

## **DUPONT MODEL: INTEGRATING THE TRADITIONAL BUSINESS FUNCTIONAL AREAS**

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### **ABSTRACT**

*For over decades business schools have been asked to help prepare students for an environment requiring systemic thinking, ability to work in teams, and skills and motivation to respond to rapid change. Recently, they have been asked to help future business leaders to prevent a repeat of the current financial crisis. Despite these calls, little has changed in business education. In this paper we report the preliminary results of an attempt to increase undergraduate students' levels of cross-functional and systemic thinking using the DuPont model to integrate across functional areas. The model provides a valuable framework that displays how typical functional-area tasks are related to firm-level outcomes.*

### **INTRODUCTION**

For over two decades employers, advisory boards, academics and others have called for improvements in business education outcomes. In particular, business schools have been asked to help prepare students for an environment that requires systemic thinking [2], cross-functional perspectives [1] [9], the ability to work in teams [3], and the skill and motivation needed to respond to rapid change [7]. Others have suggested that management education should be organized around “the nature of managerial work, not the functions worked on” [14, p.68]. And, more recently, business schools have been asked to consider their role in helping future business leaders prevent a repeat of the current global financial crisis [11]. Unfortunately, despite these calls for changing the skills and knowledge that graduates possess, and the behaviors they exhibit, little has changed in how we educate future business leaders.

In undergraduate programs core curriculum topics are largely taught by individual functional experts in stand-alone functionally-discrete courses, and because students often aren't required to complete the core curriculum until the end of their program (in preparation for a capstone course) they spend much of their time and attention focused on their functional area. The results are business graduates who are prepared to be “entry-level cogs in a machine” [9, p. 312], but not future managers who are prepared for a “whole career” [10, p. 127]. Much of the change that we have seen in business education is on the margins. For example, individual professors add integration-oriented cases, activities and exercises to a specific course, but which are isolated from changes that may or may not be occurring in other courses. As another alternative, colleges implement passive cross-functional connections between courses (e.g.,

coordinating syllabi, a common theme) without changing the nature of professor job requirements or the silo-reinforcing program and reward structures that exist in most colleges of business. A small number of schools have successfully implemented integrated, team-taught programs at the undergraduate level [16], but these programs require considerable resources and are most appropriate in settings with full-time students who can be organized into cohort groups. Programs that serve non-residential and part-time students or programs that rely on graduate teaching assistants to serve the needs of large numbers of students in the business school would be hard pressed to implement an integrated, team-taught program.

In this manuscript we describe how the DuPont Model can be used across a program as a powerful integrating tool, with minimal training and coordination among faculty. The model provides an excellent visual representation of the relationship between any functional area decisions (e.g., how much inventory to hold, how much cash to hold, what type of promotional campaign to use) and firm-level outcomes (e.g., return on equity, return on assets). And, because the model is relatively easy to explain, a student can be introduced or reintroduced to the model in any course. Thus, it is not necessary to restrict students to a specific sequence of courses. In any given class there may be students who have seen the model in other courses or students who are seeing the model for the first time. Furthermore, over the course of the program integration comes once a student sees the model applied in all of the functional areas (e.g., noticing that cash management is nearly identical to inventory management).

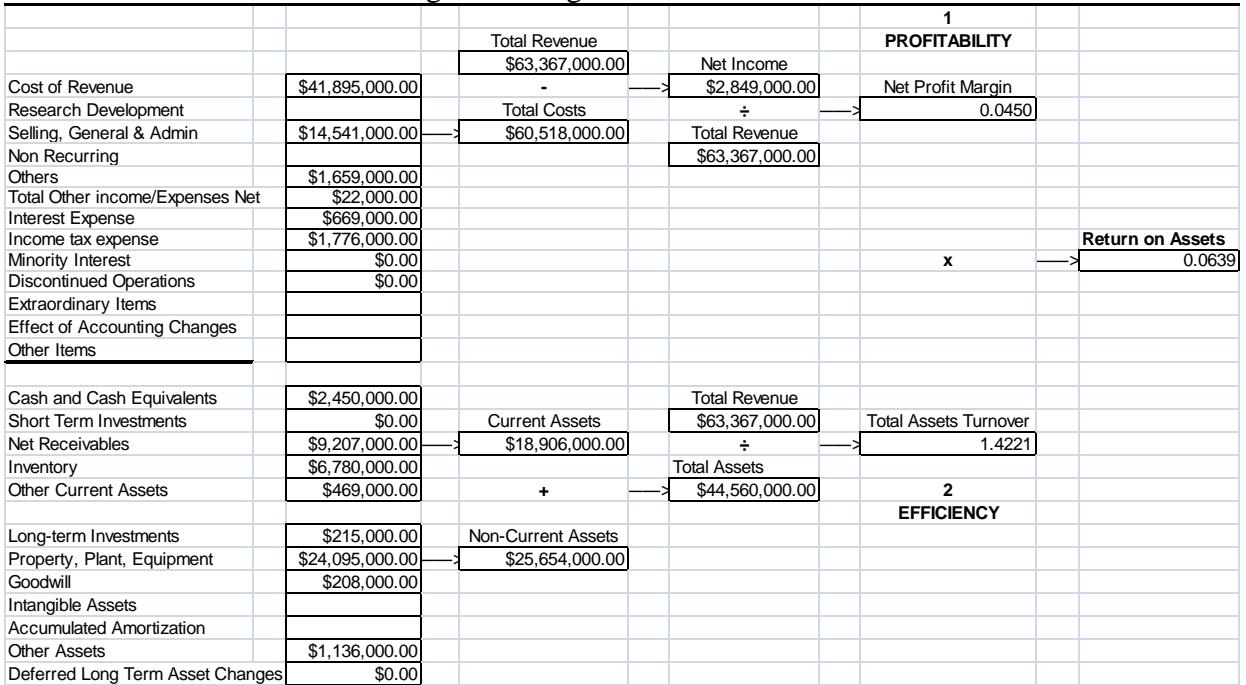
The paper is organized into three sections. The first section describes the origins, structure and applications of the DuPont Model. In an effort to highlight how the model can be used to achieve some level of integration of the core curriculum, the second section describes specific examples of how the model can be used in the standard business-principles courses (e.g., Finance, Information Systems, Management, Marketing, Operations Management). Finally we discuss some possible ways that the model can be used to integrate across a major or to achieve other learning outcomes, in addition to functional level integration

### **DuPont Model**

The use of financial ratios by financial analysts, lenders, academic researchers, and small business owners has been widely acknowledged in the literature [4] [6] [15]. The concepts of Return on Assets (ROA) and Return on Equity (ROE) are important for understanding the profitability of a business enterprise. Specifically, a “return on” ratio illustrates the relationship between profits and the investment needed to generate them. However, these concepts are often “too far removed from normal activities” to be easily understood and useful to many managers or small business owners [19].

In 1918, four years after he was hired by the Du Pont Corporation to work in its treasury department, electrical engineer F. Donaldson Brown was given the task of untangling the finances of a firm (General Motors) of which Du Pont had just purchased 23 percent the stock. Brown recognized a mathematical relationship that existed among three commonly-computed ratios: 1) net profit margin (obviously a profitability measure), 2) total asset turnover (an efficiency measure), and 3) ROA. The product of net profit margin and total asset turnover equals ROA, and became the original Du Pont model, as illustrated in Figure 1.

Figure 1: Original Du Pont Model



In the 1970s the generally accepted goal of financial management became “maximizing the wealth of the firm’s owners” [8] and focus shifted from ROA to ROE. This led to the first major modification of the original Du Pont model. In addition to profitability and efficiency, the way in which a firm financed its activities (i.e. its use of leverage) became a third area of attention for financial managers. The new ratio of interest was called the equity multiplier, which equals total assets divided by equity. The modified Du Pont model is shown in Figure 2.

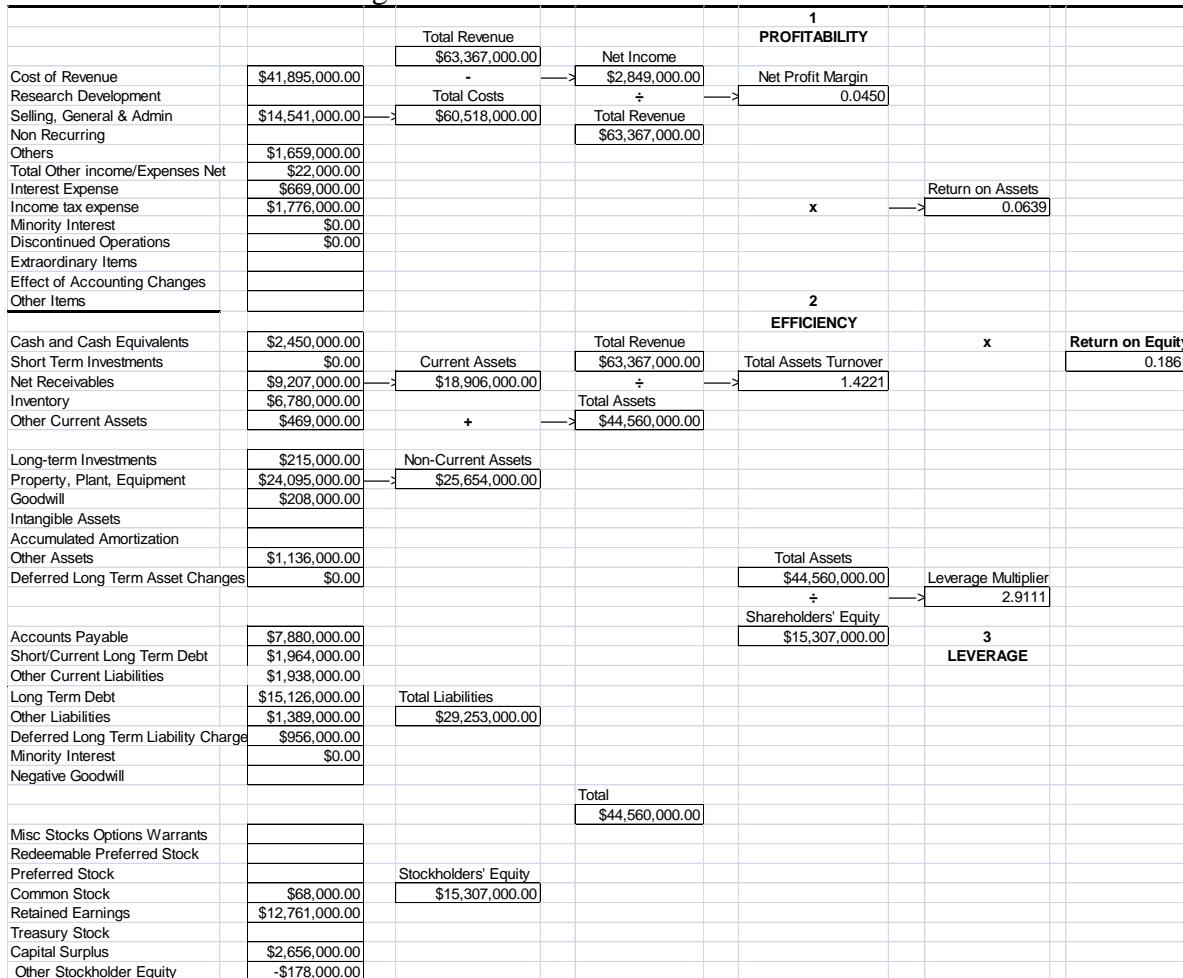
As a diagnostic tool the modified Du Pont Model can be used to compare the profitability, efficiency and leverage of one company to another, or to compare the performance of the same company from one year to the next. In addition, the model can be used to **highlight how functional area decisions (i.e., things on the left side of the model) can impact profitability, efficiency, leverage, ROA, and ROE** (i.e., things on the right side of the model).

## INTEGRATING THE BUSINESS CORE CURRICULUM

In this section we address the opportunity to use the Du Pont Model as an integration tool in teaching five principle areas, management, finance, information system, marketing and operations management. We have developed examples for the 5 disciplines but space requirements allow us to present only two.

**Finance.** One of the most crucial activities of both large and small firms is the continuous acquisition of fixed (so-called “earning”) assets. Firms must acquire new assets to grow and thrive into the future. However, managers have choices as to how these assets will be financed. In the most basic terms, the choice is between borrowing (debt), or raising capital from owners (equity), either through the sale of stock or some other owner-provided capital infusion.

Figure 2: The Modified Du Pont Model



Most managerial finance textbooks discuss this issue in chapters that titled either “Capital Structure” or “Capital Structure and Leverage” [5] [8] [12] [13]. The typical treatment of the topic involves how use of financial leverage (i.e. debt) adds financial risk to a firm, but also causes variation in financial performance, as measured by earnings per share (EPS) and return on equity (ROE).

While this typical treatment does an adequate job of illustrating how both EPS and ROE respond to alternative capital structures, the full ramifications of the financing decision is often lost to a beginning student. Although students can fairly easily crunch the numbers and determine the variations in the financial performance statistics, they rarely think through the total process of why the numbers are changing.

The use of the Du Pont model easily corrects this deficiency. With the Du Pont model, students can see the total financial ramifications of a decision made at any level or division of the firm. For example, assume the operations department decides to purchase a new machine that will replace an older, less efficient one. The machine must be paid for with equity, debt, or some combination of the two. This “financing decision” will impact the financial performance

statistics, but it is not always clear to all concerned exactly how or why each of these statistics is changing, or even in which direction.

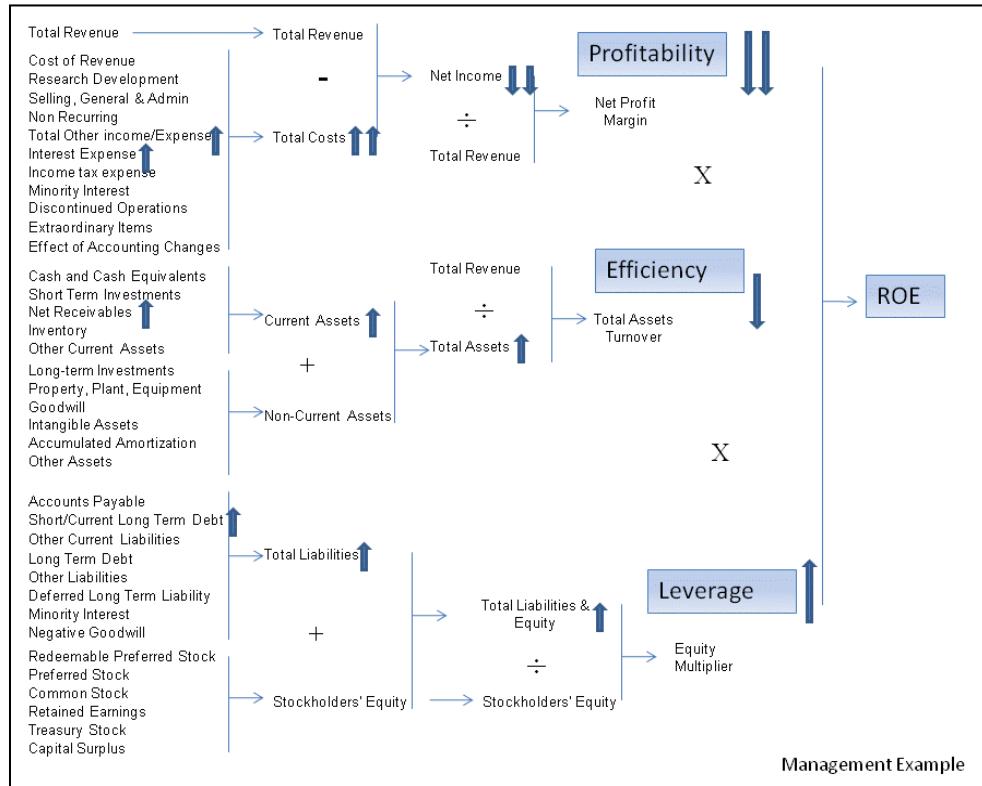
The financing decision has immediate impact upon the equity multiplier portion of the Du Pont model, but can also influence the profitability portion as well, depending upon the financing source chosen. If, for example, the manager chooses to borrow money to fund a new asset, the firm will be required to make interest payments on the debt, which will have a negative impact on profitability. If, on the other hand, the manager chooses to use an equity source to fund the new asset, profitability will not be affected by the financing decision.

Consider the following specific example. Suppose that a firm decides to purchase a new piece of equipment that costs \$100,000, which will replace an obsolete machine that has been fully depreciated and has no salvage value. The impacts upon the three “drivers” of the Du Pont model are as follows:

1. **Efficiency** (as measured by the Total Asset Turnover Ratio) *Obviously, the purchase itself will increase assets by \$100,000. Assuming no corresponding increase in sales, Total asset Turnover will decrease, with a negative impact on ROE.*
2. **Leverage** (as measured by the Equity Multiplier) *If the firm already had \$1 million in assets and was financed 50-50 by debt and equity, the equity multiplier would be 2.0 (\$1 million / \$500K). If the manager decided to finance the new asset entirely with debt, the new equity multiplier would be 2.2 (\$1.1 million / \$500K). This would have a positive impact upon ROE.*
3. **Profitability** (as measured by Net Profit Margin) *However, the addition of new debt in the capital structure of the firm will result in a higher level of interest expense, which will have a negative effect upon profitability. For example, if the interest rate on debt was 10%, the firm would pay \$10,000 of additional interest payments each year until the debt is repaid. However, there is a good possibility that the new equipment will have a positive effect on sales or costs of sales, which may offset some, if not all, of the added interest expense. The impact on ROE is ambiguous.*

**Management.** A common set of learning objectives in all principles-of-management courses and text books [17] [18] is increasing students’ levels of understanding about how to influence employee behavior. Topics cutting across a number of chapters in a typical principles-of-management textbook often include the roles that such things as attitudes, perceptions, job design, goal-setting, rewards, and personality-types play in influencing behavior. For example, in a chapter on motivation Schermerhorn [18] states that one way to influence behavior is by setting specific, challenging goals, and providing feedback on progress toward goals and rewards when goals are accomplished. In a chapter on individual behavior Schermerhorn describes the role that personality plays on an employee’s behaviors. In a subsequent chapter on conflict management Schermerhorn [18] describes five common conflict-management styles that vary as to the degree of cooperativeness and assertiveness an individual prefers. To highlight how these topics, from three different chapters in a principles-of-management textbook (and three different lectures in a course) are related to each other, and how they impact the performance of the organization, a principles of management instructor could use the following example which is presented in Figure 3):

Figure 3: Decision Impact on Firm's Financial Performance



Imagine that you promote Joe, a long-time employee, to the role of accounts receivable clerk. While the employee is somewhat introverted, you promoted him because he is very conscientious, emotionally stable, open to new experiences and agreeable (i.e., the Big Five Personality Types). One thing that you are not aware of is that, consistent with his introverted and agreeable nature, he tends to avoid conflict (i.e., low assertiveness, low cooperativeness) or accommodate another person (i.e., low assertiveness, high cooperativeness). Six months after Joe takes over the position, you notice that the amount of accounts receivable outstanding (i.e., the credit we extended to customers with a promise to pay after 30 days) has grown significantly. It is particularly disturbing that the receivables over 120 days are nearly 10% of the total receivables. In the past the amount over 120 days was only 2% of the total receivables. Using the modified Du Pont Model as a framework, consider the impact of Joe's behavior on firm. If Accounts Receivable grows (with no change in revenue) the following impacts are likely:

1. **Efficiency** (as measured by Total Asset Turnover): Accounts Receivable increase, which leads to an increase in Total Assets, which leads to a decrease in Total Asset Turnover.
2. **Leverage** (as measured by the Equity Multiplier): The basic premise behind a balance sheet is that Total Assets (i.e., things we need to run our business, such as buildings, equipment, cash, accounts receivables and inventory) must balance with the amount of debt and equity that we have (i.e., how we paid for the buildings, equipment, etc.).

*Therefore, if Accounts Receivables increase as a result of Joe's behavior, there must be a corresponding increase in either debt or equity. In this case, we will assume that the company takes on a little more debt to accommodate the increase in Accounts Receivable, which leads to an increase in the Equity Multiplier.*

3. **Profitability** (as measured by Net Profit Margin): *As receivable accounts age they often become harder to collect. Thus, there is likely to be some costs associated with writing off old receivables that cannot be collected. In addition, because we had to acquire some debt to accommodate the increase in Accounts Receivables, we will see an increase in costs associated with interest expense. Therefore, Costs will increase, leading to a decrease in Net Income, leading to a decrease in Net Profit Margin.*

*Thus, we can see how the personality type and conflict style of one employee can have impacts on all three drivers of ROE (i.e., lower efficiency, higher leverage, and lower efficiency). As the text suggests, one way to effectively manage the problem is to apply Goal-Setting principles. For example, Joe's manager could set a goal for Joe that outstanding receivables beyond 120 days not exceed 2% of the total receivables. The goal is challenging, but achievable, and is very specific, which is consistent with characteristics suggested by the theory. Providing Joe with the ability to print a daily report would help him receive feedback on his progress toward the goal. Finally, giving Joe praise for his accomplishment, or rewarding him financially when he achieves his goals, would be methods to ensure that he remains motivated and committed to the task.*

## DISCUSSION

We have proposed use of the Du Pont Model as an integrative tool in all of the “principles” courses within the business curriculum. By seeing this tool in all the functional areas, students can better understand the inter-relationships of the various functions. Furthermore, they can see that all business decisions have both more and less obvious effects on the efficiency, liquidity, and profitability of a firm. As an aside, using the Du Pont Model repeatedly should aid students in the understanding and retention of accounting concepts.

Clearly, if using the Du Pont model in all of the principles led to a better understanding and integration of concepts, a university could expand its use to courses within each major beyond the introductory level. Its integrative benefits should prove equally valuable between disparate courses within a major, just as among various general functional areas of business. Clearly, further empirical research is suggested, to test the relative efficacy of using the Du Pont Model as an integrative mechanism and tool.

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