Teaching Tip
Utilizing Classroom Simulation to Convey Key Concepts in IT Portfolio Management

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ABSTRACT

Managing a portfolio of IT projects is an important capability for firms and their managers. The classroom simulation described here provides students in an MBA information systems management/strategy course with the opportunity to deepen their understanding of the key concepts that should be considered in managing an IT portfolio and helps students appreciate the importance of taking a comprehensive view when building a firm's IT portfolio. Managing an IT portfolio involves considering a number of interdependent concepts and thus is a difficult capability to learn without context. The simulation is able to provide that context by creating a complex decision making setting in the classroom. This teaching tip provides a framework of key concepts in IT portfolio management (ITPM), describes the expected student background and classroom setting, guides the instructor through the implementation of the simulation, provides evidence of learning effectiveness and suggests next steps in the simulation's development.

Keywords: Portfolio assessment, Project management, Simulation, Strategic planning, Teaching Tips.

1. INTRODUCTION

This IT portfolio management (ITPM) simulation is designed for use in an MBA course on the management and strategic implications of IT. The simulation allows students to internalize their theoretical knowledge of the key concepts and apply that knowledge in a real decision making context. It also illustrates the interdependencies and trade-offs among the concepts of ITPM.

A comprehensive approach to ITPM includes evaluating options, actively managing the IT portfolio, aligning the IT portfolio with business strategy, basing portfolio decisions on financial measures such as NPV and ROI, ranking IT projects in terms of organizational priorities, centralized project monitoring and standardization of IT across the corporation (Jeffery and Leliveld 2004). Firms that use such a comprehensive approach to ITPM benefit from improved return-on-asset (ROA) performance, yet just 17% of firms actually take such an approach (Jeffery and Leliveld 2004). The simulation detailed here is intended to accomplish two learning objectives toward improving the practice of ITPM. Students engaged in the simulation are expected to: 1) develop an appreciation of the key concepts required to effectively manage an IT project portfolio, and 2) understand the economic value of taking a comprehensive view when assessing a firm's IT project portfolio. The simulation provides students with experiential learning recognized as important in the application of knowledge to improve decision making quality (Stewart, et al., 2011) and an effective mechanism for students to develop relevant knowledge and skills in complex organizational contexts related to information systems (e.g., Ayyagari, 2011). The ITPM simulation complements other classroom IT management simulations for IT audits (Merhout, Newport and Damo, 2012), requirements gathering (Ramiller and Wagner, 2011), and ERP systems (Seethamraju, 2011; Léger, 2006).

Students experience a realistic role-playing experience of debating issues and making decisions that are required in real managerial situations related to ITPM, defined as "managing IT as a portfolio of assets similar to a financial portfolio and striving to improve the performance of the portfolio by balancing risk and return" (Jeffrey and Leliveld, 2004, pg. 41). Addressing the portfolio level requires the context of IT to be simulated to ensure an understanding of key concepts as they apply specifically to managing an IT portfolio. This is especially true given the interdependence of IT projects that comprise an enterprise IT project portfolio (Dickinson, Thornton and Graves, 2001). The simulation is novel in that it is designed to highlight ten key concepts of ITPM that we suggest are relevant and important for both IT and general managers to understand in order to optimize their firm's return on IT investment. The exercise is also innovative with respect to its ability to recreate the context of

a firm's decision making structure and place students into the decision making context without leaving the classroom. In this context, groups of students represent different units within a single firm instead of competing firms, creating realistic incentives for both coordination and competition.

2. IT PORTFOLIO MANAGEMENT

In this proposed framework, ten key concepts that managers should understand in order to drive strong ITPM capabilities for the firms they manage are described (see Table 1), with associated conceptual references, and a brief description of how each concept is illustrated in this simulation. These concepts include common financial investment concepts such as **prioritization** given scarce resources, balancing **risk vs. return**, **real option value** and **aggregate risk**. Additional key concepts account for the interdependence of projects with other projects and with the rest of the firm. Concepts demonstrating this interdependence include **economies of scope**, **lock-in/opportunism**, **complementarity of projects**, the **strategic fit** of the IT project(s), the **value of a Project Management Office** and the **value of coordination**. The purpose of the simulation is not to introduce the ten concepts – many of the concepts are covered in finance courses, earlier in this course, or in other business courses. Instead, the purpose is to enable students the experience of seeing these concepts in action in the IT context of a firm. In addition to describing the key ITPM concepts, Table 1 serves as a reference for the instructor regarding the key learning objectives. Two additional concepts important to ITPM are not exhibited by the simulation, but mentioned during the debriefing session. Because this is a one-stage rather than multi-stage game, the importance of **sequence and timing** in creating value in the IT portfolio is not a part of the simulation. Similarly, the simulation incorporates an element of luck (in the form of random draws), but in reality, an organization may control its own "luck" by developing world-class **IT management capabilities**, one part of which is learned via the simulation.

Managing the IT portfolio is a strategic exercise with long-term, rather than short-term, implications and, as such, should be in the purview of senior executives (Pennypacker and Dye, 2002). IT projects are selected based on the balance between value creation and the risk to the organization (Jeffery and Leliveld, 2004). In addition to the basic financial necessities of prioritization and balancing risk and return, project choices may incur opportunity costs or create options in the future for a firm – the value of the flexibility inherent in these options is an important part of understanding the full value of a project in the context of the IT portfolio (Bardhan, Bagchi and Sougstad, 2004). Even on decisions regarding the same project choices, decision makers vary in their risk preferences depending on their perspective or context (Miller and Chen, 2004). As a result, the perceived risk of an aggregate set of projects as viewed from a corporate perspective is likely to differ from the perceived risk of the same projects from a business unit perspective (e.g., a corporate executive may be able to diversify risk across a set of projects, but a business unit general manager may not have the same luxury).

Interdependence among IT projects (and associated synergy) highlights the importance of taking a portfolio approach to managing a firm's IT projects (Tu and Shaw, 2010). The firm may be able to achieve economies of scope by leveraging standard systems and technology among investments (i.e. projects) across the enterprise (Sambamurthy and Zmud, 1999). Taking a portfolio perspective facilitates the identification and exploitation of such synergies. However, there may be a tradeoff. Using a single vendor for applications across the enterprise or for a significant portion of the IT services provided by the firm may expose the firm to lock-in due to high switching costs (Clemons, Redi and Row, 1993, Shapiro and Varian 1999), especially pertaining to enterprise systems. So, the firm may benefit from lower costs by standardizing on information systems from a single vendor, but the firm must balance the risk of opportunistic behavior by that vendor.

Taking a broad perspective to managing the IT portfolio allows the assessment of complementarities among different projects. For example, IT infrastructure may not provide advantage by itself, but its complementarity with other organizational capabilities can significantly impact firm performance (e.g. Zhu, 2004). A coordinated effort regarding the management of the IT portfolio facilitates the strategic alignment between IT processes and the business strategy of the firm (Henderson and Venkatraman, 1993), a persistent priority of the IT organization (Luftman and Ben-Zvi, 2010). The institution of a project management office facilitates the coordination of IT projects across the enterprise and allows the organization to evaluate the interdependencies of projects (Rad and Leven, 2002). While simple prioritization and risk vs. return calculations represent important aspects of evaluating projects in terms of the IT portfolio, the manager should incorporate the additional concepts enumerated here in considering the overall IT portfolio.

3. BACKGROUND/CLASSROOM SETTING

The target course for this ITPM simulation is an MBA course on information systems strategy and management. Students should have some prior classroom experience with finance concepts such as expected value, risk/return and return on investment. While this background is ideal, students with no such experience are able to learn ITPM basics from the simulation.

The simulation has been successfully implemented in six class sections in a nationally ranked top 20 part-time MBA program and one additional section in a top 50 full-time MBA program between 2009 and 2012. Class sizes varied from 20 to 48 students. The simulation requires six teams, so the number of students per team may be varied accordingly. The simulation may be scalable to larger class sizes by dividing the students into two competing companies, each with six teams of students, but this has not been tested in practice. The simulation is normally done about 70% through the course, after students have been introduced to the concepts of real option value, lock-in/switching costs, complementarity of IT and organizational

Key Concept	Description	References	How is this Illustrated in the Simulation?
Prioritization	Budget constraints require prioritizing projects based on relative merit (cost/benefit).	Jeffery and Leliveld, 2004	Attractive projects are available with total cost significantly exceeding the budget.
Risk vs. Return	This concept is probably the most intuitive for the students who instinctively try to balance the risk of each project with its projected return.	Jeffery and Leliveld, 2004	Risk varies widely among the menu of projects with high risk projects offering the highest potential return.
Real Option Value	The nature of some projects creates options which may provide value for the firm in the future.	Bardhan, Bagchi and Sougstad, 2004	Specific projects offer the option of a staged implementation and lower risk, a common instance of real option value.
Aggregate Risk	Risk may be perceived differently when diversified across multiple projects, as compared to a single project.	Miller and Chen, 2004	High risk/reward innovation projects are available to each steering committee that are difficult for each group to justify, but might be managed by the firm.
Economies of Scope	Using standardized technology across the firm provides economies with respect to maintenance, training and external coordination.	Sambamurthy and Zmud, 1999	Potential benefit to the firm of implementing standardized ERP by all steering committees.
Lock-in/Opportunism	Using a single vendor may expose the firm to lock-in and opportunistic behavior by the vendor.	Clemons, Redi and Row, 1993; Shapiro and Varian, 1999	Potential cost to the firm of choosing a single vendor approach for both ERP and middleware.
Complementarity of Projects	There are synergies that exist among sets of projects or a project and an organizational capability.	Rad and Leven, 2002; Zhu, 2004	The operating system project is useless without the hardware required to operate it. This is obviously an oversimplifcation of a complex concept, but students get the point.
Strategic Fit	The deliverables of IT projects should align with or fit the strategic objectives of the corporation.	Henderson and Venkatraman, 1993	A corporate metrics project has little value for each of the groups, but high value for the corporation. This exemplifies the need to align the projects with the firm's strategy.
Value of a Project Management Office	A corporate level office with the global perspective on the IT portfolio provides value by considering the combined needs of all parts of corporation.	Tu and Shaw, 2010	The ability to consider the projects of the different groups simultaneously reflects part of the mission of a PMO.
Value of Coordination	The benefit of considering the joint impact of different projects across the firm, creating value from coordination.	Larson, 2012	The interdependence of related projects for a given group and the interdependence of the different groups' projects reflects the need to coordinate.
Sequence and Timing	There is path dependence among projects that influence the return on investment in IT.	Powell and Dent-Micallef, 1997	Not simulated.
IT Management Capabilities	Firms vary in their ability to garner returns from IT, indicating different IT management capabilities.	Brown and Magill, 1998	Not simulated.

Table 1, Key Concepts of IT Portfolio Management and How Each Concept is Simulated
(as adapted from Brown and Magill, 1998 and Powell and Dent-Micallef, 1997)

capabilities, IT/business strategic alignment, and economy of standardization. The simulation provides a platform for students to revisit these concepts they learned in class and consider the concepts together as they apply to an organizational context.

4. IMPLEMENTING THE SIMULATION

Instructors implementing this simulation are encouraged to utilize the information in Table 1 to ensure their own familiarity with these key ITPM concepts. The instructor may leverage the "quick start guide" and a supplemental video which provide step-by-step instructions for preparing and implementing the simulation in the classroom. The 15 minute how-to-video may be viewed at http://jise.org/24/24-2/1210095_teaching_tip_larson .mp4. A complete set of instructor materials referenced herein may be downloaded from http://jise.org/24/24-2/1210095-itpm_simulation_materials.zip.

Prior to the simulation, the instructor prepares six packets using the pre-packaged supplemental materials (one for each steering committee representing different units comprising the firm's value chain): Corporate, Inbound Logistics, Component Materials, Assembly, Marketing and Retail. Figure 1 depicts the units of the fictitious skate manufacturer, Skates Inc. (value chain adapted from Porter and Millar (1985) to represent Skates, Inc.). Each packet contains an instruction sheet, a menu of IT projects specific for each committee, and a results scorecard.

The simulation and a debriefing session require about one hour of class time. Students prepare for the simulation by reading Jeffrey and Leliveld (2004) in order to learn some of the key concepts and the value of taking a comprehensive view in ITPM. Students are randomly divided into six equal-sized groups, with each group serving as a steering committee representing one area of the value chain. Group sizes varied from 3 – 8 students per group depending on class size - the constraint being that 6 teams are required for the simulation. Each group receives the packet described above specific to their steering committee. Students are directed to read the instruction sheet and begin their work as a steering committee. The task of each group is to choose a set of projects from the menu of projects for their committee with the objectives of maximizing their committee's IT portfolio value and the value of the corporate IT portfolio, while remaining within a specified budget. Students record their project selections on the IT Portfolio Management Scorecard. The instructor should allow about 20-30 minutes for the steering committees to discuss their options and make their project selections.

After each steering committee completes its project selections, they choose random draw sheets from the instructor and evaluate the return for each project based on the steering committee scorecard. Each project is either a success or failure, a simplification for ease of implementation that does not lessen the ability of students to understand the learning objectives. Each IT portfolio is further evaluated on its overall fit with the choices of the rest of the organization (e.g. economies of scope from standardization, concerns about vendor lock-in, and alignment with corporate objectives) in a Bonus/Penalty section to arrive at a total return for the group (see instructor materials for the bonus section of the scorecard). For example, there is a bonus when the six steering committees all successfully implement the same ERP system based on the benefits of integration and firm-wide process standardization. In addition, there is a balanced scorecard project with high value for the corporate steering committee, but less value for each of the other units. The success of the corporate level project depends on smaller projects in each of the units to rollout a consistent set of business metrics. This feature of the simulation highlights the importance of aligning IT investment with overall business strategy and emphasizes the value of coordination across the firm's IT portfolio.

Lastly, a debriefing discussion is facilitated by asking students about their thought processes in choosing projects for their IT portfolio. Students point out how they are rewarded or penalized for the choices that they make during the simulation. During the debriefing, the class discusses why bonuses and penalties might occur based on specific decisions made by each steering committee. Students are also asked how they might improve their ITPM skills in order to strengthen their thinking on these key concepts before they are called to manage a real IT portfolio in the future. During the debriefing sessions, the students were able to articulate many of the key concepts of IT portfolio management based on what they experienced in the simulation. The instructor may supplement the students' use of key concepts to ensure full coverage of the concepts in Table 1 and fulfillment of the learning objectives.

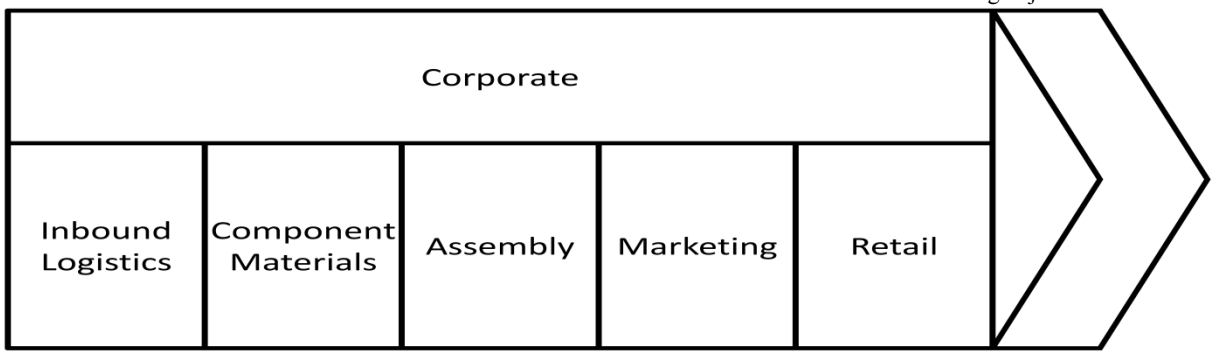

Figure 1. Steering Committee Groups
(as adapted from Porter and Millar 1985)

5. EVIDENCE OF LEARNING

This simulation was administered in seven sections of an Information Systems MBA core course taught at two major public U.S. universities between January, 2009 and December, 2012. Student responses to the simulation were generally positive and included:

- "very well thought out and effective exercise";
- "very helpful with understanding why firms make the IT decisions they do"; and
- "the exercise was good in that it connected concepts to an exercise that appeared simple - but in reality required a deeper understanding to be successful."

Learning effectiveness was assessed in two sections of the course taught in 2011. Students were given the option (not required for the course, and after obtaining consent) to self-assess their level of understanding of the ten key IT portfolio management concepts immediately before and after the simulation. Pre- and post-simulation assessments were used to determine whether any change in the students' understanding occurred as a result of participating in the simulation (the treatment). These results are intended as evidence of learning effectiveness only. They fall short of being demonstrable proof given the limitations associated with a sample of convenience, the potential immediacy bias and the subjective assessments made by respondents. The learning effectiveness survey instrument and a summary of the results may be found in the instructor materials online at http://jise.org/24/24-2/1210095-itpm_simulation_materials.zip.

6. DISCUSSION AND CONCLUSIONS

The ITPM simulation described here provides a context that is often difficult to create in the classroom. Students make investment decisions regarding an IT portfolio and then have the opportunity to assess the soundness of those decisions in a practical and realistic organizational setting. As such, this simulation provides a classroom tool for developing ITPM capabilities for MBA students.

In the majority of experiences with the simulation so far, the students quickly embraced the benefits of working cooperatively since they are all part of the same firm. In one section in particular, however, the students acted in a fiercely competitive manner until the instructor reminded students that the teams are part of one firm and might benefit from working cooperatively. In all cases, there was some degree of competitiveness or organizational conflict that is a realistic depiction of some of the agency challenges that most companies face in making choices regarding IT investments. The student experience of actually negotiating these decisions in a realistic organizational context improves the retention of key concepts especially related to complementarity and coordination.

7. FUTURE PLANS

The logical next step with the ITPM simulation is to implement the simulation in a technology-enabled environment. The random draw portion of the simulation and the subsequent calculation of return on investment could be streamlined in an electronic environment. There may be an opportunity to partner with leading software firms in the portfolio management space to offer the simulation via their products. Even a cursory experience with a leading portfolio management tool would likely be of significant value for students, especially those interested in careers in IT.

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