

## The value of information technology: A case study

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### ABSTRACT

This case requires students to examine how to effectively assess the business value created by information technology (IT). This cross-disciplinary case is intended for use in an upper level management information systems (MIS) course and accounting course as an exercise to study IT value. The objectives of this case are to encourage students to explore different valuation methods and to stimulate students' appreciation of IT in a corporate environment.

Keywords: Information Technology (IT), Valuation, Gap Analysis



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## **INTRODUCTION**

Joe Whiteoak is a business consultant working for a local consulting firm in Midwestern area. Joe has a Bachelor's degree in management majoring in accounting and finance from a regional university, where he also earned his MBA with concentration in management information systems (MIS) in 2008. The consulting firm that Joe worked with is specialized in management consulting and information technology (IT) consulting. Its primary clients include medium to small size regional businesses and the firm has had plans of expansion by seeking clientele of larger operating scale.

In the summer of 2011, Joe's firm was approached by a national corporation to assess the corporate plan to implement a new information technology system. The national corporation is a public company listed in the New York Stock Exchange (NYSE). Thus the client is subject to scrutiny of the Securities and Exchange Commission (SEC), and its stock price may fluctuate upon disclosure of corporate spending on IT.

The client wished to have a feasibility analysis of the spending on IT from various perspectives, including the evaluation of both financial and nonfinancial aspects. Joe was assigned to this project because of his educational background in accounting, finance and MIS. As a junior consultant, Joe was assigned to perform a preliminary review of applicable valuation methods of IT, and to also gather information in respect to the benefits and costs of IT spending.

### **VALUATION OF IT SPENDING: ACCOUNTING TREATMENT (GAAP)**

Joe first conducted a search of accounting regulations and literature. The client is a public company and its financial statements are required to be prepared in accordance with the Generally Accepted Accounting Principles (GAAP) in the United States. According to GAAP, IT spending should be treated on a case by case basis. For instance, the IT spending in equipment and some other tangible assets can be capitalized, whereas such spending as employee training should be expensed. The capitalized IT spending is recorded as an asset on the balance sheet for the current period, which will be allocated as expenses in the subsequent periods of usage. Those IT spending expensed, on the other hand, should be immediately accounted for as expenses on the income statement, and reduce the net income of the current period.

Despite numerous case studies indicating a positive association between IT spending and enhanced productivity or improved financial performance, the academic evidence regarding the significance of information technology is mixed (Muhanna & Stoel, 2010).

### **VALUATION OF IT SPENDING: AN ECONOMIC VALUE ADDED (EVA) APPROACH**

Joe was conservative in selecting an operational model to evaluate the costs and benefits of IT spending at a firm level. Joe decided to use Economic Value Added (EVA) for consistency in the application.

The term EVA is a registered trademark of Stern Stewart & Co. located in New York City (e.g., Stewart, 1991). Joe used the EVA model an instrument to measure whether an investment in information technology can create corporate value. EVA is a performance metric that can be computed using data computed from accounting numbers. There are various ways of computing EVA, and Joe adopted the operational formula used in a case study by Silverman (2010).

$$\text{EVA} = \text{NOPAT} - \text{Capital Invested} * \text{WACC} \dots\dots\dots (1)$$

According to Silver (2010), NOPAT stands for “Net Operating Profit After Taxes”. Capital Invested can be calculated as the sum of common equity, preferred stock, minority interest, and all debt. WACC represents “Weighted Average Cost of Capital”. The computation of WACC can be demonstrated as follows:

$$\text{WACC} = E/V * Re + D/V * Rd * (1 - Tc) \dots\dots\dots (2)$$

Where:

*Re = Cost of Equity*

*Rd = Cost of Debt*

*E = Market Value of the Firm’s Equity*

*D = Market Value of the Firm’s Debt*

*V = Equity plus Debt*

*E/V = Percentage of Financing that is equity*

*D/V = Percentage of Financing that is debt*

*Tc = Corporate Tax Rate*

The founders of EVA traditionally use Capital Asset Pricing Model (CAPM). Under CAPM Cost of Equity (Re) is computed as

$$\text{Re} = \text{Rf} + \text{Beta} * (\text{Rm} - \text{Rf}) \dots\dots\dots (3)$$

Where:

*Rf = Risk Free Return.*

*Rm = Market Expected Rate of Return.*

*Beta = Risk Co-efficient.*

EVA is a valuation framework developed on residual income model. The EVA model has been widely used in both business practices and academic research to measure performance. Joe planned to use EVA model to assess the “value added” to the client company from the IT spending. The IT investment is considered valuable if the value derived from the EVA model is favorable.

## VALUATION OF IT SPENDING: A GAP ANALYSIS

According to a comprehensive review by Kohli and Grover (2008), most IT valuation research has focused on the impact of different IT input variables on the company’s economic output. Among many methods to study the business value of IT, Joe decided to adopt gap analysis due to several reasons. First, the company proposes a brand new information technology system, so it is important to identify the gaps between the current state and the “to-be” state and decide whether they can be filled by the implementation of the new IT system. Second, the economic output of the new IT system primarily relies on the quantitative indicators and predictors, but intangible value created by IT is difficult to capture and often under-represented. Gap analysis, as a more qualitative approach, provides valuable insights to assess intangible value created by IT and answer probing questions usually raised by company executives. Third,

Joe's job is to prepare a preliminary study on how to assess the business value of the new IT system. In contrast to many valuation methods in post implementation phase, gap analysis is appropriate in the early stage of system development life cycle considering its efficiency and effectiveness. As the prerequisite to planning an IT system, gap analysis not only examines the current problems, but also lays the groundwork for the improvement that the new system will achieve.

The process to conduct gap analysis is straightforward. Joe first conducted interviews to gather inputs and insights from a wide range of stakeholders. Following top-down approach, Joe began with asking general comments about the current system and then specifically discussed the existing problems from technical, operational, organizational, economic, environmental, and other relevant perspectives. At the beginning of each interview, Joe clarified that the purpose of the interview was to identify the current state rather than to investigate anyone's fault. One of the most successful interview techniques in gap analysis is to let the interviewees use the scale to determine the current state and verbally explain the evidence and reasons to support their ratings. The information gathered from the interviews was summarized by Joe and reviewed by the system planning team. To further validate the results from the interviews, Joe also conducted a survey to reach more stakeholders. The information collected from both channels was consistent. Finally, Joe presented the findings to the system planning team to identify a desired state. As a result, gaps between current state and future state were clear. After a careful review of the company's weakness, strengths, opportunities and threats, the system planning team developed the detailed problem statement and made constructive recommendations to close the gaps.

In summary, gap analysis is an effective approach to assess the value created by IT, that is, the value of the new IT system comes through the process of identifying and filling the gaps.

## **DISCUSSION QUESTIONS**

1. Please evaluate the accounting treatment of IT spending and non-accounting valuation approach (EVA) used by Joe, and determine whether you agree or disagree with each of the approaches. Please elaborate on the underlying reasons for your opinion.
2. Please explain the purpose of gap analysis in the valuation of IT spending. Please also explain the usefulness of gap analysis in the assessment of financial and organizational benefits from IT spending.
3. Imagine you are Joe's supervisor reviewing the valuation methods proposed by Joe. What is your feedback? Would you recommend some other valuation methods?

## **TEACHING NOTES**

### **Learning Objectives**

This case provides an example for students to go out of box and explore various valuation methods for information technology. This case can be used as a supplemental exercise in instructing the significance of information technology. The learning objective of this case is for students to evaluate the importance of information technology in the context of firm valuation.

### **Suggested Use of the Case**

The case is recommended for use in a Management Information Systems (MIS) course at upstream undergraduate or graduate levels. The case study may also be used in a graduate accounting course as an exercise in the valuation of information technology. In both settings, the case can be used for class discussion or as a written project. The case requires students to explore different valuation methods in Accounting, Finance, and MIS fields. As a result, the case is best served at the graduate level in the first or second semester when students have sufficient exposure to relevant topics. The research required in the case provides an opportunity for students to explore the use of library and research sources from internet. In particular, students are required to research the EVA methods developed by Stern Stewart & Co, gap analysis, and the existing GAAP methods, in order to obtain a good understanding of the strengths and weaknesses of the methods. In the meanwhile, given the scope of the research, the use of group is highly recommended for this project.

### **Suggested Solutions to Case Questions**

1. Please evaluate the accounting treatment of IT spending and non-accounting valuation approach (EVA) used by Joe, and determine whether you agree or disagree with each of the approaches. Please elaborate on the underlying reasons for your opinion.

Students should be aware that Joe's client is a listed company subject to scrutiny of the SEC. As required, the client's financial statements should be prepared in accordance with General Accepted Accounting Principles (GAAP). Thus students should first review accounting standards on various accounts related to IT spending. Students should be aware that the investment community, however, evaluate IT spending differently from GAAP. The conventional accounting textbooks generally present most of the IT spending as an expense, while investors consider IT spending as both an expense and an intangible investment. The primary objective of an investment in intangible assets is to generate future benefits to the company, which lead to potential increase in net income, Earnings Per Share (EPS, basic EPS is computed as net income divided by the number of shares outstanding), and market value. For instance, Brynjolfsson, Hitt, and Yang (2002) suggested that an increase in the investment in computer capital is positively associated with increased market value of the company.

As previously illustrated formulas (1), (2) and (3) utilize a lot of accounting numbers that can be extracted from financial statements. EVA approach, derived from financial theory, views a firm's value based on future cash flows discounted to the present. The projected future cash flows and the cost of capital, however, lack inherent accuracy by nature. Since EVA is built upon assumptions of projected numbers, this non-accounting model is subject to the constraints imposed by the uncertainties from its components. Previous research has intensively discussed the advantages and disadvantages of the EVA approach (e.g., Silverman, 2010).

Students are required to conduct research for this question. Students should show abilities to critically examine the strengths and weaknesses of each approach. Additionally, students should be able to provide justifications for their decision in adopting the approach of choice.

2. Please explain the purpose of gap analysis in the valuation of IT spending. Please also explain the usefulness of gap analysis in the assessment of financial and organizational benefits from IT spending.

The fundamental purpose of gap analysis is to identify the gap between the current state and the desired state in the future. As the prerequisite to planning an IT system, gap analysis not only examines the current problems, but also lays the groundwork for the improvement that the new system will achieve. The value of the new IT system comes through the process of identifying and filling the gaps. Furthermore, Gap analysis is a more qualitative approach that is extremely useful to capture intangible aspects of IT value.

3. Imagine you are Joe's supervisor reviewing the valuation methods proposed by Joe. What is your feedback? Would you recommend some other valuation methods?

Joe has done a preliminary review of different IT valuation methods. The accounting and finance methods proposed by Joe capture both tangible and intangible aspects of IT value. The quantitative approach focuses on the organization's operational and economic outputs created by IT. Gap analysis, as a more qualitative approach, explores the behavioral changes facilitated by IT. Other popular methods, including but not limited to portfolio analysis, SWOT analysis, competitor analysis, balanced scorecards and etc., may be considered as supplements to the proposed methods.

Answers to this question may vary. Students are encouraged to explore more practical methods through literature review and case studies.

### **Evaluation of Student Approaches**

As noted, each of the valuation methods, namely GAAP treatment, EVA approach, and gap analysis, has its own shares of strengths and weaknesses. Students are required to assess the strengths and weaknesses of each method, and further explain the application of various methods in specific circumstances. Students may make assumptions in the process and provide justifications for decisions.

Joe's analysis was preliminary and incomplete, but it can be used as a starting point for further analysis. Students may come up with different valuation plans based on their assumptions. The case did not specify the industry and size of the client on purpose to allow more flexibility for students' analysis. For instance, IT spending will have different impacts on the client when industry varies. Students should also be aware that the case may be approached from various angles, such as accounting, finance, and organizational perspectives, yet each approach has its limitations.

The primary objective of this case study is for students to present abilities of critical thinking, and to reach a reasonable conclusion based on assessment. The valuation of IT

spending is a complex issue with no definite or clear-cut answers. According to Brynjolfsson (1994),

“Perhaps the most important reality is that despite what the statistics say about the ‘average’ return on IT investment, each manager must decide which projects are worthwhile. There is no bank where companies can deposit IT investments and withdraw an “average” return... productivity does not automatically follow IT dollars...”

Instructors may evaluate the students’ analysis using rubrics, which may include the thoroughness of analysis, evidence of critical thinking, sufficiency and appropriateness of support for conclusions, and the depth of research beyond textbooks.

## SUMMARY

This paper presents a cross-disciplinary case to stimulate students’ interest in the valuation of IT. As noted, there are multiple approaches to assess the value of IT in a corporate setting. Students can obtain a better understanding of how IT spending can be valued using both quantitative and qualitative methods as illustrated in this case study. The different approaches discussed are popularly used to capture tangible and intangible aspects of IT value. The case serves to better prepare students for the occasion when they are faced with valuation issues in practice. The case also presents an opportunity for students to be more comfortable with a variety of valuation methods, and the background and application of each method. This will also allow students to gain a better understanding of how to assess the circumstances case by case, and make professional judgment on the appropriateness of the application of valuation methods.

The case intends to promote critical thinking and analytical skills. Furthermore, students are encouraged to perform research in accounting, finance and MIS fields. As students analyze the methods, they should be able to obtain decision making skills and to determine the best approach, alone or combined, to value the IT spending.

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