ERP SIMULATION GAME: A DISTRIBUTION GAME TO TEACH THE VALUE OF INTEGRATED SYSTEMS

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ABSTRACT

This session proposes participation in a ready-to-play game to teach the concepts underlying an Enterprise Resource Planning (ERP) system. The ERP Simulation game is an innovative "learning-by-doing" and "problem-based" approach to teaching ERP concepts and competencies. The game is supported by ERPsim, a unique business simulation technology developed at HEC Montréal that enables the simulation of near-real-life business contexts of large corporate information systems. Participants are put in an environment whereby they run their business using a real life ERP system. The simulation that will be presented in this workshop consists of a distribution company where participants must operate the full business cycle (plan, procure, and sell). The game is designed to help students experience the value of upstream and downstream information flows and the value of process integration across functional silos, and to understand the impact of poor decision-making and timing by one player on team performance.

DESCRIPTION – INTRODUCTION TO ERP SIMULATION

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

system, can be very abstract due to their lack of hands-on experience with legacy systems.

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

In the current evolving business world, Clarke and Clarke (2009) state that new information technologies and new business processes are changing business practices. They call for profound changes and reforms that will bring students to master higher-order cognitive, affective, and social skills that were not in the focus of traditional programs. Reforms should go beyond changes in curriculum content or technological infrastructures and put forward learning contexts that will result in new kinds of mind altogether.

Research results (Lave and Wenger, 1991; Kumar, 1996) suggest that situated cognition is associated with higher levels of engagement and motivation by the learners and generally leads to higher understanding and better knowledge transfer. In terms of instructional strategy, this implies that the focus should be put on problem-based learning. Problem-based learning (PBL) is an instructional strategy that focuses on guiding the learning process in a situated context through a series of realistic and potentially complex open-ended problems. Problem-based learning is considered as a recent trend in higher education and training. In the growing emphasis on contribution to graduate employability, the Strata-Etan expert group (2003) states that to cope with this challenge, more and more training programs foster the implementation of better student-centered and competencies driven programs. In PBL environments, students usually work on projects that represent complex real-world problems that have no single right answer. These problems will motivate the learner to gain a set of competencies by actively resolving the task (Merill, 2002; 2007). Norman and Schmidt (1992) identify potential advantages in PBL compared with traditional programs: increased motivation; enhanced learning, retention, and recall; and better problem solving and self-directed learning abilities. This claim about the positive impact of PBL on students' motivation is consistent with research on situated learning where better motivation is a well-documented determinant for the quality of learning and achievement (Galand & Frenay, 2005).

Based on this literature, a group of professors from HEC Montréal created over five years ago a business simulation with the purpose of transforming the way ERP system usage is taught in the classroom. Today, the ERP Simulation − ERPsim Game − and the Participant's guide to the simulation (Léger et al, 2009a) are now used by more than 100 faculty members and in more than 70 universities worldwide. As of June 2009, more than 2 000 students have played the game in the USA, Canada, Australia, Italy, India, and Russia annually across the SAP University Alliance[1]. Since September 2008, the ERP Simulation Game is also used commercially by Baton Simulations[2]. Professionals at many Fortune 1000 organizations are now introduced to SAP by playing the simulation game. ERPsim is also used in research to run experimental protocols (see Cronan et al, 2008a, 2009a; Léger et al, 2009b; 2009c; 2009d, 2010).

The ERP Simulation game (Léger, 2007) is an innovative "learning-by-doing" and "problem-based" approach to teaching ERP concepts. Participants are put in a situation where they have to run their business using a real life ERP system similar to those used by the world's largest companies. An essential feature of the simulation is that the only interface between the simulator and the participants is a real ERP system (in this case, SAP®). All decisions made by the participants must be introduced into the ERP system; all information about the evolution of the game must be retrieved from standard or customized reports from the ERP system. For the participants, this is similar to using a flight simulator, but in a real plane cockpit. This creates a unique learning environment where participants can learn hands-on about the integrated business system process.

The simulation software program was developed to automate the sales process, so that every firm receives a large number of orders in each quarter of the simulation. Using standard and customized reports, students have to analyze these transactions and make business decisions to ensure the profitability of their operations. The pedagogical objectives of this game are fivefold: (i) to develop hands-on understanding of the concepts underlying enterprise systems, (ii) to experience the benefits of enterprise integration firsthand, (iii) to develop technical skills at using an ERP system, (iv) to learn how to work in a team, and (v) to learn how to strategize in a real-time business environment.

The simulation presented in this workshop consists of a distribution company where participants must operate the full business cycle (plan, procure, and sell). The game is designed to help participants experience the value of upstream and downstream information flows and the value of process integration across functional silos and to understand the impact of poor decision-making and timing by one player on team performance.

This Ready-to-Play game proposes a protocol to use the ERP Simulation Game in a 2-hour context. Firstly, we present the underlying simulation technology that supports the ERP Simulation Game. Then, we present the requirements to play the game. The last section describes the details of the proposed game.

[1] http://www.sdn.sap.com/irj/uac
[2] www.batonsimulations.com

ERPSIM: ENABLING THE SIMULATION OF NEAR-REAL-LIFE BUSINESS CONTEXTS IN ENTERPRISE SYSTEMS

ERPsim (Léger et al, 2007) is a unique business simulation technology developed at HEC Montréal that enables the simulation of near-real-life business contexts of large corporate information systems. There are other simulation games that allow participants to take a strategic view of an enterprise, but ERPsim is closely coupled with ERP technologies (SAP®); participants have to use a real ERP system like they would in a real context.

So what is it exactly that ERPsim does if it is entangled with an ERP system such as SAP? ERPsim serves three functions. First, it provides the simulation of a market for buyers so that the participants playing the game have a reasonable market that responds as would the real world. Second, ERPsim automates some of the business functions that are more administrative to make the game a little easier to play so that participants can focus on the decision making processes in the real world system while experiencing the full value of reports and decision support tools that exist in the system. The third and final aspect that ERPsim provides is the simulation of the passing of time. ERPsim compresses time into a short space but still creates the appearance of time evolving so that the impact of the decisions taken overtime can be evaluated. Every minute, the simulator pulls data from the ERP system and pushes new data into the system according to the decisions made by the teams. In this virtual time, participants of the game are able to adjust their decision making processes and take better business decisions minute by minute as they learn to play the game and see the results of their decisions.

ERPsim is built on a standard technology platform: Java. It uses a set of connectors and integrators to connect with real world ERP systems, for example the BAPI architecture of SAP. In addition to the Java technology, custom reports have been developed inside the ERP application as well as a specific configuration environment to provide the actual game context in SAP[3].

REQUIREMENTS FOR READY-TO-PLAY GAMES

The following paragraphs elicit the requirements to be able to play this game.

- Target audience: This game is designed to be played in two hours and is perfectly suited for single lecture use in graduate or undergraduate courses such as Introduction to Business, Introduction to Management Information Systems and/or Information Technology. The game can also be used in business, industrial engineering and computer systems classes (Pittarese, 2009; Seethamraju, 2008).
- Number of players: The following protocol is designed to be played by teams of two participants[4]: the first participant will be in charge of marketing, the other participant will be in charge of procurement.
- Minimum number of participants: The game can be played by a minimum of 1 team playing against the computer. The system also supports up to 26 simultaneous teams in play.
- Duration of the game: Introduction to the game takes 20 minutes. The game then consists of 60 simulated days split into three rounds of 20 days each (between 15 and 20 minutes each at the discretion of the instructor). After each round, participants discuss about their experience and prepare for the next round for about 10 minutes.
- Equipment and material: Participants in this game require a laptop with Wi-Fi capability. The laptop must have Internet explorer 7 to be able to connect to the SAP Web GUI. The SAP Web GUI is a light web-based technology used to interact with a SAP system. Also, participants must have Skype installed on their computer (www.skype.com) or some alternative chatting communication system. Participants are also provided with a one-page job-aid to help them use SAP (see Appendix 1).
- Room configuration: In order to fully experience the notion of integration, the two team members must NOT be seated together. In other word, they must not be able to see their teammate screen.
- ERPsim and SAP Business Suite: The ERPsim software and access to an SAP server and client for the game are provided through the SAP University Alliance. "*The SAP University Alliances program is a global endeavor that provides university faculty members with the tools and resources necessary to teach students how technology can enable integrated business processes and strategic thinking*"[5]. Through the SAP University Alliance, universities and colleges can gain access to the SAP Business Suite; HEC Montreal has granted a free license to use ERPsim within the University Alliance.

GAME DESCRIPTION

In the proposed game, participants will operate a bottled water distribution company in the German market. Each team sells a total of 6 products − 3 products in 2 sizes (boxes of 12x1L and 24x500mL) − in 3 regions. Each team

[3] Information about the 2009-2010 ERP Simulation Games can be found at: http://www.youtube.com/watch?v=qzqiRsuY4gg

[4] Note that it is possible to play variations of this protocol with as many as 4 participants per teams. The manufacturing version of this game supports up to 6 players per team.

[5] http://www.sap.com/about/csr/education/universityalliances.epx

starts with some initial inventory. End-of-quarter inventory is carried over to the next round. Teams can only sell a product if they have it in stock. Teams compete against each other and they also compete against importers. The goal of the game is to maximize profit.

The job-aid (see Appendix 1) provides the basic instructions for how to use the SAP system. The game allows for a maximum of 26 teams. Each team corresponds to a letter (from A to Z). Teams must use their team letter for login and to identify their products. The login, username and password are provided on the job-aid.

The game is divided into 3 quarters. What participants are asked to do during the game evolves from one quarter to the other. In Quarters 1 and 2, the login are respectively intro_$1 and intro_$2 for purchasers and sellers respectively, where the $ sign stands for the team letter. Once players have log onto the system, they will see a very limited user menu. The user menu contains all the SAP transactions required for each player for Quarters 1 and 2. In the first 2 quarters, we have restricted the set SAP transactions to which players have access. In Quarter 3, players must re-enter the system using different logins (respectively intro_$3 and intro_$4 for purchasers and sellers). In Quarter 3, players will be able to share more transactions and reports.

Figure 1 shows the timing of the game. In this figure, the color corresponds to the team member in charge of the activity.

Quarter 1: In the first quarter, each team starts with the same inventory level. No purchasing will be done during Quarter 1. The only business decision required in the first quarter is to maintain the prices of all 6 products. This task is performed by the sellers. In this quarter, the sellers have access to a sales report and the purchasers have access to a stock report. Because they are not seated together, participants must find ways to communicate using Skype or some other chatting tool.

Before launching Quarter 1, the instructor should provide the cost of each box of bottles, but should not provide any additional information about the market size nor the number of boxes in stock. The purchasers have access a report that provided them the number of boxes and the sellers receive new sales data every virtual day. Teammates must rely on that information to set their prices. Because, companies have limited stocks of products and that they cannot replenish during Quarter 1, they must set their prices sufficiently high so that they do not run out of stock too quickly and sufficiently low so they can match the competition and sell profitably their available boxes to the market. The challenge for the teams is to communicate and to use the available information adequately.

Debriefing of Quarter 1: The first focus of the debriefing should be on the navigation and use of the SAP system. Participants should have learned how to use the few reports available to them. The second part of the debriefing should focus on the fact that the system is not fully integrated. In order to share information, participants must chat. Retyping information is slow and is error prone. The information becomes untimely and inaccurate. Sellers will generally complain that the purchasers did not provide the stock level fast enough, therefore impacting their ability to make good business decisions.

Quarter 2: In the second quarter, teams continue with the stocks left over from the previous quarter. It is likely that teams experience stock-out for one or more products. In Quarter 2, the purchaser is now allowed to replenish, i.e. he can create a forecast, execute the MRP calculation and send purchase orders to vendors. In time, the simulator will confirm reception of the products in the warehouse; products then become available for customers. As for Quarter 1, sellers have access to a sales report and purchasers have access to a stock report.

Debriefing of Quarter 2: In Quarter 2, both players now become active. Not only do purchasers have to follow stock

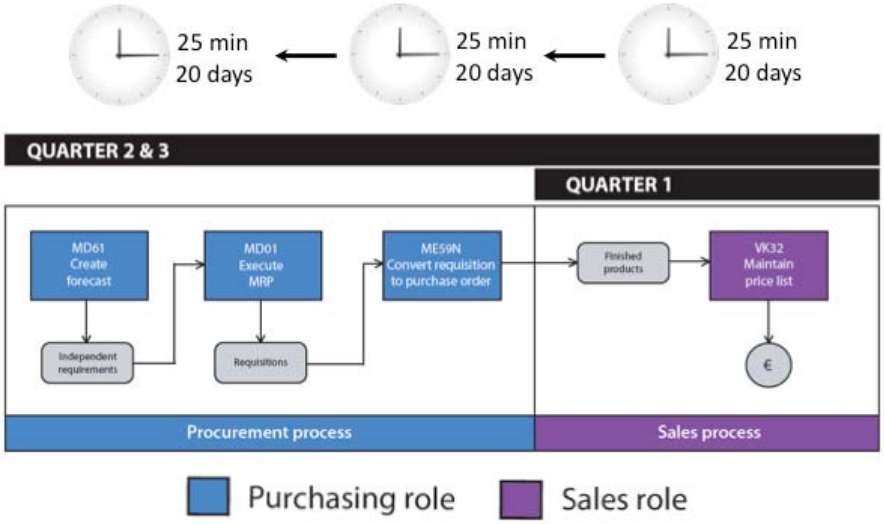

FIGURE 1: GAME DESCRIPTION

levels, they have to perform tasks to replenish their stocks. It now becomes even more difficult for purchasers to communicate to sellers the information on stock levels. Conversely, the purchasers are likely to complain that the sellers do not provide timely information on sales. Without accurate information on which products generate the highest margin, purchasers will tend to reorder the product selling the most (which might not be the product contributing the most to the bottom line). It is likely that during Quarter 2, communication remained limited between the players and that each team member focused on their individual tasks. In the debriefing, we suggest that you focus on this silo behavior.

Quarter 3: In this final quarter, barriers to integration are lifted. It is now possible for every participant to do all transactions in the system, including sharing stock and sales reports. Participants are still not seated together and must continue to coordinate using Skype.

Debriefing of Quarter 3: Having access to each other's report is likely to radically change how the teams operate. The tactical decisions of replenishing and price setting become much easier. Participants usually notice that discussions on Skype become more strategic as they don't need to exchange operational data. At the end of the debriefing, participant are able to define the main benefit of using an integrated system to support an organization (accuracy, transparency, non redundancy, timeliness).

CONCLUSION

This distribution game is now used in numerous "introduction to MIS" classes around the globe. It allows in a very short time to introduce students in business or technical university programs to the value of integrated systems. ERPsim Lab has also developed other ERP simulation games that put forward more advanced concepts related to enterprise systems: a manufacturing game, an integrated treasury management game and a business intelligence game.

On another hand, ERPsim is also a research platform where all actions of participants are recorded on our server. Following Anderson & Lawton (2009) recent research conclusions about business simulation, we are actually leading a non intrusive research project, studying attitude toward technology, cognitive learning and development of ERP competencies. Early results from Cronan et al. (2009) suggest that this approach has the potential to change attitude toward integrated systems as well as enable participants, in a fun way, increase their ability to use these systems in a realistic environment.

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APPENDIX 1 − PARTICIPANT'S JOB-AID