it requires the automation of the goods receipt. Check with your instructor if this feature is used in the simulation game you are playing. Delivery from your suppliers is quite efficient. You will receive delivery of raw material within 3 to 5 days after the purchase order is created.

1.3.3 Production

Your company operates in a make-to-stock environment and sales will not occur unless your product is in stock. Therefore, it is critical that production provides the correct products at the correct time to support your business strategy. Of course, it is equally important that your business strategy is consistent with your production capabilities.

If production control is automated, then capacity becomes an issue, and it is critical to size production orders so that you have the correct balance between flexibility and production efficiency. It is not very useful to efficiently produce products that no one wants, but it is also not very useful to try to be flexible to the point that all your production capacity is spent in machine setup.

All raw materials must be received before production of an order begins. As part of your procurement strategy, you may want to consider not only strategic purchases that minimize procurement costs, but also advance purchases that will allow production of a new order to begin immediately. In other words, you may want to maintain a sufficient stock of raw materials

so that any of your products can be produced at any time.

Finally, production process productivity may be your strategic weapon, and you will need to consider investing in your production facilities. You start the simulation with production equipment that cost 5 million Euros has a production capacity of 21,000 boxes per day with a setup time between production batches of different products of 12 hours.

You can make additional investments in your production equipment to increase the production capacity and reduce the setup time. For an investment of 100,000 euros you can increase production capacity by 400 boxes per day. Hence, an additional 1 million Euros will provide you with a total daily capacity of 25,000 boxes. You may invest additional money to increase your capacity at any time.

$$Total\ Daily\ Capacity = 21,000 + (0.004 * Additional\ Machinery\ Investment)$$

Furthermore, your company can reduce the setup time between production runs of different recipes by investing in production line improvements. If you plan to offer product variety, and wish to run small production batches, such an investment could be quite profitable.

The following table shows the setup time as a function of your investment. If you invest nothing, the setup time remains at 12 hours. You can bring down this setup time to 10.5 hours if you invest 44,117.65 €. Notice that each additional hour of setup time reduction requires greater investment than the hour before.

Table 1.7: Production improvements

Setup time (hours)	Investment (euros)	Marginal investment (euros)	Setup time (hours)	Investment (euros)	Marginal investment (euros)
12	–	–	7	250,000.00	45,454.55
11.5	13,157.89	13,157.89	6.5	305,555.56	55,555.56
11	27,777.78	14,619.88	6	375,000.00	69,444.44
10.5	44,117.65	16,339.87	5.5	464,285.71	89,285.71
10	62,500.00	18,382.35	5	583,333.33	119,047.62
9.5	83,333.33	20,833.33	4.5	750,000.00	166,666.67
9	107,142.86	23,809.52	4	1,000,000.00	250,000.00
8.5	134,615.38	27,472.53	3.5	1,416,666.67	416,666.67
8	166,666.67	32,051.28	3	2,250,000.00	833,333.33
7.5	204,545.45	37,878.79	2.5	4,750,000.00	2,500,000.00

The optimal setup time reduction depends on the number of times you expect to switch recipes and the expected profit per box sold. For example, suppose you intend to switch products every two days, that you have a total daily capacity of 25,000 boxes and that you expect to sell each box 2 euros above the variable costs. An investment in setup time reduction of an hour will provide 60 hours of extra production time over a period of 120 days. In 60 hours, you can produce about 62,500 extra boxes over this 120-day period. So you should be willing to pay up to 125,000 € for an extra half hour reduction in setup time.

The exact formula for calculating the set up time as a function of investment is the following:

$$Setup\ time = 2 + \frac{2,500,000}{250,000 + Investments}$$

1.3.4 Inventory storage costs

The company has two warehouses. The finished product warehouse (storage location 02) has enough space for 250,000 boxes of finished product. The raw material warehouse (storage location 88) has enough room for 250,000 kg of raw materials and 500,000 boxes and 500,000 bags. If your company requires more space warehouse space, you can rent additional space on a daily basis. The additional space can be rented at a cost of: 50€/day for each 100,000 additional empty boxes and bags, 350€/day for each additional 100,000 kg of raw materials and 200€/day for each additional 100,000 boxes of finished products. The cost of additional storage will be automatically billed, and paid immediately.

HERE IS A TIP: Storage costs can be onerous and quickly drain cash reserves. Make sure that you manage your replenishing strategy to keep these costs under control.

1.3.5 Product costing

Table 1.10 shows the cost breakdown for an average 1 kg box of muesli cereal. Materials make up approximately 54% of the cost of goods sold (COGS), while direct labor makes up 6% and manufacturing overhead makes up 39%. The remaining 5% of COGS is depreciation. Because of union labor rules, it is not possible to lay workers off for short periods of time. As a result, labor and manufacturing overhead costs are essentially a constant that will be incurred each week. To maximize profit, a company must avoid idling the production facility. This can happen through poor process management. For example, production orders may not be released when needed, raw materials may not be ordered in a timely fashion or production runs that are too small may cause large amounts of production capacity to be used for equipment setups.

During the simulation, you will be able to use the cost estimating capabilities of the SAP® system to estimate your product costs based on the current value of your raw materials in stock and an estimate of the labor and overhead expenses. The following table contains the list of the various fixed costs that the company pay every week (each 5 open days).

Table 1.8: Fixed costs per week

Cost	Amount
Direct Labor	21,120 €
Factory overhead	14,400 €
SG&A	46,400 €

To this, one must add the interest expenses, the additional warehousing costs, the cost of depreciation, and any additional advertising expenditures.

Table 1.9: Average breakdown of manufacturer prices and costs per one kg box

Selling price				4,23
Direct material	Grain	0,67		
	Other ingredients	0,69		
	Packaging	0,40		
	Sub total	1,76	1,76	
Direct labor			0,20	
Manufacturing overhead (1)	Depreciation (2)	0,16		
	Other manufacturing overhead	0,14		
	Warehousing costs (3)	0,05		
	Sub total	0,35	0,35	
Cost of goods sold			2,31	(2,31)
SG&A (1)	Advertizing (4)	0,48		
	Other SG&A	0,44		
	Sub total	0,92		(0,92)
Operating income				1,00
Interest	Interest on bank loan (5)			(0,19)
Net profit				0,81

Notes: (1) All fixed costs are calculated under the assumption of a production capacity of 21,000 boxes per day. (2) Annual depreciation is calculated as 5% of building value and 10% of machinery value at 5 million. (3) Based on average space rentals of 1,000 Euros a day. (4) Based on daily advertising expenditures of 10,000 euros. (5) The interest payment calculation in based of a 7.5% interest rate over a 12 million loan.

1.3.6 Pricing

A firm may choose to change its selling price whenever it desires. Pricing is a key element of your strategy. If your prices are too high, demand will be low and your production will sit as inventory; if your prices are too low, you will not make enough money to cover your expenses. Note that your pricing need not be the same for all distribution channels. Because convenience store customers are less price sensitive, it is smart to charge these stores a higher price than traditional grocery stores. Similarly, calculating the optimal price for each product and distribution channel is a complex task. Business acumen is required to make the correct pricing decisions. Remember that muesli consumption accounts for a small proportion of ready-to-eat cereal consumption. Consumers have other options. They can buy something else if muesli cereal is out of their price range. Remember also that you have advertising expenditures, interest payments, and payments for the raw materials; you must price your products correctly so that you do not lose money. As your boss often says, " We do not run a charity down here." You must make a profit.

Considering the fixed cost, you should have a mark-up above cost of goods sold of at least 2 euros, and preferably 3 euros, per box. Optimal pricing depends on many things: (i) the prices charged by competitors; (ii) the size and cost of the product; (iii) the distribution channel; and (iv) ultimately the strategy of the firm including its advertising strategy.

1.3.7 Advertising

Advertising is optional: check with your instructor if this simulation feature is enabled in the game you are playing.

You must decide on how much to invest in marketing. You must determine the *daily* advertising budget for each of your products (up to 6) and each of the 3 regional areas.

Advertising campaigns are organized around 3 main geographical areas: South (Bavaria, Baden-Wurttemberg, Hesse, Thuringia), North (Saxony, Saxony-Anhalt, Brandenburg, Berlin, Mecklenburg-Vorpomm, Schleswig-Holstein North, Hamburg, Lower Saxony, Bremen) and West (North Rhine Westfalia, Rhineland Palatinate, Saarland).

Because the preferences of consumers might differ from one area to the other, it may be optimal to target advertising expenditures differently from one area to the other. The difficulty, of course, is to know how much should be invested for marketing each product in each area.

You may change your daily marketing budget at anytime.

HERE IS A TIP: Advertising is good but not always necessary, especially if your product has the desired recipe. Do not spend all your available cash on advertising; you will end up losing money. Marketing expenses only affect demand for the current period and its benefits are not carried over to the future. Hence, it is useless to spend on marketing on any given day for a product that you do not have in stock.

In the Muesli industry, marketing is persuasive. It seeks to convince consumers that your product is the one they should prefer. Globally, it is like a zero-sum game. If a firm increases advertising for one of its products, it attracts consumers away from other products of the same company in the same area. Note that sensitivity to advertising is segmented. Those who buy at corner stores are more easily influenced than those looking for low prices in hypermarkets.

HERE IS A TIP: Try to avoid spending a lot of advertising money for two different products in the same geographic area. One euro spent on a product hurts the sale of the other and vice versa.

1.4 Review of the major rules

In this section we will provide several important tips to help you as you start to learn the simulation game. We've attempted to make the game sufficiently challenging and fast-paced so that you will not be bored. First, we wish to remind you of the important rules of the game. Second, we will provide strategy tips to prepare you for the simulation.

The rules proposed below have two main objectives. The first and most important one is fairness. The second objective is to make the game challenging and instructive.

At the end of the game, raw material and finished goods inventory may be liquidated at a reduced price

The end game inventory liquidation is optional: check with your instructor to see if this simulation feature is enabled in the game you are playing.

In the end game inventory liquidation, inventory of grain and fruits, including the quantity reserved for unfinished production orders, are sold at a price lower than the current market price. The packaging goods cannot be resold and inventories are written off. Finally, the finished goods are salvaged at the value of the grain and fruits they contain.

You may not change the recipe of a product if you are still carrying inventory

In the simulation game, changing a recipe in the BOM is equivalent to changing the label on the box. If you change the BOM of a product for which you still have boxes in inventory, it is similar to changing the recipe on the labels of those boxes. It is simply not done!

Interest payment and loan renegotiation

You can repay your bank loan with the bank at anytime. Interest is accrued daily and will be charged automatically at the end of every week (every five days). Consequently, you will not have to do it during the game.

Your instructor will act as the banker. After each quarter, you may ask the banker for an extension of the bank loan. Your

instructor has the discretion to grant your request. In principle, as you accumulate profits, you should be able to begin paying back your loan and you should not need to borrow additional funds.

You should, at no time during the game, have a negative cash balance. If you do, your banker will automatically reduce your credit rating.

Customers do not change throughout the game, hence you may learn from their past behaviour

At the beginning of the simulation, the simulator creates a large population of consumers, each endowed with a "preferred recipe". These preferences help determine the purchase orders issued by the retailers.

As the game progresses, you may infer the "preferences" of the retailers using your transactional data and adapt your plans accordingly.

The company displaying the highest shareholder's equity at the end of the simulation wins the game

We compare the performance of the teams by simply using the equity value of the companies at the end.

During the game, your equity value includes the value of inventories evaluated at standard costs. If standard costs of finished products do not correctly reflect the potential return accruing from the sale of these inventories, your equity value will be biased. Beware of this. Because the standard cost of finished products is higher than the material costs of production, it is always better to produce finished product rather than not producing.

Be aware that the investments in marketing as well as investments to reduce your setup time are recorded as direct expenses. Although they have value in increasing sales and productivity, their immediate impact on profit is negative. Investment in capacity increases the assets of the company. Hence, the cost of investing in machinery is only reflected in the increase in depreciation.

You must behave ethically at all times

The simulation game is fun when it is played competitively. As in real-life, cheating may prove to be an easy way to get a head start, but it should never be an option. We ask participants of the simulation game to act as they would in real life, with the highest ethical standards. Cheating in this game includes the use of any transaction not explicitly permitted in this book and that is used for the sole purpose of increasing the firm's equity.

Albeit, there are several ways to cheat in this game, remember however, that the ERP system and the simulation software keeps track of all illicit transactions, thus cheaters will be prosecuted by the appropriate financial authorities!

1.5 Elements of a winning strategy

Use the ERP system efficiently

The ERP system that you are using for the ERP simulation game is one of the most complex pieces of software available in the marketplace. Business systems are complex because running a business is a complex affair. We provide you with instructions to use the system properly for the purpose of the game. Do your homework. If not, you are likely to run into trouble.

During the simulation game, you will only use a very small portion of the mySAP™ ERP. When it comes to the operational transactions, we urge you to stick to the instructions provided in this book and not to be too imaginative. Unless you are very experienced, doing otherwise is more likely to get you into trouble. Conversely, when it comes to reports and analytics, you are invited to browse and explore some of the available reports in the system. There are many reports available in the menu "information systems" that could help you.

Doing the operational transactions quickly and correctly is a prerequisite for winning the game, but is it not sufficient. You must know when and what to produce. Properly analyzing your data is very important as well.

In the end, all teams should use the ERP system properly. What should matter is team organization and strategy.

Do not run out of stock

One of the first tips for participants of the game is "do not run out of stock". Even if you have the best marketing strategy, if you do not have products to sell, it will not matter.

This is particularly important at the beginning of the game. Before you manage to have finished products in inventory, you must perform a series of tasks. If you are too slow to perform these tasks you will miss lucrative opportunities to sell. You need to learn quickly how to perform the operational transactions to create finished product inventories.

One of your objectives should be to hold inventories of a large range of products. To do so is harder than you think. Your popular brand may sell quickly and unexpectedly; unless, you react quickly to this information you may run out of stock before you realize it. There are two actions you can take to avoid running out of stock: increase supply by initiating production or reduce demand by increasing the price. Managing inventories of popular brands requires operational excellence and is a key element in a winning strategy.

Delays, production capacities and liquidity constraints are important elements of the game

When the production and procurement processes are automated, delays and capacity constraints are built into the simulation. These features are important because they limit your ability to react quickly to changes in the marketplace.

To have a product available for the customer, you will have to account for the delays in deliveries of raw materials and production capacity limitations. This means that you will need to plan in advance and start builiding the inventories of raw materials and finished products.

If you have enough inventory, it will be easy to respond quickly to shifts in demand. Hovewer, this will require some liquidity. At the beginning of the game, you have 3 millions euros in cash and part of it will be invested in machinery. Since you are not permitted to run out of cash, you must be careful not to buy too much raw material or hold too much finished goods inventory.

The challenge is to be able to find the right balance between low inventory levels and readiness to respondn to market demand.

Exploration and exploitation

Beginning the game with a precise strategy is a little presumptuous. You must accept that the simulated marketplace is full of surprises. Learning and adapting should be your motto. Use your data to learn and use the system to adapt to the market.

Most members of your team have the misfortune of having little experience in the Muesli industry. Fortunately for you, it is the same amongst your competitors. To fully exploit the full potential of your business, you will need to learn more about the market and industry. You should use a strategy of "exploration and exploitation".

The initial part of the game should be devoted to exploration. You should experiment with different recipes and advertising and pricing strategies with the objective of learning more about the market and what works and what does not.

Once you have identified a profitable niche (or niches), you should design your strategy around these niches and exploit them as much as possible.

There is a lot of "hype" today in the business world around the idea of building customer-centric and flexible companies. One of the virtues of an ERP system is it allows you to extract and process transactional data. This data provides information about customers. You must use that information to respond to the customers' needs.

Organization may be the most important factor in your team's success.

A large number of tasks need to be coordinated. Your team needs to (i) keep track of market and sales information, (ii) follow the evolution of stocks of goods and cash, (iii) select the right recipes, (iv) produce goods in a timely fashion, etc. Good team work is essential.

If your team members work in silos, you will undoubtedly fail. You cannot do this if the roles and the information flow within the team is not well adapted to the requirements of this fast-paced game. You are faced with the challenge of organization and must learn how to delegate roles within your team. There are many possibilities for innovation that will make your team more efficient. This innovation may ultimately make the difference.

Have fun!

This is only a game! So enjoy being a manager using a real-life ERP system. Ultimately, this is about learning not winning.

The business simulation presented in this book is an obvious simplification of reality. There are numerouselements of running a business that have not been included. Yet the game remains a complex affair. You must be able to extract the information necessary to make timely decisions from a large set of transactional data. You need to operate this virtual enterprise in an accelerated time frame.

We have taken the point of view that if there is no challenge then it's no fun, and if the simulation is no fun and unchallenging then one does not learn as much. You are asked to run a company at an accelerated pace with a real-life highly complex ERP system. You are bound at one point or another in the game to make errors and find yourself in trouble. Cursing the computer will generally not help. Ask your friends or the instructor for help and keep smiling.

Ultimately, what matters is what you have learned from the experience. There are many things for you to learn from the ERP business simulation. We hope you do.

CHAPTER 2 – INTRODUCTORY GAME

In this chapter, we introduce a simple game. The objective is to provide a quick hands-on experience of an integrated business process in order to get an overview of both the ERP simulation game and of the SAP system.

As a make-to-stock manufacturing company, there are a set of processes that must be performed to run your business. There are four main processes that are presented here: (i) the planning process, (ii) the procurement process, (iii) the production process, and (iv) the sales process (See figure 2.1). Each process can be decomposed into transactions. In SAP®, a transaction corresponds to an operation that interacts with the centralized data of the ERP system.

2.1 Introduction to SAP

Each company in the game is using an integrated information system to manage its operation. The idea is to use all existing information to avoid data re-entry, and to create and store new data for future use in other transactions. A transaction may require using information stored in the organizational elements or the master data; it also creates new transactional and accounting documents.

The organizational elements represent the structure in the ERP system. They help portray the specific organizational structure of a business in the system. Master data is one of the cornerstones of an ERP. This is data stored in the system's central database and used in a number of the organization's business processes. More information on organizational elements is provided in chapters 7 and 8.

An enterprise system is built around an integrated database. A system like SAP contains tens of thousands of data tables. When a user creates, changes or views data in the system, he or she performs a transaction. Data changed or created by one user can be exploited by all other users (ex. reporting, tracking, execution of orders, etc.). This is the virtue of an integrated system.

A large number of pre-programmed transactions exist in SAP. All transactions are traceable; for legal and controlling purposes, transactions with financial impacts can be reversed but not erased.

Each transaction has a transaction code or technical name – a user can execute a transaction if one knows the transaction code. An alternative way to select a transaction is to use the SAP menu. One can browse the SAP menu by drilling down through the successive folders and finding the desired transaction. The SAP menu provides access to a very large number of transactions; to facilitate the navigation one can create a user menu or a list of favourites with the most commonly used

transactions. For the purpose of the ERP Simulation Game, we have created a user menu that contains all of the transactions mentioned in this book. For each transaction that you will use, we provide in this book the transaction code and the path in the user menu to access it. Finally, a list of favourites or commonly used transactions can be maintained by each user.

Reports and queries are transactions that allows the user to view existing data. A typical query is performed as follows. In the first page of the transaction, you must enter the selection criteria for the query (ex. Company code, product code, etc.). In order to execute the query click on ⚙ . A table containing the requested data will appear. For some reports, the display and layout can be modified.

Use the navigation buttons to go back (🔙)or get out of a transaction (🏠 ❌).

You can open up to 6 sessions or windows. Click on 🗔 to open a new session.

2.2 Description of the integrated business process

In this introductory game, a total of 12 transactions need to be performed in SAP. However, because part of those transactions are automated by ERPsim, we need only to focus on the decision making transactions. To operate your company in this introductory game, only 6 transactions need to be executed. Figure 2.1 provides an overview of what needs to be done by each team.

Figure 2.1: The operational processes
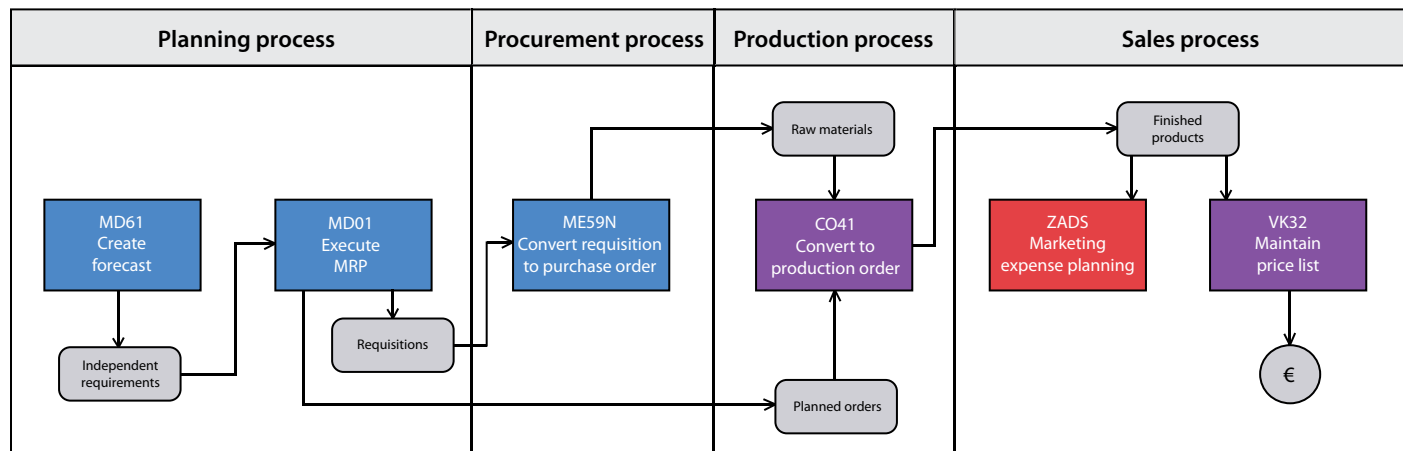
The first transaction in the business process is the creation of the independent requirements or forecasts. This transaction creates a planning document. An independent requirement of 100,000 units of Product 1 corresponds to the forecasted consumption of 100,000 boxes of Product 1 in the next period. The second transaction is the MRP calculation process. The MRP process creates new planning documents. The MRP process calculates how many units of each finished product must be produced in order to meet the independent requirements taking into consideration the quantities of finished products available. The MRP process creates planned orders accordingly . A planned order for 50,000 units of product 1 is an internal planning document that represents a plan to produce 50,000 units of product 1. A planned order, like any other planning document, can be deleted or changed. Based on the planned orders created, the MRP process also creates dependent requirements for raw materials. For every planned order, the MRP process calculates how much of each raw material is required to complete it. Finally, for each raw material, the MRP process calculates the quantity that must be purchased to meet those requirements taking into consideration the available raw material inventory. Purchase requisitions for each raw material are created accordingly.

The third transaction consists in transforming the purchase requisitions into purchase orders. The system takes the purchase requisitions for all raw materials and creates one purchase order per vendor. While the purchase requisition is a planning document and can be erased or modified, the purchase order is a formal contract between your company and your vendor and, and in the simulation game, cannot be changed.

Once the raw materials are delivered by the vendor - processed automatically by ERPsim- your team can begin production. Consequently, the fourth transaction is to convert the planned orders into production orders. It consists of checking the availability of the required raw materials and the release of the production order to the shop floor. Once the production orders are released, the system reserves the required raw materials and a time slot on the production line. In this game, once a production order is released, it cannot be changed.

Once the production of finished products are confirmed and the produced boxes are put into the finished product warehouse - again, is done automatically by ERPsim - your company can now sell those boxes. The final two transactions consists of setting the sales price for the different finished products in the different distribution channels and investing in marketing.

2.3 Game settings

To provide a quick hands-on experience in the introductory game, you will be gradually introduced to each of the the required transactions over 3 quarters lasting 30 days each.In quarter 1 you will be introduced to sales transactions, in quarter 2 you will be introduced to production transactions, followed by planning and procurement transaction in quarter 3 (see figure 2.2). In the beginning of the game, each team has 100,000 boxes of 6 different products (for a total of 600,000 boxes)

and enough raw materials to produce 100,000 additional boxes of each product. In the first quarter, the only task of each team is to price and sell existing inventory of finished products. In Quarter 2, teams will be able to produce additional finished products using the raw materials in inventory. Teams will be allowed to buy more raw materials only in Quarter 3 and beyond. Using this approach, we add a extra layer of complexity in each new quarter.

Figure 2.2: Transactions for each quarter
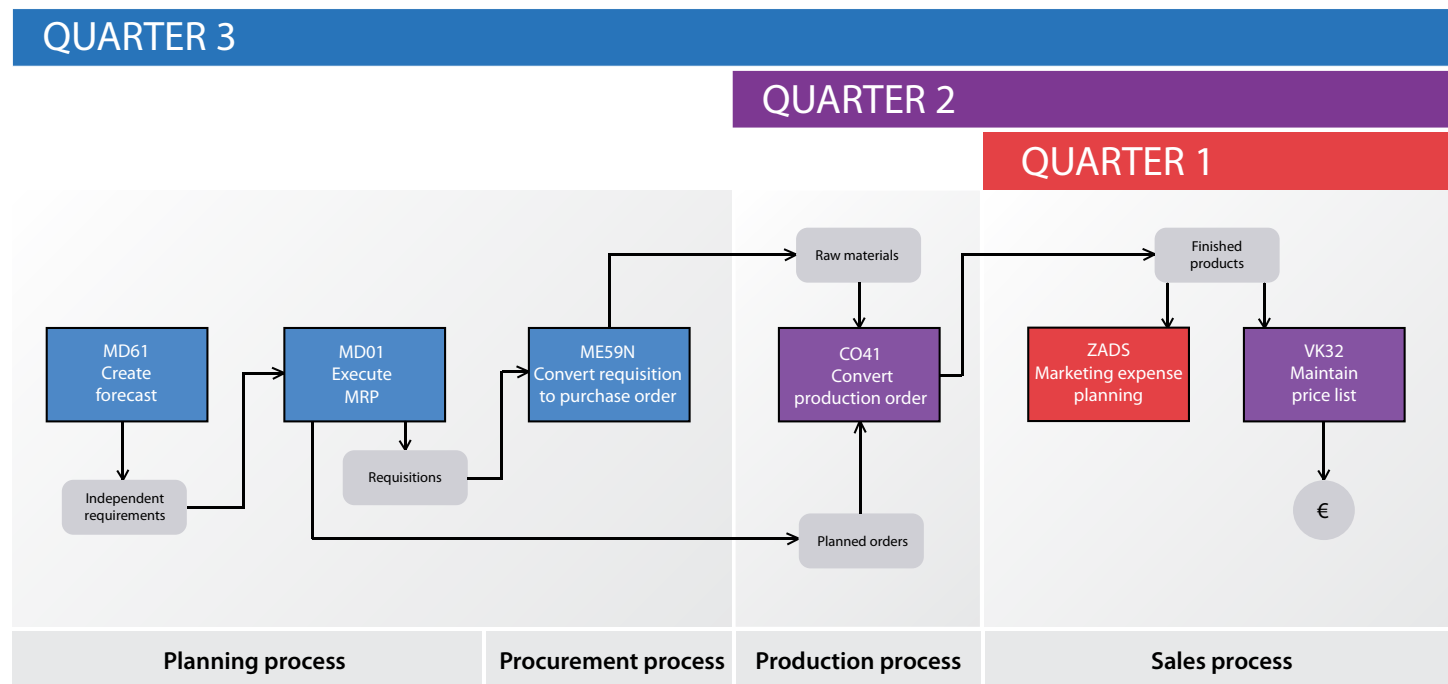
The following sections present in detail the transactions used in every quarter of this introductory game. At the end of this book, you will find job aids that summarize all the procedures to execute these transactions.

2.4 Sales process - Quarter 1

The game starts in quarter one and each company begins with 100,000 boxes of each of the 6 products. Your only task in the first quarter is to price and promote those products correctly. Before the quarter begins, you can also check product costing and the existing price list. After each day, you will get new updated reports on sales and inventory levels. Every five days, you

will also get a summary market report on sales in the industry (you and your competitors). All these reports will be instrumental in setting your prices and your marketing strategy. Because this is a continuous-time game, you can change your prices and advertising expenditures at any time during the game. The simulator will adjust the demand for your products accordingly in the next day. So you must constantly monitor the relevant reports and adjust your decisions throughout the game. Please note that you may not produce in quarter 1 of this introductory game.

The sales process con ,sts of two transactions and six reports (See figure 2.3).

Figure 2.3: Quarter 1: the sale process
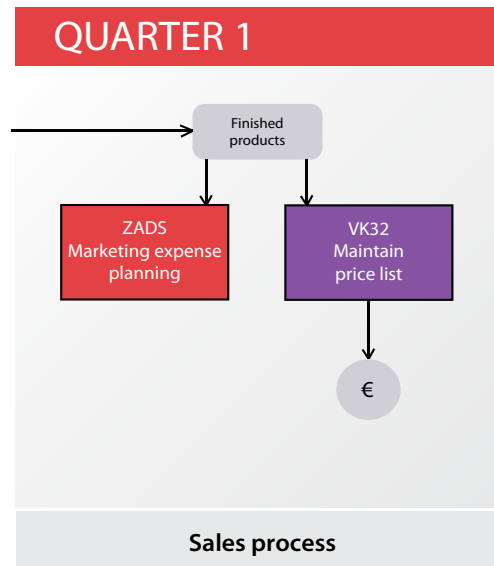
Product cost planning

Pricing is a major challenge in the simulation. What you should charge for your products depends on the market, your finished product inventory levels, and the actions of your competitors. Whether the price you can get for your product will earn you a profit depends on what it costs you to bring that product to market.

We have developed a modified version of the SAP product cost planning tool to help you estimate the costs for your product (transaction ZCK11).

When the transaction is executed, the tool will calculate the unit cost of the selected product based on the price of the raw materials and the material content of each product. At the beginning of the introductory game, the product cost displayed in this report corresponds to the cost of producing your initial inventory. Note that although there are no fixed costs in the introductory game, this transaction includes considerations for fixed costs.

Maintain price list

In SAP®, a price list is a condition record. When a sales order is created, the transaction uses a pricing procedure to determine the price automatically. The pricing procedure looks for condition records to set the prices based on the various conditions applicable when a product is sold. These condition records include the price list, discounts, surcharges, transportation costs and taxes. You must specify a sales price condition record for each finished product that you wish to sell to every sales area (a unique combination of sales organization, division and distribution channel) Each of these price conditions is contained in a price list.

You will be able to change these prices during the simulation by using the following instructions.

VK32
Quarter 1 / Condition Maintance: Change
711

On the "Create Condition Records: Overview" screen, open the "price" foder and click on "price list". Click on the icon and then enter the following information:

Fields	Data to input
Sales organization	$$
Distribution channel	12

Click on ⊕

On "Change Condition Records: Overview", enter the following information:

Field	Data to input
Amount	*The new sale price of your material*

Click on 🖫 to save.

Marketing expense planning

You may invest in marketing at any point in time in the game. Remember that the marketing budget is only valid in the quarter in which it is invested and that customers have no memory, so the effect of marketing does not carry over into future quarters.

When you enter in this transaction, you will have defaulted values, you can click on Clear to clear the values in the table. Enter the following information:

Fields	Data to input		
Material / Area	North	South	West
$$-F01			
$$-F02	It's up to you!		
$$-F03			
$$-F04			
$$-F05			
$$-F06			

Click on 💾 to save.

Inventory management

One of the key elements of the game is to be able to react to customer demand and ensure that the inventory of your products is maintained at the right level. Each time production for a given product is confirmed, the inventory of the finished product goes up. Each time a sale is processed the inventory goes down accordingly. Tracking the evolution of inventory levels provides you with a useful diagnostic on how well your production schedule matches the pace of sales. If stocks deplete quickly, you will either have to issue larger production orders, produce new batches more often, or increase the sales price to take advantage of high demand. Monitoring inventory levels will help you forecast demand and decide when you should issue production orders. It also provides information about the raw materials available.

ZMB52
Quarter 1 / Reporting / ERPsim: Inventory Report
602

To view the stock level in the various warehouses, we have created an easy-to-access customized report. Transaction code ZMB52 shows the inventory level for each product. Unlike transaction MD07, transaction ZMB52 has a refresh button (🔄) and it also displays the simulated day on which the report was last refreshed.

Sales order report

A fundamental task in your business is monitoring and analyzing sales orders to understand the market demand for your products.

ZVC2
Quarter 1 / Reporting / ERPsim: Summary Sales Report
605

You can use the summary sales report (transaction ZVC2) to monitor the sales of your company. This report will display for each day and each product - the total number of orders (Orders),the sum of all boxes sold (Qty), and the total sales revenue (Value).

To review the sales orders received by your company in detail, use the sales order report (transaction ZVA05). This report will display all of your sales orders and provide the following information: quarter and day when the order was received (Quarter, Day), where the product was sold (Distribution channel, Area), which product was sold (Material description), to who (sold-to-party), the number of boxes in the order (Qty), the sales revenues from the order (Value), the price at which these products were sold (Price), and when cash payment is expected (A/R Qtr, A\R Day).

ZVA05
Quarter 1 / Reporting / ERPsim: Sales Order Report
606

Notice that the sales report can be refreshed quickly by clicking on the refresh button (🔄). Furthermore, the display can be customized according to your needs. For instance, you can sort the information in descend quarter and days in order to have the more recent data on the top of the screen (select the quarter and day columns and click on the 🔽 button). You create totals and subtotals by clicking on the summation signs (Σ and) in the top menu. You are encouraged to experiment with different ways to display your data.

Market report

ZMARKET
Quarter 1 / Reporting / ERPsim: Price Market Report
607

Another very interesting transaction is the market report (ZMARKET). Your company subscribes to a service that provides summary data for the entire muesli market . At the end of every five days, this report is updated to reflect the latest changes in industry sales and market prices. For each product and distribution channel, you have the total sales in both revenue and boxes (units) and the weighted average price for that 5 day period. You may refresh this report with (🔄).

Financial statements

In SAP®, you can get current financial statements at any point in time during the simulation to get a snapshot of your financial situation.

Transaction F.01 is used to display your financial statement. Enter the following information:

Fields	Data to input
Company Code	$$
Financial Statement Version	SIM1
ALV Tree Control	Check the radio button (optional)

This standard report provides you with the balance sheet and the income statement of your company. If you have selected the ALV Tree Control display, you can get more details on each section of this report by clicking on the triangle on the left hand side of every item.

The net income line corresponds to the cumulative profit (or loss) of your firm since the beginning of the game. Note that from the second quarter on, the report will show the financial results at the end of the previous quarter under the heading "tot.cmp.pr" so that the "Abs.diff." column will show changes for the current quarter, giving you a good idea of your current performance.

This report is a stardard SAP transaction and has not been modified for this game. This report does not contain a refresh button. To refresh the data, you will need to go back to the selection screen using 🔄 and execute the query again with 🕐 .

2.5 Production process - Quarter 2

After Quarter 1, your initial stock of finished products has most likely depleted considerably. To be able to sustain sales, you must begin production. In the introductory game, planned orders have been created in advance. All raw materials required to put this order into production are available in your warehouse.

Your task is to convert planned orders to production orders, and to monitor the production schedule. Hence, the production process is composed of one transaction and one report (See figure 2.4). In the introductory game, you have a daily production capacity of 25,000 units and there is no time lost between production runs (setup).

Figure 2.4: Quarter 2: the production process
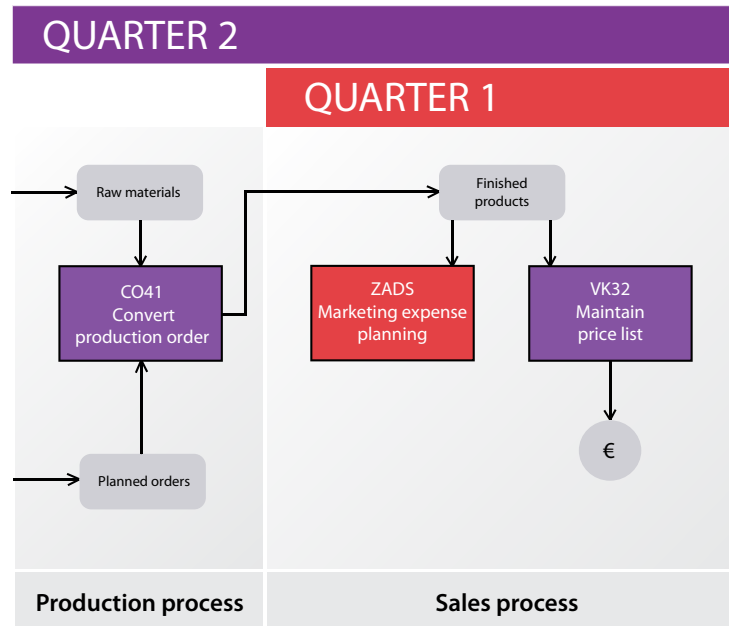
Release production orders

The transaction Collective Conversion of Planned Orders (CO41) will allow you to convert multiple planned orders into production orders. After entering the transaction code, input the following information in the first screen and then click 🕐 to execute.

CO41
Quarter 2 / Collective conversion of planned orders
410

Fields	Data to input
Production Plant	$$
MRP Controller	101

If there are no planned orders available for conversion, you will get the following message: "Planned order could not be selected".

The next screen will provide a list of planned orders. You can convert one, many or all available planned orders into production orders. To do this, select the planned orders you wish to convert by clicking on the selection box on the left hand side of the list. You can use the "select all" icon (📑) at the bottom of the screen to select all planned orders.

Once you have selected the desired planned orders, click on the "convert" icon (🔧 Convert) at the bottom of the screen. You will receive a confirmation that the selected planned orders were converted to production orders. If the planned order can not be converted a red "X" (❌) will appear. Click on ❌ in order to see why the conversion failed, most likely because raw material are not available.

Planned orders are planning documents that specify the quantity of each product to be produced.

Production schedule

<table>
<tr><td style="background:#c00;color:#fff">**ZCOOIS**</td></tr>
<tr><td>Quarter 2 / Reporting / ERPsim: Production Schedule</td></tr>
<tr><td>604</td></tr>
</table>

When you release a production order, it sits in the production order queue until it can be processed. To keep track of these production orders, use the production schedule report (transaction ZCOOIS). This custom report provides detailed schedule information for each production order : the order number, the material description, the quarter and day when production will start (Start Qtr, Start Day), the quarter and day when production will end (End Qtr, End Day), the duration of the setup in hours (Setup hour), when the production ord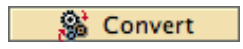er was released (Rel Qtr, Rel Day), the target quantity of the production order (Total Qty) and the confirmed quantity so far (Conf Qty).

In Quarter 2, you have enough raw materials to release all existing planned orders in the system and confirm production of 100,000 boxes for each of the 6 products available. Given the existing producton capacity (25,000 boxes per day), production of all 600,000 boxes will take 24 days. Because production takes time, the sequence in which the production orders are released matters.. Use the sales and inventory / stock reports to aid you in your deciding how to release production orders.

2.6 Planning process - Quarter 3

By the end of Quarter 2, you should have converted all your planned orders, confirmed all production, and used all your raw materials. To continue production, you need to buy more raw materials and create new planned orders. This subsection explains the planning process while the next subsection explains how to do procurement.

Before Quarter 3, you need to create planned orders and requisitions. This is done with the planning process, which is composed of two transactions (See figure 2.5).

Figure 2.5: Quarter 3: the planning and procurement process

Forecasting

Forecasting (MD61) is where you enter independent requirements which are in turn used to execute the MRP (material requirements planning) process. The MRP process uses the BOM to calculate all of the raw materials required for the production process. The MRP process will also create the purchase requisitions automatically. Purchase requisitionsare internal documents to be used by the company's purchasing department to produce purchase orders. Please note that a forecast has to be entered for every product you plan to produce.

Creating the forecast		
First screen	Create Planned Independent Requirements: Initial Screen		
	Fields	**Data to input**	
	Product group	$$	
	Plant	$$	
	Task	**Navigation**	**Result**
	Continue	✅	A second screen appears.
Second screen	Plnd ind. reqmts Create: Planning Table		
	Field	**Data to input**	
	Planned Independent Requirements	Enter the forecasted quantity in the next month and press "enter". (For example, if you run the game in September 2009, then enter your forecast in the month of October 2009.)	
	Tasks	**Navigation**	**Results**
	Save the independent requirements.	Press 💾	The independent requirements for this material are now saved.

Run the MRP calculation process

The second transaction (MRP calculation process) uses the independent requirements to calculate the raw material requirements. If you wish to produce 1000 large boxes of muesli, each containing 0.570 kg of wheat and 0.430 kg of oats, then you must acquire 570 kg of wheat, 430 kg of oats, 1000 large bags and 1000 large boxes before production. The MRP process calculates the requirements for all components in the BOM. The system also takes into consideration the inventory that you already have. Hence, if you already have 400 kg of wheat, only 170 extra kg will be put in the purchase requisition.

Execute MRP		
	MRP Run Screen	
	Fields	**Data to input**
	Plant	$$
	Processing Key	NEUPL
	Create purchase req.	1
	Schedule lines	3
	Create MRP list	1
First screen	Planning mode	3
	Scheduling	1
	Planning date	Today
	Display material list	x
	Tasks	**Navigation**	**Results**
	Continue		A notice pops up at the bottom of the page.
	Ignore the notice	press "enter"	The notice disappears.
	Start the planning run		The planning run is carried out.

You may save the MRP settings by using the following pull down menu path: settings / save. You will need to press enter to confirm saving these settings. You should get the following message if you are successful: "Selection parameters were saved". These are user-specific settings.

2.7 Procurement process - Quarter 3

The MRP process creates requisitions which are internal documents. To place orders with your vendors you need to create and send purchase orders.

You will need to know how to convert purchase requisitions into purchase orders, and how to monitor purchase orders. The procurement process is typically performed by the purchasing department. For your firm, it includes one transaction and one report (See figure 2.5).

To generate purchase requisitions, the system used two other documents, the info-record and the source list. Your firm has selected a single vendor for each material, so the source list was configured to be relevant to the MRP calculation. Therefore, the approved vendor was automatically assigned to the purchase requisition when it was generated by the system.

Purchase order

The purchase requisitions must be converted into purchase orders. A purchase order constitutes an official request to the supplier for the purchase of a specific quantity of material. The transaction ME59N automatically creates consolidated purchase orders for each vendor. In other words, if more than one requisition was assigned to the same vendor, only one purchase order with multiple items will be created. To complete the transaction, you must enter your purchasing organization number and plant to extract only the relevant open requisitions.

ME59N
Quarter 3 / Automatic generation of PO
403

	Generating automatically consolidated purchase orders from purchase requisitions		
First screen	Automatic creation of purchase order from requisitions		
	Fields	**Data to input**	
	Purchasing organization	$$	
	Plant	$$	
	Tasks	**Navigation**	**Results**
	Execute the query	Click ⊕ .	A report is displayed confirming the conversion of the purchase requisition and creation of the consolidated PO. The PO number should be highlighted in green.

Should you get the message at the bottom level of the screen saying that "no suitable requisition found", it means that either the MRP calculation did not recreate new requisitions or that someone else in your team already converted the requisitions into a purchase order.

Monitor purchase orders

Managing procurement efficiently is critical to the success of your company. A report was specifically designed for the simulation game to track purchase orders (transaction ZME2N). In this report, you will find a list of your purchase orders. This report will be very useful to determine the status of your purchase orders in the purchasing cycle. For each order, you will see all the items included in the order and their quantities. The report provides the material, the quantity, the quarter and day at which the purchase order was created (PO Qtr, PO Day), the day of actual or expected goods receipt (Exp MIGO Qtr, Exp MIGO Day) as well as the day at which payment to the vendor will be (or was) made (Vendor payment Qtr, Vendor payment Day).

2.8 Conclusion

The objective of this chapter was to provide a quick overview of the ERP simulation and an introduction to the navigation in SAP. The next chapters present an extended version of this simulation and a more detailed description of the underlying business processes and decision support tools.
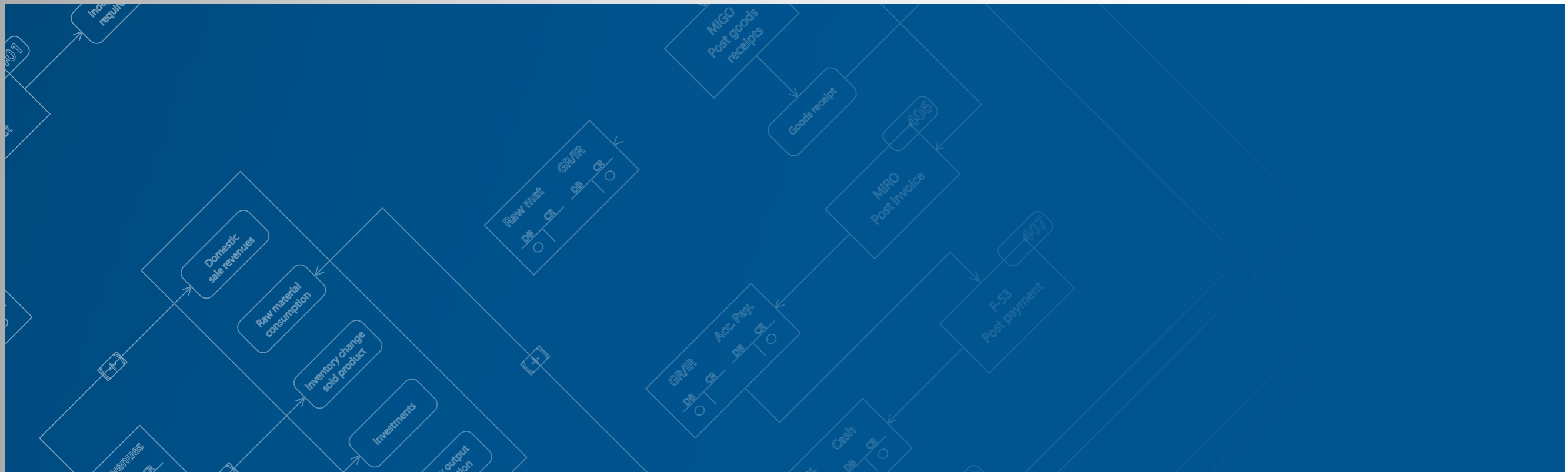
Part 2

Extended game

HEC MONTRÉAL
ERP SIMULATION GAME

powered by ERPsim

CHAPTER 3 − FINANCIAL BUSINESS PROCESSES

This chapter and the next show how to execute the different business processes required to run your organization in SAP®. There are two types of business processes you will perform in the course of the simulation game. This chapter presents the financial business processes, which are processed as transactions in the general ledger. Chapter 4 presents the operational business processes, which are used to manage the production of muesli cereal. In this chapter we will start with the financial transactions that are processed before the simulation begins. This will be followed by a description of the financial transactions that are executed during the simulation.

Before we execute these transactions in the system, we shall first review some basic accounting concepts and examine how SAP®'s financial accounting module is organized.

The Financial Accounting (FI) module of SAP® contains the necessary components to comply with all Generally Accepted Accounting Principles (GAAP). The financial module manages accounting-related business transactions following the document principle; this insures that all postings are stored in the form of documents to ensure an unbroken audit trail throughout the financial statement. The FI module is tightly integrated with the other modules in SAP®, and most postings to the FI module are performed automatically. For example, posting an invoice in the sales and distribution module will automatically create the associated financial accounting transactions in FI.

 There are two important organizational elements in the financial module: the company code and the chart of accounts. The company code is the smallest organizational unit for which a complete self-contained set of accounts can be drawn to produce legal financial statements. In the simulation game, each team is represented by a unique company code.

Each company code is assigned to a chart of accounts. The chart of accounts is a classification scheme consisting of a group of general ledger (G/L) accounts used in the preparation of financial statements. These accounts can be classified into five categories: Assets, Liability, Equity, Sales Revenues, Cost of Goods Sold and Other Costs. The main master data used in the FI module are the G/L accounts. G/L accounts are structures that record value transactions in a company code. The account holds the transactional data generated by the accounting transactions. All accounting-relevant transactions are recorded in the appropriate G/L accounts.

The followings tables present all of the balanced sheet and the profit and loss statement accounts that you will be using during the simulation game.

Table 3.1: Chart of accounts – Balanced Sheet

Account categories			Accounts	Account number
Assets	Current Assets	Cash	WeizenBank Cash Account	113 300
		Inventory	Finished Goods	792 000
			Raw materials	300 000
		Receivables	Customers – Domestic Receivables	140 000
	Long-term assets	Land	Land	1 000
		Buildings	Buildings	2 000
			Accumulated depreciation – Buildings	2 010
		Machinery and equipment	Machinery and equipment	11 000
			Accumulated depreciation – Machinery and equipment	11 010
Liabilities	Current liabilities	Accounts payables	GR/IR Clearing – External procurement	191 100
			Accounts payable – Domestic	160 000
		Bank	WeizenBank Bankloan	113 101
Equity		Common stock	Common stock	70 000
		Retained earnings	Calculated profit	From P/L

Table 3.2: Chart of accounts – Profit and loss statement

Account categories			Accounts	Account number
Sales Revenues			Sales Revenues – Domestic	800 000
Cost of Goods Sold	Cost of Goods Manufactured		Consumption Raw Materials	400 000
			Direct Labor Costs	500 000
			Factory Overhead Expenses	510 000
			Depreciation Expenses: Building	211 120
			Depreciation Expenses: Machinery and Equipment	211 130
			Warehousing costs	478 100
	Ending Inventory		Total Finished Products Sold	893 010
			Total Finished Products Produced	895 000
	Gain / Loss from valuation of inventory		Loss from Valuation of Own Materials	232 500
			Gain from Valuation of Own Materials	282 500
Other Costs	SG&A		Sales, General and Administrative Expenses	520 000
	Production Improvement Expenses		Lean Manufacturing Program Expenses	478 000
	Marketing expenses	Marketing expenses in northern Germany	Advertizing North-01	477 001
			Advertizing North-02	477 004
			Advertizing North-03	477 007
			Advertizing North-04	477 010
			Advertizing North-05	477 013
			Advertizing North-06	477 016
		Marketing expenses in southern Gernamy	Advertizing South-01	477 002
			Advertizing South-02	477 005
			Advertizing South-03	477 008
			Advertizing South-04	477 011
			Advertizing South-05	477 014
			Advertizing South-06	477 017
		Marketing expenses in western Germany	Advertizing West-01	477 003
			Advertizing West-02	477 006
			Advertizing West-03	477 009
			Advertizing West-04	477 012
			Advertizing West-05	477 015
			Advertizing West-06	477 018
	Interest expenses		Interest expenses	476 900

3.1 Pre-game financial transactions

The simulation game requires a number of financial transactions to be posted before the simulation begins: initial capitalization of the firm through both equity and liability and the acquisition of assets (land, building and equipment). These transactions are executed through postings to balance sheet accounts.

The company's board of directors has approved the issue of 1,000,000 shares of common stock at 8 euros per share, so each team must post an initial capitalization of 8 million euros. In addition, the board of directors has also approved the acquisition of a loan for 12 million euros to complete the financing of the firm, so this loan must also be posted. Using this 20 million euro of funding, the company will acquire land for 2 million euros, a building for 10 million euros and an assembly line for 5 million euros, leaving the company with 3 million euros to begin operations. Remember that the investment of 5 million euro for the assembly line provides your company a daily production capacity of 21,000 boxes. Refer to chapter 5 to learn how to further invest in your assembly line to increase the daily production capacity.

Whenever you post a transaction in the G/L, you need to provide certain information. On the header of the transaction, you need to input the date of the financial posting (Field Document Date) and to describe the posting (Field Doc. Header Text). For each line of the document, you then need to set the G/L account (Field G/L acct), determine if the line is a debit or credit (Field D/C) and input the amount posted in the account (Field amount). Remember that debits and credits must balance: when posting to the general ledger the values entered in all lines (a G/L transaction may involve postings to more than 2 lines) must conform to the double-entry accounting principle.

The following table explains how to post the capitalization and your bank loan.

Fields		Posting Initial capitalization	Posting bank loan
Header	Document Date	Today	
	Doc. Header Text	Initial capitalization	Bank loan
On the first line	G/L acct	113300 (Weizen bank, cash)	
	D/C	Debit	
	Amount in doc. curr	Enter amount	Loan amount
On the second line	G/L acct	70000 (Common stock)	113101 (Weizen bank, bank loan)
	D/C	Credit	
	Amount in doc. curr	8 million euros	12 million euros

Now that you have 20 million euros in cash, we can now process the transactions to record the purchase of the physical assets (land, building and assembly line).

The following table explains how to post the acquisition of the land and building. The building has a useful life of 20 years and will be used for production and inventory storage. Your firm will use simple straight line depreciation for the building. Note that it is customary to assume that land does not lose value and thus is not depreciated.

Fields		Acquiring Land	Acquiring Building
Header	Document Date	Today	
	Doc. Header Text	Land	Building
On the first line	G/L acct	1000 (Land)	2000 (Building)
	D/C	Debit	
	Amount in doc. curr	2 million euros	10 million euros
On the second line	G/L acct	113300 (Weizen bank, cash)	
	D/C	Credit	
	Amount in doc. curr	2 million euros	10 million euros

Next the acquisition of the assembly line must be posted to the general ledger. The assembly line has a useful life of 10 years with no residual value. Your firm will also use simple straight line depreciation for the assembly line.

Fields		Acquiring Assembly Line
Header	Document Date	Today
	Doc. Header Text	Assembly line
On the first line	G/L acct	11000 (Machinery and equipment)
	D/C	Debit
	Amount in doc. curr	5 million euros
On the second line	G/L acct	113300 (Weizen bank, cash)
	D/C	Credit
	Amount in doc. curr	5 million euros

3.2 Recurring financial transactions

The following section presents transactions that you will perform throughout the simulation game to reflect your business decisions.

These transactions post expenses in profit and loss accounts. Because of this, you must also specify the appropriate cost center when posting these transactions (cost centers $$).

3.2.1 Marketing investments

The next transactions involve the payment of marketing expenses. The marketing expenses must be posted in the appropriate account(s) and you must spend a total of 100,000 euros in marketing for the first quarter. You can market each of your six products in the three areas (18 accounts numbered 477001 to 477018).

The following table gives the G/L account number that represents an investment in marketing for a specific product in a specific area.

Table 3.3: Marketing account table

Area / Product	$$-F01	$$-F02	$$-F03	$$-F04	$$-F05	$$-F06
North	477001	477004	477007	477010	477013	477016
South	477002	477005	477008	477011	477014	477017
West	477003	477006	477009	477012	477015	477018

For instance, a posting in account 477014, would correspond to a marketing investment for product $$-F05 in southern Germany.

Fields		Marketing investments
Header	Document Date	Today
	Doc. Header Text	Advertizing
On the first line	G/L acct	113300 (Wiezen Bank)
	D/C	Credit
	Amount in doc. curr	100,000 euros for the first quarter. In later quarters, you must decide how much to invest
On the next lines	G/L acct	Enter the appropriate G/L accounts for the products and area you wish to invest in. You can use multiple lines to post all marketing investments in a single transaction, as long as the total of the debits equals the credit amount.
	D/C	Debit
	Cost center	$$
	Amount in doc. curr	Advertizing

Press "enter" and then click on "Simulate" to test the transaction. Click on "Back" to return to the transaction screen.

Save by clicking on 💾 and note the document number.

Please note that a customized transaction has been developed to simplify the marketing investment during the game. Th e technical nme of this transaction is ZADS and will be described in chapter 5.

3.2.2 Interest payment transaction

Please note that for the first quarter of the game, the interest on the bank loan will be at a rate of 7.5%.

<table>
<tr><td colspan="2">FB50
Accounting / G/L Acct Pstg: Single Screen Trans.
307</td><td></td></tr>
</table>

Fields		Interest payment
Header	Document Date	Today's date
	Doc. Header Text	Interest payment
On the first line	G/L acct	113300 (Weizen bank)
	D/C	Credit
	Amount in doc. curr	Loan amount x Quarterly interest rate (122,727.27 for first 30 days)
On the second line	G/L acct	476900 (Interest expenses)
	D/C	Debit
	Cost center	$$
	Amount in doc. curr	Loan x Quarterly interest rate (122,727.27 for first 30 days)

Press "enter" and then click on "Simulate" to test the transaction. Click on "Back" to return to the transaction screen.

Save by clicking on 💾 and note the document number.

IMPORTANT: If you are playing a game where interest payment is automated, you will not need to manually process this transaction after the first quarter. In other words, you will only post the interest expense in the first quarter of the game, and the simulator will automatically post the interest expense in each of the following quarters.

3.2.3 Depreciation expenses

We recognize that our building and equipment have a finite life by making postings to the appropriate depreciation expense accounts. While depreciation is not an actual cash expense like labor or raw material expenses, it is important to recognize the use of these finite resources to get an appropriate picture of the company's profitability.

The following table shows the postings required to post the building and equipment depreciation expenses.

Fields		Building depreciation	Machinery depreciation
Header	Document Date	Today's date	
	Doc. Header Text	Building depreciation	Machinery depreciation
On the first line	G/L acct	2010 (Accumulated Depreciation – Building)	11010 (Accumulated Depreciation – Machinery)
	D/C	Credit	
	Amount in doc. curr	68,181.82 euros per 30 days (5% annually)	68,181.82 euros per 30 days (10% annually)
On the second line	G/L acct	211120 (Depreciation Expenses – Building)	211130 (Depreciation Expenses – Equipment)
	D/C	Debit	
	Cost center	$$	
	Amount in doc. curr	68,181.82 euros per 30 days (5% annually)	68,181.82 euros per 30 days (10% annually)

IMPORTANT: If you are playing a game where depreciation is automated, you will not need to manually process this transaction after the first quarter. In other words, you will only post depreciation in the first quarter of the game and the simulator will automatically post the depreciation expense for all of the remaining quarters.

3.2.4 Production improvement transactions

Production improvements will increase the actual production throughput of your plant. More specifically, this transaction will reduce the time to perform the allergen cleanup and set up the assembly line.

In the first quarter, all firms must invest 50 000 euros to reduce the setup time.

FB50

Accounting / G/L Acct Pstg: Single Screen Trans.

310

Fields		Lean manufacturing investments
Header	Document Date	Today's date
	Doc. Header Text	Lean manufacturing
On the first line	G/L acct	113300 (Weizen bank)
	D/C	Credit
	Amount in doc. curr	For the first quarter, you must invest 50,000 euros. After that, it's up to you!
On the second line	G/L acct	478 000 (Lean manufacturing expenses)
	D/C	Debit
	Cost center	$$
	Amount in doc. curr	For the first quarter, you must invest 50,000 euros. After that, it's up to you!

3.2.5 Other expenses

The other expenses in producing muesli cereals can be classified as direct labor, manufacturing "overhead (in addition to assembly line depreciation and building depreciation) and SG&A. The following table gives the information to post these expenses each quarter.

Fields		Direct labor expenses	Factory overhead expenses	SG&A expenses
Header	Document Date	Today's date		
	Doc. Header Text	Direct labor cost	Factory overhead	SG&A
On the first line	G/L acct	113300 (Weizen bank)		
	D/C	Credit		
	Amount in doc. curr	126,720 euros per 30 days	86,400 euros per 30 days	278,400 euros per 30 days
On the second line	G/L acct	500000 (Direct labor expenses)	510000 (Factory overhead)	520000 (SG&A)
	D/C	Debit		
	Cost center	$$		
	Amount in doc. curr	126,720 euros per 30 days	86,400 euros per 30 days	278,400 euros per 30 days

IMPORTANT: If you are playing a game where these expenses are automated, you will not need to manually process this transaction after the first quarter. In other words, you will only post these expenses in the first quarter of the game and the simulator will automatically post these expenses for all of the remaining quarters

3.3 Other useful financial transactions

3.3.1 Reversing a transaction

The document principle in accounting requires an unbroken audit trail. Consequently, whenever you post an erroneous transaction, you must reverse it to preserve the audit trail.

In the screen "Reverse Document Header data" , enter the following information:

Fields	Data to input
Document Number	Number of the document to be reversed
Company code	$$
Fiscal year	Current fiscal year
Reversal reason	Your reason to reverse the transaction

Click on "Display before reversal". In the screen "Document overview-Display", click on Then, click on in the dialogue box.

3.3.2 To unpark a financial document

Enter the following information:

Fields	Data to input
Document Number	Number of the document to be displayed
Company code	$$

Click on , then click on to post the document.

3.3.3 To display a financial document

Enter the following information:

Fields	Data to input
Document Number	Number of the document to be displayed
Company code	$$
Fiscal Year	Current fiscal year

Click on .

CHAPTER 4 – OPERATIONAL BUSINESS PROCESSES

As a make-to-stock manufacturing company, there is a set of processes that must be performed to run your business. There are four main processes that are presented here: (i) the planning process, (ii) the procurement process, (iii) the production process, and (iv) the sales process (See figure 3.1).

Each process can be decomposed into transactions. In SAP®, a transaction corresponds to an operation that interacts with the centralized data of the ERP system. To complete the four processes mentioned above, a total of 12 transactions must be performed.

Most of the transactions involved in these processes are operational in nature, such as purchasing materials or delivering finished products. We will also cover some financial transactions that are associated with these integrated business processes.

We are managing these processes with SAP®, which is an integrated system. For any business process, each transaction is related in some way to one or many other building blocks of the system. The idea behind an integrated system is to use all existing information to avoid data re-entry, and to create and store new data for future use in other transactions.
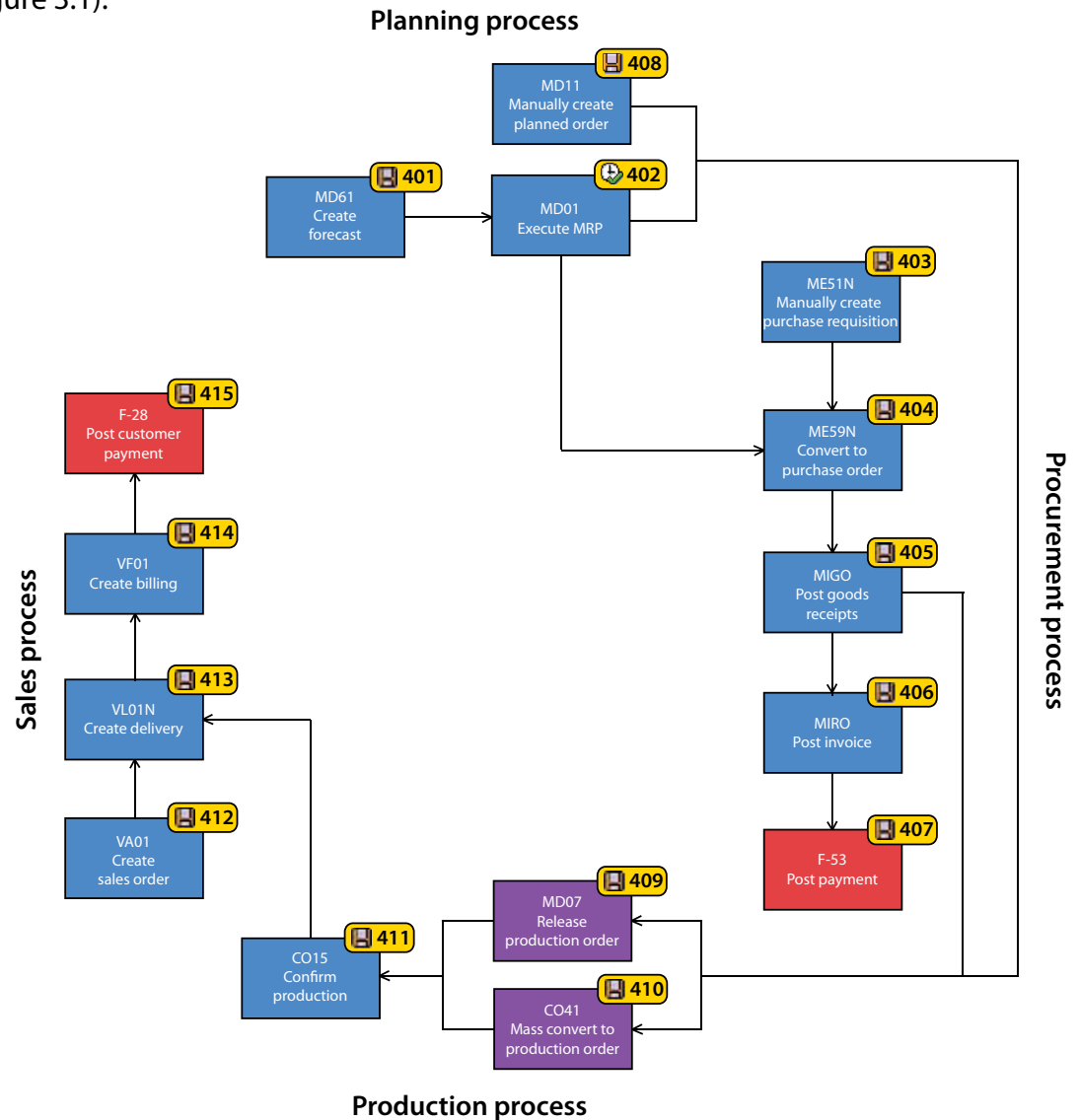
Figure 4.1: The operational processes

A transaction may require using information stored in the organizational elements or the master data; it also creates new transactional and accounting documents.

Figure 4.2 provides the notation used to represent the business processes in this chapter.

Figure 4.2: Notation

Decisional transaction	Operational transaction	Accouting transaction	Business document	Cost element

G/L Posting

DB   CR   DB   CR

💾 000 **Post**

🖊 000 **Change**

⏱ 000 **Execute**
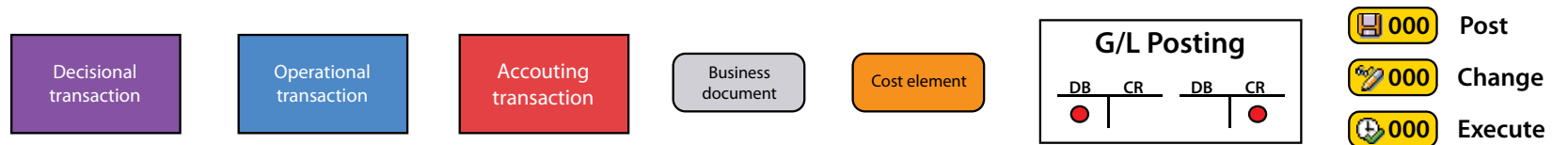
4.1 Planning process

Before we can produce finished products, we need to procure the raw materials in the required quantity in time for production. The planning process facilitates the accurate calculation of raw material requirements. First, we create a forecast for each finished product (the quantity needed to fulfill expected sales). Forecasting (MD61) generates the independent requirements for each finished product, which are used as an input to the MRP (material requirement planning) process. The MRP process calculates all of the raw materials required for the production process.using the BOM (bill of material) and the independent requirements. The MRP process will also automatically create the purchase requisitions, which are internal documents to be used by the company's purchasing department to create purchase orders, which are external documents used to communicate these raw material needs to the vendors. Please note that a forecast has to be done for every product you plan to produce.

Figure 4.3: The planning process

Creating the forecast		
First screen	Create Planned Independent Requirements: Initial Screen		

Fields	Data to input
Material	$$-F%%
Plant	$$

Task	Navigation	Result
Continue	✅	A second screen appears.

Second screen	Plnd ind. reqmts Create: Planning Table

Field	Data to input
Planned Independent Requirements	Enter the forecasted quantity in the next month and press "enter". (For example, if you run the game in September 2008, then enter your forecast in the month of October 2008.)

Tasks	Navigation	Results
Save the independent requirements.	Press "save"	The independent requirements for this material are now saved.

The second transaction, execute MRP, uses the independent requirements and the BOM to calculate the raw material requirements. If you wish to produce 1000 large boxes of muesli, each containing 570 grams of wheat and 430 grams of oats, then you must acquire 570 kilos of wheat, 430 kilos of oats, 1000 large bags and 1000 large boxes before production can start. The MRP process calculates these requirements for all components in the BOM. The system also takes into consideration the stock of material that you already have. Hence, if you already have 400 kilos of wheat, only 170 extra kilos will be put in the purchase requisition.

To execute the MRP process (MD01), you need to enter your plant number. The system will then automatically extract the independent requirements previously generated for your plant, pull the information from the BOM of the finished products mentioned in the document, calculate the quantity of raw materials you need, subtract the quantity of raw materials you already have in stock, then create purchase requisitions for the net quantity of raw materials required.

MD01

Logistics / Production Planning / MRP / MRP Run

402

Execute MRP		
First screen	**MRP Run Screen**	
	Fields	**Data to input**
	Plant	$$
	Processing Key	NEUPL
	Create purchase req.	1
	Schedule lines	3
	Create MRP list	1
	Planning mode	3
	Scheduling	1
	Planning date	Today
	Display material list	x
	Tasks	**Navigation**	**Results**
	Continue	✅	A notice pops up at the bottom of the page.
	Ignore the notice	press "enter"	The notice disappears.
	Start the planning run	✅	The planning run is carried out.

You may save the MRP settings by using the following pull down menu path: settings / save. You will need to press enter to confirm saving these settings. You should get the following message if you are successful: "Selection parameters were saved". Remember that these are user-specific settings.

You can view the stock / requirement lists using the transaction code MD04, which will show you the results of the MRP planning process.

<table>
<tr><td rowspan="2">MD04 (individual) or MD07 (collective)</td><td colspan="3">View the stock/requirement list</td></tr>
</table>

MD04 (individual) or MD07 (collective)			
Logistics / Shop Floor Control / Order / Create / Display Stock/ Requirements Situation			

First screen	**View the stock/requirement list**		
	Requirements List: Initial screen		
	Fields	**Data to input**	
	Material	$$-F%%	
	Plant	$$	
	Task	**Navigation**	**Result**
	Continue	✅	The second screen appears

4.2 Procurement process

The procurement process is typically performed by the purchasing department. For your firm, it includes four transactions: create purchase order, post goods receipt, post invoice, and post payment. In other words, the procurement process manages the ordering, receiving, and payment for the raw and packaging materials (see figure 4.3).

The MRP planning process generates a document called a "purchase requisition". This is an internal document that has been assigned a reference number and is used to identify raw material needs to the purchasing department.. To generate these purchase requisitions, the system used information contained in the info-record and the source list. Because your firm has selected a single vendor for all material, the source list was configured to be relevant to the MRP calculation. As a result, the approved vendor was automatically assigned to the purchase requisition when it was generated by the system.

Figure 4.4: The procurement process

Note that it is possible to order raw materials without running the MRP planning process, i.e. you can create a purchase requisition manually. To do this use transaction ME51N as before and enter the product code, the quantity and your plant. By doing so, you will bypass the MRP calculation and create a purchase requisition which is not related to an independent requirement. You can use this technique to stock up raw materials when the prices are lowest.

ME51N
Logistics / Materials Management / Purchase Requisition / Create
403

	Creating a purchase requisition manually	
First screen	Create Purchase Requisition: Initial Screen	
	Task	
	Expand the item overview section by clicking on 🗔	
	Fields	**Data to input**
	Material	$$-R%%	$$-P%%
	Quantity	Enter the quantity needed	
	Plant	$$	
	Fixed vendor	V01	V02
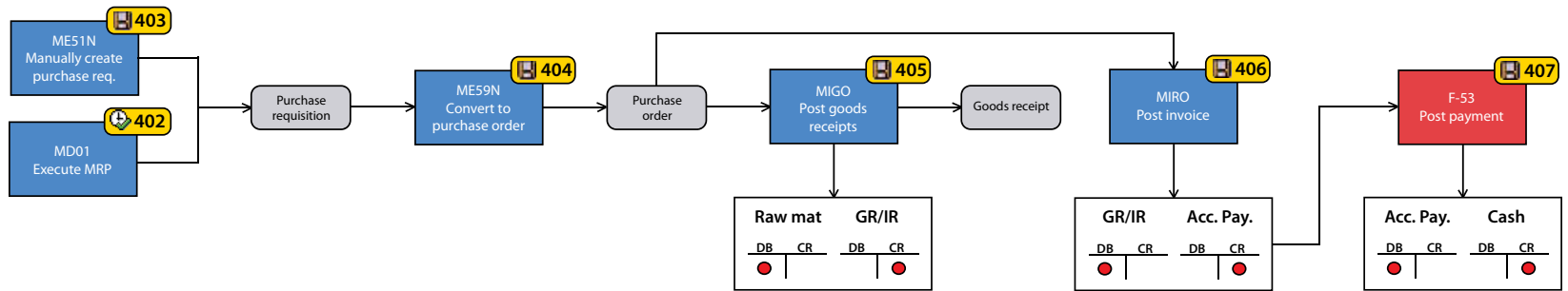
Then, click on save 💾.

The purchase requisitions must be converted into purchase orders. A purchase order constitutes an official request to the supplier (vendor) for the purchase of a specific quantity of material. The transaction ME59N automatically creates consolidated purchase orders for each vendor. In other words, if more than one requisition was assigned to the same vendor, only one purchase order with multiple items will be created. To complete the transaction, you must enter your purchasing organization number to extract only the open requisitions relevant to your company.

<table>
<tr><td rowspan="2" style="background:red; color:white">ME59N

Logistics / Materials Management / Purchase Order / Create / Automatically via Purchase Requisition

404</td><td colspan="3">Generating automatically consolidated purchase order from purchase requisitions</td></tr>
<tr><td rowspan="7">First screen</td><td colspan="2">Automatic creation of purchase order from requisitions</td></tr>
</table>

ME59N Logistics / Materials Management / Purchase Order / Create / Automatically via Purchase Requisition 404	**Generating automatically consolidated purchase order from purchase requisitions**		
First screen	Automatic creation of purchase order from requisitions		
	Fields	**Data to input**	
	Purchasing organization	$$	
	Plant	$$	
	Tasks	**Navigation**	**Results**
	Execute the query	Press ⊕ .	A report is displayed confirming the conversion of the purchase requisition in the consolidated PO. The PO number should be highlighted in green.

When goods are received, a goods receipt must be completed. The receiving clerk checks the quantity and quality of goods received and documents this in the system. This is done using the transaction code MIGO. You must enter the number of the purchase order used to purchase these goods to link the goods receipt with the purchase order that initiated the purchase. Verify that the quantity corresponds to the quantity ordered and check OK to validate that the material has been received in good condition as planned. When you enter a goods receipt, the SAP® system debits the raw material inventory account and credits the GR/IR account in addition to recording the increase in raw material stock levels.
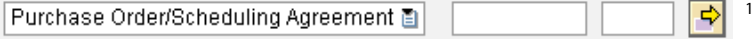
MIGO
Logistics / Materials Management / Goods Receipt / Goods Movement
405

	Post goods receipt		
First screen	Goods Receipt Purchase Order- YOUR NAME screen		
	Field	**Data to input**	
	Purchase order	Your purchase order	
	Tasks	**Navigation**	**Results**
	Continue	✅	The purchase order information appears
	Enter storage location for each items.	88	
	Complete the Good Receipts	click on "Item OK"	The goods quality and quantity are checked for each item.
	Save	💾	Note the number
	Repeat the same operations for your other purchase order.		
	Please note that to avoid selection problems with the lines of the PO, close the "Detail data" tab on the bottom left of the screen.		

The next transaction is posting the vendor's invoice (MIRO). In this step you are recording the invoice received from the vendor into the SAP® system. Again you must enter the number of purchase order to link this invoice to the purchase order and goods receipt. This transaction automatically creates an accounts payable in the system. When you post an invoice, the SAP® system credits an account payable to the vendor and debits the GR/IR account. Invoices must be paid upon receipt.

<table>
<tr><td rowspan="2">MIRO</td><td colspan="3">Post vendor's invoice</td></tr>
<tr><td colspan="3">Enter Incoming Invoice: YOUR COMPANY CODE screen</td></tr>
</table>

<table>
<tr><td rowspan="16">First screen</td><td colspan="2">Fields</td><td>Data to input</td></tr>
<tr><td colspan="2">Invoice Date</td><td>Today</td></tr>
<tr><td colspan="2">Posting date</td><td>Today</td></tr>
<tr><td colspan="2">Purchase Order/
Scheduling Agreement</td><td>Your purchase order</td></tr>
<tr><td colspan="3">Purchase Order/Scheduling Agreement [ ]   [ ] [ ] [→] [1]</td></tr>
<tr><td>Task</td><td>Navigation</td><td>Result</td></tr>
<tr><td>Continue</td><td>Click on "enter"</td><td>The purchase order informations appear</td></tr>
<tr><td colspan="2">Fields</td><td>Data to input</td></tr>
<tr><td colspan="2">Amount</td><td>Amount beside 🔴⚪⚪ Balance</td></tr>
<tr><td colspan="2">BaselineDT
(in payment tab)</td><td>Today</td></tr>
<tr><td colspan="2">Pmnt terms
(in payment tab)</td><td>0001</td></tr>
<tr><td>Task</td><td>Navigation</td><td>Result</td></tr>
<tr><td>Continue</td><td>Press "enter"</td><td>Ignore the notice saying that the terms of payment have been changed.</td></tr>
<tr><td>Check if the amount entered balance</td><td>▦ Simulate</td><td>The balance (bal.) should be zero.
IMPORTANT: copy the invoice amount to paste it in the next transaction.</td></tr>
<tr><td>Return to the main screen</td><td>click on "Back"</td><td>You are returned to the main screen</td></tr>
<tr><td>Save</td><td>💾</td><td>Note the number</td></tr>
</table>

MIRO

Logistics / Materials Management / Invoice / Logistics Invoice Verification

406

Repeat the same operations for each vendor.

[1] © 2009. Copyright SAP AG

Payment is made from the bank account, which clears the accounts payable. The transaction code for the payment of the vendor's invoice is F-53. You must pay the totality of the amount due. You must enter your company code (Field company code) and the vendor number (Field Account). Your cash account will be credited when you complete the transaction. Make sure that you have enough funds to complete the payment. If not, you will have a negative cash account and your banker will be notified.

F-53

Logistics / Materials Management / Accounts Payable / Outgoing Payment

407

Payment of the vendor's invoice		
First screen	Post Outgoing Payment with Printout: Header Data screen	
	Fields	**Data to input**	
	Company Code	$$	
	Document date	Today's date	
	Bank data: Account	113300	
	Bank data: Amount	From the invoice	
	Open item selection: Account	Vendor id	
	Task	**Navigation**	**Result**
	Continue	Click on "Process open items"	The next screen appears
Second screen	Post outgoing payment: Process open item		
	Task	**Navigation**	**Result**
	Save		The invoice is paid
	Repeat the same operations for each vendor		

4.3 Production process

The production process is composed of two transactions. Each of these transactions records the evolution of the production process and the flow of goods within the production system (see figure 4.5).

The planning process leads to the creation of a document called the planned order. The document contains information about the quantity of the finished good that is to produced to meet the forecast (via the independent requirement) and information contained in the BOM and the routing master data. This information does not need to be reentered.

Recall that the MRP run creates planned orders if a gap exists between the forecast (independent requirements) and existing stock levels and Production plans (other planned orders and production orders).

Another option is to directly create a planned production order in the system. This way, you would pass by the step of creating a forecast. To do so, use transaction MD11.

In the "Create planned order: Initial screen", enter the following information:

<table>
<tr><td style="background:#c00000;color:white">MD11</td></tr>
<tr><td>Logistics / Shop Floor Control / Planned Order / Create Planned Order</td></tr>
<tr><td style="text-align:center">408</td></tr>
</table>

Fields	Data to input
Planned order profile	LA

On the "Create planned order: Stock order"

Fields	Data to input
Material	$$-F%%
Order quantity	Enter the quantity of the planned order
Order finished	Today's date

Click on 💾 to save the planned order. You can now run the MRP and the system will calculate the raw material requirements to be able to carry out this new production planning and create the required purchase requisitions.

The first transaction of the production process consists of taking the planned order and converting it into a production order (transaction code MD07). A production order is a formal document issued to the workers on the shop floor to produce a requested quantity of a finished good.

A production order must be released before the shop floor personnel can begin production. To release a production order,

one must check the availability of raw material required to go into production.

When the verification is successfully completed, the production order can be released. If the production order is not released, you will not be able to process it, i.e. shop floor document cannot be printed, raw materials cannot be issued and production cannot start.

Figure 4.5: The production process
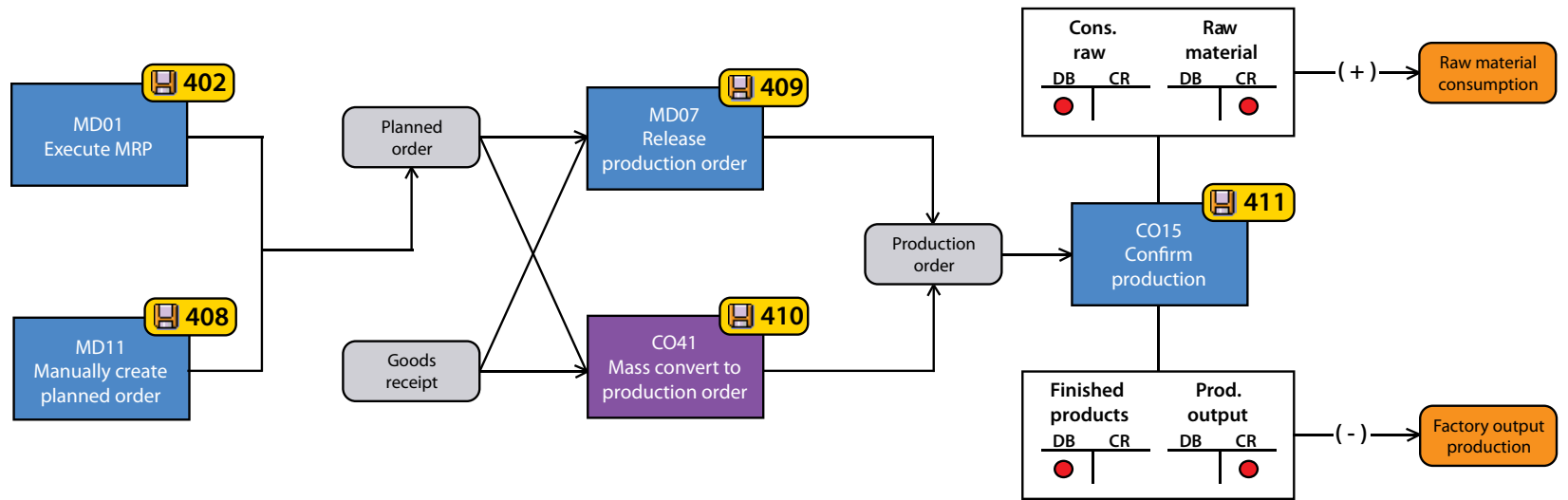
MD04 (individual) or
MD07 (collective)

Logistics / Shop Floor
Control / Order / Create /
Current Material
Overview

409

		Production order	
First screen		Stock/Requirement List: Initial Screen	
		Fields	**Data to input**
		Material	$$-F%%
		Plant	$$
		Task	**Navigation**	**Result**
		Continue	✅	A new screen appears
Second screen		Stock/Requirements List as of THE TIME THE SCREEN IS OPENED Hrs	
		Task	**Navigation**	**Result**
		Check that raw materials are available	🗃️	All required raw materials should have a green light
		Convert planned order in production order	Place the cursor on "PlOrd" and right-click. Select "PlndOrd. --> Prod.ord."	A new screen appears
Third screen		Production order Create: Header screen	
		Fields	**Data to input**
		Finish (date)	Today
		Start (date)	Today
		Task	**Navigation**	**Result**
		Check that all materials are available	Click on 🔲 Material	This message should be displayed at the bottom of the screen: "All checked materials in order are available"
		Release the production order	🚩	The production order is released
		Save	💾	Note the number

There is an alternative to manually converting planned orders into production orders. The transaction Collective Conversion of Planned Order transaction (CO41) allows you to convert multiple planned orders into production orders. In addition to converting the planned orders to production orders, this transaction will automatically release the orders if the raw materials are in stock. After entering the transaction, input the following information and then click execute.

Fields	Data to input
Production Plant	$$
MRP Controller	101

If there are no planned orders available for conversion, you will get the following message: "Planned order could not be selected". In this case, make sure that the forecasting and MRP transactions were performed correctly.

The next screen will provide a list of planned orders. You can convert one, many or all available planned orders into production orders. To do this, select the planned orders you wish to convert by clicking on the selection box on the left hand side of the list. You can use the "select all" icon at the bottom of the screen to select all planned orders.

Once you have selected the desired planned orders, click on the "convert" icon at the bottom of the screen. You will receive a confirmation that the selected planned orders were converted to production orders. If all of the raw materials required for these planned orders are not in stock, you will receive a message. Check the log file if this occurs to find the missing parts. This means you will not be able to release one or more of these new production orders, which means that the product will not be produced.

The next transaction creates a production order confirmation (transaction code CO15). After the production is carried out, you need to confirm the production of finished goods in the system. If the ERP system were connected to a manufacturing execution system, the information would be relayed automatically to the ERP system, but this is not the situation in our case. We need to manually confirm the completed production in the SAP® system. In practice this could be done by scanning the production batches at the end of the production line. In our case, we will confirm the entire production simultaneously by using the final confirmation option. You need to enter your production order number, press on "continue", confirm that the production is done by clicking on "final confirmation", and save.

The confirmation process affects both inventory levels and general ledger accounts. In confirming production, SAP® has been configured for this environment to increase the inventory level of finished goods and reduce the inventory levels of the raw materials based on the production quantity and BOM. In addition, SAP® credits the raw inventory account and debits the raw material consumption in both the financial and the cost accounting modules. In other words, it is the con-

firmation of the production that triggers the consumption of raw material. The system automatically moves the finished products to the storage location 02 (MB31).

Confirm production execution			
First screen	Create Production Order Confirmation: Initial screen		
	Fields	**Data to input**	
	Order	your production order number	
	Tasks	**Navigation**	**Results**
	Continue	✅	The next screen appears
Second screen	Confirmation of Production Order create: Actual data		
	Task	**Navigation**	**Result**
	Confirm that the production is done	Click on "Final Confirmtn"	The production is confirmed
	Save	💾	The confirmation is saved

IMPORTANT: When saving this transaction, you should get a message at the bottom left of the screen that confirms the operation involved in the goods movement postings. The message should tell you that all goods movements were successfully posted.

Occasionally, you may obtain a message that will indicate that some goods movement could not be posted due to incorrect or insufficient data. This is due to a shortage of raw materials in storage location 88. Raw material may accidently be stored in an incorrect storage location (02 instead of 88). Also, in some cases, the error may be caused by a conflict with another transaction processed at the same time (e.g. changing the info records when confirming the production may cause the system to lock some tables and impede a valid goods movements).

In any of these cases, you need to run transaction COGI (Automatic goods receipt: Error Handling) to manually post the goods movement. In this transaction, you must enter your plant number and execute the report. Select the goods movement you wish to process manually by clicking on the check box and then press the 'change details' button. In the 'Goods movements with error' screen, modify the goods if needed (for example by changing the storage location if the materials were stored in the wrong place). If the error was created by a conflict between CO15 and ME1M, we may just ask the other user to close his session and then save the goods movement as is.

When this process is completed, you may go back to the stock/requirement list. You will see that the stock level has increased and that the production order has now disappeared.

<table>
<tr><td rowspan="2" style="background:#c00;color:#fff">MD04 (individual) or MD07 (collective)</td><td colspan="3">View stock of products</td></tr>
</table>

MD04 (individual) or **MD07 (collective)**
Logistics / Shop Floor Control / Order / Create / Display Stock/ Requirements Situation

	View stock of products		
First screen	Stock/Requirements List: Initial screen		
	Fields	**Data to imput**	
	Material	$$-F%%	
	Plant	$$	
	Tasks	**Navigation**	**Results**
	Continue	✅	The second screen appears
Second screen	Stock/Requirements List as of THE TIME THE SCREEN IS OPEN Hrs		
	Tasks	**Navigation**	**Results**
	Check the stock	Double-click on the available quantity (the blue number at the first line)	A stock statistics screen pops up
	Check the stock at the storage location level	Click on "Stock overview"	The screen "Stock overview:/Companycode/ Plant / Storage location/Batch" appears

4.4 Sales process

The sales process consists of four transactions.

The first transaction creates a sales order (Transaction code VA01). A sales order is a document that represents the formal request for goods or services from a customer. A list of information about the customer and the sale must be entered into the ERP system. A sales order carries all information relevant to the sales process: the product and the quantity requested, the sales conditions, the billing and shipping information of the customer and many other pieces of information required in the subsequent transactions of the sales process.

Figure 4.6: The sale process

The creation of the sales order has no impact on the financial accounts. Even though the sales order document is a legally binding contract, it there is no financial change recorded until confirmation of shipment of the product results in the recording of change in finished goods inventory.

VA01		
Logistics / Sales and Distribution / Sales / Create Sales Order		
412		

	Create sales order			
First screen	Creates Sales Order: Initial Screen			
	Fields	**Data to input**	**Fields**	**Data to input**
	Order Type	OR	Distribution Channel	10
	Sales Organization	$$	Division	00
	Task	**Navigation**	**Result**	
	Continue	✅	The second screen appears	
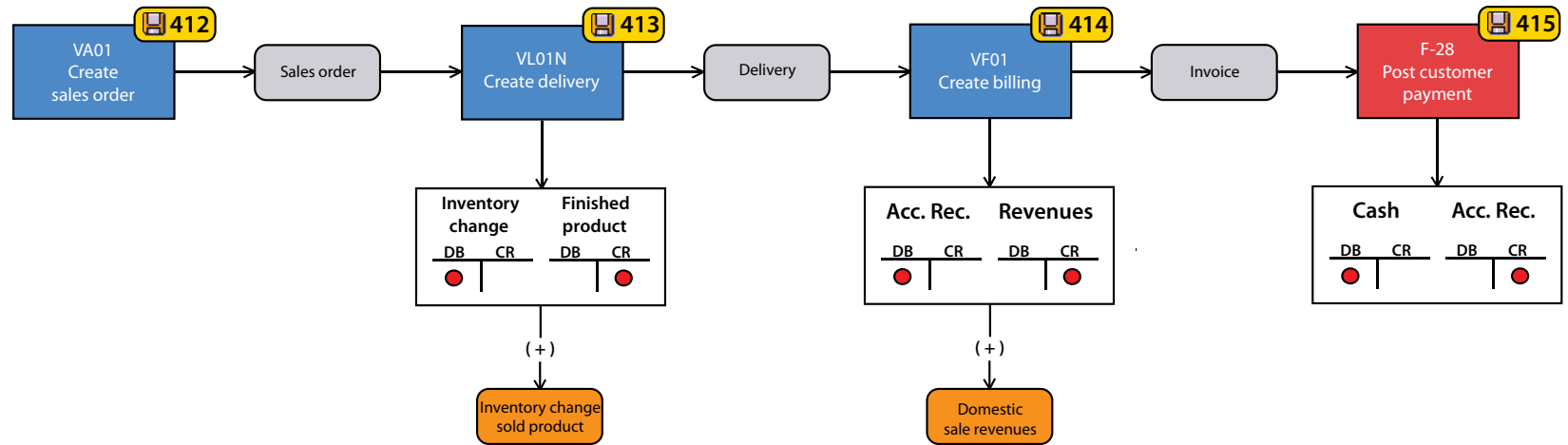
	Create Sales Order: overview screen			
Second screen	**Fields**	**Data to input**	**Fields**	**Data to input**
	Sold-to party	Your customer number	PO date	Today
	Ship-to party	Your customer number	Material	$$-F%%
	PO Number	Your name	Order quantity	Quantity ordered
	Task	**Navigation**	**Result**	
	Continue	Press "enter"	The sale is not completed yet	
	To complete the sale	Edit menu > Incompletion Log Click on and then on "Complete data"	You can now enter the missing information. NB: If a notice appears saying that the document is complete save right away.	
	Create standard order: Item data			
Third screen	**Fields**	**Data to input**	**Fields**	**Data to input**
	Plant	$$	Storage location	02
	Shipping point	$$	Profit Center	$$
	Task	**Navigation**	**Result**	
	Continue	Click on "Edit next data"	A notice saying that the document is completed appears	
	Save		Note the number	

The second transaction creates the delivery document (Transaction code VL01N). The delivery document is created in reference to the sales order; this document authorizes the storage location to pick, pack and ship the order. You must indicate from which warehouse the goods must be picked. As the goods are issued, the finished inventory is credited and the decrease in inventory is debited from an account called "inventory change" that carries the cost of goods sold that will appear in the profit and loss statement.

Delivery to customer		

First screen

Create Outbound Delivery with Order Reference

Fields	Data to input	
Shipping point	$$	
Selection date	One week from now	
Order	Your sales order number	

Task	Navigation	Result
Continue	✅	The second screen appears

Second screen

Delivery Create: Item Overview screen

Fields	Data to input	
Storage location	02	
Delivery quantity	Depending on the order	
Pick quantity	Depending on the order	

Task	Navigation	Result
Post the goods issue and save	Click on "Post good issue"	The inventory is now decreased.

After the goods are shipped, the customer is billed. This is done using the transaction code VF01. An invoice is created in reference to the delivery document. A customer is billed only for the goods delivered. Invoicing the customer will generate a financial posting: an accounts receivable is credited and sales revenues will be debited. The sales revenues are also posted in the appropriate profit center.

VF01
Logistics / Sales and Distribution / Billing / Create Billing Document
414

Invoicing the customer		
First screen	Creates Billing: Initial Screen		
	Field	**Data to input**	
	Document	Your delivery number	
	Tasks	**Navigation**	**Results**
	Create the Billing Document		The invoice is created
	Save		The account receivable is now credited and the sales revenues is debited.
Second screen			

The last transaction (F-28) posts the payment from the customer. This payment is done in reference to the open items in the receivable accounts. When entering the payment, the system expects a complete payment from the customer and will indicate if a balance is still outstanding after the payment. You will need to indicate in which account the payment is to be posted. This transaction will therefore credit the cash account and debit the accounts receivables. At any point in the process, it is possible to visualize the sales process flow from an order with transaction VA05. Select the sales order you wish to analyze and click on "display document flow". Through this function, a sales order can be tracked and appropriate measures can be taken to insure the completion of the process.

F-28	
Logistics / Sales and Distribution / Accounts Receivable / Incoming Payment	
415	

	Post payment		
First screen	Post Incoming Payments: Header Data screen Customer		
	Fields	**Data to input**	
	Document Date	Today	
	Company code	$$	
	Currency	EUR	
	Account (Bank data)	113300	
	Amount	Amount	
	Account (Open item selection)	Your customer number	
	Task	**Navigation**	**Result**
	Continue	✅	The second screen appears
Second screen	Process Incoming Payments:Process open items		
	Save	💾	The account receivable is credited and the cash account debited.

4.5 Performing the full cash-to-cash cycle

In the simulated version of the game, not all the transactions presented in this section are actually used by participants. Indeed, many transactions presented here are automated by ERPsim in the game. In order to help you understand how all these transactions and the business processes are integrated through the ERP system, we strongly recommend that you go over the full cash-to-cash cycle at least once and perform all the above transactions manually.

A total of 12 operational transactions must be performed. As you proceed step by step, we recommend that you record the impacts of each transaction. Chapter 6 provides reports that help track how things evolve within your company. Try to track impacts of each step on (i) the financial postings of the Company (FB03 and F.01), (ii) on the managerial accounting (KE5Z), and (iii) on the stock and requirement lists of the relevant products (MD07). In order to do so, note for every step the record number of each document created and the time when it has been performed. In order to keep track of the evolution of the stock & requirement list, you can take, after every step, a print screen of the stock & requirement lists of one finished product (say the Blueberry Muesli ($$-F02)) and of one raw material (say the Blueberries ($$-R02)) and copy it in a PowerPoint file.

Follow the following steps and enter the proposed amount.

1. Create the forecast (MD61, p.4-3) – perform a forecast of 140 000 boxes for 3 products 01 to 03

2. Execute MRP (MD01, p.4-4)

3. Generate automatically consolidated purchase order (ME59N, p.4-7) – note the number of each PO created.

4. Post goods receipt (MIGO, p.4-8)

5. Post vendor's invoice (MIRO, p.4-9) – note the amount due for each PO.

6. Pay the vendor's invoice (F-53, p.4-10) – notice change in cash account

7. Convert all planned orders (CO41, p.4-14) –note the production order numbers

8. Confirm production execution (CO15, p.4-16)

9. Create sales order (VA01, p.4-17 and 4-18) – create the following 3 sales orders

Products	Number of boxes	Prices	Customers
$$-F01	110 000 boxes	3.87 €	80100 (Hypermarket)
$$-F02	110 000 boxes	5.18 €	80101 (Hypermarket)
$$-F03	100 000 boxes	5.43 €	80112 (Grocery store)

10. Initiate Delivery to customer (VL01N, p.4-19)

11. Sent Invoice to the customer (VF01, p.4-20)

12. Post customers' payments (F.28, p.4-21)

By the end of the exercise, you should be able to document and (more importantly) understand all the impacts for each of the above 12 steps. Figures 4.3 to 4.6 highlight how each transaction affects the financial and accounting accounts. Review those figures and verify that this corresponds with what occurs in the system. Understanding the impact on each transaction on the stock and requirement lists is crucial to understanding how the enterprise system works. In Chapter 6 (Section 6.1.2), we explain how to interpret the reports from the stock and requirement lists. We strongly recommend that you review the impacts of all of the above steps and make sure that you understand the logic of the stock and requirement lists.

CHAPTER 5 – BUSINESS DECISIONS

In the simulation, you will need to make several tactical and operational business decision that will affect your performance in the game. This chapter provides everything you will need to process these decisions in SAP®.

5.1 New product development

At the beginning of the game, each of the six products has a preset recipe.

Should you wish to change the recipe of a product during the simulation, you need to change its bill of material. Be careful as the system will not allow you to change a BOM if you still have inventory of the product. You must use the custom transaction, ZCS02, to change the BOM. If you do not use this transaction, then the simulator will not recognize your product, and it will not sell. Also, transaction ZCS02 will make sure that your new product is within the prescribed guidelines for recipes (Tabe 5.1). In addition, it will change the description in the material master to match the new content and weight.

Here are the steps to modify a bill-of-material in SAP®.

- On "Change Material BOM: Initial Screen", enter the following information. Remember that $ is the letter of your plant.

ZCS02
Master Data / Bill of Material / ERPsim: Validated Change to BOM
707

Fields	Data to input					
Product	$$-F01	$$-F02	$$-F03	$$-F04	$$-F05	$$-F06
Plant	$$					

- In the "Change Material BOM: General Item Overview", you can add or delete items in the BOM. To delete a BOM item, select the line (click the block on the left hand side) and right click to display the contextual menu. Select "Delete item". Disregard the yellow warning by pressing Enter. Confirm that you wish to delete the item by selecting "Yes ". The item is now removed from the BOM.

- To add a BOM item, enter the new material on the first available line. For each new BOM item, you need to specify the material number of the component (field Component), its quantity (field Quantity), its unit of measure and the category of the item (field Ict). The category of all BOM items is stock item (L).

Do not forget that when changing the bill of material, your recipe must match the MMA guidelines. Here is a reminder of those guidelines:

Table 5.1: Muesli Manufacturing Association Label Regulation

	Ingredients					
Labels	**Wheat** **($$-R05)**	**Oats** **($$-R06)**	**Blueberries** **($$-R02)**	**Strawberries** **($$-R03)**	**Raisins** **($$-R04)**	**Nuts** **($$-R01)**
Original ($$-F05)	Min 20%	Min 30%	No	No	No	No
Blueberries ($$-F02)	Min 20%	Min 20%	Min 20%	No	No	No
Strawberries ($$-F03)	Min 20%	Min 20%	No	Min 20%	No	No
Raisins ($$-F04)	Min 20%	Min 20%	No	No	Min 20%	No
Nuts ($$-F01)	Min 20%	Min 20%	No	No	No	Min 20%
Mixed fruits ($$-F06)	Min 20%	Min 20%	Min 30% (With at least some of all products.)			

- The unit of measure (field Un) of the ingredients is kilograms (Kg) and the unit of measure for packaging is piece (ST). So, if you need to change box size, make sure that your total quantity of raw material is valid and make sure you select the correct box and bag size ($$-P01, etc.).

- When finished, click on 💾 to save your list of components. The ERPsim game uses a modified transaction that checks the validity of recipe in the game (this is why this transaction name starts with a 'Z'). If your recipe is valid, the system will confirm the new label and size of the product and it will automatically change the description of the product in the master data. This will help you to analyze the profitability of your product over time. If your recipe is invalid, the system will not allow you to exit the transaction until it is correct. It will return you to the Change BOM screen to make the necessary changes.

5.2 Production planning decision

The production planning decision refers to the creation of planned production orders.

There are two ways to create these planned orders.

The first option is to follow the instructions in section 4.1 by creating a forecast (i.e. independent requirements) and run the MRP calculation process against this planned demand. One output of this calculation would be the planned production orders. The MRP calculation process will also create requisitions for the raw materials needed to produce those production orders.

Another option is to directly create a planned order in the system. This way, you can bypass the step of creating a forecast, or add a "rush" order to an existing forecast. To do so, use transaction MD11.

- In the "Create planned order: Initial screen", enter the following information:

Fields	Data to input
Planned order profile	LA

- On the "Create planned order: Stock order"

Fields	Data to input
Material	$$-F%%
Order quantity	Enter the quantity of the planned order
Order finished	Today's date

- Click on 💾 to save the planned order. You can now run the MRP process and the system will calculate the raw material requirements and create the required purchase requisitions to produce the new planned orders.

Remember that planned order quantities can be changed until the planned order is converted into a production order. Should you need to change the quantity of a planned order, you can do so from the stock requirements list (MD04 or MD07). Select the product with the planned order you want to change. On the left hand side of the planned order, click on 🔲 and click on the 🖉 button. You can now modify the quantity of the planned order. Click on 💾 to save the planned order with the new values.

5.3 Procurement decision

When the procurement process is automated by the system, the simulator automatically looks for purchase orders. It will take three to five days for your vendor to supply your ordered materials. The simulator will automatically post the goods receipts of the material after this delay and enter the invoice received. The invoice payment will also be made automatically by the simulator 15 days later.

The decision you have to make with regards to procurement is when to release the purchase order. Purchase orders are created by mass converting requisitions using transaction ME59N (see section 4.2). As for the size of the purchase order, that depends on your production planning. Should you wish to organize a constant flow of smaller purchase orders, you will need to have smaller planned orders of finished products and run the MRP process more frequently. Remember to consider the impact on your cash flow! Extending your bank loan to be able to pay your vendors will drop your credit rating. Also, take into account that you warehouse has a limited capacity - if you produce too much product at once you will need to pay rent for additional storage.

5.4 Production execution decision

An important decision is whether to use small or large batch production runs. If you go with large batches, you will reduce the number of setups and produce more finished product for a given time period. This will increase your productivity and lower your per-unit production costs, but you are more likely to stock out and have a less diverse range of product to offer to your customers. If you go with smaller batches, you will be better able to react to changing markets, but you will also lose productivity because having to setup more frequently.

Remember that the system will automatically execute the production orders with first in / first out priority. Beware of large production orders because they will consume your production capacity for quite some time. Once a production order is released, you may not change it or cancel it.
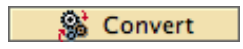
The transaction Collective Conversion of Planned Orders (CO41) will allow you to convert multiple planned orders into production orders. After entering the transaction code, input the following information in the first screen and then click ⊕ to execute.

CO41
Logistics / Shop Floor Control / Order / Create / Collective conversion of planned orders
410

Fields	Data to input
Production Plant	$$
MRP Controller	101

If there are no planned orders available for conversion, you will get the following message: "Planned order could not be selected".

The next screen will provide a list of planned orders. You can convert one, many or all available planned orders into production orders. To do this, select the planned orders you wish to convert by clicking on the selection box on the left hand side of the list. You can use the "select all" icon ( )at the bottom of the screen to select all planned orders.

Once you have selected the desired planned orders, click on the "convert" icon ( )at the bottom of the screen. You will receive a confirmation that the selected planned orders were converted to production orders. If the planned order can not be converted a red "X" ( )will appear. Click on to see why the conversion failed, most likely this will be because the required raw materials are not available.

5.5 Production improvement decision

A very strategic decision in this game is to decide on the level of investment in your production facility.

You can invest in a lean manufacturing program to reduce your set up time and also procure extra capacity by upgrading your production equipment. You may invest in production equipment and process at any point in the game and your investments are cumulative. Remember that the more you reduce your setup time, the more expensive it is to make further improvements.The exact formulas for production improvement are specified in Chapter 1.

To acquire additional capacity, use transaction FB50 to post the amount you wish to invest to the machinery and equipment account. Remember that this investment acquires an asset in exchange for cash which results in no net impact on retained earnings at the time of the transaction. The impact on retained earnins is from the depreciation expense for the asset, which occurs over time.

Fields		Acquiring Assembly Line
Header	Document Date	Today
	Doc. Header Text	Assembly line
On the first line	G/L acct	113300 (Weizen bank, cash)
	D/C	Credit
	Amount in doc. curr	It's up to you!

FB50

Accounting / G/L Acct Pstg: Single Screen Trans.

305

On the second line	G/L acct	11000 (Machinery and equipment)
	D/C	Debit
	Amount in doc. curr	It's up to you!

To reduce set up time, use transaction FB50 to post to the lean manufacturing account in the general ledger the additional amount that you wish to invest. Remember that this investment does not acquire an asset. The impact to profit is direct ad immediate!

Fields		Lean manufacturing investments
Header	Document Date	Today's date
	Doc. Header Text	Lean manufacturing
On the first line	G/L acct	113300 (Weizen bank)
	D/C	Credit
	Amount in doc. curr	It's up to you!
On the second line	G/L acct	478 000 (Lean manufacturing expenses)
	D/C	Debit
	Cost center	$$
	Amount in doc. curr	It's up to you!

5.6 Pricing decision

You can change prices at any time during the game, however your price lists are only sent to your customers once per day. so changing more often than once per day will have no impact as only the last price entered will be in effect the next day. Do not forget that small boxes cannot be sold in the hypermarket distribution channel (10) while large boxes cannot be sold in the independent grocers distribution channel (14), even though you can set prices in these distribution channels.

You can change prices by using the following instructions.

- On "Price List with Release Status", enter the following information:

Fields	Data to input
Sales organization	$$
Distribution channel	10, 12 or 14
Material number	$$-F%%, or leave blank to change all at once

- Click on ⊕.

- On "Change Condition Records: Overview", enter the following information:

Field	Data to input
Amount	*The new sale price of your material*

- Click on 💾 to save.

5.7 Marketing decision

You may invest in marketing at any point in time in the game. Remember that the impact of marketing is immediate and that customers have no memory, so the effect of marketing does not linger of you stop investing. Refer to chapter 3 for further details on how to manage the marketing plan.

Table 5.2 provides the G/L accounts that you must post payments to corresponding to the area and product where the marketing investment is to be made.

Table 5.2: Marketing account table

Area / Product	$$-F01	$$-F02	$$-F03	$$-F04	$$-F05	$$-F06
North	477001	477004	477007	477010	477013	477016
South	477002	477005	477008	477011	477014	477017
West	477003	477006	477009	477012	477015	477018

When you enter transaction ZADS, you will see your current daily plan. You can click on [✏ Clear] to clear the values in the table. Enter the following information:

Fields	Data to input		
Material / Area	North	South	West
$$-F01			
$$-F02			
$$-F03	It's up to you!		
$$-F04			
$$-F05			
$$-F06			

- Click on 💾 to save.

Remember, marketing investmens have an immediate negative impact on profit, and (hopefully) a positive one through increased sales.

5.8 Financing decision

In this game, you will need to carefully manage your cash flow. You must be able to finance your operation while waiting to receive payment from your customers and making the necessary payments to your suppliers. While the bank will always cover any shortfall, your credit rating will be reduced, resulting in higher interest costs. Therefore, it is always better to plan ahead. Also, too much cash in the bank is a waste of assets. If you don't plan on investing cash into your business, then use it to repay your loan.

CHAPTER 6 – REPORTING AND ANALYTICAL TOOLS

So far we have examined how to perform the main business processes of your organization. You are now ready to plan production and run MRP, purchase raw materials and pay suppliers, produce boxes of muesli cereal, store them in your finished product warehouse, set finished product prices and invest in marketing. You have the knowledge to perform all of these functions during the simulation. But this is not enough.

The challenge for you and your team is to decide what to do and when to do it. You must decide which recipe to use, how much of and when to produce each product, when to order raw materials, how much to invest in marketing and what price to charge for each product in each distribution channel. Obviously, it is impossible for you to make all of these decisions in advance. In addition, your decisions are not made in isolation—they depend on the behavior or your competitors. To be successful, you must make those decisions based on current data and information.

The information provided in Chapter 1 about the Muesli industry is out of date. You must presume that the industry has changed. Consumers and competitors have changed since the latest Muesli industry report was written. Furthermore, since you are new to the industry, you enter the simulation with little information about the Muesli market. Your success will largely depend on your ability to learn as you go and on your ability to adapt your strategy to changing market conditions. One of the benefits of an enterprise system is that it provides real-time information to help you do both. An enterprise system allows you to track the evolution of your firm and to quickly coordinate your response to new information from the marketplace. The best teams will be those able to exploit the data and make sense of it and act accordingly. You must be able to "compete on analytics".

Before considering the data provided by the system, let us first examine what use can be made of the data.

The first function of data within an enterprise is to support business processes. Take the example of the process of creating a purchase order. A purchase order requires data from a number of sources: The quantity of each material to be purchased and the date it is to be delivered (which comes from the purchase requisition), the price for the material (from the purchasing info record), etc. Once the purchase order is created, it is stored for use in the receiving process. In addition, the data in the purchase order can be used to answer specific operational questions such as: what purchase orders are to be delivered today? What products are included in a specific purchase order? When will it be delivered? What is the price we are being charged for a material? Modern companies rely on sustainable and comprehensive data to ensure the smooth operation of their processes.

But some companies collect and gather data beyond what is necessary for their transactional needs. The data collected by these companies enables them to better understand the economic environment in which they operate. Hence, the second function of data is to answer complex business and strategic questions: In which region does advertising yield the most? What products should be produced in priorty? What will the demand be for our products during the next period? What are the characteristics of products that are most valued by consumers? How should we price our products? And so on.

These questions are critical to business success but are not easy to answer. Providing the appropriate answers requires additional data and further analysis. To be competitive, a company must do more than just be an effective from an operational point of view. It must also be able to forecast market trends and the needs of its customers, be flexible to changes in demand, and adapt its stragegy and processes to the competitive environment. The biggest challenge is being able to anticipate future needs and foresee the consequences of various strategic decisions. To achieve this, companies must collect, process, analyze and interpret large amounts of data. This is the purpose of business intelligence.

Information systems have adapted to the different requirements for information (business processes support and strategic management) by using two different types of information system: OLTP (Online Transactional Processing) and OLAP (Online Analytical Processing). The term "Online Transaction Processing", or OLTP, refers to information systems that facilitate the entry and extraction of data for transactional purposes. The term "Online Analytical Processing" or OLAP refers to multidimensional data analysis methods used in business intelligence.

The SAP® R3 system is an OLTP system. It supports business transactions. It is used to read, write and update transactional data; it allows all stakeholders of a business processes to access the same data in real time. The first section of this chapter explores the OLTP reporting capabilities of SAP®. The second section of this chapter proposes a way to perform more in depth analytics using an OLAP system.

6.1 OLTP reporting for SAP®

The SAP® R3 system provides a large number of reports and analytical tools. We cannot discuss all the possible reports one can execute with the software, so we will describe the few that we believe are important for the simulation game. Some of these reporting transactions are standard reports provided with SAP®, while others were created specifically for the ERP Simulation game. We encourage each team to explore the system on their own to find other reports that might prove useful and provide your team with a competitive advantage. To find standard reports in the SAP® system, navigate to the folders 'Information Systems' in each module. Note that the standard reports from SAP® do not take into account the simulator's virtual time.

6.1.1 Procurement management

Managing procurement efficiently is critical to the success of your company. A report was specifically designed for the simulation game to track purchase orders (transaction ZME2N). In this report, you will find a list of your purchase orders. This report is very useful in determining the status of your purchase orders in the purchasing cycle. For each item in the purchase order, the report provides the material, quantity, the simulation quarter and day when the purchase order was created (PO Qtr, PO Day), the simulation quarter and day when the goods will be received(Exp MIGO Qtr, Exp MIGO Day) as well as the day and quarter when payment of the vendor invoice will be (or was) made (Vendor payment Qtr, Vendor payment Day).

6.1.2 Inventory management

One of the key elements of the game is to be able to react to customer demand, and to do that you must ensure that the inventory of your products is maintained at an appropriate level. Along with knowing the quantity of material in stock, it is just as important to know where the material is.

To view the stock level in the various warehouses, we have created an easy-to-use customized report. Transaction code ZMB52 shows the inventory level for each product in the two warehouses -02 for finished products, and 88 for raw materials. The transaction ZMB52 has a refresh button so that the data can be updated without having to rerun the transaction. In addition so showing inventory levels, it also displays the current simulated quarter and day.

Transaction code MD07 is a standard SAP® report that will also show you inventory levels plus other information on material plans (purchase orders, production orders, etc.). To view an inventory overview, enter the following information in transaction MD07 :

Fields	Data to input
Plant	$$
MRP controller	101

This will provide you with a general overview of all the stock available for every product. This report allows the user to drill down and view the deails of material plans. Select one or more of the materials on the list by clicking on the box on the left side of the line corresponding to the desired material, then click on the "select stock/requirements list" button. A third screen will appear.

The stock/requirements list contains all of the details pertaining to the plans for a specific material. It lists all the requirements and the availability (or planned availability) for the material. Understanding the stock/requirements list is useful for understanding how the MRP calculation process works. The MRP calculation can be interpreted as a decision support system that calculates the quantity of finished products that must be produced and the quantity of raw materials that must purchased to satisfy forecast demand according to a set of prespecified rules. The MRP calculation process also creates the internal planning documents consistent with these calculations. The use of the MRP planning process facilitates the work of the planning team by guaranteeing consistent plans and by automatically creating all of the planning documents.

For finished products, each line in the stock/requirements list will correspond to either the current inventory (Stock), independent requirements (IndReq), the planned orders (PldOrd), production orders (PrdOrd), sales orders, and deliveries. A sales forecast takes the form of an independent requirement. It represents the quantity of a finished product that the organization wants to produce to satisfy sales objectives for a given period of time. To match those requirements, the MRP calculation process will create one (or more) planned orders to meet the independent requirements. In the MRP typical setting, the quantity planned for production is equal to the sum of all independent requirements minus what is already in stock and minus is already planned for production (existing planned orders and production orders). Through the production process, planned orders are transformed into production orders and then into inventory(stock) of finished products. Finally, as products are sold and delivered, the inventory level(stock) AND the the independent requirement decreases accordingly for the matching time period. In principle, the sum of the independent requirements should be equal to the sum of all other MRP elements in the table. If the requirements are larger, the MRP run will create new planned orders to fill the gap.

 For raw materials, the different lines in the stock/requirements list correspond to the inventory level(stock), the dependent requirement (DepReq), the dependent order (OrdRes), the purchase requisitions (PurRqs) and the purchase orders (POitem). When the MRP planning process creates a planned order for a finished product, dependent requirements for all raw materials needed to produce the finished product are also created. The MRP planning process uses information from the bill of material to calculate the quantity of each raw material required. The dependent requirements are then used to calculate how much of each raw material must be purchased . This calculation takes into consideration existing stocks, reserved stocks, purchase requisitions and purchase orders. In the typical setting, the quantity of a given raw material in a requisition corresponds to the sum of quantities in the dependent requirements minus the quantities in stock, purchase requisitions and purchase orders. The stock/requirements list then tracks the conversion of requisitions into purchase orders and the receipt of goods into inventory (stock). Finally, when planned orders for finished goods are converted into production orders, the corresponding raw materials reservations are changed from dependent requirements (DepReq) into order reservations (OrdRes).

The stock/requirements list is a powerful tool to diagnose problems in the production and procurement processes. Understanding the stock requirement list and how it displays the current status of materials is essential to detecting problems and bottlenecks when they occur and finding the best way to correct them.

6.1.3 Production execution

When you release a production order, it is placed in the production order queue until it can be processed. To keep track of these production orders, use the production schedule report (transaction ZCOOIS). This custom report provides detailed schedule information for each production order: the order number, the material description, the quarter and day when the production will start (Start Qtr, Start Day), the quarter and day when the production will end (End Qtr, End Day), the duration of the setup in hours (Setup hour), when the production order was released (Rel Qtr, Rel Day), the target quantity of the production order (Total Qty) and the confirmed quantity so far (Conf Qty).

Note that if you have created a production order, but have not released it, it will not show up on this report. Production orders will not be processed until they are released, and they cannot be released until all raw materials are in stock. If a production order is listed on the stock/requirements list but does not show up in this report, you know that it has not been released.

6.1.4 Sales order and market report

Monitoring and analyzing sales orders to understand market demand for your products is a fundamental task in your business.

 You can use the summary sales report (transaction ZVC2) to monitor the sales of your company. This report will display for each day and each product - the total number of orders (Orders),the sum of all boxes sold (Qty), and the total sales revenue (Value).

To review sales orders received by your company, use the sales order report (transaction ZVA05). This report will display all of your sales orders and provide the following information: quarter and day when the order was received (Quarter, Day), where the product was sold (Distribution channel, Area), which product was sold (Material description), to whom (sold-to-party), the number of boxes in the order (Qty), the sales revenues from the order (Value), the price at which these products were sold (Price), and when payment for the order will be recived (A/R Qtr, A\R Day).

If one of your products does not sell fast enough you might consider decreasing the sales price or reviewing your marketing for the product. If these are not successful, you might want to adjust the recipe or even phase the product out completely. Conversely, if it sells too fast and you expect to stock out before you can produce new units, then you may want to increase your selling price to slow demand and earn a higher margin on the inventory you have left.

Notice that the sales report can be refreshed quickly by clicking on 🔄. Further, the display can be customized according to your needs. You can create subtotals by clicking on the double summation sign in the top menu. You are invited to experiment to find the best way to display the data for your needs.

<table>
<tr><td>**ZMARKET**</td></tr>
<tr><td>Information System / Sales and Distribution / ERPsim: Price Market Report</td></tr>
<tr><td>**607**</td></tr>
</table>

Another interesting and useful transaction is the market report (ZMARKET). Your company subscribes to a service that provides data for the entire market. At the end of every five days, this report is updated to reflect the latest changes in industry sales and market prices. For each product and distribution channel, you have the total sales in both revenue and boxes (units) and the weighted average price for that 5 day period. You may refresh this report with (🔄).

6.1.5 Financial statements

In SAP®, you can get current financial statements at any point in time during the simulation to get a snapshot of your financial position.

<table>
<tr><td>**F.01**</td></tr>
<tr><td>Information System / Accounting / ABAP Report: Financial Statements</td></tr>
<tr><td>**608**</td></tr>
</table>

Transaction F.01 is used to create your financial statement. Enter the following information:

Fields	Data to input
Company Code	$$
Financial Statement Version	SIM1
ALV Tree Control	Check the radio button

This standard report provides you with the balance sheet and the income statement of your company. You can get more details on each section of this report by clicking on the triangle on the left hand side of every item.

The net income line corresponds to the cumulative profit (or loss) of your firm since the beginning of the game. Note that

from the second quarter on, the report will show the financial results at the end of the previous quarter under the heading "tot.cmp.pr" so that the "Abs.diff." column will show changes for the current quarter, giving you a good idea of your current performance.

6.1.6 Profit center analysis

The objective of managerial accounting is to gather accounting information in a manner that supports decision making within the organization. The profit center analysis report provides the complete list of all cost and revenue attributed to a specific profit center.

In this simulation, we are using profit centers to segment the revenues and cost associated with each team. Whenever a production order consumes raw materials and generates a finished product, and whenever a sales order is issued, a cost/revenue element is recorded in the profit center in which it was incurred.

The profit center report can provide a line item list of all the revenues and cost incurred in a profit center. This report can be displayed using the transaction KE5Z.

In the initial screen of this transaction, input the following value:

Fields	Data to input
Record Type	0
Company Code	$$

Then click 🕐 to obtain the report.

A table containing all the line items recorded is displayed. Each line item corresponds to a specific cost or revenue element. If you click on a specific line item, the precise electronic document that corresponds to this item will be shown. With this capability, one can track down all the transactions that have an impact on profitability.

6.1.7 Raw material cost per PO

Because of the complexity associated with using the profit center line item report to analyze profitability, a custom report (transaction ZKSB1) was developed for the simulation game to provide unit production costs. This report tracks every

production order and calculates the cost of all raw materials used to produce the finished product. The report provides the total cost of the order, the quantity confirmed and the unit cost of each production order. Bear in mind that this report only gives the raw materials costs—it does not take into account the significant fixed costs incurred while running your business.

6.1.8 Product cost planning

<table>
<tr><td>

ZCK11

Information System /
Accounting / ERPsim:
Product Cost Planning

611

</td></tr>
</table>

Pricing is a major challenge in this simulation. Your finished product prices depend on the market, your product design, your advertising expenditures and the actions of your competitors. Whether the price you can get for your product will earn you a profit depends on what it costs you to bring that product to market.

We have developed a modified version of the SAP product cost planning tool to help you estimate the costs for your product (transaction ZCK11).

In this transaction, enter the following information :

Fields	Data to input
Productivity	(Enter your productivity assumption in %)

When the transaction is executed ( ), the tool will calculate the unit cost of all products. The report provides two estimates of the unit cost: one using the only the variable costs and one including both variable and fixed costs. The fixed costs are allocated based on an estimation of the number of units (boxes) that you company should be able to produced each quarter. This estimation of number of units produced is calculated by multiplying the productivity ratio by the daily production capacity (by default productivity ratio is set to 75%, but you may change this ratio based on your estimation). Remember that production time is lost because of setup changes and cleaning required when switching between different products, as well as raw material shortages and delivery delays. Your estimation of the productivity ratio should consider this lost capacity.

This report also displays your current pricing of this product in the various distribution channels to let you estimate the net margin.

Important : This product costing report does not consider the marketing, warehousing or production improvement expenses you

may choose to make.

6.1.9 Liquidity planning

<table>
<tr><td style="background-color:#c00;color:#fff">**ZFF7B**</td></tr>
<tr><td>Information System / Accounting / ERPsim: Lquidity Planning</td></tr>
<tr><td>612</td></tr>
</table>

Cash flow management is also very important in this simulation game. You need to monitor closely your liquidity to make sure you are not running out of money. If your cash account goes negative, you will be penalized and your credit rating will be dropped.

A customized version of the liquidity management report was developed for this simulation game (ZFF7B). This report displays an estimate of your cash flow for the next 6 weeks so you will be able to anticipate your future cash position. For each virtual week, the report provides the expected accounts receivable payments (if any), the expected accounts payable payments (if any), overhead cost and SG&A expenses, as well as the interest payment. The last column is the expected closing balance at the end of the virtual week.

Bear in mind that this report only takes into account events with cash implications. For example, if you have open requisitions that have not yet been converted into POs, they will not be taken into account in the cash flow calculation.

The exception column shows a green light if your closing balance is stable or increasing, a yellow light if your balance is decreasing, and a red light if your balance is negative. Also, this report does not consider warehousing costs or marketing expenditure, so remember to factor those costs into your cash flow planning.

6.2 Business Intelligence for the Muesli game

An OLAP-type system, whose purpose is to perform business intelligence, has a very different architecture than an OLTP system, whose purpose is to support operations. The need for more sophisticated analysis of the data requires that we aggregate the data, detect trends across several dimensions, run statistical analyses, create charts, etc. Business intelligence uses not only contemporary data, but also historical data, to detect trends. There is more to B.I. than just using internal data. True true power of these systems comes from analysing internal data alongside data about competitiors, industry and the economic environment.

To build a business intelligence infrastructure, we must collect, sort, and cleanse data from many sources: internal transactional data, socio-economic data, time series data(economic, stock market, weather etc.), published market analyses

from external sources, etc. The data collected and archived forms a vast data warehouse that can be of great strategic value to the organization.

For OLAP analysis, key performance indicators or key figures are organized over different dimensions. To visuliaze how this is done, imagine a series of small blocks or cubes that are mounted on each other to form a large cube of several storeys high, several rows wide and deep. For the moment, imagine that this big cube has three dimensions (height, width, depth). Each small block, contains one or many values associated with one or many key figures. These values can be aggregated over the various dimensions using various operators (SUM, MIN, MAX, AVERAGE, LAST, etc.) or filter based on certain criteria. Because in general, these cubes may have more then three dimensions, they are called hypercubes. From this warehouse, you can create hypercubes.

Each analysis or business question may require one or more different hypercubes. A business intelligence system also provides the analytic tools to facilitate the creation of dashboards, cross tabulations, graphs and to perform advanced statistical analysis. Hence, a hypercube contains large amounts of aggregated data (often key performance indicators) pre-calculated and pre-classified according to the different dimensions of the hypercube.

In practice, data required for data mining and analysis is usually not updated on a realtime basis as it would be unnecessary and too costly from an economic and technical perspective to do so. Data extracts also slowdown the transactional systems. The business intelligence data warehouses and cubes are typically updated periodically in the middle of the night or the weekends.

In the context of the ERP Simulation Game, we are limited by the fast pace of the game. We cannot use the powerful and advanced business intelligence tools that are used in the industry. However, we can explore many of the techniques and concepts with much simpler technology: MS ACCESS and MS EXCEL from Microsoft. To do the analysis, users simply need to know how to create charts and graphs from pivot tables in MS EXCEL.

At the end of every quarter, data from the game can be made available to you by your instructor. The updated data is contained in an MS ACCESS database. The MS ACCESS database contains not only data from your own company but also data from all your competitors. Having access to such high quality and comprehensive data from all your competitors may be somewhat unrealistic, but the learning objective is to understand how to exploit quality data when it is available.

6.2.1 The ACCESS database

The MS ACCESS file provided by your instructor is divided into three elements: macros, tables, and queries.

The macros allow the user to connect to the SAP database and import into MS ACCESS exact copies of data tables from the SAP system. Only your instructor has the authorization in the SAP system to use the macros.

The MS ACCESS database contains approximately 20 tables. Both the names of the tables and the field names are identical to the those in the SAP system. Most of the field names (ex. BURK, MANDT, WAERK, POSNR, WERKS, etc.) are incomprehensible (except maybe for someone with good knowledge of German and with a very good imagination). An English description of each database field is provided in the tables' metadata. Note that the tables with names starting with a Z are custom tables created for the purpose of the simulation game.

Finally, the MS ACCESS database contains many existing queries. A query is defined by a set of instructions that specifies how to reorganize the data contained in the database. Through a query, one can merge data from different tables or other queries, sort, filter and regroup records and create calculated fields. Participants who are familiar with MS ACCESS can look at the instructions used to create each query in the MS ACCESS file. We present here the queries that are created in the MS ACCESS file and that can be used for data analysis.

BalanceSheet: The query "BalanceSheet" extracts data from the financial tables and generates a report that contains a history of the balance sheet for every virtual day for every company. The key figures are the balance sheet accounts, including short term and long term assets, liabilities and profits. The dimensions are the virtual time (quarter and day) and the CompanyCode.

Ratios: The query "Ratios" generates a report that contains a history of the main financial ratios for every virtual day for every company. The ratios include: NetMargin (NetProfits/Sales), GrossMargin ((NetProfit+OtherCosts)/Sales); AssetTurnover (Sales/Assets); CurrentAssetTurnover (Sales/CurrentAssets), Leverage (LongTermAssets/Equity), ROA (NetProfit/Assets), ROE (NetProfit/Equity), Mktg/Sales (Marketing expenses/Sales), SalesDaysOutstanding (Receivables/Sales per day), RMInventoryDaysOutstanding (value of raw material inventory/ Consumption of raw material per day); CurrentRatio (CurrentAssets/CurrentLiability), PlantAssetTurnover (Sales/LongTermAssets).

ZVA05: The query ZVA05 replicates the same report as the one generated by the transaction ZVA05 in the simulation game. It contains three key figures: SalesPrice, QtySold and Amount for every sales order. Sales orders are classified in three dimensions: virtual time (Quarter, Day), customers (DC, Area, SoldtoParty), Products (Plant, ProductCode, ProductDesc).

SalesQuery: The SalesQuery generates a report that is very useful in analyzing the marketplace. . This report provides daily detailed sales information (prices for each distribution channel, marketing expenses per day, inventory on hand, number of sales orders, quantity sold and sales revenue) for every competitor.

StockManagement : The query StockManagement provides an overview of the material inventory over time. It contains the following key figures: daily sales and production (for finished products only), CostMovAvg (value at the moving average cost), CostStd (the standard cost for finished products only), BeginStock, EndStock, EndStockMaterialValue. The query generates a record for every virtual day and every product. Hence the records are classified in two dimensions: virtual time (Quarter, Day) and Products (Plant, MatType, ProductCode, ProductDesc)

ProdUse: The ProdUse query presents, for every production order confirmation, the quantity of finished product confirmed and the quantity of raw materials used and cost of the raw materials. The dimensions include the information on the production order (Plant, production order number, start quarter and start day, order confirmation number, finished product confirmed) and the raw material (Raw material description and units). The query is useful to track the evolution of material costs due to changes the bill of materials and raw materials costs.

ProdSchedule and ProdQuery: The ProdSchedule query tracks all production order confirmations. For every production order confirmation, it provides the plant, the virtual day of the production order release, start and confirmation, the quantity confirmed and the product description. The ProdQuery reports the same information but adds all days for which there was no production.

6.2.2 Using MS EXCEL to analyze data

We recommend that you use MS EXCEL to analyse the data in the queries contained in the MS ACCESS file.. The following steps show how to create and reuse an MS EXCEL file to analyse the data from the game. Note these instructions are specific to MS Excel 2007.

- Download the MS ACCESS file provided by your instructor and save it in a folder on your hard drive as *ERPsimData. accdb*.

- Create and open a new Excel file.

- In the Excel file, on the "Data" tab, click on the "From Access" button.

- Navigate in order to find and select the ERPsimData.accdb MS ACCESS file on your hard drive. Select the query you want to analyse (for example the "SalesQuery" query). This will create a link between your MS EXCEL file and the content of the query.

- Select PivotTable Report. This will create a pivot table within MS EXCEL.

- Select the fields you want to use in your report. One needs to specify the content of four fields: (i) Filter, (ii) Column labels, (iii) Row labels, and (iv) Values.

- Once the pivot table is created, you can create a graph by clicking on Graph in the Insert tab.

- You can repeat Steps 3 to 7 as many times as you want. You may want to create for each query in the MS ACCESS file one or more graphs or tables in MS EXCEL. This will create a large MS EXCEL file with many relevant tables and graphs. Save this MS EXCEL file and share it with the other members of your team

- Each time the instructor submits a new MS ACCESS file with new and updated data, download the file and save it under the same name in the same folder: *ERPsimData.accdb*. Open your MS EXCEL file and click on the refresh data button in the data tab. MS EXCEL will fetch the new data from the MS ACCESS file and will update all the graphs and tables accordingly. Hence, with the same MS EXCEL file, you and your team can follow the evolution of the game and compare your data with that of the other teams. The better the quality of the MS EXCEL file that you have created prior to the game, the easier it will be to analyse the data and obtain answers to your business questions.