Teaching undergraduate business IT:
Using ERPSIM to provide a real-world perspective

John B. Isett
University of Tampa

Raymond Papp
University of Tampa

ABSTRACT

The authors draw on their years of experience introducing undergraduate and graduate students to the world of Information Technology (IT) including the more recent addition of ERPsim.   A brief discussion of important IT concepts for business is presented to insure a common vocabulary. ERPsim is then described as supporting an investigation of these topics drawing on specific examples from ERPsim gameplay.   Most importantly, a pedagogical approach is outlined with illustrative ERPsim interaction and resulting Excel spreadsheet data analysis examples to bring home the practical application of ERPsim to the introduction of business IT.

Keywords: business IT, teaching, ERP, pedagogy, business intelligence, peer evaluation
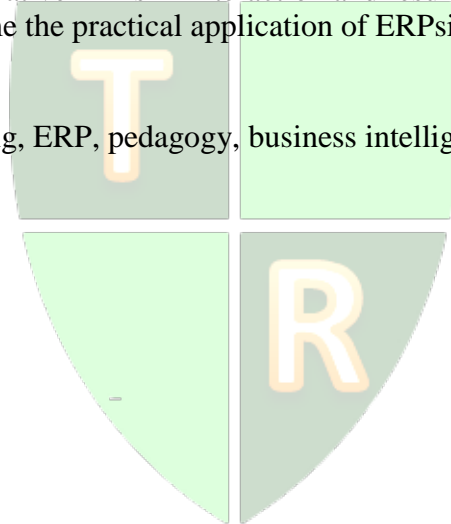
INTRODUCTION

Undergraduate Business IT[1]

The emphasis on technology and its use in business has matured in the last ten to fifteen years—ever since the infamous "tech wreck" at the turn of the century. The use of spreadsheets was, and still is, an important tool in business IT but its technical application is becoming infused with the importance of improving business processes and supply chains, not just the largely routine calculation of P&L or Balance Sheet. McKinney and Kroenke offer insight into this maturation and its impact on teaching business IT in their widely adopted MIS textbook family (2015).

One thing these authors have noted over the years is a declining interest in understanding the inherently powerful analysis capabilities of Excel--to include the use of pivot tables and charting. Most incoming college students have used Excel to create simple spreadsheets and accompanying charts, but few have had the chance to tie these to important business intelligence (BI) operations. In order to perform effective BI, a strong concept of business operations is needed for the students and thus the emphasis on business processes and supply chain relationships. The authors have found a very effective tool to do this is through the use of ERPsim.

ERPsim

The result of many years of development by HEC Montreal, ERPsim is offered to participating universities and colleges in the US through two university competency centers: University of Wisconsin, Milwaukee and California State University, Chico. (Leger, et.al., 2013)

At the risk of sounding like a promoter, ERPsim is based on the number one ERP information system in the world—SAP. This is both a great positive and a great negative from the perspective of the students—and faculty, for that matter. As the number one ERP, SAP is enthusiastically received by the students who realize they will almost certainly be using SAP in their future business employment but, on the other hand, SAP is extremely complex and offers overwhelmingly powerful alternatives guaranteed to confuse even the brightest student. HEC has done an excellent job of customizing the use of SAP to support a sophisticated business simulation—ERPsim.

The authors will provide a link between teaching business IT and using ERPsim by describing a walkthrough of using ERPsim and then analyzing some of the collected data with the use of an Excel spreadsheet. The steps are numerous, but if followed, guarantee a thorough opportunity to discuss business and the use of Excel to perform basic business intelligence analysis.

At this moment an aside is in order. The reader familiar with SAP knows there is a built-in business intelligence analysis tool. In fact, this tool is introduced as part of an exercise in Chapter 11 of the McKinney and Kroenke textbook. However powerful and useful this feature, it still does not introduce the student to the use of the ubiquitous spreadsheet as part of their

---

[1] The authors will abstain from entering an esoteric discussion of whether one should be using the term IT or IS (Information Systems). From the perspective of the undergraduate student, it is all "computers" regardless of the terminology used. That said, the distinction is made by the authors in their classrooms and the students are encouraged to remember the difference--but the terms are still often interchanged.

business IT introduction. Therefore, this pedagogical approach presents the lesson of both using ERPsim to generate business data and using basic IT to perform business intelligence.

GETTING READY AND COMPLETING THE GAMEPLAY

ERPsim Considerations

There are myriad steps in preparing for ERPsim gameplay, not the least of which are assigning students to team membership (three to six students per team with a preferred total of seven teams), establishing ERPsim Userids (one per student), and configuring the game client—in this pedagogical example, the Extended Manufacturing client is used as it produces a rich set of business data for student analysis.

These authors then spend between one and two classroom hours introducing the concept of ERP, business simulation, and, specifically, introducing ERPsim commands and the idea of multi-round gameplay (five to eight rounds provide good experience for the students—and good data sets for analysis). Figure 1 illustrates an animated PowerPoint used to introduce the commands that are used in the extended manufacturing game and how they relate to the order of gameplay.

Once the preparatory work is complete the actual gameplay may begin. It is one author's approach to use two "practice" rounds where students can learn and make mistakes without penalties then start the five to eight rounds of actual gameplay. The other author prefers to use a lock-step approach for the first round and a stop-and-go for round two as introduction followed by the remaining rounds in live gameplay. Either approach can take an additional four to five hours of class time.
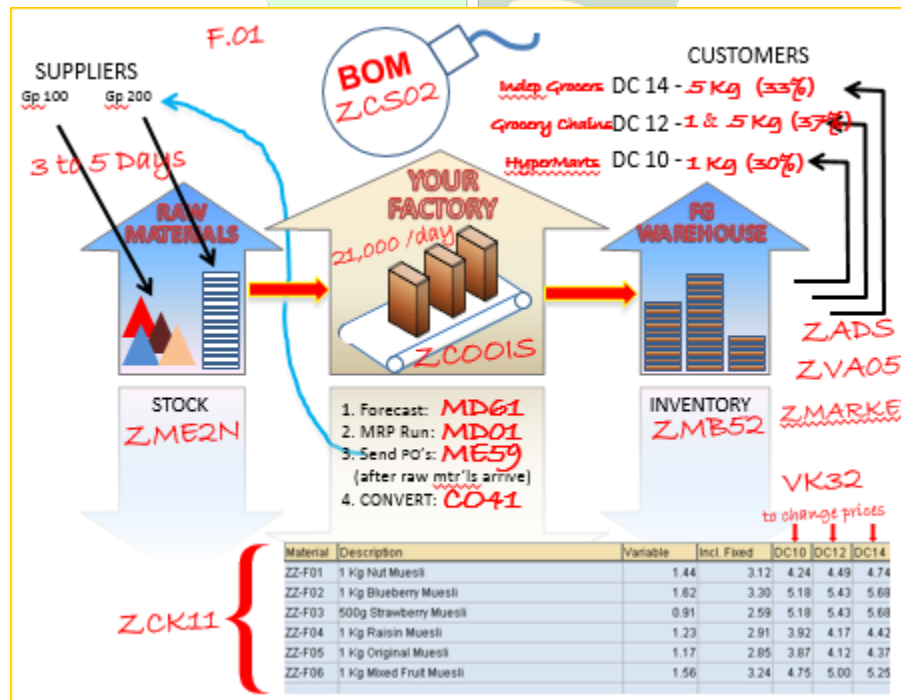

Figure 1. ERPsim Gameplay Summary—An Animated PowerPoint Presentation

Excel Considerations

An introduction to Excel pivot tables, pivot charts, and charting in-general, is important and must be completed either immediately before or just-after conducting ERPsim gameplay in order that the value of business intelligence using Excel might have a more tangible meaning to the students. That said, this is still an elusive concept for many students to grasp and for some it is not until after the assignment is completed that full appreciation for the power of spreadsheet data analysis becomes evident. (A bit late for a better grade, but certainly beneficial for future application on the job.)

Gameplay: Generating the Business Intelligence Data

Though most data to be used in BI analysis will be available after ERPsim gameplay is finished, i.e., five to eight rounds have been completed, there is a cumulative "results" report that must be captured at the end of each round, or performance for individual rounds cannot be easily determined. In other words, at the end of each round, the instructor should screen-capture the "Results" administration screen and save that to an individual file or somehow set aside for easy retrieval. These authors capture the "Results" image and post as a course announcement so it is immediately available to all students. An example results table is shown in Figure 2 and is called "Financial Statements" by the system. (It is cumulative for the indicated round and all preceding rounds. In case you're wondering, Team H is the instructor team and he's not doing so well.)

It is important to capture this "Financial Statements" image after each round. If a round is missed it is difficult but not impossible to recreate a single missing round. If consecutive rounds are not captured then it is practically impossible to recreate the data. But all is not lost as there is much additional data from ERPsim that may be analyzed.

FINANCIAL STATEMENTS - R3

TEAM	CREDIT RATINGS	INTEREST RATE (%)	RANK	CUMULATIVE NET INCOME	TOTAL SALES	GROSS MARGIN (%)	NET MARGIN (%)	ROE (%)	ROA (%)	D/E (%)	MKTG/S (%)	ROUND NET INCOME	ROUND PRODUCTIVITY	ROUND SALES PER TEAM
A	AAA	5.000	5	1,592,158.17	5,532,664.76	55.202	28.777	16.599	7.280	128.015	2.096	779,065.23	90.318	3,023,749.96
B	AAA	5.000	4	1,637,589.86	5,429,426.64	58.601	30.161	16.992	7.568	124.512	3.648	156,763.63	64.926	1,456,864.83
C	AAA	5.000	1	2,175,146.95	6,159,390.02	61.220	35.314	21.377	9.599	122.702	4.052	980,170.84	94.842	2,900,377.70
D	AAA	5.000	3	1,843,763.62	5,257,207.70	62.044	35.071	18.730	8.283	126.119	1.370	1,082,671.87	96.666	2,713,929.11
E	AAA	5.000	2	2,034,400.42	5,677,931.64	62.245	35.830	20.274	9.093	122.972	2.709	931,901.64	98.333	2,180,725.59
F	AAA	5.000	7	1,346,214.14	4,480,441.93	64.575	30.046	14.404	6.229	131.246	4.486	736,293.24	95.000	2,251,521.83
H	AAA	5.000	6	1,432,233.86	3,032,266.27	94.740	47.233	15.184	6.683	127.223	3.116	535,933.86	98.333	814,351.92

Figure 2. Example "Results" Table from ERPsim Administration Screen

AN APPROACH TO THE COLLECTION AND ANALYSIS OF ERPSIM DATA

Identifying and Preparing the Useful Business Raw Data

At the end of regular ERPsim gameplay, there should now be several valuable data sets available for BI analysis. Some of this data has already been gathered, and some must be extracted by running selected commands as an administrator and exporting that data in spreadsheet format. (Figure 4 below illustrates the use of this export feature.) The following is a list of the data sets the author's prepare for their students' IT assignment in business intelligence.

Financial Statements – Although captured only as images at the end of each round, the useful data for analysis is easily transferred manually to a spreadsheet by the students. No additional effort on the instructor's part is required here. (See Figure 2 as a reminder.)

Profit and Loss – As administrator, one is able to view an HTML version for all teams using the "Banker" view, then copy and paste into an Excel worksheet for student use. An example of the screen is shown in Figure 3.
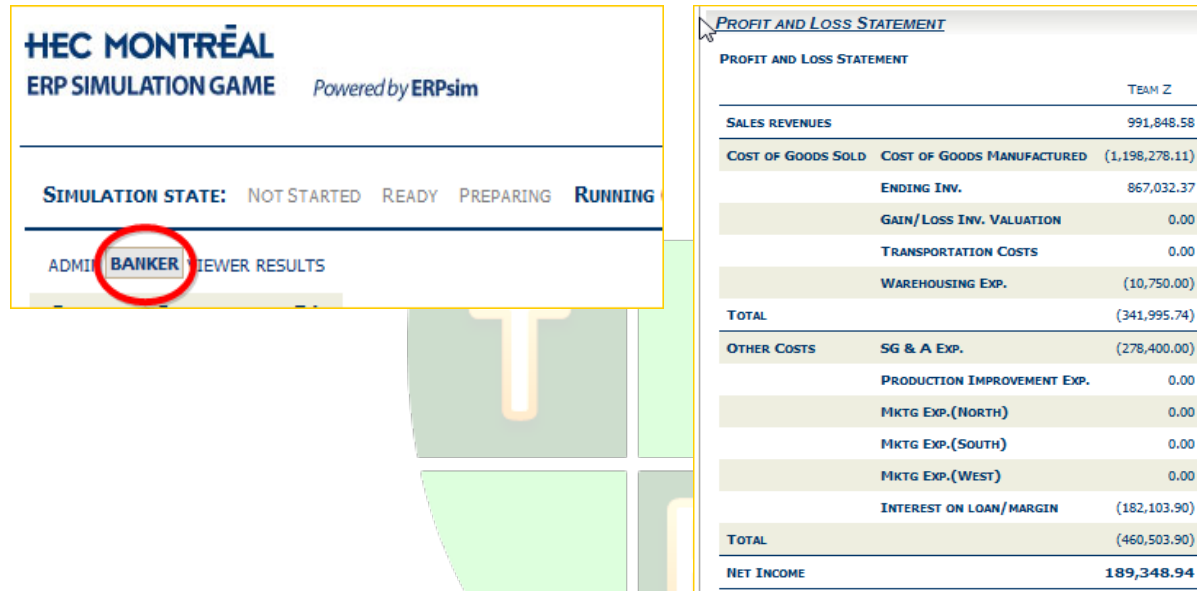

Figure 3. Administrator's view of Banker Selection and HTML P&L

Balance Sheet – Similarly to capturing the P&L, the administrator is able to view an HTML version for all teams using the "Banker" view, then copy and paste into an Excel worksheet for student use.

Sales Report Data – When logged-in to ERPsim as administrator, the command ZVA05 will display all sales data for each team on each day of the simulation (30 days per round of gameplay). This data may be extracted by selecting the icon shown in Figure 4 followed by selecting "Spreadsheet" for the format and identifying Excel .xlsx as the preferred export. This is a very large data set (although not Big Data) but easily analyzed with correct application of spreadsheet tools. [2]

---

[2] A note may be in order for export of certain data sets using the ".xlsx" format. Some ERPsim data may export with values such as "2/15" in certain columns where this means "Round 2/Day 15". This will be interpreted by Excel as a calendar date thinking that it stands for February 15 of the current year! One way to avoid this is to export the data in .xls format and then ODBC import into Excel, identifying the offending column as data type "text." If the preceding makes little sense to the reader, then perhaps just deleting the offending column will be an easier fix!

Figure 4. Sales Report (ZVA05) for Export

Inventory Report Data – Again, logged-in to ERPsim as administrator, one enters the command ZMB52 which will show ending inventory for each team in a report similar to appearance of Figure 4 with the same "Export" icon available. Export this report as above. Some teams will have little inventory while others will have huge amounts of unsold inventory. (What went wrong for them? That's part of the BI analysis, of course.)

Production Data – As before, logged-in as administrator, one enters the command ZCOOIS which will provide a detailed daily view of production for each team. Export this report. This can be used to determine the productivity of each team—were some teams not taking advantage of all available production?

Student Team Assignments for BI Data Analysis using Excel

At this point the instructor will have several visual reports (Financial Statements) and Excel workbooks—Balance Sheet, P&L, Sales, Inventory, and Production. How these are analyzed by the student teams is now the challenge. The following examples are merely one way of approaching the BI assessment. Perhaps the reader may envision even more insightful and useful examples given the same raw data. (The authors would welcome such critical improvement to the content of this paper.)

Financial Statements – The students are asked to prepare a summary chart displaying Total Sales and Net Income. Figure 5 contains an example of a possible chart created from the screenshot of the final round results. An obvious improvement to this chart would be sorting the data according to Net Income. Another might be to add a secondary axis reflecting the percent Net Income represents of Total Sales (a value available from the report or easily calculated).

Possible BI questions to answer using Financial Statements and Excel tools:
BI-1.   Which team had the highest profitability percentage (not just highest gross)?
BI-2.   Develop a trend chart for all teams showing performance over multiple rounds.
        Which team showed greatest improvement?

Figure 5. Summary Performance Chart from Financial Statement

Profit and Loss – The P&L for each team will vary little except for Sales Revenue and COGS, but this is the only report reflecting discretionary spending for Advertising and any expenses to improve Production performance. (This latter expense is rarely incurred and only made by the teams with advanced understanding of ERPsim—not often attainable in the tight timeframe in which ERPsim is introduced and performed.) P&L data is therefore most useful in analyzing differences in performance.

Possible BI questions to answer using P&L data and Excel tools:
BI-3.   Did advertising appear to help or hurt individual team performance?

Balance Sheet – As with the P&L, the Balance sheet offers limited insight to reasons for performance differences but quickly summarizes the liquid asset position of each team, especially in terms of finished goods and raw materials inventory values. These values can help identify the source of poor (or good) team performance; for example, low finished goods value and low revenue suggest production problems while high finished goods value suggests sales issues.

Possible BI questions to answer using Balance Sheet data and Excel tools:
BI-4.   If the game continued, which team is in the best position to remain competitive? Why?

Sales Report Data – This data set (in an Excel worksheet after being exported from ERPsim) will be several thousand rows and will lend itself to insightful analysis using pivot tables and charts. For example, a thorough comparison of products sold and comparative pricing among teams can be very revealing. A simplified chart in Figure 6 illustrates such a comparison. Above-average selling prices can explain why a team had inventory build-up and poor performance. Below-average selling prices can explain quick sales and low inventory but perhaps poor Net Income. The biggest challenge in analysis of Sales data is developing a simplified yet insightful graphic.

Possible BI questions to answer using Sales Report data and Excel tools:

BI-5. Which team sold the most profitable products and how did this affect their competitive position?

BI-6. Were any "fire" sales made (probably to clear inventory)? Were these likely at a loss to the company?

Figure 6. Example Comparison of Average Product Selling Prices

Inventory Report Data – This very small data set can be used to explain the valuation offered in the Balance Sheet for finished goods and raw material assets. As such it specifically identifies the unsold finished goods allowing a more thorough analysis of "why" these goods remain unsold. Figure 7 shows a sample Inventory analysis pivot chart.

Possible BI questions to answer using Inventory Report data and Excel tools:

BI-7. Which team has the potentially most profitable quantity of finished goods remaining in inventory?

BI-8. If this resulting calculation is different than shown on the Balance Sheet, why?
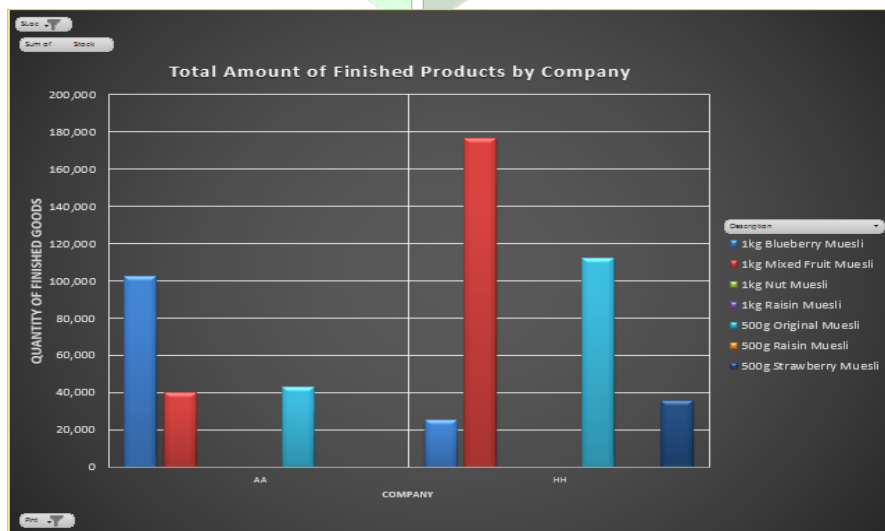

Figure 7. Example Pivot Chart for Comparison of Inventory Finished Goods

Production Data – This data set is always the most difficult for students to understand. It basically summarizes each team's production in terms of completing lot sizes of 50,000 units. (Although some partial lots are possible.) The theoretical maximum of 100% productivity would allow a team to produce 630,000 units per 30-day round. So in order to understand a team's productivity, the student's must compare actual units produced to this theoretical maximum. Though easily said, calculating the actual number of units produced is slightly more complicated as production lots may easily cross time boundaries between rounds—in other words, production on a lot may begin in one round and finish in the next.

Possible BI questions to answer using Production data and Excel tools:
BI-9.   Which team in which round had the highest production performance? Why?
BI-10. How many different products did each team make and in what total quantity for each over the course of the game?
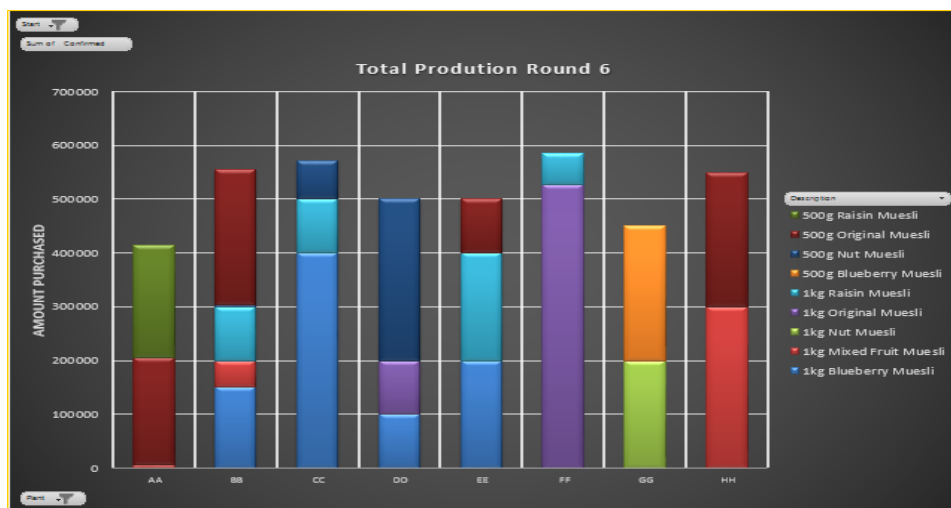

Figure 8. Example Production Pivot Table Comparison

A Final Important Consideration – As this introduction to business IT through ERPsim is necessarily a team learning experience, it is critical that an effective peer-evaluation exercise be part of the final report. The authors have found that numeric scores are somewhat helpful, but the real insight is given when students are asked to provide written comments on not only the performance of their teammates but, as well, on their own contribution to the team's effort. Peer evaluation is understandably a difficult exercise to complete. (Paswan and Gollakota, 2004; Brindley and Scoffield, 1998).   And some summary BI questions that might help the students understand the totality of ERPsim as an effective business simulation tool and the value of Excel spreadsheet analysis tools:
BI-11. Which team won the competition? Why? (This requires a much more in-depth assessment than merely net profit. The analysis should include a consideration of nearly all the above data, especially the current inventory position as well as sales performance and per item profitability.)
BI-12. Consider the poorest performing team. Analyze what they did wrong—from production to sales, there is probably an interesting story in the BI data.

CONCLUSIONS AND RECOMMENDATIONS

It has been shown that ERPsim may be used to effectively introduce business IT concepts and to provide data for external analysis using standard spreadsheet software such as Excel. An emphasis on the use of pivot tables and charts is considered an important part of business IT introduction and should be worth the effort to integrate with ERPsim after-action data analysis.

Recommendations for Further Study

As the educational model moves further away from basic tools such as Excel and into the more sophisticated business intelligence tools now coming available—for example, as built-in to SAP—it will be important to evaluate the impact of their use on the loss of understanding and ability to turn data upside-down and inside-out with standard spreadsheet software. These authors believe that the simplification of BI data analysis may lead to an inability to apply and a loss of appreciation for truly powerful business IT such as Excel.

REFERENCES

BI demo for SAP, http://hanademo.testdrivesap.com/copa/#freeplay, last accessed January 19, 2015.

Brindley, C., and Scoffield, S. (1998) "Peer Assessment in Undergraduate Programs." Teaching in Higher Education, 3(1), 79–89.

HEC Website, https://erpsim.hec.ca/learning, last accessed January 24, 2015.

Léger, P.-M., Robert, J., Babin, G, Pellerin, R., Wagner, B (2013) *ERP Simulation Game with SAP ERP: Participant's guide, 2013-2014 Edition*.

McKinney, Earl H. Jr., Kroenke, David M. (2015) *Processes, Systems, and Information: An Introduction to MIS*, 2/E, Prentice Hall, 480 pp.

Paswan, A. K., and Gollakota, K. (2004) "Dimensions of Peer Evaluation, Overall Satisfaction, and Overall Evaluation: An Investigation in a Group Task Environment." Journal of Education for Business, 79(4), 225–231.