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Clarifying the SAP ERPsim Experience

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Clarifying the SAP ERPsim Experience

Research-in-Progress

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Abstract

This paper provides readers not familiar with the ERPsim games a simple overview. It also provides a detailed description of the ERPsim Manufacturing Game. Further, it provides a detailed prescription (a set of maxims and a roadmap) for using the simulation. A research plan is framed to answer the research question: "Will students that are taught using the maxims and the road map understand how information systems support business processes better?" If the planned experiment begins to show that the maxims and roadmap are efficacious, the researcher's contribution will be pedagogy that instructors can apply with non-MIS (and MIS) major students to help these students understand the value of MIS, and prospectively, to help these same students engage their MIS (e.g., data analytics) course more fully. The author also seeks advice from experienced ERPsim instructors as to how to improve the maxims/roadmap or the research plan.

Introduction

MIS faculty frequently find themselves in the challenging circumstances of teaching MIS courses to students who have not developed an appreciation for IS. Despite undergraduates living in a world that has ubiquitous computing, part-time MBA students interacting with information systems during the day prior to coming to class at night, and full-time MBA students using systems prior to starting graduate school, many of these students arrive to our classes believing they already understand IS, that IS are tangential to their developing core competencies, or both. These evaluations by students keep them from engaging an MIS course fully. In order to address this lackluster evaluation of MIS by non-MIS major students and its effects, the author clarified his students' experiences with the ERPsim learning experience (Leger 2006; Leger et al. 2007; Leger et al. 2012-2013), which asks students to use SAP ERP software as they "run" organizations.

ERPsim is a simulation game suite that helps students study ERP concepts by using an ERP system. There are three ERPsim simulation games: Distribution, Manufacturing, and Logistics. This paper discusses the Manufacturing Game. The ERPsim Manufacturing Game asks students to, in teams, run a company that makes and sells muesli (e.g., granola). If coached, students can develop their skills to optimize and synchronize the planning, procuring, manufacturing, and selling business processes. Figure 1 graphically shows major aspects of the game, including creating a forecast of sales which drives production, changing prices, and managing marketing expenses.

In order to use an ERPsim simulation game, an instructor's institution needs to be a member of the University Alliance. Information about how to become a member can be found at http://scn.sap.com/docs/DOC-7876. Further, since the games are complex, instructors must become certified. S/he can attend training and take a certification exam at the HEC Montreal ERPsim Lab or other venues. More information can be found at http://erpsim.ca or by emailing erpsim@hec.ca. Finally, licenses for learning materials must be purchased to run the Manufacturing and Logistics Games. The Distribution Game is free. The outline of the paper is thus:

1. ERPsim Manufacturing Game Overview
2. ERPsim Manufacturing Game in Detail
3. Hypothesized Maxims and Prescription for the ERPsim Manufacturing Game
4. Research Plan
5. Conclusion and Acknowledgements

ERPsim Manufacturing Game Overview

The ERPsim Manufacturing Game (hence, Game) asks student teams to "run" a German for-profit enterprise that makes and sells muesli to German independent grocers (e.g., convenience stores), grocery stores, and hypermarkets (e.g., Sam's Club) in three marketing regions (North, West, South). In addition to providing experiences that help students understand that transactions are at the foundation of today's commerce, it helps students understand the concept of a business process and that business processes are interdependent.

Key skills students can begin to appreciate are the abilities to plan purchases of raw materials, keep a manufacturing line running and fully utilized, and selling finished goods so as to maximize profit. The Introductory version of the Game is designed so that students are carefully introduced to SAP ERP functionality over the first three rounds. Rounds last at least 20 days but can be longer. Each "day" is roughly one minute in length. In the first round, students focus on learning how to use the SAP ERP pricing transaction form to set prices for muesli product distribution channels and a marketing expense transaction form which asks students to set marketing (e.g., advertising) expenses for each muesli product by day by sales region (hence, area).

During the second round of the introductory Game students learn to access reports (e.g., inventory levels, market prices). The second round also requires students to become familiar with and execute a transaction that converts planned production orders to actual production orders (which drive the muesli assembly line).

In the third round of the Game, students learn how to place their forecasts for sales (and thus, production) in the SAP ERP system. Further they learn how to initiate material requirements planning (MRP) using a SAP ERP transaction. MRP determines the raw materials that are necessary to create the muesli products; it also creates planned production orders. Students then learn to execute a transaction that creates all the purchase orders (PO) that are necessary to obtain the raw materials. Finally, students then learn how to convert planned production orders to actual production orders, and by doing so, placing production runs in the production schedule. Students also manage sales as they have in the first two rounds.

The three previous paragraphs describe the Introductory version of the game, the Extended version of the Game requires students to use all of the transactions across the planning, purchasing, producing, and selling business processes beginning in the first round. It also can include depreciation, fixed overhead, interest and loan management, and inventory storage cost features. The Advanced version of the Game includes an additional process—allocating finished goods muesli products to the three sales areas prior to their sale.

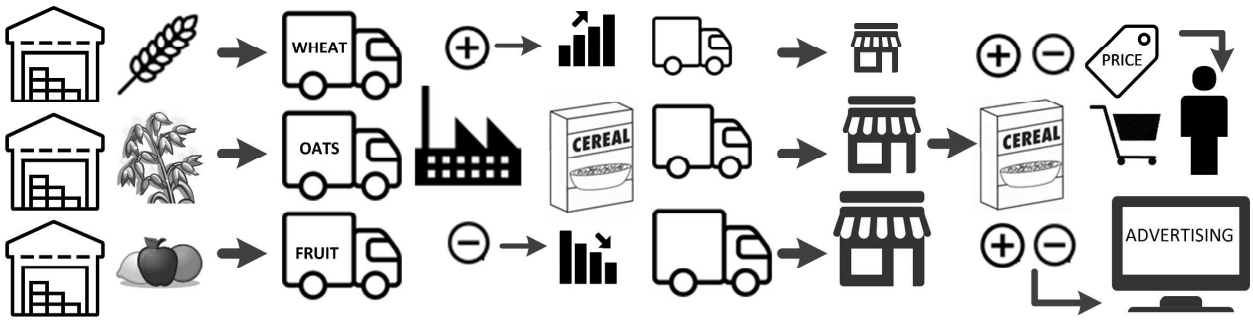

Figure 1: ERPsim Manufacturing Game Overview

ERPsim Manufacturing Game in Detail

Planning, Procuring, Manufacturing, and Selling Business Processes

The business cycle encompasses four business processes: Planning, Procuring, Manufacturing, and Selling. During Planning, students indicate the sales of the muesli products that they expect, and therefore need to manufacture by using the MD61 transaction form. Further, the required amounts of each raw material (e.g., wheat, oats, strawberries) are calculated when they use the MD01 transaction form to perform MRP. Process outputs are purchase requisitions and planned production orders.

During the Procuring business process, student teams use the ME59N transaction to create purchase orders (po) for the raw materials. POs are then "sent" to suppliers and the raw materials arrive at the student team's production facility in three to five days. Accounting transactions (e.g., goods receipt) are automated. After the raw materials arrive student teams convert planned production orders to production orders and start production runs using the CO41 transaction form. Upon production of muesli, the muesli products are available for sale at the prices set by student teams using VK32 transaction and as influenced by marketing (e.g., advertising) expenditures managed via the ZADS transaction. See Figure 2.

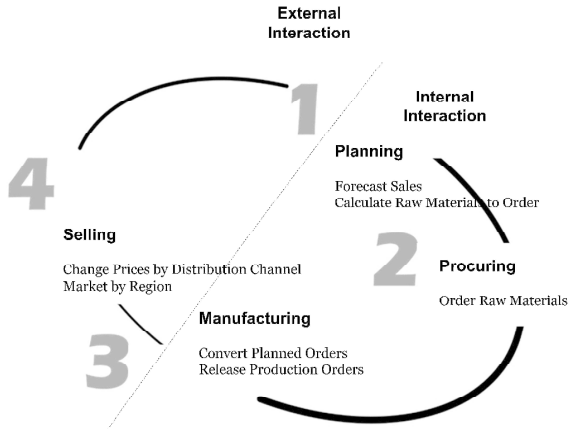

Figure 2: Actions to be Taken by Students in Every Manufacturing Game

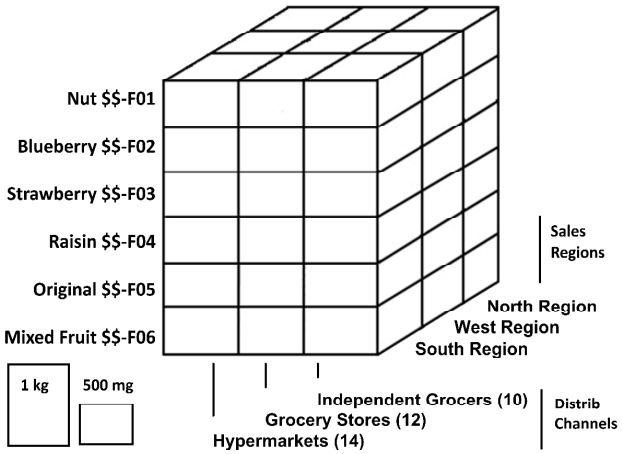

Figure 3: Products, Distribution Channels, and Sales Areas

Products, Distribution Channels, and Sales Areas

The Products that are by default "manufactured and sold" are Nut (Product Number $$-F01), Blueberry ($$-F02), Strawberry ($$-F03), Raisin ($$-F04), Original ($$-F05), and Mixed Fruit ($$-F06) Muesli in 1 Kg boxes. The $ in the product numbers represents a variable that is replaced with a teams' identifying letter. Each of the 1 kg boxes of muesli are primarily wheat, then oats, and sometimes, a smaller amount of each of the special ingredients of raisins, nuts, berries, etc. In the Extended and Advanced versions of the game, one to six of these six products can be replaced by new products which can be combinations of wheat, oats, nuts, and varying berries and can be in 500 mg boxes.

The Distribution Channels that are by default the organizations that the students sell through are hypermarkets (Distribution Channel 10), grocery stores (12), and independent grocers (14). Student teams can use the price change transaction form (VK32) to set and change prices for each of the six products for each of the three distribution channels. Prices changed on one day become effective the next day. There are 12 hypermarkets, 59 grocery stores, and 123 conveniences stores.

The Sales Areas are the North, the West and the South of Germany. These areas are primarily important to students as they determine, set, and use marketing (e.g., advertising) expenses via transaction form ZADS. The amounts that students enter for each product/sales area combination are the amounts of money (Euros) to be spent on marketing each day. These values can be changed each day and are effective

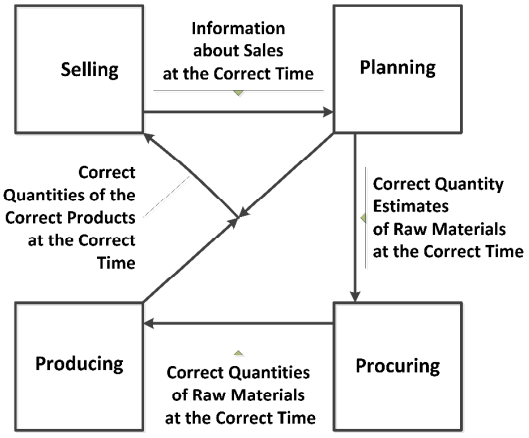

Figure 4: Optimal Flows of Information, Raw Materials, and Products

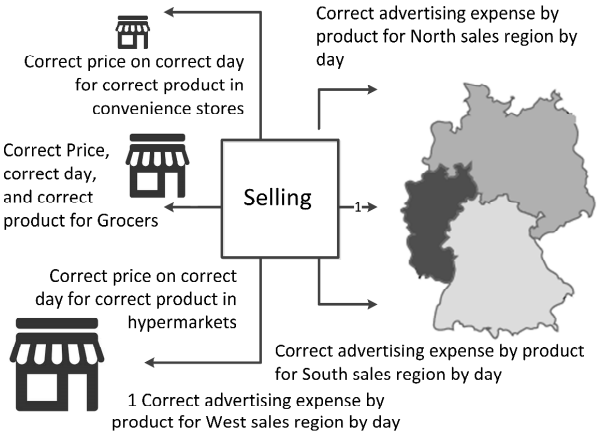

Figure 5: Optimal Flows of Information and Capital outside of Company

Business Process	Pivot Table	Fields
Planning	None	Not applicable.
Procuring	Muesli Purchase	Company (Student team), Product Name, Purchase Order Number, Purchase Order Date, Expected Delivery Time in Days, Actual Delivery Delay in Days, Receipt Date (in Quarter/Day form), Raw Material Cost
Manufacturing	Muesli Daily Stock	Company, Product Name, Product Number, Quarter, Week, Day, Quantity on Hand, Warehouse Location
Selling	Muesli Sales	Company, Customer Number, Product Number, Product Name, Price per Sales Order, Quantity Sold, Revenue per Sales Order, Distribution Channel, Sales Area Name, Quarter, Week, Day, Product Standard Cost, Warehouse Location
	Muesli Market Share	Product Name, Sales Area Name, Market Quantity Sold, Market Revenue, Company Quantity Sold, Company Revenue, Daily Quantity Sold, Daily Revenue, Week
	Product Profitability	Company, Product Name, Account (Revenue, Cost), Net Profit, Sales Area, Week
Financial Accounting	Muesli Financial	Account Number, Account Name, Financial Statement Level 1 Category (e.g., Liabilities), Financial Statement Level 2 Category (Current Liabilities), Financial Statement Level 3 Category (Bank), Credit/Debit, Euro Amount

Table 1: SAP ERPsim Reports

Business Process	Report	Information
Planning	None	Not applicable.
Procuring	Purchase Order Tracking Report	Products ordered, the quantity ordered of each, expected receipt date, whether goods have been received, and the expected payment date for each PO.
Manufacturing	Inventory Report	Amounts of raw materials, packing materials (boxes and bags), and finished goods for the day that has just transpired.
	Current Material Overview	Amount of a finished goods on hand. Amount of finished goods in process.
	Production Schedule Report	Production orders for each day. Each production batch/run includes when it was placed on the schedule, when it will start/finish, how much time it took to setup the line for that batch/run, how many units (boxes) should be produced, how many were produced, and the unit cost for each box.
	Production Cost Analysis Report	Variable and fixed costs for each product as well as the prices for each distribution channel.
	Raw Material Cost Per Order Report	Raw Materials and Costs by Production Order
Selling	Sales Order Report	Product, price, quantity sold in boxes, total revenue, customer number, and quarter, day, distribution channel, and sales area.
	Sales Summary Report	Product, quantity sold in boxes, and total revenue for each quarter and day.
	Price Market Report	Product, quantity sold, average price, every five days.
Financial Accounting	Financial	Revenue, expenses, assets, and liabilities for a quarter.

Table 2: Business Intelligence Excel Pivot Tables/Charts Reports

the next day. See Figures 2 and 3. Figures 4 and 5 indicate optimal flows with regards to internal and external flows of information and product.

SAP ERPsim Reports

See Table 1.

Excel Pivot Tables

To extend the information available to students as they play the Game as well as to facilitate drill-down analysis, the ERPsim Lab has developed a spreadsheet that can be populated with data from a specific run of a Game. See Table 2.

Data Extraction Tools

Business Process	SAP tables	ERPsim tables
Planning	None	None
Procuring	Purchase Order Header Purchase Order Detail	Purchase Order by Quarter/Day
Manufacturing- Bill of Material	Bill of Material Header Bill of Material Detail	None
Manufacturing- Production	Production Order Header Production Order Detail	Production Order by Quarter/Day
Manufacturing- Finishing	Production Confirmation Inventory Movement	None
Selling	Sales Order Header Sales Order Detail Customer	Sales Order by Quarter/Day Sales by Sales Area, Distribution Channel, and Quarter/Day Sales Area Contribution Margin by Quarter/Day
Financial Accounting	Transaction Header Transaction Detail Account Numbers Account Names	Income Statement Accounts Marketing Expense Accounts by Quarter, Day, Sales Area, and Product Balance Sheet Accounts
Materials	Material Material Type Material Location	Finished Goods by Quarter/Day
ERPsim Timing	None	Quarter/Day Occurrence Counting

Table 3: Table Data Available through ERPsim Simulation Data Extraction Tool

The Game has three related data extraction tools, which are Microsoft Database files which establish connections with SAP database instances and query data: Simulation, Cash-to-Cash, and Configuration. This paper discusses the Simulation data extraction tool (hence, Tool).

The Tool contains eighteen "vanilla" tables that exist in most SAP instances. The Tool has another eleven tables that are specific to the ERPsim games. Further, it contains fourteen queries. Table 3 describes the tables. The queries in the Tool are named clearly so are not described here. In effect the ERPsim tables accessible via the Tool largely link the SAP tables to a concept of time in the Game which is rounds and days (e.g., minutes). Further, three other Tool tables store information about Game sales while another three tables store Income Statement and Balance Sheet Account information. See Table 3.

Hypothesized Maxims and Roadmap for the Game

The Game is an excellent learning environment for non-MIS major business/management students. If the Game is used carefully, students can:

1. Develop an intuitive understanding about what a business process is.
2. Learn that business processes are interconnected.
3. Learn that business processes cannot be performed without information systems.
4. Learn that modern corporations use expansive information systems called enterprise systems.

5. Develop an appreciation for the complexity of enterprise systems.
6. Learn that even a very small decision made by one person in an organization can have significant financial effects (either positive or negative).
7. Develop intuitive understanding of the model of a manufacturing corporation (i.e., exchange money for inputs, transform those inputs into something new and valuable using people and equipment, exchange outputs for money).
8. See the inter-relationship of accounting and information systems.
9. See an inter-relationship of sales and information systems.
10. See an inter-relationship of operations management and information systems.

When using the Game as a proxy for a corporation and its use of data, the instructor asked student teams to use SAP ERP to first "operate" their organizations. Then the author asked the student teams to analyze their internal performance using data extracted from the ERPsim SAP ERP instance for their team. The author asked the students to develop an understanding of their external performance in the marketplace. He then asked the students to identify problems, develop, and implement action operational plans. Finally, the author asked the students to develop and implement strategies to dominate the marketplace. Again, students were to gather data, analyze the data, adjust strategy, and implement. The roadmap below is a result of knowledge the author gained during those runs of the Game.

As the Game is provided, it takes four class sessions of at least 60 minutes to run the game. This assumes students have already learnt the transactions and understand the four business processes and their contribution to the business cycle. Given its length and associated use of class time, the hypothesized maxims and prescription provided here is probably more appropriate as part of an introductory module of a data analytics course, thereby providing tangible motivation for students as they complete the rest of the course and tackle learning more difficult skills. Importantly, the author is interested in other experienced ERPsim instructors' thoughts about improving the hypothesized roadmap and about the provided experimental design that could be used to assess the roadmap as a whole or in parts. These maxims and the prescription are with regards to an Extended Game with pre-game capitalization, depreciation, fixed overhead, interest and loan management, and inventory storage cost features enabled, and that has eight rounds of 30 days each. The maxims identified below are ordered by degree of importance.

Hypothesized Maxims:

1. The production line runs continuously and production line setups are minimized but flexibility to change products is developed and then maintained. Thus the total amount of boxes of muesli that should be created across all production cycles (MD61 through CO41) in a round is represented by the equation below.

   $\Sigma = \alpha\beta - \gamma\delta\varepsilon$

   where

   Σ : the total amount of boxes to create in a month (e.g., 419,136)

   α : amount of boxes that can be made in a day (e.g., 21,000)

   β : the number of days in the round (e.g., 20)

   γ : the number of boxes that can be produced in an hour

   (e.g., 875, if production runs 5 days a week 24 hours a day)

   δ : the number of hours it takes to setup a new production configuration (e.g., 12)

   ε : the number of setups that are necessary in the month (e.g., 3)

   Note: If setup times (see below) are decreased via investment then 12 should be replaced with the new setup time. Note if production in a day increases past 21,000 (e.g., to 25000), that number should replace the 21,000 in the equation.

2. Price should be increased, decreased or held stable based upon the arc elasticity at the next price. If the arc elasticity is less than -1 (i.e., -1.01 to -∞) then prices should be increased. If the arc elasticity is greater than -1 (i.e., -.99 to +∞) prices should be decreased. In the case below price should not be changed, unless quantities sold are decreasing at the same offer price. (See number 2 below.) Arc elasticity should be computed thus:

   $E_p = \Delta Q / \Delta P * (P_2 - P_1)/(Q_2 - Q_1)$ (e.g., (2527 /.05) * (€1.80 – €1.75) / (21,346 – 23,873) = -1

   Note: If competitors lower their price on that product, and your quantities sold begin decreasing, you should decrease your price until your quantities sold stabilize. This price is referred to as the adjusted theoretical price below.

3. Product sales (and therefore, production), as much as possible, should occur in ranked order descending. The ranking of products in terms of selling preference should be based upon contribution margin at unit elasticity and as influenced by competitors' prices, with each product that has a higher contribution margin sold at the maximum quantity prior to moving to produce and sell another product.

   Note: if the product that has the highest contribution margin and which has a price set according to 1 and 2 above, then the next production runs should create that same product, until sales stop. Then the focus should move to the second highest contribution margin set using numbers 1 and 2 above, while monitoring for lack of sales or sales of the highest ranked product.

4. New products should be designed and assessed with regards to profitability, particularly in the .5 kg size in the distribution channel that supplies independent grocers. These new products should replace the poorest selling products that you start a game with.

5. Setup times should be decreased incrementally if sales keep increasing and price is at the adjusted theoretical price on all products, and the total profit in a round attributable to the setup time reduction is greater than its affiliated depreciation expense (.008 * the capacity improvement cost), and cash on hand is greater than the mean cash on hand over the rounds that have transpired. When the total profit – depreciation expense approaches the cost of interest on the loan or setup time has reached 2.5 hours, setup time reductions should be discontinued. An estimate of the increment to use is 1% of cash on hand. Teams should adjust from 1% based upon their risk tolerance.

   Note: If return on investment in capital for the previous falls below .0046 per month, then cash available greater than the mean cash on hand over the rounds that have transpired should be used to pay down the loan.

6. Production capacity should be increased incrementally if sales keep increasing and price is at the adjusted theoretical price, and the total profit in a round attributable to the capacity increase is greater than its affiliated depreciation expense (.008 * the capacity improvement cost), and cash on hand is greater than the mean cash on hand over the rounds that have transpired. When the total profit – depreciation expense approaches €0 production capacity improvements should be discontinued. An estimate of the increment to use is 1% of cash on hand. Teams should adjust from 1% based upon their risk tolerance.

   Note: If return on investment in capital for the previous falls below .0046 per month, then cash available greater than the mean cash on hand over the rounds that have transpired should be used to pay down the loan.

7. As prices are managed, so should marketing expenses. Marketing expenses for each product / sales area combination should maximize the effectiveness of Euros, in terms of quantity of sales increased per Euro spent on marketing in a Sales Area as measured via marketing expense elasticity. The equation below can be used to set optimal marketing spending. However, if quantity sold decreases (when price is relatively stable) and marketing expense is at the optimal amount given elasticity, then marketing spending should be eliminated for that product in that sales area.

   $$E_m = \Delta Q / \Delta M * (M_2 - M_1)/(Q_2 - Q_1)$$

Hypothesized Roadmap:

Round 1

- As per Maxim 1:
    - Do not make more product than can be made in 30 days.
    - Be sure to keep all products to be sold stocked so that you sell all products on all days and so that you have five days of each product at the end of the round.
    - Set lot size at 21,000.

- To fulfill Maxim 2:
    - Decrease prices on three products $$-F01, $$-F02, and $$-F03 in all three distribution channels from the start-of-the-game price + € .75 using decrements of € .05. If products begin selling quickly, and you will run out of product before the end of the round, change your decrement to € .025.
    - Increase prices on the other three product $$-F04, $$-F05, $$-F06 from the starting price - € .75 using increments of € .05. If products begin selling quickly, and you will run out of product before the end of the round, change your decrement to € .025.

Round 2

- As per Maxim 1:
    - Do not make more than 15 days of product in a production cycle.
    - Run business cycle twice. Run the second cycle no later than the ninth day of the round.
    - Be sure to keep all products to be sold stocked so that you sell all products on all days and so that you have five days of each product at the end of the round.
    - Set lot size at 22,000 at end of round.

- To fulfill Maxim 2:
    - Increase prices on three products $$-F01, $$-F02, and $$-F03 from the start-of-the-game price + € .75 using increments of € .05.
    - Increase prices on the other three product $$-F04, $$-F05, $$-F06 from the start-of-the-game price - € .75 using increments of € .05.

Round 3

- As per Maxim 1:
    - Do not make more than ten days of product in a production cycle.
    - Run the production cycle thrice. Run the second business cycle on fourth day of the round and the third no later than the fourteenth day of the round.
    - Be sure to keep all products to be sold stocked so that you sell all products on all days and so that you have five days of each product at the end of the round.
    - Set lot size at 23,000 at end of round.

- As per Maxim 2, compute arc elasticity for prices on the six products and price according to the theoretically correct price. Move to adjusted theoretically correct price if appropriate.

- As per Maxim 3, rank products by profitability.
- As per Maxim 4:
    - Design products to replace the products ranked 5th and 6th most profitable.
    - Eliminate inventory of products ranked 5 and 6 as quickly as possible while still making the most profit possible on each sale, so that the products you are designing can be sold in the next round.

Round 4

- As per Maxim 1:
    - Do not make more than 8 days of product in a production cycle.
    - Run the production cycle four times. Run the second business cycle on fourth day of the round and the third no later than the ninth day of the round, and the fourth no later than the fourteenth of the month.
    - Set lot size at 24,000 at end of round.
- As per Maxim 3, re-rank all six products.
- As per Maxim 4:
    - Manufacture the newly designed products in first business cycle.
    - Sell off least profitable product so that you are making the most profit possible as you sell it off. (Use a price is the highest possible where you expect to sell off all of the product but be sure product is out of stock by the end of round.)
    - Design new product.

Round 5

- As per Maxim 1:
    - Do not make more than 8 days of product in a production cycle.
    - Run the production cycle four times. Run the second business cycle on fourth day of the round and the third no later than the ninth day of the round, and the fourth no later than the fourteenth of the month.
    - Set lot size at 25,000 at end of round.
- As per Maxim 3:
    - Re-rank all six products.
- As per Maxim 4,
    - Manufacture the newly designed product in first production cycle.
    - Sell off least profitable product so that you are making the most profit possible as you sell it off. (Use a price is the highest possible where you expect to sell off all the inventory but be sure product is out of stock by the end of round.)
    - Design new product.
- As per Maxim 5, invest in setup time reductions or loan payment daily.
- To fulfill Maxim 7, increase marketing expenses on .5 kg products in the West and South sales regions in areas at increments of € 5 from € 25.

Round 6

- As per Maxim 1:
  - Do not make more than 8 days of product in a production cycle.
  - Run the production cycle four times. Run the second business cycle on fourth day of the round and the third no later than the ninth day of the round, and the fourth no later than the fourteenth of the month.
  - Set lot size at 25,000 at end of round.
- As per Maxim 3:
  - Re-rank all six products.
- As per Maxim 4,
  - Manufacture the newly designed product in first production cycle.
  - Sell off least profitable product so that you are making the most profit possible as you sell it off. (Use a price is the highest possible where you expect to sell off all the inventory but be sure product is out of stock by the end of round.)
  - Design new product.
- As per Maxim 6, invest in capacity increases or loan payment daily.
- To fulfill Maxim 7, decrease marketing expenses on .5 kg products in the West and South sales regions in areas at increments of € 5 from € 175.

Round 7

- As per Maxim 1:
  - Do not make more than 8 days of product in a production cycle.
  - Run the production cycle four times. Run the second business cycle on fourth day of the round and the third no later than the ninth day of the round, and the fourth no later than the fourteenth of the month.
  - Set lot size at 25,000 at end of round.
- As per Maxim 3:
  - Re-rank all six products.
- As per Maxim 4,
  - Manufacture the newly designed product in first production cycle.
  - Sell off least profitable product so that you are making the most profit possible as you sell it off. (Use a price is the highest possible where you expect to sell off all the inventory but be sure product is out of stock by the end of round.)
  - Design new product.
- As per Maxims 5 and 6, invest in capacity increases, setup time reductions, or loan payment daily.
- As per Maxim 7, compute marketing expense elasticities and set Marketing expenses accordingly.

Round 8

Follow Maxims 1, 3, 4, 5, and 6.

Research Plan

This is pedagogical action research seeking to help instructors use ERPsim more effectively. It seeks to begin to argue for a detailed roadmap for using ERPsim in the classroom by experimentally showing the difference between the learning outcomes achieved when using maxims and a prescribed approach as compared to not. The research question is: Will students that are taught using the maxims and the prescription above (under the auspices of the hypotheses) understand how information systems support business processes better?

One experimenter/instructor will concurrently teach two sections with at least thirty students in each section. One course will use the maxims (treatment). The other course will not (control). Each student will be asked the following quantitative and qualitative questions during the weeks directly before and after the simulation using an online survey given in class. The experimenter/instructor and a proctor will assure that students are not using the Internet as research tools as they complete the survey either via their laptops or phones. Students will not be remunerated for the time/effort they spend on the survey. The survey and the experiment will be approved by the Institute Review Board.

1. To what degree are information systems valuable for organizations?
2. To what degree are information systems helpful for companies?
3. To what degree are information systems useful to managers and employees?
4. To what degree are information systems necessary to support business processes?
5. To what degree are information systems relevant to businesses?1.
6. Why is a business process important?
7. How do information systems enable business processes?

Questions numbered 1 through 5 will be answerable via a six-point Likert scale (no neutral response). If there are 35 to 40 students in each section the author will review for normality using bar/boxplot/stem-leaf charts, analyzing skewedness and kurtosis, as well as the Shapiro-Wilk (1965) and Anderson-Darling (1954) tests. If normality is suggested, the author will compute, compare, and report parametric statistics (e.g., $\bar{x}$, σ, t, r, X^2). The non-parametric ordinal tests applied will be the Spearman rank-order coefficient ρ, Mann-Whitney U, and the Wilcoxon signed rank and rank sum tests.

The data from the Likert questions will also be dichotomized (lower three scale values vs. higher three scale values). The binomial test will be applied. The pre/post treatment/control contingency table will be analyzed using Fisher's exact test, Φ, and Cramer's V. Questions 6 and 7 will be analyzed using the codes below. The dichotomous nominal data will be studied as just described. Inter-coder agreement will be reported using Cohen's Kappa, Krippendorf's Alpha, and Kendall's W.

Question 6: (Why is a business process important?)

- Code 1. Did the student mention that a business process helps an organization provide value to the customer/patron?
- Code 2. Did the student mention that a business process helps an organization make a profit (or more revenue than expenses)?
- Code 3. Did the student mention that a business process helps an organization (or person) do something that is important for the business?
- Code 4. Did the student mention that business process frequently provides an input to or is dependent upon another business process?

Question 7: (How do information systems enable business processes?)

- Code 5. Did the student mention that information systems organize large amounts of data?
- Code 6. Did the student mention that information systems allow employees to do work in the business process that they would not be able to do otherwise?

- Code 7. Did the student mention that information systems help employees do much more work than they could otherwise?
- Code 8. Did the student mention that information systems allow employees to assess and improve their performance?

Conclusion

This paper provides readers not familiar with the ERPsim games a simple overview. It provides a detailed description of the ERPsim Manufacturing Game. Further, it provides a detailed prescription (a set of maxims and a roadmap) for using the simulation. A research plan is framed to answer the research question: "Will students that are taught using the maxims and the roadmap above understand how information systems support business processes better?" If the experiment begins to show that the maxims and roadmap are efficacious, the researcher's contribution will be pedagogy that instructors can apply with non-MIS students to help these students understand the value of MIS, and prospectively, to help these same students engage their MIS course fully.

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