

## TEACHING CASE: A SITUATED LEARNING APPROACH TO ERP ROLE ADAPTATION AND BUSINESS INTELLIGENCE

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### ABSTRACT

*Enterprise Resource Planning (ERP), business process, and Business Intelligence (BI) knowledge are important skills that employers seek when hiring new college graduates. Today's business colleges are attempting to meet the demands by developing marketable ERP skills and delivering exposure to the realities of modern business into the curricula. Functional role adaptations in real-world settings such as ERP systems use enhance students' ability to learn conceptual knowledge and use BI techniques for decision making. The situated learning approach capitalizes on a specified context where the context extensively impacts learning. The functional role orientation experience gained through learning is complemented by other factors of knowledge transfer that are valuable and important to achieve student learning assurance.*

**Keywords:** Situated Learning, ERP, Business Intelligence, Learning, Pedagogy, Text Mining, Co-Occurrence Network

### INTRODUCTION

Many ERP systems have established learning environments that introduce a combination of role-playing and business process situations to develop the necessary technical and soft skills for the real-world job roles. Several simulators such as ERPSIM, Microsoft Dynamics, Management of Interactive Case Study Simulator (MICSS), and Open Source ERP products are used for teaching enterprise process-oriented concepts. The simulated ERP environments have various aspects related to systems configuration, business processes, BI, and decision making. These type learning environments are pedagogical tools within a controlled context. These learning environments enable students to more clearly appreciate various aspects related to real-world decision making, situational business scenarios, ERP systems configuration, business processes, and information sharing. Role play and simulations are forms of experiential learning [29]. Experiential Learning theory proposes that a learner can understand more with experience. It is where learners take on different roles, assuming a characteristic profile, and interact and participate in diverse and complex learning settings.

Historically, businesses had organizational structures that separated the functional areas, such as Accounting or Management, and business schools have been similarly organized, so each functional area is taught as a separate course [26]. Boyle proposed an ERP technical knowledge framework, grounded in business functions and ERP technology, which emphasizes business processes, organizational justification for ERP systems, emergent ERP technology, along with real-world ERP industry exposure [5]. The foundation for the framework illustrates the importance of roles for entry-level ERP professionals and emerging ERP trends. Magal & Word emphasized the need for adequate support material when introducing ERP concepts and hands-on exercises to students [23]. As a result, today many universities are changing their curriculum and have begun to implement integrated business process [25], decision making, and functional orientation concepts in additional to ERP simulation games ([31], [8, 9]).

Within most companies, managers utilize performance reports to gain insights into business process execution, future process re-engineering and workflow improvements [31]. "BI is a critical tool for analyzing business process data" [31]. Linking BI with business process provides a key integral component to help organizations create stronger operations and process capability, improving the way companies operate. The performance goals that are established are connected to a company's business processes when integrated with BI metrics [28]. Employers often complain that their newly hired employees have totally inadequate education. Part of their complaint is that the employees cannot perform tasks on the job that they "should have" learned to do while in school. Schools (i.e. universities) respond by saying that the students have been taught to accomplish the tasks. Clearly, this is a transfer

of learning problem that is owned jointly by universities and colleges, employees, and employers. Thus, learning and applying business process knowledge and BI can help provide a company with streamlined business processes and greater visibility of potential issues, which can help their bottom-line.

### **Situational Learning Theory**

The Situated Learning Theory is the foundational basis of the functional role orientation learning approach. Situated learning theorizes that learning takes place in a specified context where the context extensively impacts learning [17, 2]. Learning begins as the individual participates in environments and also engages with the communities who formed the environments [30]. A practice-based approach is incorporated in situated learning, creating a seamless line between school-based and real-world learning [20]. Hence, role playing or scenario-based learning activities are enriched by the situation or context of its environment [24].

Many scholars suggest greater emphasis on the relationship between what is learned in the classroom and what is needed outside the classroom [20, 16, 19, 15]. Situated learning involves a practice-based approach, which integrates classroom learning and real-world situations where the environment is dynamic [11]. A consequence of the learner is to recognize the practical utility of knowledge conveyed as well as the need to use it to interpret, analyze and to solve real-world problems [6]. Also, the collaborative process in which the student interacts with other members of a “community of practice” [14, 11] tends to be peer-based rather than the more formal teacher-student relationship of the classroom.

The ERP Simulation (ERPSIM) game and the team interaction provide the environment for learning to transpire [18] (Reference Appendix A for the ERPSIM Success Story). The functional role and the ERPSIM game provide the specific learning context. According to Léger “as the learner’s knowledge and skills increase, the role and status of the learner as a member of a community gradually evolves from that of novice or apprentice to expert” ([18],p. 39). The Situated Learning theory is important to the role response strategy offering support for the mechanisms that enable ERP learning. Situated learning reflects the thematic interactive activities, cognitive engagement, participation, and group social structure [13].

### **Importance of ERP Business Process and Business Intelligence Learning**

Business schools are attempting to meet the demands by developing marketable ERP skills and delivering exposure to the realities of modern business into their curricula [3, 22, 21]. The increased importance of ERP and its pedagogical value to demonstrate business process integration, functional role orientation, and business decision making already have started to reengineer curricula [29, 8]. According to Chen, Razi, & Rienzo, ERP system learning involves complex knowledge domains requiring a holistic curricula perspective to enhance student motivation and interest. Advances in pedagogical approaches that emphasize learning approaches such as active or learn-by-doing experience provide greater benefits to students than solely lecture-based [7]. Prior research has shown learning limited to a lecture-based approach can make students passive learners [4].

The business process drives the functional role orientation for the activities and tasks to be performed. Typical business processes within an ERP learning curriculum may entail the planning, procurement, production, and sales processes. Each business process area is tied to a specific functional role orientation similar to real-world job responsibilities within a company. Within each business process operational transactions, analytical reporting, and business intelligence in-form decision making for the functional role orientation. For example, the Sales process, hands-on basic handling of market expense allocation, price list changes, and sales order reports are positioned for the Sales Analyst or Product Marketing role. Whereas in a Production process, finished goods forecast, materials requirement planning, and purchase supplier goods are performed.

## **RESEARCH METHODOLOGY**

### **Background/Classroom Setting**

Students were enrolled in an Introduction to ERP course where learning ERP software application SAP is the focus. The course consists of a traditional classroom setting with lectures, videos, team project, and hands-on lab

assignments in addition to the ERPSIM game. The ERPSIM game [18] is developed by faculty at HEC Montreal and is a type of simulation game where students operate a business and make decisions for a make-to-stock cereal product similar to what is done in today's large companies. The simulation game involves a cash-to-cash cycle consisting of the procurement, production, and sales processes [18]. Students are organized into teams to manage their own fictitious manufacturing company to produce the cereal product. The ERPSIM is executed in simulated 30-day fast track time intervals representing a fiscal year quarter.

Teams of four students perform operations and tasks, which requires them to interact with suppliers and customers by sending and receiving purchase orders, delivering products, and completing the entire cash-to-cash cycle. The simulation game, ERPSIM automates (1) the sales process that each firm receives in a large number of orders every minute, (2) the procurement process to purchase raw materials, and (3) the production process to utilize machine capacity, inventory, and warehouse functions. These operational functions are performed directly in the ERPSIM real-time. Several pre-defined SAP reports are available to help students evaluate their company's profit and operations of the business. Several key business decisions which student teams are required to make during the simulation are:

- Product formulation (raw materials and packaging)
- Target sales by region and market segment
- Product pricing adjusted throughout the business operations
- Sales forecasting to predict sales volumes by product for production planning
- Manufacturing resource planning and production
- Investment in production efficiencies to reduce cost/time delays
- Advertising to regional markets
- Debt management, which consists of loan repayment

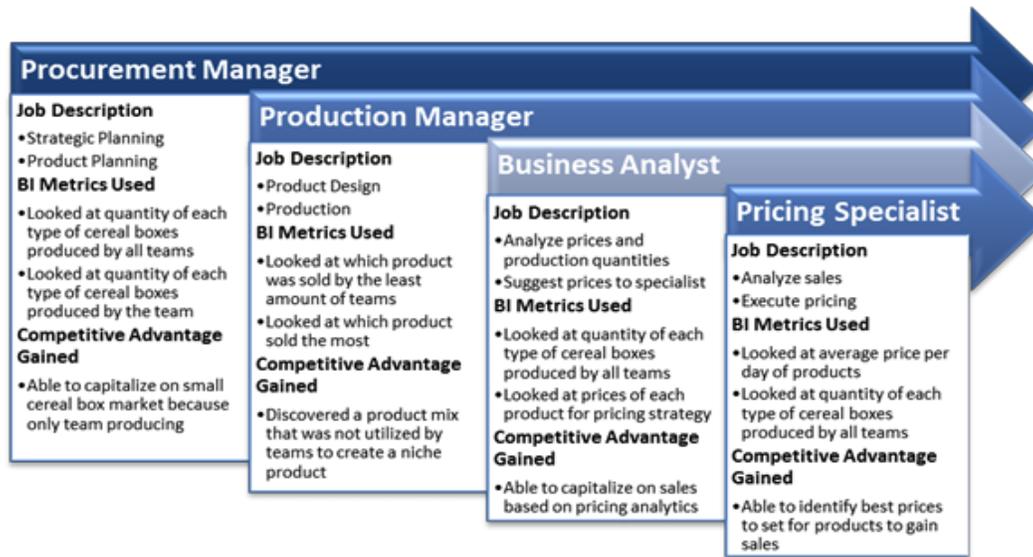
### **Functional Role Adaption**

Before the simulation game begins, each team makes a decision on what roles should be represented during the game and who will perform the activities and tasks accompanying the role. Teams usually follow a similar pattern for role division of labor across the simulation game. Common roles selected are procurement manager, production manager, business analyst, pricing specialist or analyst, operations manager, chief financial officer, financial analyst, and marketing director.

### **Functional Role Adaption Objectives**

There are several objectives to be accomplished by a functional role orientation pedagogical approach. Students will have an understanding of:

- How roles collectively work together is integrated in the business processes performed while using an ERP system.
- How the individual roles of which they represent contribute to business processes.
- The importance of selecting and using appropriate BI metrics based on their role to gain competitive advantage for the team.



**Figure 1.** Describes the Functional Role Orientation Practicum Example from a Previous Class

### Pedagogical Approach Using Functional Role Orientation

There are three main areas of pedagogy of which roles can provide value, which are infused by the role strategies. They are community learning, engagement encouragement, and motivation and interest improvement. Table 1 shows the steps of how the functional roles are imparted in the students' learning.

**Table 1.** Pedagogical Approach using Role Strategies

Pedagogical Approach	Steps	Infusion of Role Strategies
Community of Learning	Team building	As students take on their role orientation, team building occurs as each person will play their part and work together to complete the cash-to-cash cycle. Each person will depend on each other in their role to be successful.
	Opportunities for interaction	As the quarters are played, the students communicate with each other to work through the business processes. The quarterly game BI metrics information will be conveyed within the team to learn from this data and to create competitive advantage.
Engagement Encouragement	Gain and sustain attention	The contribution by the collective roles, informed by the BI analytics and role performance provides the opportunity for the student to focus attention on the tasks at hand.
Motivation and Interest Improvement	Establish relevance	When functional role orientation is introduced in the class, the importance of each student's role is emphasized. How the collective roles work together to accomplish the business processes and how they are applicable to the overall business strategy are infused in the discussion. Industry examples are used to relate class activity to the real world.

### Functional Role Adaption Strategy

Prior to the ERP Simulation Game, the students develop two BI metrics that are appropriate for their chosen role. These metrics are then executed in Microsoft Excel with ERP simulation data gathered from a Microsoft Access database. The metrics designed by the student contribute to the overall competitive advantage for the team. Once

the metrics are developed and analyzed, the students are required to write a report for the metrics that will be used after each completed quarter and how they will be used to help the team gain competitive advantage over other competing teams. The guidelines received by students are the following:

- BI Strategy Report**
- Using data available in the Microsoft Access database, establish at least 2 metrics & measurements to align with your company’s strategy.
  - Briefly describe your role’s strategy, and explain how your company will use the information to establish and maintain a competitive advantage (1-2 pages typed, double-spaced).
  - Create reports and graphs using Microsoft Excel (and the Microsoft Access data) to enable you’re your metrics for use during the simulation competition. Include examples as supplements in your BI Strategy submission.

**Figure 2.** BI Strategy Report Section of the ERP Simulation Game Project Guidelines

Once all of the ERP Simulation quarters have been completed, the teams must provide an overall summary report of the simulation experience. Additionally, there is a role response section of the report that is accomplished individually. The responsibilities of the role and how the role fits into the overall cash-to-cash cycle are written. Analytics and BI must also be discussed from a role point of view, specifically how the operational reports in the ERP system were used to help with decision making, how the student’s role utilized the information obtained through the metrics, and finally how the role contributed to the overall team’s competitive advantage.

## RESULTS

### Analysis of Student Role Responses

The sample (N = 62) was collected from students’ final written projects spanning three semesters. Each team was required to write a paper following the ERP Simulation Guidelines (Reference Appendix B). Within the guidelines, each team member was responsible for writing a role response. The role responses were related to each team member’s role, and Analytics & Business Intelligence application.

A text mining analysis using KH Coder software was performed across the students’ role response data to uncover patterns and learning themes. KH Coder is a free software for quantitative content analysis or text mining. It is also utilized for computational linguistics. Three words were removed from the sample that did not provide additional meaning for the analysis. The words excluded were *and*, *the*, and *of*.

Table 2 shows the word frequency students used to describe their role during the ERP simulation experience. The most used words students used to describe a role were Manager, Officer, and Chief. The business process areas related to those roles were Marketing, Pricing, Financial, and Production. These areas and roles align with the ERP system knowledge transfer where students learn Sales, Procurement, and Planning business processes. The results indeed demonstrate the differentiated roles in ERP systems use that are associated with ERP system professionals.

**Table 2.** Frequency of Words in Student Role Response

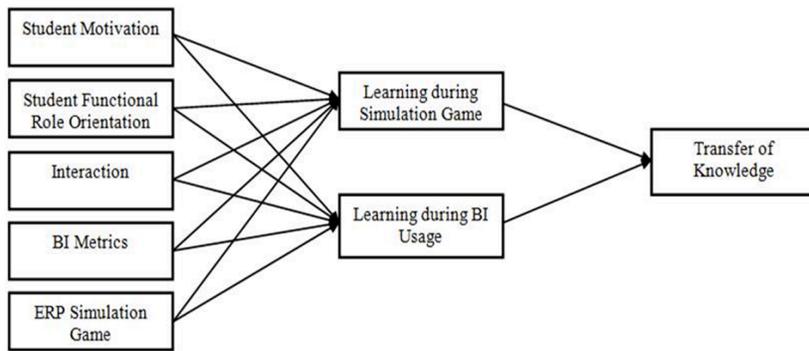
Noun		ProperNoun			
Word	Frequency	Word	Frequency	Word	Frequency
pricing	8	Manager	12	Acquisitions	1
production	7	Chief	9	Analytics	1
coordinator	3	Marketing	9	Chain	1
price	3	Officer	8	Executive	1
sale	3	Financial	6	Improvements	1
planner	2	Analyst	6	Materials	1

strategist	2	Business	3	Optimizer	1
activity	1	Controller	3	President	1
cash	1	Director	3	Process	1
cost	1	Product	3	Purchasing	1
design	1	Inventory	2	Raw	1
forecast	1	Material	2	Resource	1
forecasting	1	Operating	2	Strategist	1
market	1	Operations	2	Supply	1
procurement	1	Procurement	2	Tracker	1
specialist	1	Accounting	1		

Further analysis was performed using the Co-occurrence networks [32, 33] technique to analyze the student role response data. This technique is generally used to provide a graphic visualization of potential relationships between people, organizations, concepts or other entities represented within text data. The generation and visualization of co-occurrence networks has become practical with electronically stored text amenable to text mining. Co-occurrence networks are the collective interconnection of terms based on their paired presence within a specified unit of text. Networks are generated by connecting pairs of terms using a set of criteria defining co-occurrence. For example, terms A and B may be said to “co-occur” if they both appear in a particular article. Another article may contain terms B and C. Linking A to B and B to C creates a co-occurrence network of these three terms.

Figure 3 represents the Co-occurrence network summarizing the learning themes that emerged from the students’ role responses. The analysis shows how key business processes emerge and interconnect the role responses. The relationships connect pairs of role responses to define the co-occurrence. The role responses interconnectedness relate to the tasks engaged when using the ERP system to support the various business processes. In particular, the role of Chief is associated with operations and analytics tasks. Managers are associated with pricing, production, forecast, and financial related tasks. Managers are related to material planning and financial control. Marketing roles were interconnected with pricing, forecasting, and process improvements. Lastly, Accounting Manager roles were associated with Supply Chain, Procurement, and Inventory tasks.





**Figure 4.** Adapted from [12, 21, 32]

In following the [1] learning assurance process, steps have been taken to measure performance of the functional role orientation exercise. In Table 3 are excerpt responses to the functional role orientation experience as written by several students captured over three semesters.

**Table 3.** Excerpts from Student Functional Role Orientation Experience

<b>ERP Student Functional Role</b>	<b>ERP Student Response</b>
ERP Student 1	As <b>Chief Operations Officer</b> , my responsibilities dealt with production planning. I was tasked with forecasting, procuring, and producing the amount of product in a manner that was cost friendly to the company. <u>My role played a vital part in the cash to cash cycle of our company because we had the potential to incur substantial storage cost for excess inventory and raw materials.</u>
ERP Student 2	My duties as <b>Chief Financial Officer</b> primarily focused upon investment decisions. I managed decisions regarding gauging the cost vs. gain of investments in production capacity, increased efficiency through setup time reduction, budget in marketing expenses, as deciding on whether to change the Bill of Materials on our products. My role was crucial to the cash to cash cycle in that every investing opportunity taken was completely focused on whether it would yield more of a profit than it cost the company. Through the simulation lesson were learned in regards to where to spend and not to spend, and when was the right time to stop because additional cost would not produce a worthwhile profit. <u>IT was awesome for all of us to see how our roles were so intertwined with each other and how every step directly impacted another.</u>
ERP Student 3	I had a very unique role throughout this whole process. I was <b>Data Coordinator</b> for this assignment, as well as I also was in charge of product design and BOM modification. My role was to use data from previous rounds to gauge how much our product should be modified to ensure that our product was differentiated without incurring too much cost. I created this metric to ensure that we were competitively differentiating our products and just as importantly, ourselves from the competition. <u>Our team learned what the numbers were really telling us and that knowledge will translate to our future careers and will benefit us in the workplace.</u>

The findings observed in this study closely align with the transfer of learning through the ERP Role orientation and BI use in the context of a situated learning environment. Situated learning is enriched by this experience where students are able to develop attributes and cognitive practices of related ERP roles. This type experience can help students transition into the workforce after graduation to anticipate the jargon, value, and roles in the ERP

profession. These results support prior literature where the aspects of the knowledge transfer enhancing activities lead to recall and application of what has been learned [32].

### CONCLUSIONS AND LIMITATIONS

The pedagogical approach as described provides business process learning that emphasizes the functional role orientation. The situated learning experience enhances students' knowledge capabilities for ERP, BI, and business process concepts beyond the lecture only. The use of functional role orientation and BI is a strategy to assist learning and provide a deeper insight of business process knowledge for practical business relevance. This instruction approach is synergistic and reinforces a students' learning experience. This case study supports [24] research findings affirms that the hands-on experience of ERP systems indeed help student's understand business process. Moreover, their study demonstrated that students can use the knowledge gained in university classes and apply it to making business decisions.

Also, the student is able to transfer and apply business process scenarios and business intelligence knowledge enabling a more broad and integrative approach to learning. Students develop the necessary skills and decision making strategies that closely align practical business situations faced by organizations today. Most importantly, based on student feedback, the functional role orientation and BI learning strategy create benefits that aid in identification of career roles sought after graduation. The BI reports created based on their role enabled students to visually examine past trend and patterns for future decision-making. Students said they felt their roles helped them to learn early the future career expectations. They reported feeling empowered and confident that they could succeed in a chosen career.

The ERPSIM game is a huge success that gave students practical experience of business processes, decision-making, and exposure to all components of an enterprise information system. Moreover, the students enjoyed playing the simulation game. Typically students want to play the ERPSIM game much longer than the class time period allows. The teams become very competitive and strategic-thinking about their company operations. Many students research their particular role to help understand how to apply decisions to the company operations. At the conclusion, students felt more knowledgeable about SAP and that they gained real-world experience and skills for the job market. Student comments were largely very favorable with suggestions for improvement being in the areas of more simulation game time and a more detailed explanation related to their performance in the competition.

This teaching practice is limited to the context of the southern university and its curriculum. While this paper asserts the benefits from the functional role orientation and BI combination with the ERP environment, other factors may play a direct or indirect role in the learning outcomes. Further research will utilize quantitative and qualitative methods to examine empirically the functional role orientation and BI relationship on learning outcomes. A quantitative research approach will enable capture of performance, attitude, and observational data within the business process learning environment.

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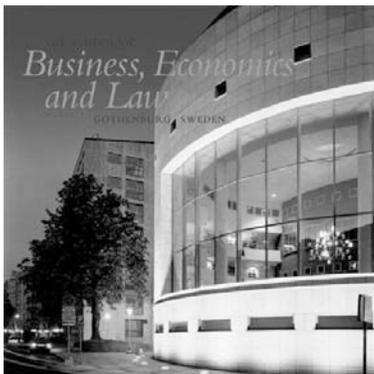
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**APPENDIX A - ERPSIM USE IN THE CLASSROOM**



**The ERPsim Success Story**

The ERP Simulation Game (ERPsim) is an innovative approach that allows the concept and functionality of ERP to be taught in a cutting-edge way. It was developed by HEC Montréal in cooperation with SAP University Alliances. This simulation game consists of two components: (1) ERP System - SAP ERP ECC 6.0 (2) ERPsim - a simulation program that automates and simulates business processes. Users can realistically simulate the entire cash-to-cash cycle: procuring raw materials from suppliers, processing orders from customers, producing necessary products, handling payment and conducting marketing. The system is based on a standard client using the SAP ERP ECC 6.0 and a web server with Java applications running the simulations. ERPsim was installed and successfully tested at the UCC Munich in 2009 and can now be offered to all SAP UA EMEA customers. The University of Gothenburg and the Technische Universität München used ERPsim with great success in their curricula in the final semester of 2009. In the new course "Enterprise Information Systems" for master students 12 students of the Technische Universität München were the first in Europe to officially try ERPsim out and experience how ERP systems support business strategies. Students were very interested to play the simulation game, allowing them to develop decision making skills with enterprise software. Additionally, lecturers enjoyed this new and simple way to make the tangible benefits of ERP systems accessible and understandable. All those participating in the course were of the opinion that ERPsim enriches standard curricula making learning much more enjoyable. For the first time as part of the course "Applied Enterprise Systems" the University of Gothenburg offered 120 logistics, accounting and MBA students a hands-on, realistic simulation of enterprise information systems. The lecturer emphasizes: "We are very proud of this innovative learning approach. Using ERPsim is often the first time students encounter ERP systems, but their -comments indicated that it was a great way of getting an overview of how the systems work in supporting all company processes. ERPsim does this in a very inspiring way." Students agreed, "ERPsim has really provided a clearer understanding of the role of IS in organizations. It is really a great tool for experiencing the power of IS and integration in a hands-on-way!" In summary, all students concluded, "We want more!" The success story of ERPsim has only just begun.



**APPENDIX B – ERP SIMULATION PROJECT GUIDELINES**

**Important Dates**

- **Optional – 11/24** - Role Pre-Sim BI Metrics and Report (feedback provided by the instructor)
- **12/2** – Completed execution of the graded simulation exercise
- **12/12** –
  - A report to management summarizing the results and experience - **deliverable**
  - A presentation of results and experience to management & other teams – **team presentation**
    - Team presentations should be video-taped outside of class and uploaded to Blackboard. Please contact the WCOB technology center to check-out the necessary video equipment for your team presentation. A copy of the powerpoint presentation should be emailed to the instructor.
  - Peer evaluation - **deliverable**

**Topical Coverage for Report (Include each section in your report)**

Team response

- Team dynamics – organizational structure and separation of duties
  - How were decisions made?
  - How were responsibilities divided?
  - How did the team approach change during the process?
  - How did SAP enable, enhance, or restrict the performance of the team?
- Business Strategy – strategic decision points throughout the process
  - What was the initial strategy, and why?
  - How did the strategy evolve during the process?
  - Was the strategy successful? Why or why not?
- Process Execution – excellence in execution, tactical approach
  - What approach was taken to executing the procurement, production, and sales processes?
  - How did the execution approach change as the simulation progressed?
  - Was the team successful in executing the processes efficiently (any problems with gluts, stock-outs, soft landing, etc.)?
  - How did SAP enable, enhance, or restrict the execution of the integrated processes?
- Results
  - What worked, and what did not work? Why?
  - What decisions were made that supported positive results?
  - What decisions were made that led to negative results?
  - Knowing then what you know now how would your strategy and tactics have changed?

Role response (each team member will write a Role response)

- Role
  - What were the responsibilities of your role?
  - How did your role fit into the overall cash-to-cash cycle?
- Analytics & Business Intelligence
  - How did operational reports in SAP aid in your decision making?
  - How did you in your role use the informational data provided in Access and Excel? *Include reports to substantiate decision making for your role.*
  - If your role achieved competitive advantage through the use of operational and informational reports, explain. In retrospect, how could you have used this information more effectively?

**Presentation Guidelines**

- 12-15 minutes in length (including setup & transition)
- No more than 10 slides
- 1 slide each for Team Dynamics, Business Strategy, Process Execution, Individual Roles (1 slide per team member), Results
  - Focus on the 1 or 2 most important elements of each topic excluding individual roles – for your company
  - Individual roles – focus on a brief description of your role and discuss one analytical report used in your role’s decision-making

**Grading Guidelines**

**25 points – Group Portion of Report to Management**

- Refer to the topical coverage guidelines for questions that should be answered in the report. There is no minimum length for the report, but I have never seen all topics adequately covered in less than 7 or 8 pages. 8-12 pages are fairly typical.

**20 points – Presentation of Results**

- Cohesive summary of the process and results presented in a professional manner, 10-12 minutes per team. Refer to the topical coverage guidelines for questions that should be answered in the presentation (if there are too many for the allotted time, choose the ones that had the greatest impact on your team).

**10 points – Peer Assessment (complete form and upload to Blackboard)**

- Each of you will rank the contributions of all members of your team.

**20 points – Team Performance**

- First Place            22 points (bonus 2 points for 1<sup>st</sup> place)
- Second Place        20 points
- Third Place          18 points
- Fourth Place        16 points
- Fifth Place          14 points

**25 points – Business Intelligence Strategy Report**

- Using data available in the ERPSim queries, establish at least 2 metrics/ measurements that align with your company’s strategy and role response. These metrics should be in the form of reports and graphs using the ERPSim queries and used during the simulation competition. Include examples of these as supplements in your Analytics and Business Intelligence submission.
- Briefly describe your role’s strategy, and explain how your company will use this information to establish and maintain a competitive advantage (1-2 pages typed, double-spaced).

**Credit Rating Adjustment**

- Teams with the highest credit rating will receive no deduction. Each team with a credit rating below the highest credit rating will receive a **2 point deduction for each level between their credit rating and the highest credit rating**. For example, if the highest credit rating achieved was AA+, teams with a credit rating of AA would receive a 2-point deduction; AA- would receive a 4-point deduction, etc.