

**Financial Statements Analysis for Managers Using ERP Software:  
A Simulation based Approach using ERP-Sim**

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Ohannes G. Paskelian\*  
Assistant Professor of Finance  
University of Houston Downtown  
Email: [paskeliano@uhd.edu](mailto:paskeliano@uhd.edu)  
713 221-8204

Peter DeVries  
Associate Professor of CIS  
University of Houston Downtown  
Email: [Peter@uhd.edu](mailto:Peter@uhd.edu)  
713 221-8238

Leonie Karkoviata  
Lecturer of Economics  
University of Houston Downtown  
Email: [karkoviatal@uhd.edu](mailto:karkoviatal@uhd.edu)  
713 221-8576

**COB** Dean: Donald Bates

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\* Corresponding Author

## ABSTRACT

In this paper, we examine how enterprise resource planning (ERP) based simulation approach can be used to teach financial statements analysis for managers. We also examine and evaluate the effectiveness of teaching financial statements analysis in a dynamic simulated environment using ERP-Sim.

The ERPSim is a simulation game, designed by faculty at HEC Montreal, and runs on the SAP platform. The purpose of the game is to simulate a business and its different processes to enable the students to learn by making strategic business decisions. Students are expected to work in collaborative teams of four students with each team operating a firm. Each team will interact with customers and suppliers by sending and receiving orders, delivering products, determining pricing strategy, cash flows, credit management, using business intelligence and reporting in successive quarters and completing cash-to-cash cycle. The game relies on the information, transactions and reports provided by SAP, an industry-standard enterprise resource planning (ERP) system.

Financial statements analysis is an integral and important function of any manager's job. A manager needs to analyze effectively and efficiently the company's business environment, its strategies, and its financial position and performance.

In this paper we provide a novel approach to teaching financial statements by exposing students to a complex simulated business environment that is the closest thing to using SAP in the real-world.

### 1) Introduction

Business Schools around the world are prioritizing the integration of real life examples, case studies and technology into their curriculum. This integration of different instructional methodologies is not without obstacles. One of the major difficulties is the time and effort required to create and update course material incorporating changing technologies.

Another fundamental aspect that professional business and industry organizations, the American Institute of CPAs (AICPA) and the Chartered Financial Analysts Institute (CFA) among others, emphasize is the integration and recognition of the importance of financial statements and financial statements analysis in business curriculums. Financial statements are dubbed as being the language of business. Therefore, it is imperative for any business graduate to have a strong understanding of financial statements and the ability to analyze a business through its financial statements.

Innovative technology in business education allows students to think actively about information, make choices, and learn skills better than in typical teacher-led classes. Moreover, innovative technology as a learning tool helps students to define their goals, make decisions, and evaluate progress. The use of innovative technology makes students active recipients of information transmitted by a teacher, textbook, or seminar. Thus, the teacher's role changes from being the center of attention as the dispenser of information to a facilitator who sets learning goals and provides guidelines and resources (Stallings, 1997).

SAP is a worldwide leader in Enterprise Resource Planning (ERP) software. Headquartered in Germany, SAP's ERP system is used by a large number of the Fortune 500 companies to integrate their business processes with their information needs. SAP allows organizations to seamlessly integrate their operational and functional units and provides management the capability to monitor and control the operations on real-time basis. One of the most important characteristics of SAP's ERP software is its

capability to customize and integrate numerous business processes allowing organizations to configure the ERP system to satisfy their unique needs without major changes in the core ERP system (Hejazi et al., 2003).

In this paper, we examine the use of ERP-Sim, innovative simulation software developed by researchers at HEC Montreal to teach financial statements analysis for undergraduate business students. The ERP-Sim is a team-based simulation software that allows each team to make decisions related to customers and suppliers by forecasting the team's expected sales for a given period, receiving customer orders, determining pricing strategy, analyzing the cash flows and the expected need for financing, arranging for credit if necessary, using business intelligence and reporting in successive quarters to complete the cash-to-cash cycle. The simulation relies on the information, transactions and reports provided by SAP, an industry-standard enterprise resource planning (ERP) system (Seethamraju, 2008).

The remainder of the paper is organized as follows: Section 2 is the literature review of previous studies related to innovative technology usage in business schools. Section 3 discusses the ERP-Simulation software. Section 4 covers the financial statements analysis project using ERP-Sim. Finally, section 5 concludes the paper and presents some of the student comments and suggestions.

## **2) Literature Review**

Numerous studies address the use of technology in the classroom. For example, Anderson, Getz, and Siegfried (1997) state that if institutions of higher education do not adopt innovations in a timely manner, their productivity will stagnate. Based on a survey of 238 U.S. colleges and universities, they find that innovations in libraries and computing have occurred twice as rapidly as in other educational settings. They conclude that using innovative teaching tools is crucial to the strategic and economic growth of such institutions.

Fuchs and Wobmann (2004) find a positive relation between using computers in education and student achievement. However, they do not distinguish between the types of "computer presence" as teaching tools: computer-based presentation and computer-based instruction. Computer-based presentation involves a multimedia presentation or using computers to enhance the conventional classroom delivery method and to make it more appealing. Computer-based instruction diminishes the traditional role of the teacher in favor of the computer.

Euliano, Lefebvre, and Principe (1998) maintain that computer-based presentation alone does not improve the learning environment but serves as a faster and more accurate way to present material. They assert that this type of learning environment increases the distance between the professor and students by making students more passive thus hindering understanding and retention. Yet, Diwan et al. (2001) find that exposure to Internet-based learning enhances the learning environment and increases student enjoyment.

In response to this continued criticism, business schools have been implementing several pedagogical strategies such as capstone project, integrated case studies, team teaching, information technologies/tools (Seethamraju, 2007) and developed learning environments such as workplace learning, experiential learning, experimental learning, collaborative learning, problem-based learning, blended learning and simulation games (Van Baalen and Moratis, 2001). The need to focus on learning outcomes that incorporate industry-relevant skills is forcing business schools to develop innovative, new and effective teaching and learning methods and pedagogy and simulation is one of them.

One such innovative learning tool is the ERP-Sim game developed by a team of academics at HEC Montreal. It uses state of the art Enterprise Resource Planning (ERP) software to facilitate a simulation game. In the following paragraph we present the major characteristics of this simulation game and outline how it can be used for a financial analysis course.

### **3) ERP – Simulation Game**

The ERP-Sim is a simulation environment on the SAP ERP software designed by a research team led by Pierre-Majorique Léger and Jacques Robert of HEC Montreal. The simulation game is best implemented when students are divided into teams of 4 to 5 students, with each team operating the firm and making the strategic and financial decisions.

The simulation game has several variations that can be used depending on the learning outcomes outlined by the instructor. The distribution game, which is free of charge, is the most simple version of the simulation game; teams do not have the full capability to make decisions and changes in the game. The manufacturing game and the extended manufacturing game are more sophisticated versions of the simulation game, where students have the ability to perform more decisions and implement different strategies. Recently, ERP-Sim researchers introduced a fourth simulation game, the ERP-Sim logistics game.

The common characteristic of the simulation can be summarized as follows: each team will make decisions related to customers and suppliers by forecasting an expected sales and receiving orders, delivering the products, determining pricing strategy, analyzing the cash flows and the expected need for cash, arranging for credit if necessary, using business intelligence and reporting in successive quarters and completing cash-to-cash cycle. The game relies on the information, transactions and reports provided by SAP, an industry-standard enterprise resource planning (ERP) system (Seethamraju, 2008).

The distribution game consists of selling bottled water in 3 flavors and 2 different sizes. The product is already manufactured, so the teams only make decisions regarding their expected sales and forecast the quantities and types of each bottled water they need to purchase. The second decision teams can make is the pricing strategy. Each team can decide the selling price of each bottled water, however, for this simulation game, the purchase price is the same for every team in the game.

The manufacturing game consists of the manufacturing and distribution of muesli cereals. Each company can produce up to six muesli different cereals, each with its own distinct flavor. The six different varieties are: Muesli Original, Nuts Muesli, Strawberry Muesli, Blueberry Muesli, Raisins Muesli and Mixed Fruit Muesli. The raw materials to produce the six varieties are wheat flakes, oats, strawberries, blueberries, raisins and nuts. Each team can create its own recipes for each of the flavors in their product line. In addition, cardboard boxes and plastic bags are needed to package the cereals. All grains are bought on a spot market, thus during the simulation the price of the raw materials can fluctuate based on their availability and market prices (Leger, 2006).

The simulation game is set up in Germany. Each company tries to sell their products in the German market. There are three types of distribution channels that companies can accommodate - independent grocers, grocery chains, and hypermarkets. The buying behavior of the retailer is driven by end customer needs and may be influenced to various degrees by prices and marketing investments.

Each team uses a real-life Enterprise Resource Planning tool, SAP R/3, to run their businesses and make decisions. The business processes incorporated in the simulation are actual SAP processes: the material

management (MM), production planning (PP), sales and distribution (SD), financial accounting (FI), cost accounting (CO) and business intelligence (BW) modules.

The simulation has been developed in such a way that participants do not have prior experience with SAP R/3 and do not need to configure the system in advance. The simulation uses a fictional company already configured in R/3: IDES (Internet Demonstration and Evaluation System) (Leger, 2006).

The simulation can be run over successive business quarters during which plants receive orders, procure the necessary materials and produce the goods before shipping them to the customer and billing the customer for them. Within each business cycle, each team has to make several business decisions that will influence its profitability. Teams can decide which market segment they wish to target and determine their pricing strategy and the level of marketing investments. These decisions are uploaded into the simulation software, which determines, based on a market algorithm, the number of orders that each plant will receive. This software generates a script that is imported into SAP R/3, automatically triggering the sales process associated with each order obtained. After every business cycle, students must use the ERP system to analyze their financial situation (Leger, 2006).

Using standard SAP reports, teams can analyze their financial statements and perform ratio analysis on quarterly basis to determine their profitability, the operating efficiency and liquidity. Also, teams can decide whether their pricing and marketing strategy is optimal or needs to be changed for the next quarter. Finally, teams have to keep track of their cash flow with a standard report in the SAP treasury module. Should they run out of cash, they have to negotiate a line of credit with the bank and pay interest on the loan (Leger, 2006)

#### **4) Description of Financial Statements Analysis Project**

The primary goal of the project is to develop students' technical, analytical and critical thinking skills; in addition, the projects enhance their ability to work in teams. In the different steps of the project, students are required to: analyze key aspects of a company's financial statements as generated by the SAP software while playing the ERP-Simulation game; evaluate their company's financial decisions; discuss non-financial items that affect a company's ability to be successful; compare their company's performance to the other company's playing the game; and make and defend strategic decisions.

In addition, the project also develops the students' ability to work as a group and interact with each other to make strategic decisions that affect the profitability of their company. In incorporating the project of financial statements analysis with ERP simulation game, we believe that we have created a solid pedagogical tool that incorporates and assesses the impact of business decision making in the company's accounting statements.

Along with emphasizing the importance of financial statements analysis and strategic business decision-making ability of the students, the project incorporates SAP based simulation software that in itself gives the students an edge in understanding integrated business processes.

##### *Project Requirements*

The students divided into teams of four run their own company and make strategic decisions over three quarters. Each quarter represents actual 30 day time period, which is simulated in the game over 20-minutes period.

The strategic decisions that the students can make affecting the financial position and statements of their company are the following:

1. Product Planning and Forecasting
2. Investing in fixed assets
3. Product Pricing
4. Advertising

#### *Product Planning and Forecasting*

In the simulation game, each company can produce up to six different types of muesli cereal. Each team can decide the types of cereals they will produce and can specify the composition of the cereal; also, each team can decide the box size of the cereals.

In deciding the type and box size of the cereals, each team can strategize itself for a particular niche market. In addition, this decision will also affect the investment required to purchase the raw material that will be needed to produce the cereals. In order to place the order for the raw materials and start the production process, each team needs to forecast the expected demand for each cereal box planned.

The forecasting process is very important because the company cannot sell any product unless it has it in its inventory. Also, the forecasting will affect the liquidity of the company and its cash position because the company has to pay its suppliers regardless they sell the products or not.

#### *Investing in fixed assets*

Each company has a fixed capacity to produce a certain amount of cereal boxes per day. The fixed capacity can create bottlenecks in the production process and does not give any strategic advantage to the teams playing the simulation game.

Each team can decide whether to make additional investment in the production facilities. This decision entails two aspects: either investing in the production capacity thus increasing the amount of cereal boxes produced per day or decreasing the setup time of the production process. The setup time is the amount of idle time where the production is halted when the company switches from one type of cereal to another.

The decision to increase capacity or reduce setup time will affect the financial statements of the company by reducing the cash balance or requiring the company to borrow additional funds from the bank. Also, this decision will increase the fixed assets that the company owns.

#### *Product Pricing*

The most important aspect of the simulation game is to price each type of cereal box that the company has for sale. The competitiveness and profitability of each company depends on the pricing strategy that each team uses to try to gain the largest market share possible.

Each team can use the cost estimating capabilities of the SAP system to estimate each product's costs based on the current value of the raw material, labor and overhead expenses.

Also, every 5<sup>th</sup> day during the simulation, the simulation game will produce average market prices for each product available in the market. Teams can use the average market prices to make adjustments to their pricing strategy.

### Advertising

The last strategy that each team can use to increase their sales is the marketing option. Each team can decide if and how much they can spend on marketing and advertising. Also, they can decide the geographical area where they can advertise.

### Simulation Results Analysis

To illustrate the functionality of the simulation game and its pedagogical value, in particular for financial statements analysis purpose, the actual outputs from the simulation is provided below.

**Figure 1: A typical company's financial statement at the beginning of the game**

The screenshot shows the SAP Financial Statements interface for an ERP simulation game. The window title is 'Financial Statements - ERPsim Game'. The interface includes a menu bar (System, Help), a toolbar with various icons, and a main table area. The table displays a balance sheet with the following data:

F.S. item/account	Tot.rpt.pr	tot.cmp.pr	Abs. diff.
Balance Sheet	0.00	0.00	0.00
Assets	500,000.00	0.00	500,000.00
Current assets	250,000.00	0.00	250,000.00
113300 Bank Cash Account	146,060.00	0.00	146,060.00
792000 Finished goods	103,940.00	0.00	103,940.00
Long-term assets	250,000.00	0.00	250,000.00
011000 Machinery and equipment	250,000.00	0.00	250,000.00
Liabilities and Owners' Equity	500,000.00-	0.00	500,000.00-
Equity	500,000.00-	0.00	500,000.00-
Shareholders Equity	500,000.00-	0.00	500,000.00-
Retained Earnings	0.00	0.00	0.00

As we can see in figure 1, each team will start the game with a certain amount of cash in their cash account and a certain amount of inventory. The values of the fixed assets reflect the value of the plant and equipment that the company owns at the beginning of the game. A depreciation expense can be allowed by the instructor which will decrease the value of fixed assets over the life of the simulation.

**Figure 2: Figure 1: A typical company's financial statement at the end of the first quarter of the game**

The screenshot displays three SAP Financial Statements for Company A, Ledger 0L, as of 2011-12-11. The interface includes a menu bar (List, Edit, Goto, System, Help) and a toolbar with various icons. The data is presented in three tables, each with columns for Component Code, Business Area, Texts, Reporting period (01.2011-16.2011), Comparison period (01.2010-16.2010), Absolute difference, Relative difference, and Summation level.

C Comp F code	Bus. area	Texts	Reporting period (01.2011-16.2011)	Comparison period (01.2010-16.2010)	Absolute difference	Rel dif	Sumtn level
AA	113300	Bank Cash Account	150,711.35	0.00	150,711.35		
AA	140000	Customers - Domestic Receivables 1	43,472.51	0.00	43,472.51		
AA	792000	Finished goods	10,364,797.86	0.00	10,364,797.86		
			10,558,981.72	0.00	10,558,981.72		*3*
AA	011000	Machinery and equipment	250,000.00	0.00	250,000.00		
			250,000.00	0.00	250,000.00		*3*
			10,808,981.72	0.00	10,808,981.72		*2*
AA	160000	Accounts payable-domestic	10,300,839.72-	0.00	10,300,839.72-		
			10,300,839.72-	0.00	10,300,839.72-		*4*
			10,300,839.72-	0.00	10,300,839.72-		*3*
AA	070000	Common stock	500,000.00-	0.00	500,000.00-		
			500,000.00-	0.00	500,000.00-		*4*
			0.00	0.00	0.00		*5*
			8,142.00-	0.00	8,142.00-		*5*
			8,142.00-	0.00	8,142.00-		*4*
			508,142.00-	0.00	508,142.00-		*3*
			10,808,981.72-	0.00	10,808,981.72-		*2*
			0.00	0.00	0.00		*1*

  

C Comp F code	Bus. area	Texts	Reporting period (01.2011-16.2011)	Comparison period (01.2010-16.2010)	Absolute difference	Rel dif	Sumtn level
AA	800000	Sales revenues - domestic	48,123.86-	0.00	48,123.86-		
			48,123.86-	0.00	48,123.86-		*2*
AA	893010	Inventory change - sales	39,981.86	0.00	39,981.86		
			39,981.86	0.00	39,981.86		*2*
			8,142.00-	0.00	8,142.00-		*1*

Figure 2 illustrates the financial statements of the company at the end of the first quarter. The change in each of the accounts can be used to analyze the impact of each of the strategic decisions made by each team playing the simulation game. Also, the instructor can provide the total sales and revenue numbers per team to estimate each team's market share.

Similar financial outputs are available at the end of each quarter. Using the financial statements, a team can perform financial analysis by calculating their profitability, liquidity and operating efficiency ratios and comparing them over each quarter. The importance of this ratio analysis lies in the fact that each strategic decision made by the team, such as pricing strategy or advertising strategy, can be analyzed



using its appropriate ratio and compared to the other firms to assess the impact of each team's strategy during the game.

## 5) Conclusions

We used the simulation during two academic semesters in the same course, where the majority of the students had little or no experience with ERP systems. Based on our discussions with the students and their written comments, we can assert the following:

- Students who played the simulation game appear to have better assimilated the ERP concepts and the integration of the business processes.
- Students were able to analyze the financial statements more thoroughly and be able to interpret the ratios and link them to their strategic choices.
- The simulation approach seemed to be more engaging and allowed to students to work closely with each other in a real team approach.
- The simulation provided the students an opportunity to run a business and make decisions affecting their company's profitability and position in the market.

Overall, we feel that the simulation approach is an effective pedagogical tool for teaching financial statements analysis. This simulation provided the students a simulated real company to run and make strategic choices; further students were able to analyze and assess the impact of each of their strategic choices on the company's financial statements and profitability.

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