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AN EXPOSITION ON THE MATHEMATICS AND ECONOMICS OF OPTION PRICING

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ABSTRACT

The application of options pricing theory to value irreversible investment decisions has witnessed a marked increase over the last decade. For instructional and simplified applications, the Black-Scholes model is commonly demonstrated due to its tractability and acceptance in the finance community. This paper provides a detailed mathematical exposition of the Black-Scholes model. The main contribution of this paper is the step-by-step instructional account of the Black-Scholes model that can be used directly in the classroom to introduce stochastic calculus, arbitrage-free valuation, and option-pricing theory. In contrast with most Black-Scholes derivations found in the pedagogical literature, this paper develops the fair option price from an economic equilibrium perspective. Through this approach, it is hoped the reader will comprehend both the mathematics and economics underlying option pricing theory, as both are equally important.

JEL: A22, A23, C02, G00, M19

KEYWORDS: Options Pricing, Black-Scholes Model, Stochastic Calculus, Pedagogy

INTRODUCTION

Black and Scholes (1973) and Merton (1973) published their seminal work on pricing financial options using a continuous-time model that is known as the Black-Scholes equation. Their work led to an explosion of financial risk management practices within firms, and some attribute their efforts to the successful Chicago Board Options Exchange (CBOE) which today has an estimated nominal value of \$100 trillion.

In order to fully comprehend and appreciate options literature, a basic understanding of financial option pricing mathematics is required. As the majority of these mathematical efforts have been initiated and developed under the financial economist umbrella, many business professionals and non-finance experts lack the appropriate exposure to the material. Numerous texts exist on the subject; however, a detailed step-by-step and line-by-line treatment of the Black-Scholes equation are not easily found in texts and related materials.

As such, the purpose of this paper is to formally develop the mathematics and economics behind the Black-Scholes equation. In contrast with most Black-Scholes derivations found in the pedagogical literature, this paper develops the fair option price from an economic equilibrium perspective. Through this approach, it is hoped the reader will comprehend both the mathematics and economics underlying option pricing theory, as both are equally important. This paper does not develop new theories, but instead contributes with its detailed exposition of existing material. For those interested in options pricing, we believe this detailed presentation provides a clear and concise path to comprehend and/or teach basic option pricing mathematics. We have used the techniques in this paper for our *Financial Engineering* courses and find it appropriate for advanced undergraduate and graduate students across numerous disciplines.

This paper is organized as follows. After a brief literature review, Section 2 discusses the mathematics necessary for deriving the Black-Scholes model and its relevance for asset pricing in general. Section 3 develops the Black-Scholes partial differential equation using appropriate mathematical and economic principles. Section 4 provides concluding remarks.

LITERATURE REVIEW

In order to understand option pricing models, analysts must first understand the tools used to develop these models. This module is a brief introduction to stochastic calculus and its import in asset pricing. Far from being a mere theoretical development, stochastic calculus is a practical method that can be used by both academics and market professionals. An introduction to stochastic calculus can be found in Baxter and Rennie (1996), Hoel et. al (1972), Kushner (1995), Merton (1990), Neftci (2000), and Wilmot et. al (1995). Dixit and Pindyck (1994) and Copeland and Antikarov (2001) demonstrate these financial option-pricing techniques applied to capital budgeting decision-making.

Understanding the derivation of the Black-Scholes-Merton equation will assist scholars to understand numerous other closed-form equations to value options. The option to exchange one asset for another was developed by Margrabe (1978). Fischer (1978) developed an equation to for option valuation with an uncertain exercise price. Geske (1979) developed an equation to value compound options with deterministic exercise prices. Carr (1988) developed a compound option equation with stochastic exercise prices.

Finally, the techniques demonstrated in this paper allow a more intuitive interpretation to understand numerous lattice approaches. Cox, Ross, and Rubinstein (1979) developed a binomial discrete-time option valuation technique. Boyle (1986) developed a trinomial tree, and Boyle (1988) developed a five-jump tree. Madan, Milne, and Shefrin (1989) generalized the binomial model to the multinomial case.

Introduction to Stochastic Calculus

For any option pricing model the objective is to find an analytical function, $C(S(t), t)$, that expresses the value of an option in terms of the underlying asset price, $S(t)$, and time, t . A fundamental step to obtain this pricing equation begins with obtaining the dynamics of the option. The reason is simple. Understanding the dynamics of the option allows an analyst to either internalize the contribution the option contributes to a portfolio or to formulate a reasonable forecast of the asset's price at some future point in time.

Deterministic Calculus: To illustrate the usefulness of the options dynamics, consider a simple example of a derivative asset, whose value is a function of a stock price and time, namely $C(S(t), t)$. Furthermore, presume the dynamics of the stock price, $S(t)$, are deterministic or non-random. In this particular case, if the option is a continuously differentiable function with respect to the stock price and time, then from ordinary calculus a Taylor series expansion may be used to express the dynamics of the option. Using a Taylor series expansion, the functional value of the option at some point in time, T , is expressed as

$$C(S(T), T) = C(S(t), t) + C_s(S(T) - S(t)) + \frac{1}{2} C_{ss}(S(T) - S(t))^2 + C_t(T - t) + \frac{1}{2} C_{tt}(T - t)^2 + o(h), \quad (1)$$

where C_s , C_{ss} , C_t , and C_{tt} are the first and second partial derivatives of the option with respect to $S(t)$ and t , and $o(h)$ represents all the remaining higher order terms in the Taylor series expansion.

Expression (1) may be rewritten by defining the discrete increments of time and the stock price as $\Delta t \equiv (T - t)$ and $\Delta S(t) \equiv S(T) - S(t)$. Substituting these definitions into expression (1) yields

$$C(S(t) + \Delta S(t), t + \Delta t) = C(S(t), t) + C_s \Delta S(t) + \frac{1}{2} C_{ss} (\Delta S(t))^2 + C_t \Delta t + \frac{1}{2} C_{tt} \Delta t^2 + o(h).$$

To obtain the infinitesimal change in the option price let $\Delta t \rightarrow 0$, which implies $\Delta S(t) \rightarrow 0$. The discrete increments are now expressed as infinitesimal changes denoted by dt and $dS(t)$, thereby, changing the above expression to

$$C(S(t) + dS(t), t + dt) = C(S(t), t) + C_s dS(t) + \frac{1}{2} C_{ss} (dS(t))^2 + C_t dt + \frac{1}{2} C_{tt} dt^2 + o(h). \quad (2)$$

Since dt and $dS(t)$ represent infinitesimal changes in time and the stock price, the square and higher order terms are deemed negligible. That is, dt and $dS(t)$ are infinitesimally small and their squares are even smaller. Moreover, the numbers become so negligible their impact to changes in the option price may be ignored. Ignoring the squared changes in time and the spot price reduces the above expression to

$$\begin{aligned} C(S(t) + dS(t), t + dt) &= C(S(t), t) + C_s dS(t) + C_t dt \\ C(S(t) + dS(t), t + dt) - C(S(t), t) &= C_s dS(t) + C_t dt, \\ dC(S(t), t) &= C_s dS(t) + C_t dt. \end{aligned} \quad (3)$$

Expression (3) is a well known result from calculus and it shows the total change in the derivative's price in terms of the infinitesimal and total changes of its determinants. Further, if analysts want to determine the value of the derivative security at some time T , they need only sum the individual increments. That is,

$$\begin{aligned} \int_t^T dC(S(v), v) &= \int_t^T C_s dS(v) + \int_t^T C_v dv, \quad C(S(T), T) - C(S(t), t) = \int_t^T C_s dS(v) + \int_t^T C_v dv, \\ C(S(T), T) &= C(S(t), t) + \int_t^T [C_s dS(v) + C_v dv], \quad C(S(T), T) = C(S(t), t) + \int_t^T dC(S(v), v). \end{aligned} \quad (4)$$

Expression (4) shows the value of the option at time T as the linear combination of its initial asset value and the summary of all the individual increments over a specified finite time horizon.

Stochastic Calculus: In the heuristic example above, the rules of calculus work well to describe the dynamics of an option when the option derives its value from deterministic variables. In practice, however, options derive their value from financial assets that are stochastic. In fact, the problem for all analysts is that they are interested in pricing options whose value is contingent on random variables measured over infinitesimal time intervals. Consider again, a call option written on a share of common stock at a particular point in time, but now let the stock price fluctuate randomly. To price the option, analysts would like to differentiate the relation between the call option and the stock price. In the previous example the rules of calculus worked well to describe this relation. However, the stock price is

stochastic and the option is no longer a smooth function with respect to the stock price. Therefore, analysts may not use ordinary methods to derive a relation between the option and the stock price. Instead a new method to differentiate this relation must be used.

To model asset prices analysts use mathematics which assume that time passes continuously. This assumption is resourceful both mathematically and economically. From a modeling perspective, the advantage of continuous time mathematics is that it allows economists to obtain results that the discrete models cannot otherwise produce. Economically, the idea of continuous time fits the notion of markets and information. For instance, investors who are exposed to uncertainty, try to resolve any uncertainty in their investments by obtaining information which is continuously introduced to the market. While the arrival of news is random, it does provide feedback to investors who then buy and sell securities. As a result of this, trading markets witness instantaneous changes in asset prices and these prices may be viewed as a sequence of random variables measured over time. By definition this sequence of stock prices is called a stochastic process.

While stock prices tend to fluctuate randomly, this does not mean movements in prices are completely unpredictable. Investors continually gather information from a market in order to surmise what the value of an asset will be at some point in time. These forecasts are the investors' expectations about future changes in an asset's price given all current news. These expectations are not exact but do account for both expected and unexpected changes in prices over time.

To illustrate consider the change in a stock's price over a finite period of time expressed as

$$S(t + \Delta t) - S(t) = E_t[S(t + \Delta t) - S(t) | I_t] + \sigma \Delta Z(t). \quad (5)$$

The first term on the right hand side is the expected movement in the stock price given all public information, I_t , up to time t . The second term is the unpredictable change in the stock price and is referred to as an innovation term. Expression (4) states that over time the stock price is expected to change by some known amount, $E_t[S(t + \Delta t) - S(t) | I_t]$, but the degree of certainty of this change is measured by $\sigma \Delta Z(t)$.

Price changes in Equation (5) are for discrete movements over a finite interval of time. To model this price behavior in continuous time, let $\Delta t \rightarrow 0$. Allowing the interval of time to approach zero captures the infinitesimal changes in the asset price, and this infinitesimal change is denoted as

$$dS(t) = \mu dt + \sigma dZ(t), \quad (6)$$

where μ and σ are called the drift and diffusion coefficients and $dZ(t)$ is the increment of a Brownian motion (also referred to as a Wiener process). Equation (6) is called a stochastic differential equation.

Uncertainty in the price dynamic, expression (6), is introduced by the last term, $dZ(t)$. $dZ(t)$ is called a Brownian motion and it is a Markov process that has been used in physics to describe the motion of a particle that is subject to a large number of infinitesimal shocks. For purposes of modeling price behavior analysts use this process to describe the motion of an asset's price that is subject to a large number of random news shocks. Important properties of the Brownian motion are:

- (i) It is nowhere differentiable.

- (ii) $Z(0) = 0$.
- (iii) $dZ(t)$ has a normal distribution with mean 0 and variance dt for $s \leq t$.
- (iv) $Z(t_2) - Z(t_1), Z(t_3) - Z(t_2), \dots, Z(t_n) - Z(t_{n-1})$ are independent for all $t_1 \leq t_2 \leq \dots \leq t_n$.
- (v) $[dZ(t)]^2 = dt$ and $dZ(t)dt = 0$.

Property two states that the position of the process today is known given current information. Property three indicates that the price changes are normally distributed. Property four shows the prices follow a Markov property. That is, only the last observable price has any impact on forecasting the next increment. Intuitively, this property fits the notion that markets are semi-strong form efficient (all public and historical information is already incorporated in the asset price). Property five follows by construction since price changes are normally distributed.

Recall that economists want to differentiate the relation between the option and the stock price. Understanding the properties and dynamics of the stock price in expression (6) analysts can describe the impact that this price dynamic has on an option. For instance, recall the previous example where we found the dynamics of an option using a Taylor series expansion. Applying a Taylor series expansion to the option yielded

$$C(S(T), T) = C(S(t), t) + C_s(S(T) - S(t)) + \frac{1}{2} C_{ss}(S(T) - S(t))^2 + C_t(T - t) + \frac{1}{2} C_{tt}(T - t)^2 + o(h), \quad (7)$$

where C_s , C_{ss} , C_t , and C_{tt} are the first and second partial derivatives of $C(S(t), t)$, and $o(h)$ represents all remaining higher order terms of the Taylor series expansion. Next define the discrete increments in time and the stock price as $\Delta t \equiv (T - t)$ and $\Delta S(t) \equiv S(T) - S(t)$ and then substitute these definitions into expression (1) to obtain

$$C(S(t) + \Delta S(t), t + \Delta t) = C(S(t), t) + C_s \Delta S(t) + \frac{1}{2} C_{ss} (\Delta S(t))^2 + C_t \Delta t + \frac{1}{2} C_{tt} \Delta t^2 + o(h).$$

Letting $\Delta t \rightarrow 0$, which implies $\Delta S(t) \rightarrow 0$, reduces the discrete increments to infinitesimal changes dt and $dS(t)$, thereby, changing the above expression to

$$C(S(t) + dS(t), t + dt) = C(S(t), t) + C_s dS(t) + \frac{1}{2} C_{ss} (dS(t))^2 + C_t dt + \frac{1}{2} C_{tt} dt^2 + o(h). \quad (8)$$

So far the Taylor expansion has been used in the same fashion as the previous example. The next step is to eliminate all negligible terms from expression (8). In the previous example, the underlying stock price $S(t)$ and time were deterministic and ordinary rules of calculus allowed the squared and higher order terms to vanish. However, in a stochastic environment the term $[dS(t)]^2$ does not vanish even though the higher order terms still vanish. Intuitively, $dS(t)$ in ordinary calculus is small such that $[dS(t)]^2$ is sufficiently close to zero. In a stochastic environment $dS(t)$ is a normally distributed random variable,

which by definition means it has a positive variance. Therefore, $[dS(t)]^2$ cannot be removed from expression (8), but from property five of the Brownian motion, $[dS(t)]^2$ converges to dt and the higher order moments may be omitted. This leaves

$$C(S(t) + dS(t), t + dt) = C(S(t), t) + C_s dS(t) + \frac{1}{2} C_{ss} [dS(t)]^2 + C_t dt .$$

Rearranging the above we have

$$\begin{aligned} C(S(t) + dS(t), t + dt) - C(S(t), t) &= C_s dS(t) + \frac{1}{2} C_{ss} [dS(t)]^2 + C_t dt , \\ dC(S(t), t) &= C_s dS(t) + \frac{1}{2} C_{ss} [dS(t)]^2 + C_t dt . \end{aligned} \tag{9}$$

Expression (9) is the well known result from stochastic calculus called Ito's lemma. Intuitively, Ito's lemma is the continuous time analog of the total derivative and it is the procedure that allows analysts to relate the dynamics of an underlying security to a corresponding derivative security.

Example of Ito's Lemma – Geometric Brownian Motion: Properties of geometric Brownian motion are discussed in Hull (2003) and Luenberger (1998). It is assumed the project's instantaneous value is defined by the following stochastic differential equation (SDE):

$$\frac{dS(t)}{S(t)} = rdt + \sigma dZ(t), \tag{10}$$

where $S(t)$ is the underlying asset value, r is the drift term of the underlying asset, dt is the infinitesimal time change, σ is the volatility (or standard deviation) of the project's return, $dZ(t)$ is the increment of a standard Brownian motion. One objective in options pricing is to surmise the value of the security at a particular point in time. From the assumed dynamics, this entails finding a solution to the stochastic differential equation in expression (10).

To find a solution, let $H(t) = \ln S(t)$. The transformation and Ito's lemma (expression (9)) yield the following process for the increment of $H(t)$

$$dH(t) = H_s dS(t) + \frac{1}{2} H_{ss} [dS(t)]^2 . \tag{11}$$

The process is expressed in terms of the stochastic differential for the spot price. To find a solution for $H(t)$ the analyst may substitute the expressions for the partial derivatives of $H(t)$ with respect to the stock price, the differential for the stock price $dS(t)$ and $[dS(t)]^2$ into expression (11). From equation (10), the squared increment of the spot price is found as follows

$$[dS(t)]^2 = [rS(t)dt + \sigma S(t)dZ(t)]^2 , = r^2[S(t)]^2 dt^2 + \sigma^2[S(t)]^2 [dZ(t)]^2 + r\sigma[S(t)]^2 dZ(t)dt .$$

The first term in the expression above is equal to zero. This is true since $dt^2 = 0$. Furthermore, the last term in the expression above is also zero since by definition of property five $dZ(t)dt = 0$. Therefore the above reduces to

$$[dS(t)]^2 = \sigma^2 [S(t)]^2 dt .$$

The partial derivatives of $H(t)$ with respect to $S(t)$ are

$$H_s(t) = \frac{1}{S(t)}$$

and

$$H_{ss}(t) = -\frac{1}{[S(t)]^2} .$$

Substituting the partials for $H(t)$, $dS(t)$ and $[dS(t)]^2$, into expression (11) yields

$$\begin{aligned} dH(t) &= \left(\frac{1}{S(t)} \right) S(t) (rdt + \sigma dZ(t)) - \frac{1}{2} \frac{1}{[S(t)]^2} ([S(t)]^2 \sigma^2 dt) = rdt + \sigma dZ(t) - \frac{1}{2} \sigma^2 dt , \\ &= \left(r - \frac{1}{2} \sigma^2 \right) dt + \sigma dZ(t) . \end{aligned}$$

To find the solution to expression (10), we integrate over the above expression to obtain

$$\begin{aligned} \int_t^T dH(v) &= \int_t^T \left(r - \frac{1}{2} \sigma^2 \right) dv + \int_t^T \sigma dZ(v) , \quad H(T) - H(t) = \int_t^T \left(r - \frac{1}{2} \sigma^2 \right) dv + \int_t^T \sigma dZ(v) , \\ H(T) - H(t) &= \left(r - \frac{1}{2} \sigma^2 \right) (T - t) + \int_t^T \sigma dZ(v) \quad H(T) = H(t) + \left(r - \frac{1}{2} \sigma^2 \right) \tau + \int_t^T \sigma dZ(v) . \end{aligned}$$

Raising both sides to the power e yields

$$\begin{aligned} \exp\{H(T)\} &= \exp\left\{ H(t) + \left(r - \frac{1}{2} \sigma^2 \right) \tau + \int_t^T \sigma dZ(v) \right\} S(T) = S(t) \exp\left\{ \left(r - \frac{1}{2} \sigma^2 \right) \tau + \int_t^T \sigma dZ(v) \right\} \\ S(T) &= S(t) \exp[Y(T)] , \end{aligned} \tag{12}$$

where $Y(T) = \left(r - \frac{1}{2} \sigma^2 \right) \tau + \int_t^T \sigma dZ(v)$, and $\tau = T - t$ is the time to maturity. Expression (12) is a solution to equation (10) and it shows that the log returns, $\ln\left(\frac{S(T)}{S(t)}\right) = Y(T)$, for the spot price are normally distributed with a mean of $\left(r - \frac{1}{2} \sigma^2 \right) \tau$ and a variance of $\sigma^2 \tau$.

Since the returns are normally distributed, then by definition the spot price is log-normally distributed. That is if $Y(T)$ is normal then $\exp(Y(T))$ is lognormal. Therefore, the best forecast for the spot price at time T is found as

$$\begin{aligned} E_t[S(T)] &= S(t) \exp\left\{E_t[Y(T)] + \frac{1}{2}V_t[Y(T)]\right\} \\ E_t[S(T)] &= S(t) \exp\left\{\left(r - \frac{1}{2}\sigma^2\right)\tau + \frac{1}{2}\sigma^2\tau\right\} \\ E_t[S(T)] &= S(t)e^{r\tau}. \end{aligned} \tag{13}$$

BLACK-SCHOLES PARTIAL DIFFERENTIAL EQUATION DEVELOPMENT

The Black-Scholes pricing equation is stated in most financial option textbooks, however, the mathematical details are rarely presented. Pedagogical references include Hull (2003), Luenberger (1998), Wilmott et al. (1995), and Neftci (2000). Additionally, the focus of these textbooks is directed to the Black-Scholes result as opposed to its development. When the textbooks illustrate the derivation of the Black-Scholes pricing equation, the derivation is filled with mathematical ‘shortcuts’ and convenient assumptions which often leaves the reader lacking any economic intuition. In our analysis, we focus on the economics and the mathematics behind the Black-Scholes equation.

The presentation for the Black-Scholes equation is segmented into three stages. The first phase consists of developing the dynamics of the call option using the mathematics from section two. The second phase focuses on constructing an equilibrium pricing condition by strategically combining the stock, the option, and a risk-free asset in a portfolio. The last phase solves for the Black-Scholes solution from the equilibrium condition.

Dynamics: Black and Scholes (1973) posit that the stock prices follow an exogenously determined stochastic process (geometric Brownian motion), which we formally describe as

$$\frac{dS(t)}{S(t)} = \mu_s dt + \sigma_s dZ(t), \tag{14}$$

where μ_s is the mean return σ_s is the diffusion coefficient, and $dZ(t)$ is the increment of a standard Brownian motion. Equation (14) shows that stock price returns appreciate over time by some amount μ_s , but are also influenced over time by some uncertainty measure, σ_s . In the Black-Scholes model an option contract derives its value from an underlying stock, whose price obeys the dynamics in expression (14). Since the option is a function of a stochastic process (the stock price) the option itself is a stochastic process. If an option contract can be written as a twice-continuously differentiable function of the stock price and time, namely $C(S, t)$, then the option return dynamics can be written in a similar form as

$$\frac{dC(S, t)}{C(S, t)} = \mu_c dt + \sigma_c dZ(t), \tag{15}$$

where μ_c is the mean return of the option, σ_c is the diffusion coefficient of the option, and $dZ(t)$ is the increment of a standard Brownian motion. Equation (15) is only a general expression for the return

dynamics of the option contract where μ_c and σ_c have not been formally defined. The actual drift and diffusion terms for the option may be determined by formally developing the stochastic differential equation in expression (15). This is done using Ito's lemma.

We define the option value as $C(S, t)$. Invoking Ito's lemma the increment for the option contract is

$$\begin{aligned} dC(S, t) &= C_s dS(t) + \frac{1}{2} C_{ss} [dS(t)]^2 + C_t dt, \\ &= C_s [\mu_s S(t) dt + \sigma_s S(t) dZ(t)] + \frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 dt + C_t dt, \\ &= \left[\frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + \mu_s S(t) C_s + C_t \right] dt + \sigma_s S(t) C_s dZ(t). \end{aligned} \tag{16}$$

To express these movements in terms of returns we divide the left-hand side and the right-hand side by $C(S, t)$. That is,

$$\frac{dC(S, t)}{C(S, t)} = \left[\left(\frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + \mu_s S(t) C_s + C_t \right) / C(S, t) \right] dt + \left[\sigma_s S(t) C_s / C(S, t) \right] dZ(t) \tag{17}$$

Comparing expressions (17) and (15), an analyst can identify that both are expressed in the same units (returns) and both expressions describe the same time series behavior for the option contract. Hence, they are equal and we can equate the drift and diffusion terms in both expressions. As such,

$$\mu_c = \left[\frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + \mu_s S(t) C_s + C_t \right] / C(S, t), \tag{18}$$

$$\sigma_c = \sigma_s S(t) C_s / C(S, t). \tag{19}$$

In addition to the coefficients above, the reader probably noted that we did not formally define the innovation term $dZ(t)$ in expression (15). We now see the Brownian motions in equations (15) and (17) are the same as the Brownian motion term in the spot price shown in equation (14). Thus, erratic price movements in the call option and the stock originate from the same source.

Arbitrage Strategy

Given the time series behavior of the assets, investors would like to combine the stock, the option, and the risk free asset in a portfolio so the payout next period is known with certainty (Merton (1973)). To illustrate, consider an investor who decides to hold portions of the stock, the option, and a riskless asset in a portfolio, where the aggregate investment in the portfolio is zero. The weights are denoted as

w_1 , w_2 , and w_3 respectively. By definition the portfolio weights sum to one, $\sum_{j=1}^3 w_j = 1$, and the value of

the portfolio is denoted as $A(t)$. Since the portfolio is a function of both the stock and the option, an analyst may express the return process of the portfolio as a stochastic process. This dynamic is expressed in a similar fashion as the stock return dynamics and is denoted as,

$$\frac{dA(t)}{A(t)} = \mu_A dt + \sigma_A dZ(t), \quad (20)$$

where μ_A is the mean return and σ_A is the diffusion coefficient. For now we define $dZ(t)$ as the increment of a standard Brownian motion, with an expected value of zero and a variance of \sqrt{t} . Below we will see that this term is the linear combination of the individual asset diffusion coefficients.

Since the portfolio is a linear combination of the three assets, it follows from modern portfolio theory that the drift term for the portfolio is the linear combination of the drift coefficients of the individual assets in the portfolio. This is,

$$\mu_A = w_s \mu_s + w_c \mu_c + w_r \mu_r. \quad (21)$$

In addition, portfolio theory shows the variance of a portfolio is equal to the sum of the variances and covariances of all assets in the portfolio. Formally this is

$$\sigma_A^2 = w_s^2 \sigma_s^2 + w_c^2 \sigma_c^2 + w_r^2 \sigma_r^2 + 2w_s w_c \text{Cov}(S, C) + 2w_s w_r \text{Cov}(S, r) + 2w_c w_r \text{Cov}(C, r) \quad (22)$$

Given the variance and return for the portfolio, the objective for any investor is to find a portfolio weighting scheme that minimizes the variance while maintaining a positive return. Formally we may define the problem as such:

$$\text{Min } \sigma_A^2 = w_s^2 \sigma_s^2 + w_c^2 \sigma_c^2 + w_r^2 \sigma_r^2 + 2w_s w_c \text{Cov}(S, C) + 2w_s w_r \text{Cov}(S, r) + 2w_c w_r \text{Cov}(C, r)$$

subject to

$$\mu_A = w_s \mu_s + w_c \mu_c + w_r \mu_r = \theta,$$

and

$$\sum_{j=1}^3 w_j = 1.$$

Inspection of the objective function shows the interest rate is nonstochastic, therefore, σ_r , $\text{Cov}(S, r)$, and $\text{Cov}(C, r)$ are all equal to zero. As for the underlying asset and option, both are influenced by the same innovation term which by definition indicates they are perfectly correlated. From basic statistics the covariance between the option and the stock is expressed as

$$\text{Cov}(S, C) = \sigma_s \sigma_c \rho_{sc},$$

where ρ_{sc} is the correlation coefficient. In this particular case $\rho_{sc} = 1$, which yields

$$\text{Cov}(S, C) = \sigma_s \sigma_c.$$

Substituting this into the expression for the portfolio variance yields

$$\sigma_A^2 = w_s^2 \sigma_s^2 + w_c^2 \sigma_c^2 + 2w_s w_c \sigma \sigma_c.$$

This expression can be expressed as

$$\sigma_A^2 = (w_s \sigma_s + w_c \sigma_c)^2.$$

Taking the square root of this expression yields

$$\sigma_A = w_s \sigma_s + w_c \sigma_c \tag{23}$$

Thus, the diffusion of the portfolio is a linear combination of the diffusion for the underlying asset, σ_s , and the option, σ_c .

From inspection of expression (23), the objective function will be minimized when the standard deviation to the portfolio is equal to zero. One possible solution for this optimization problem is the trivial solution, $w_j = 0$ for $j = (s, c, r)$. However, from the constraint, $\sum_{j=1}^3 w_j = 1$, this is not permissible. To find an alternative solution, consider expressions (21) and (23). Investors wish to make their portfolio variance zero, which implies

$$\sigma_A = w_1 \sigma_s + w_2 \sigma_c = 0.$$

That is investors wish to find a portfolio that yields a riskless return. Consequently, if the portfolio in expression (20) is risk-free, then the return to this portfolio over the investment horizon should equal the riskless rate of return, $\mu_A = r$. Otherwise arbitrage possibilities exist. Using expression (21) and the portfolio weighting constraint, $\sum_{j=1}^3 w_j = 1$, the portfolio return may be written as

$$\mu_A = w_s (\mu_s - r) + w_c (\mu_c - r) + r = r \tag{24}$$

Rearranging expression (24) and considering the portfolio variance, investor wish to find a nontrivial solution for the following system of homogeneous equations

$$\mu_A - r = w_1 (\mu_s - r) + w_2 (\mu_c - r) = 0 \tag{25}$$

$$\sigma_A = w_1 \sigma_s + w_2 \sigma_c = 0. \tag{26}$$

Using expression (25), the weight for stock is obtained and is equal to

$$w_1^* (\mu_s - r) + w_2^* (\mu_c - r) = 0,$$

$$w_1^* (\mu_s - r) = -w_2^* (\mu_c - r),$$

$$w_1^* = -w_2^* \frac{(\mu_c - r)}{(\mu_s - r)}.$$

Substituting this expression into expression (26) yields

$$\left(-w_2^* \frac{(\mu_c - r)}{(\mu_s - r)}\right) \sigma_s + w_2^* \sigma_c = 0,$$

$$w_2^* \left[\left(-\frac{(\mu_c - r)}{(\mu_s - r)}\right) \sigma_s + \sigma_c \right] = 0.$$

The goal is to find the non-trivial solution $w_i^* \neq 0$. The only way the equation above equals zero is if the expression inside the brackets equals zero. This implies

$$\begin{aligned} \left(-\frac{(\mu_c - r)}{(\mu_s - r)}\right) \sigma_s + \sigma_c &= 0, \\ \left(\frac{(\mu_c - r)}{(\mu_s - r)}\right) \sigma_s &= \sigma_c, \\ \sigma_s (\mu_c - r) &= \sigma_c (\mu_s - r) \\ \frac{(\mu_s - r)}{\sigma_s} &= \frac{(\mu_c - r)}{\sigma_c}. \end{aligned} \tag{27}$$

Expression (27) is an equilibrium condition that must hold under a no-arbitrage constraint in order for an optimal weighting scheme to exist. In equilibrium, expression (27) illustrates that all assets earn the same the reward to risk ratio, $\frac{(\mu_i - r)}{\sigma_i}$. Intuitively, the market is pricing risks for all assets in the same

manner. Using the equilibrium condition in expression (27), we may obtain the expected dynamics of the option contract. Substituting the expression for the option's drift and diffusion coefficients (expressions (18) and (19)) into the equilibrium condition lead to:

$$\begin{aligned} \frac{\mu_s - r}{\sigma_s} &= \frac{\left\{ \left[\frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + \mu_s S(t) C_s + C_t \right] / C(S, t) \right\} - r}{\sigma_s S(t) C_s / C(S, t)}, \\ \frac{(\mu_s - r) \sigma_s S(t) C_s}{\sigma_s C(S, t)} &= \frac{\left[\frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + \mu_s S(t) C_s + C_t \right]}{C(S, t)} - r, \\ \frac{(\mu_s - r) \sigma_s S(t) C_s}{\sigma_s} &= \frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + \mu_s S(t) C_s + C_t - r C(S, t), \\ (\mu_s - r) S(t) C_s &= \frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + \mu_s S(t) C_s + C_t - r C(S, t), \\ -\mu_s S(t) C_s + \mu_s S(t) C_s + \frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + r S(t) C_s + C_t - r C(S, t) &= 0, \\ \frac{1}{2} C_{ss} \sigma_s^2 [S(t)]^2 + C_s r S(t) - r C(S, t) + C_t &= 0. \end{aligned} \tag{28}$$

Expression (28) is a partial differential equation for an option contract written on a stock whose price follows a geometric Brownian motion. The result is unique in that the price dynamics of the option contract are now expressed deterministically. This is made possible from the investor's ability to construct a self-replicating arbitrage portfolio of the stock, option, and risk-free asset. Notably, the use of this arbitrage portfolio is the continuous-time analog to the discrete-time binomial model discussed in Cox et. al. [3] and Appendix A.

Black-Scholes Solution

Using standard solution techniques analysts may determine the value of an option contract from expression (28) either analytically or numerically. To derive the value of the option the analyst only needs to specify the necessary boundary conditions to solve the partial differential equation. For the Black-Scholes model the boundary conditions for the option are

$$C(0, \tau) = 0, \tag{29}$$

$$C(S, 0) = \max[0, S(T) - X], \tag{30}$$

where X is the exercise price of the option and $\tau = T - t$ is the time to maturity. Intuitively, expressions (29) and (30) are contractual clauses for an option contract. Expression (29) implies that if a market does not exist for the underlying asset the option is worthless. Expression (30) states that at maturity the value of the option will equal the greater of the two amounts, $S(T) - X$ or 0. The function (solution) that satisfies (28), (29), and (30) simultaneously is

$$C(S, t) = S(t)N(d_1) - e^{-r\tau} XN(d_2), \tag{31}$$

where
$$N(d_1) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{d_1} e^{-\frac{z^2}{2}} dz, \tag{32}$$

$$d_1 = \left[\ln\left(\frac{S(t)}{X}\right) + \left(r + \frac{1}{2}\sigma_s^2\right)\tau \right] / \sigma_s \sqrt{\tau}, \tag{33}$$

$$d_2 = d_1 - \sigma_s \sqrt{\tau}. \tag{34}$$

Expression (31) is the well known Black-Scholes pricing formula for a call option. The expression is a function of the underlying stock price, the exercise price, the volatility of the stock price, the risk free rate of interest, and time to maturity.

CONCLUSIONS

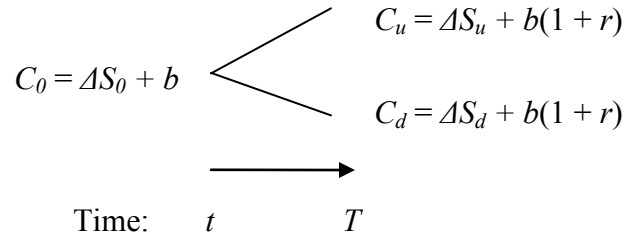
The main contribution of this paper is the detailed mathematical and economic account of the Black-Scholes development. The paper begins by introducing the concept of stochastic versus traditional calculus and then develops an expression for geometric Brownian motion. The main portion of the paper details the replicating portfolio argument of financial option pricing, the development of the economic equilibrium reward-to-risk ratio, and the Black-Scholes-Merton ordinary differential equation. To fully comprehend the literature and to acquire an appreciation for the modeling techniques, a basic understanding of financial option pricing mathematics is a necessary prerequisite.

APPENDIX

Appendix: Binomial Example

Consider a simple discussion of Cox, Ross, and Rubinstein's (1979) binomial lattice option valuation technique [3]. Technically, their approach is a numerical approximation to its Black-Scholes counterpart. However, the principles demonstrated are key to truly understanding option-pricing. In general, the approach assumes: (1) the underlying asset follows a discrete, binomial, multiplicative stochastic process throughout time, (2) arbitrage-free pricing, and (3) the law of one price, which states that if two portfolios are equal in value at the expiration time T , then they must have equivalent values today. Using these assumptions, a portfolio consisting of the underlying asset and risk-free bonds may be formed that replicates the option payoff in any state of nature. This portfolio will consist of Δ shares of the underlying asset financed in part by an amount b at the risk free rate. Figure 1 demonstrates the replicating portfolio concept.

Figure 1. Replicating portfolio option valuation approach



Δ = number of shares of the underlying asset

b = amount of cash borrowed at the risk-free rate

r = risk free rate of interest

S_0 = value of the underlying asset today

S_u = upward movement value of the underlying asset in the future at time T

S_d = downward movement value of the underlying asset in the future at time T

C_0 = value of the call option today

$C_u = \max(S_u - I, 0)$

$C_d = \max(S_d - I, 0)$

The motivation of the investor is to construct the portfolio so that the option payoff at any future time is known today. Under the assumption of the law of one price, the cost to set up the replicating portfolio must be equal to the option's value today. Solving the equations for C_u and C_d in Figure 1 yields:

$$\Delta = \frac{C_u - C_d}{S_u - S_d} \quad \text{and} \quad b = \frac{uC_d - dC_u}{(1+r)(u-d)}$$

The value of the option today, C_0 , is then:

$$C_0 = \Delta S_0 + b = \frac{C_u - C_d}{S_u - S_d} S_0 + \frac{uC_d - dC_u}{(1+r)(u-d)} = \frac{C_u - C_d}{S_0(u-d)} S_0 + \frac{uC_d - dC_u}{(1+r)(u-d)}$$

$$= \frac{1}{(1+r)} \left(\frac{(1+r)-d}{u-d} C_u + \frac{u-(1+r)}{u-d} C_d \right)$$

Defining $p = \frac{(1+r)-d}{u-d}$ as the synthetic (or risk-neutral) probability, the option price may be stated as:

$$C_0 = \frac{1}{(1+r)}(pC_u + (1-p)C_d)$$

The option value today is the discounted expected payoff using the risk-free rate of interest and risk-neutral probabilities.

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BUSINESS ETHICS AS AN ACCREDITATION REQUIREMENT: A KNOWLEDGE MAPPING APPROACH

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ABSTRACT

Most of the more prominent and highly ranked business and management schools in the United States and elsewhere are accredited by one of two international accrediting organizations, the Association to Advance Collegiate Schools of Business (AACSB) or the Accreditation Council for Business Schools & Programs (ACBSP). Both of these organizations require the inclusion of business ethics in the curriculum of each accredited institution. "Business ethics," however, is a concept that includes, overlaps or integrates with such notions as social issues in management, corporate social responsibility, corporate citizenship and sustainability. Larger disciplines such as philosophy, psychology, the social sciences and even religion can also impact and interact with business ethics. This paper uses knowledge mapping to organize the various pockets of knowledge that comprise the business ethics domain, relying in part on traditional library science classification systems. The paper concludes that the accreditation regime would benefit from a more carefully constructed articulation of the content of business ethics.

JEL: A2, M14, Z12

KEYWORDS: Business Ethics, Accreditation, Knowledge Mapping, Philosophy, Religion.

INTRODUCTION

There are two international accreditation bodies for higher education business schools, the Association to Advance Collegiate Schools of Business (AACSB) and the Accreditation Council for Business Schools and Programs (ACBSP). Both of these organizations require business schools to incorporate ethics into their curricula. The standards put forth by the AACSB are more detailed than those put forth by the ACBSP.

Under the AACSB approach, ethics education is required as part of the general knowledge and skills portion of the standards for undergraduates, and in the management-specific portion of the standards for undergraduate and master's students. Ethics education under this regime involves four subject areas: (a) responsibility of business and society, (b) ethical leadership, (c) ethical corporate governance, and (d) ethical decision-making (2004).

Under the ACBSP regime, ethical issues are expected to be addressed within several contexts. For example, business ethics is considered to be part of a member school's education in regard to the impact of business on society. In addition, the standards require that ethical awareness and global awareness be included in the student skills that are assessed by member schools. Business ethics is also included as part of the common professional component of a typical business school curriculum (2011).

Despite these accreditation requirements, the content of business ethics is not specifically defined or circumscribed by either of the major business school accreditation bodies. In their glossary section, for example, the ACBSP provides a definition of ethical behavior that refers to how organization insures that all its decisions, actions and stakeholder interactions conformed to the organization's moral and professional principles. Even though the ACBSP standards acknowledge that an organization's "moral

principles” define right and wrong, the standards do not require instruction in moral theory *per se*, and the standards do not offer any guidance as to how those moral and professional principles are or ought to be derived (ACBSP, 2011, p. 62).

Similarly, the AACSB standards suggest that students should be provided with the opportunity to learn and practice “multiple models for ethical decision making” as an important step in supporting their ability to make good personal choices and business decisions in the future (AACSB, 2004, p. 18). As an assurance of learning guideline, the AACSB offers as possible learning goal the ability of students to “identify an ethical dilemma in a scenario case and apply an ethics model or framework to propose and defend a resolution” (AACSB, 2007, p. 7). No guidance is provided as to which models ought to be considered, or what content should be included. The possible depth and breadth of required ethics education is also not addressed.

As a result of the vagueness of the ethical standards of business school accreditation agencies, the idea and the ideals of business ethics may have been somewhat diluted. Various notions such as corporate social responsibility, corporate citizenship and social issues in management are accommodated under the broad umbrella of business ethics, but the theoretical connections between these larger social concepts and business ethics proper are not always articulated. This paper serves as an effort to sort through the various overlapping ideas that comprise the current business ethics pedagogy, in an effort to highlight the components and characteristics of the body of knowledge of business ethics proper. We employ knowledge mapping as it used in such fields as library science and the social sciences in this effort.

The remaining sections of this paper divide as follows: Section II reviews the recent literature pertaining to role and components of business ethics in the context of the accreditation of graduate programs in business; Section III critiques the paucity of rigorous ethical theory within graduate business degree programs; Section IV explains how the content of business ethics has been diluted by other related subject areas such as global corporate citizenship and sustainability; Section V presents our proposal for the utilization of knowledge mapping in our effort to rediscover the essential components of business ethics; Section VI is an *excursus* that takes note of the often unhelpful and ill-advised avoidance of any discussion of religion in the study of ethics; and Section VII contains concluding remarks.

LITERATURE REVIEW AND BACKGROUND

Business Ethics as an Accreditation Requirement

Heller and Heller (2011) examined the standards established for business ethics education in AACSB accredited programs, and reviewed AACSB accredited business school courses to determine if they were addressing the standards set by the accreditation body. The researchers examined business ethics course content, syllabi, textbooks and related readings. Their content analysis of 50 ethics courses revealed that the four broad AACSB themes (responsibility of business and society, ethical decision-making, ethical leadership, and corporate governance) were inconsistently addressed in the courses examined. Ethical decision-making had the lowest scores. Perhaps most significantly, the authors found that most of the discourse that took place around applied ethical decision-making involved very little reference to theoretical ethical foundations of decision-making.

Heller and Heller’s quantitative analysis of the content of ethics education in business schools study confirmed many of the expressions of concern that had already been proffered by other observers. Lowrie and Willmott (2009), for example, pointed out that “there is no core curriculum for, or minimal level of provision of, for example, ethics education” (p. 414). Swanson (2004) was more blunt, asserting that:

AACSB can give its stamp of approval to the most superficial coverage of ethics in MBA and undergraduate degree programs, such as the promise that ethics will be mentioned in a few courses and/or condensed into a two-week seminar for new students. In other words, AACSB's allegiance to flexibility is a loophole through which ethics can be slipped out. It is a green light that ethics can be strewn across curriculum, even haphazardly, and delivered by professors who have plenty to do without trying to learn practical applications of a 2000-year-old moral tradition of Western philosophy (p. 49).

Some have attributed this apparent ambivalence toward specific ethical content or curricular standards to a shift in focus on the part of accreditation bodies. The AACSB, in particular, changed from a model requiring universally applied standards, to a mission-linked model incorporating a peer-review process with a more recent emphasis upon continuous improvement in achieving the school-specific mission (Lowrie & Willmott, 2009, p. 414).

This shift to a mission-linked approach has resulted in the erosion, if not elimination, of any core business ethics curriculum, and it seems to reflect an institutionalized inability or unwillingness to fill this vacuum with AACSB-preferred recommendations or guidelines (Lowrie & Willmott, 2009, p. 415). Swanson and Frederick (2003, p. 26) have also suggested that an added consequence of the mission-linked approach is that it contributes directly to reducing or eliminating the number of professors teaching ethics in business schools.

Others, such as Francisco *et al* (2008) have expressed a high degree of cynicism toward the AACSB's commitment to ethics education generally, suggesting that ethics (like the use of technology and the internationalization of the curriculum) is a subject area that comes into vogue from time to time but is not necessarily a core component of business education (pp. 25-26). Meanwhile, business schools are often blamed for ethical lapses by their alumni. For example, in a survey conducted by the *Harvard Business Review* on whether business schools are to blame for the current global crisis, 67 percent of the respondents felt that business schools were at least partially responsible for the ethical and strategic lapses of their graduates (Podolny, 2009).

Prior Descriptions of the Components of the Business Ethics Domain

Kahn (1990) conceptualized the content of business ethics after interviewing business ethics researchers. He organized the field's concepts into two general categories, normative and contextual (p. 312). Normative concepts represent a focus on how individuals "ought" to behave, given normative standards and justifications of morality, i.e., such Enlightenment theories as utilitarianism, Kantian ethics and deontology (p. 312). Contextual concepts focus on organizational climate and culture, corporate governance, work group segmentation and organizational behavior.

Nicholson's (1994) taxonomy of business ethics writings involved four categories: texts, essays, results of surveys, and popular writings. He found that the format of business ethics textbooks "typically comprises a high-speed tour of ethics philosophy, a high-speed tour of ethical philosophy, followed by discussion of common ethical dilemmas and case examples, concluding with a review of strategies on themes and issues such as pollution, safety, business conduct and the like" (p. 582). By comparison, the essays and empirical research categories emphasized sociological, psychological, organizational behavior, economic and cultural/anthropological studies (pp. 582-583). The popular writings were generally "aimed at the managerial market, with the avowedly missionary intent of raising the ethical tone of business conduct" and with the general theme that "good business is good for business" (p. 582). Nicholson acknowledged that "Underlying these four strands of writings is a vast body of more disparate and discipline-specific literature" including philosophical literature that incorporates concerns and theories about justice, rights, utilitarianism, theism, humanism, ideology and dialectics (p. 582)

As part of their effort to develop their “Walk the Talk” case-based approach designed to help students develop personal ethical agency, Matherne *et al* (2006) organized the various approaches to ethical decision-making around seven domains: utilitarianism, virtue, moral duty, rights, justice, caring and religious ideals. These seven domains were, in turn, consulted by students as they discussed and attempted to resolve various business ethics issues arising from real and hypothetical cases.

These and similar previous efforts at taking into account the content of business ethics are not themselves efforts to map the conceptual domain of business ethics. They are not intended to serve as guidance for and articulation of the appropriate content of business ethics in view of the accreditation standards. This paper, by contrast, will look more directly at the components of business ethics in an effort to initiate a discussion about what should be included under the banner of business ethics at accredited institutions.

BUSINESS ETHICS WITHOUT RIGOROUS ETHICAL THEORY

The paucity of content guidelines on the part of the accreditation agencies may be part of a structural problem of business ethics education. At its deepest levels, ethics addresses behavioral norms which, in turn, represents some of the highest aspirations in society. These include values such as respect for human dignity, justice, freedom, and liberty (Bird, 1996). Ethics has been defined as “the study of what is good or right for human beings. It asks what goals people ought to pursue and what actions they ought to perform” (Hoffman & Moore, 1990, p. 1).

Business ethics is an applied ethics discipline, and is built on the same foundation of moral philosophy as is ethics proper. As Dienhart and Curnutt (1998) observed, “The roots of business ethics are in philosophy, theology, and in the business community itself” (p. 2). As in the case of ethics generally, business ethics uses logic, reason, faith, and/or tradition, to address many issues involving difficult decisions concerning business situations (Hunt, 2000).

The lack of emphasis on ethical theory in business ethics education, however, has been the subject of consistent criticism, as described by Anninos and Chytiris (2011):

Incomplete theories, unquestioned assumptions by management practitioners and scholars and the “bottom line” culture have stripped business education off its ethical dimension and have degraded management, from a comprehensive to a technocratic knowledge corpus, whose consequences are often combined with complaints that management educators fail to meet corporate needs (p. 884).

Anninos and Chytiris suggest that the humanities have much to offer in adding depth and dimension to ethical epistemology, and propose that training in philosophy, logic and classical studies be added to the ethics education of business students (p. 888). They conclude that by “reflecting on classical works, building virtues to students, cultivating logic, teaching management through philosophically sound rudiments and researching for solving true business problems, the first step for excellent business education will have been achieved” (p. 889).

A widely cited definition of the moral domain is that of Turiel’s (1983, p. 3): “prescriptive judgments of justice, rights, and welfare pertaining to how people ought to relate to each other.” For Turiel, morality pertains mostly to the consequences of interactions between people. This somewhat narrow view of morality results in ethics being understood largely in terms of “do no harm” and not in terms of “do no evil.” Seemingly harmless offenses are rarely condemned under this definition, even when they are disgusting or disrespectful (Haidt, Koller, & Dias, 1993).

In recent years, however, there has been a broadening of the moral domain scope, in the view of many researchers and scholars, beyond analysis of actions that result in empirically measurable negative consequences. One reason that ethics is viewed as a discipline that overlaps such domains as philosophy and religion is that for many people ethics is not limited to such a consequentialistic “do no harm” paradigm. As Joseph and Haidt (2007, p. 239) observed, “Even a cursory look at foundational religious texts reveals that, while God or the gods do seem to care about whether we help or hurt each other, they care about many other things besides. It would be a gross misunderstanding of ancient Judaism, for example, to describe the Ten Commandments as a mixture of moral rules (about not stealing, killing, or lying) and social conventions (about the Sabbath, and prescribed ways of speaking and worshipping.)”

BUSINESS ETHICS DILUTED BY OTHER RELATED SUBJECT AREAS

The lack of content guidelines on the part of the accreditation agencies may be part of a structural problem of business ethics education. As a result of this vague guidance provided by the accreditation agencies, business schools are not required to focus on traditional concepts of moral philosophy and ethics. Instead, related subjects such as corporate social responsibility (CSR), global corporate citizenship, sustainability, social issues in management, organizational behavior and management science compete with business ethics proper for attention by business faculty. In many colleges and universities, faculty who are experts in accounting, finance, management, marketing, information systems and other disciplines are called upon to incorporate ethics into their courses. Most of these instructors are experts in their specific fields, but do not have formal training in ethics.

Business ethics can be properly distinguished from other subjects such as corporate social responsibility (CSR) and sustainability. Christensen *et al* (2007) define business ethics as a form of applied ethics that emphasizes the examination of ethical rules and principles within a commercial context, taking into account the various moral or ethical problems that can arise in a business setting as well as any special duties or obligations that apply to persons who are engaged in commerce (p. 351). CSR, by contrast, pertains to voluntary actions taken by a company to address economic, social, and environmental impacts of its business operations and the concerns of its principal stakeholders (p. 351). Sustainability refers to the contributions of business to an equitable and ecologically sustainable economy by offering products and services that fulfill society’s needs while contributing to earth inhabitants well-being (p. 351).

In their content study of ethics and ethics-related courses at top MBA programs in the United States, Christensen *et al* (2007) found that of the 75% of such programs that required ethics study, only 5% did so by way of a separate ethics course in their curriculum (pp. 3541-3552). The other programs combined ethics with CSR, leadership or other subjects. For the most part, ethics was not labeled or taught as a stand-alone topic within these latter mixed courses. In other words, there was not a separate focus on ethical theory or principles.

Early business school programs grew out of a traditional liberal arts background and often included a course in moral philosophy in their curricula. That course was often required as a capstone course at the end of a student’s program and was in many cases taught by the school’s president (Pamental, 1988). More recently, most undergraduate business ethics courses continue to be taught at the freshman and sophomore level by faculty from philosophy departments, while most graduate level courses that focus on business ethics are taught by business faculty (Pamental, 1989).

McDonald and Donleavy (1995) have observed that there is often a reluctance among business school faculty, if not overt resistance, to the teaching of business ethics. The oft-stated criticisms range from the view that business ethics does not focus on profit-maximization and is therefore not seen to be part of the domain of business, to the pragmatic difficulties of introducing business ethics into existing business school curricula (p. 842).

There is also an ambivalence toward the subjects of philosophy and religion, which overlap normative ethical and moral principles of right and wrong. Philosophy and religion, it is argued, are theoretical, while business ethics is more practical subject that does not benefit from such lofty viewpoints. McDonald and Donleavy (p. 846) point to McCoy's (1983) assertions in this regard:

A well-led course in business ethics should impart self-confidence in dealing with ethical issues without formal philosophical or theological training. To suggest otherwise removes ethics from day-to-day normal activities (McCoy, 1983, p. 22).

The antipathy toward philosophy and religion as expressed by McDonald and Donleavy, and by McCoy, is not universally shared by business ethics scholars. Klein (1998) contends that McDonald and Donleavy, in particular, are:

simply out of line with respect to this caricature of philosophers – as not having any conception of the "real world." This criticism is as old as Plato and more hackneyed. It is so misconceived that I am surprised that it is still being bandied about. This shows me that the members of the academic business community are seriously out of touch with what is going on in both the scholarly pedagogical literature as well as the contemporary business ethics classrooms of people like De George, Robert Ladenson, Norman Bowie and Patricia Werhane (p. 568).

Klein suggests that philosophy and the philosophical method of inquiry are essential to the study and teaching of business ethics, so much so that the AACSB standards requiring coverage of ethics in the common body of knowledge cannot be met without the intentional incorporation of philosophy (p. 563).

KNOWLEDGE MAP OF BUSINESS ETHICS

We believe that Klein's claim, that philosophy forms the foundation of business ethics, is a good starting place for rediscovering the essential content of business ethics. Ethics, after all, can be simply defined as moral philosophy, and at its deepest level ethics represents the highest aspirations of humanity (Bird, 1996). The question that we face, however, is how to unravel the various themes, causes, special interests and perspectives that are intertwined with the idea and ideals of business ethics *per se*. In order to begin to find an answer to that question, we turned to the technique of knowledge mapping.

Knowledge maps are node-link representations in which ideas are located in nodes are connected to other related ideas through a series of labeled links. Knowledge maps can be used as primary sources for knowledge acquisition, adjunct aids to text processing, communication tools for organizing ideas, or retrieval cues (O'Donnell *et al*, 2002, p. 74). Knowledge maps have been employed in many contexts, including systems support (Ebener *et al*, 2006), information science (Zins, 2007), technology management (Pelc, 2002), knowledge management (Wexler, 2001) and library science (Chaudhry & Higgins, 2003).

In their effort to map the moral domain, Graham *et al* (2011) revealed that "moral considerations beyond the individual-based concerns of harm and fairness, involving concerns about spiritual purity and degradation (even for acts that involve no harm), concerns about proper hierarchical role fulfillment, and moral expectations of loyalty to the local or national group" (p. 367). The authors noted that participants in morality studies tend to think of morality and ethics in terms of harm-avoidance, but also in terms of duty, obedience, respect, and the preservation of tradition, irrespective of the presence or lack of specific measurable consequences of behavior. Many participants also made references to God or religious norms, decency, the soul, and the maintenance of purity for its own sake. Graham *et al* concluded that scales that attempt to measure morality by assessing attitudes about harm and fairness are thus leaving out

much of what people – including Westerners and non-Westerners – explicitly and spontaneously include in their descriptions of the moral domain (p. 367).

Our methodology in this study involves the construction of a rudimentary knowledge map for business ethics. We first consider the theoretical and practical implications of Graham *et al* (2011), whose effort to map the moral domain addressed the scope of psychological views of morality while taking into account demographic and cultural differences in moral intuitions. These researchers observed that the moral domain is broader than “empathy” and “justice” concerns assessed by existing moral competence, and that it is not just a subset of the values assessed by value inventories. With that study as a backdrop, we use the knowledge mapping techniques that have been developed and employed within education and related fields (McCagg & Dansereau, 1991; O'Donnell 1993).

Dewey Decimal Classification System

One approach to the organization of ethics-related knowledge involves the emulation of the classifications of knowledge under library systems such as the Dewey Decimal Classification System (DDC). That system arranges theoretical knowledge into four parts: the realm of reason (wherein the mind attempts to understand itself and the spiritual and physical world outside of itself); the realm of imagination (wherein the mind produces literary inventions regarding life, no matter how much based in fact); the realm of memory (where the mind records events and conditions regarding the life of the planet and of humanity); and all other topics not included in these three realms (Scott, 1998, p. 13).

Under the DDC, ethics proper (that is, moral philosophy) is classified under the realm of reason in the larger category of philosophy and psychology (i.e., the 100's). Ethics-related subjects such as metaphysics, epistemology, humanism and related systems, pantheism, and moral development reside within this category. The DDC accommodates specific sub-categories of ethics, including ethics of recreation and leisure, ethics of sex and reproduction, ethics of social relations, ethical consumption, and other ethical norms. Ancient Greek systems such as Epicurean philosophy and Stoic philosophy are included with Medieval Western philosophy, modern Western philosophy, and related topics.

By comparison, the DDC classifies the subject of "good and evil" under the larger category of religion (i.e., the 200's), rather than philosophy and psychology. All of the subject areas normally associated with religious studies, including philosophy of religion, sacred texts, moral theology, comparative religion, and the historical development of world religions are included within the category of religion proper.

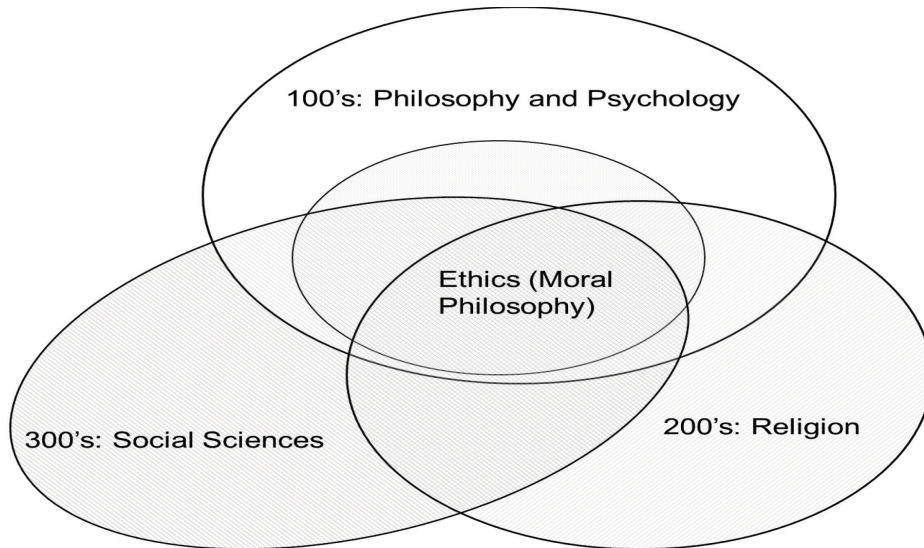
The social sciences (except psychology) comprise the third larger category (i.e., the 300's). Various social issues such as civil rights, slavery and emancipation are included. Social policies, such as socialism and related systems, law and legal studies, social services, social welfare problems, criminology, and customs and etiquette are folded into this third category. Also included among the social sciences are management-oriented disciplines such as management science and organizational behavior.

Specific ethical issues, norms and applications are sprinkled throughout the remainder of the DDC. For example, research ethics affects nearly every area of knowledge. Applied arts such as architecture necessarily take into account the ethics of accommodating human needs (including the needs of those with disabilities), and also take into account religion and religious symbolism where appropriate. For the most part, though, ethics, understood in terms of the engagement of principles of right and wrong, are ensconced in the first three larger categories of knowledge described above.

Each of the three larger categories of knowledge includes a robust body of ethical content. There is a significant amount of overlapping among them around the notion of ethics within the DDC. A helpful

way to visualize the interaction of these three larger categories of knowledge within the DDC would be to depict a Venn diagram wherein ethical principles are found at center of several overlapping circles, as in Figure 1.

Figure 1: Dewey Decimal Classification (DDC) Knowledge Domains



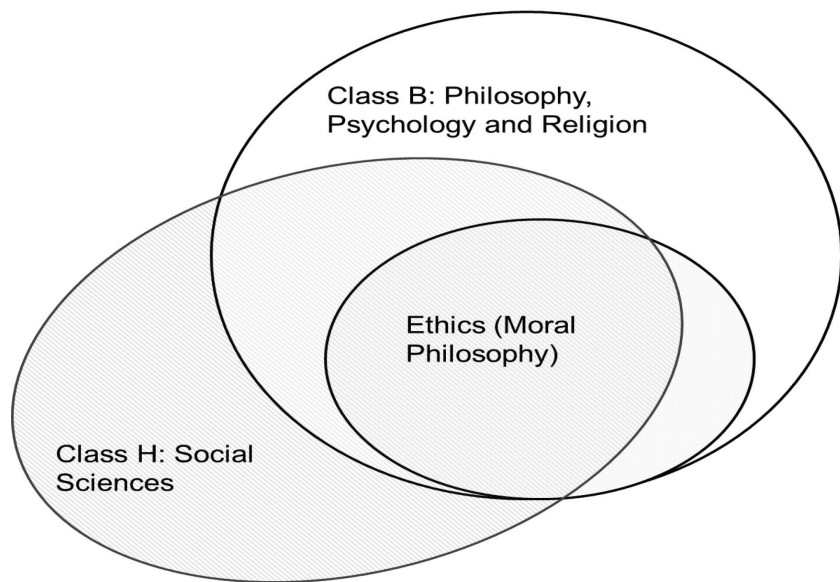
This figure conceptualizes the overlapping domains of the Dewey Decimal Classification System (DDC) as they touch on the subject of ethics. In the DDC, subjects classified with numbers starting with the numeral 1 (that is, subjects classified within the 100's) emphasize philosophy and psychology and include ethics and moral philosophy. Similarly, subjects related to religion (classified in the 200's) and subjects related to the social sciences (classified in the 300's) also address ethics, moral development, and moral philosophy.

Library of Congress Classification of Knowledge Domains

The Library of Congress classification scheme (LOC), like the DDC, organizes knowledge around major categories, and then subdivides those categories. In comparison to the DDC, the LOC classifies the social sciences in one large category (Class H.), but combines philosophy, psychology and religion in a single large category (Class B.). Within class B., however, there are subclasses for the history of philosophy, speculative philosophy (including metaphysics and epistemology), psychology, ethics, religion, theology, and religious denominational studies. The ethics subclass includes general works on ethics, history of ethics, religious ethics, evolutionary and genetic ethics, positivist ethics, socialist and communist ethics, feminist ethics, professional ethics, and etiquette. Even though ethics is ensconced in its own subclass, many of the other subclasses noted above include subject matter that overlaps with ethics.

Class H., the social sciences category, includes various topics that intersect with ethics. These include business ethics, sexual ethics, mental and moral life, workplace etiquette and, as in the DDC, a variety of social issues that brush up against ethical principles. Similarly, Class K., Law, takes into account moral and ethical issues pertaining to public policy, specific legal systems (including canon law and Islamic sharia law), corporate governance, the ethics of jurisprudence, and professional legal ethics. Moral education, character building, and related subject areas are included in Class L., Education. Figure 2 depicts the interaction of these categories of knowledge within the LOC by representing several overlapping circles.

Figure 2: Library of Congress (LOC) Knowledge Domains



This figure conceptualizes the overlapping domains of the Library of Congress (LOC) classification scheme as they touch on the subject of ethics. In the LOC, subjects included under Class B. emphasize philosophy, psychology and religion, and include ethics and moral philosophy. Similarly, subjects related to the social sciences under Class H. also address ethics, moral development, and moral philosophy.

Other Classification Systems and Approaches

Two other library classification systems were considered as part of this study. The Universal Decimal Classification system, used primarily outside of the United States, is based on the DDC (Harper, 1954), and categorizes ethics-related topics in the same manner as the DDC. The Colon Classification, also used primarily outside of the United States, resembles the LOC in its organization and structure (Satija, 1990 & 2002), including its manner of taking into account ethics-related subjects.

WHAT ABOUT THE R-WORD (RELIGION)?

One of the advantages of using knowledge mapping is the manner in which the technique highlights conceptual relationships that are not necessarily intuitive or even particularly rational. As a result of our effort here, we note that there is a significant amount of overlapping between moral philosophy and religion (or religious studies, or theology). Business ethics and religious notions are seldom paired in the modern Western thought, but they are not so severely segregated in other cultures. We find this outcome of our study to be interesting in two ways: first, it raises the question as to whether there has been too much effort to ban religion from the discussion of business ethics in the Western business schools; and second, it raises the question as to whether modern Western efforts to ensure the secular goal of objective education has created an environment where those for whom ethics and faith are not separated and compartmentalized find themselves at odds the prevailing tone of the business ethics classroom. The former is a question of intellectual honesty and open-mindedness, and the latter is a question of multiculturalism and the accommodation of intellectual diversity.

Prowse (2002) claims that we are living “in times that might aptly be called ‘post-ethical’” (p. 2). He suggests that people still use moral language, but that they have increasingly stopped believing that it has any objective foundation. In other words, Prowse believes that people today are for the most part emotivists, that is, that they increasingly treat moral judgments as no more than personal expressions of approval or disapproval:

That being so, many people's behaviour is now guided almost exclusively by prudential considerations: in other words they obey the law, help others and respect customs and mores only if they calculate that this will benefit them personally in some way. They do not accept the validity of "oughts" or "shoulds". On this view, "doing one's duty, regardless of the personal cost" is a philosophy to which only fools should subscribe. (p. 2).

Prowse proposes that a waning of religious faith in Western culture is the ultimate cause of the loss of ethics:

What accounts for this hollowing out of morality, for this loss of belief in objective ethical standards? Why are so many people de facto emotivists? The growing authority of empirical science and the loss of faith in religion are partly responsible. If people believe the world consists of nothing but tiny particles or quantum wave functions, why should they treat ethics as anything but a matter of taste? (p. 2)

If Prowse was right, the fading of religion might well be a mixed "blessing." As Glover (2000) has observed:

Those of us who do not believe in a religious moral law should still be troubled by its fading. The evils of religious intolerance, religious persecution and religious wars are well known, but it is striking how many protests against and acts of resistance to atrocity have also come from principled religious commitment (p. 405).

The research of Evans *et al* (2006) demonstrated that religious affiliation is highly influential in determining the amount of ethics content in the curriculum. Comegys (2010) also found evidence that students attending religiously affiliated colleges and universities may have more ethically inclined attitudes about business, and concluded that the religious orientated climate at such institutions may influence the attitudes of these students. In any event, it may well be a mistake to attempt to ban religion from the domain of business ethics for both conceptual and practical reasons.

In this regard, Caroline Whitbeck (Glagola et al, 1997) makes an interesting observation. She argues that the use of traditional secular theories of ethics (utilitarianism, Kantian duty-based ethics, etc.) actually alienates students. She notes that by using these theories, students are taught to choose their theory, restrict their vocabulary, and then defend that position within the constraints of that theory, rather than to examine all morally relevant considerations (p. 446).

Irrespective of the extent to which specific religious tenets accommodate promote diversity, respect for religious views is a diversity issue. Indeed, diversity can be properly defined to include "real or perceived differences among people with regard to race, ethnicity, sex, religion, age, physical and mental ability, sexual orientation, and family status that affect their treatment, opportunities, and outcomes" (Bell *et al*, 2009, p. 598).

CONCLUDING COMMENTS

Knowledge mapping is a helpful technique for the identification, definition and taxonomy of components of business ethics. By working from well-established categories of knowledge as used in the field of library science, our goal has been to demonstrate that business ethics is a field that draws from both the humanities and the social sciences. Any effort to focus on one without the other will result in something less than the optimization of the knowledge base of this important domain. Our methodology in pursuing this goal has been to make use of knowledge mapping with emphasis on the prominent classification regimes used in library science. This study has led to our finding that ethics and moral philosophy are

subject areas that cannot be isolated from any of the overlapping domains of philosophy, psychology, religion and the social sciences. Our research is limited to the extent that it is qualitative and conceptual; we would encourage future empirical research that could support or refute our proposition that student acquisition of ethical knowledge is optimized when all, rather than some, of the above domains are engaged in ethics education.

As a result of this knowledge mapping project, we have been alerted to the possible neglect of some of the metaphysical aspects of business ethics. As a practical application of this finding, we would suggest that business ethics educators risk alienating some of those students whose moral epistemology is informed by faith (including both Western students of faith as well as international students whose cultural backgrounds include Islamic, Buddhist, Hindu, Christianity and other religious influences). A robust discourse in business ethics can, and in many cases should, allow for the possibility that students of faith have something to say about issues of right and wrong behavior in the marketplace. This widened discourse will not only serve to be more respectful of those students, but it will likely enrich the business discourse itself.

Along the way, business ethics research and scholars should probably lead the way in helping to push accreditation guidelines toward more structure and more specific content. In so doing, related subjects such as corporate social responsibility, social issues in management, business and society, and sustainability need not be weakened. Indeed, the first principles that can be promoted by theoretically diverse and strong business ethics will likely strengthen these related subjects as well.

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ACCOUNTING STUDENT AND LECTURER ETHICAL BEHAVIOR: EVIDENCE FROM INDONESIA

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ABSTRACT

Research on ethical behavior has been conducted to understand human behavior in their environment. It became an issue in Indonesia since there are many issues related to accountant behavior in their professional role. This study provides empirical evidence on an ethical behavior issue related to accounting student and lecturers in a private university in Surabaya, East Java-Indonesia. We added a personal variable of gender and locus of control to identify how women differ from men. Women in Indonesia have been treated as second citizen, not only in education but also in the working environment. This has held despite efforts of emancipation undertaken for many years. The locus of control as an individual factor represents how individuals react to making decision. About half of 23 private universities in Surabaya and 548 respondents engaged in the survey. The universities were separated by accounting program accreditation. Using analysis of variance and Pearson correlation the result of this study show women’s ethical attitudes were better than men’s. Second, it was concluded that individuals with internal locus of control are more reluctant to do unfair and unethical acts than individual with external locus of control. Finally, accounting programs with better accreditation revealed better ethical behavior, even though the difference was statistically insignificant.

JEL: M49

KEYWORDS: Ethical Behavior, Gender, Locus of Control.

INTRODUCTION

Research in accounting ethics is growing rapidly throughout the world especially since the Enron case in 2002. In Indonesia, the issue of accounting ethics developed along with the occurrence of multiple violations of ethics involving the accounting profession. In public accounting, based on the accountability report of the Honorary Board of IAI (Institute of Indonesian Accountants) in 1990 – 1994 period, there were 53 public accountant cases of ethics violations (Husada, 1996). Other cases of unethical behavior are quite common. This paper addressed these issues by conducting research on ethical behavior in accounting education.

This research was built upon the work of Ameen et al (1996). It conducted a survey to identify the relationship between individual factors such gender with the willingness to tolerate unethical academic behavior. The result ascertained that female accounting students are more sensitive to ethical issues and less tolerant of unethical behavior than male students are. In this research, gender was chosen since there are some gender related issues in education in Indonesia. The condition and position of women in Indonesia still lags far behind men. The data showed that there were less female students in higher education and levels of illiteracy for women 5.3% higher than 2.7% in men (Pulungsih, 2007). There are a number of traditional cultural values in Indonesia that identify the main tasks of women in domestic positions. When the funding sources of a family are limited, the school should come first to the boy. Although the task of women is in the domestic area, they also must educate children and maintain the welfare of the family. Thus, women should remain knowledgeable for the task. Limitations of education and training opportunities for women by gender equality still require a more serious struggle. Even

though female students are growing, discrimination against women remains a major problem (Ameen et al, 1996; McNicholas, 2004).

In this research, the work of Ameen, et al. (1996) was expanded by adding another individual factor locus of control. The potential link between the personality variable locus of control and ethical behavior has been reported by a number of studies (Cherry and Fraedrich, 2000; Rogers and Smith, 2001; Shapeero et al, 2003). The object of this study was also expanded on accounting lecturers. The addition of accounting lecturers as the object of this research is primarily due to their influence to the ethical behavior of accounting students (Khomsiyah and Indriantoro, 1998). Therefore, in addition to testing and demonstrating ethical behavior in accounting students and accounting lecturers in terms of individual factors of gender and locus of control, this study also looks at the relationship between ethical behavior of accounting students and accounting lecturers. The rest of this paper will be organized as follows: the second section of this paper is the literature review and the development of research hypotheses. The third section outlines the research methods and the fourth section describes research results. Finally, discussion and conclusion are set forth in the last section.

LITERATURE REVIEW

Ward, et al. (1993) defines ethics as a complex process of determining what to do in certain situations. According to Wahyudin (2003), normative ethics are divided into two aspects, moral accountability and normative ethics. Moral accountability includes ethical revelation, ethics rules, and relativism. The normative ethics to happiness involve egoism, self-development, and utilitarianism. Husada (1996) mentions that there are at least four reasons learning ethics is important. First, the ethics of human guide in selecting the various decisions faced in life. Second, ethics is a pattern of behavior based on agreement so that the values of a harmonious life can be achieved. Third, the dynamics of human life led to changes in moral values that need to be analyzed and reviewed. Fourth, encouraging ethical instincts of morality and human inspired for both looking for, find, and apply the essential values of life.

According to Keraf (2001: 33-35), ethics are divided into general ethics and special ethics. Special ethics are further subdivided into three groups: individual ethics, environmental ethics, and social ethics. Social ethics talk about the obligations and rights, attitudes and behavior patterns of humans as social beings who interact with each other. Ethics is concerned with individual relationships between people with one another and about social interaction. Social ethics are about professional ethics. Emphasis on professional ethics demands on one's profession, which in this case concerns about the expertise and moral commitment (responsibility, seriousness, discipline, and moral integrity). Larkin (1990) states the ability to identify ethical and unethical behavior is useful in all professions including auditors.

Research ethics in accounting education have been widely carried out (see, Stevens et al, 1993; Ameen et al., 1996; Buff and Yonkers, 2005; Saravanamuthu and Tinker, 2008). However, there exists limited research on ethics in accounting education in Indonesia (Adib, 2001; Sihwahjoeni and Gudono, 2000; Ludigdo and Machfoed, 1999; Maryani and Ludigdo, 2001). Most of this research indicates that ethics in accounting education was a necessity since it explained ethical behavior.

Gender and Ethical Behaviour

In a business environment, especially in accounting practices, many women entering the work force are entering the accounting and business community. Thus it is important to evaluate whether gender differences affect ethical perceptions of accounting students (Clikeman, 2000). Eagly (1987) suggested that men and women are fundamentally different in moral development and have a tendency to bring different values to the workplace. Differences in values were seen from their attitude and ethical behavior. Based on this theory man puts more value on money, advancement, power and measuring the expression

of individual performance. Women pay more attention to the harmonious relationship and help people. Similarly, Gilligan (1982) stated that American men are socialized in the instrument orientation that emphasizes achievement and problem solving, while women are socialized in the sense orientation that emphasizes the maintenance of relationships.

Past research indicated inconsistent results about the difference of gender influence on ethical behavior (Huton et al., 1996; Jones and Kavanagh, 1996; Cohen et al., 1998; Bass et al., 1999; Shafer et al., 2001) Huton et al. (1996) researched the issue of gender effects on behavior in the form of attitudes, motivations, perceptions of discrimination, and the desire to move jobs. The results showed gender differences in behavior, attitudes, motivations, perceptions of discrimination and the desire to move jobs. Research conducted by Ameen, et al (1996) concerning the relationship between gender and ethical sensitivity showed that female accounting students are more sensitive to ethical issues and less tolerant than male students. Cohen et al (1998) examined the influence of gender on ethical behavior finding differences in intensity and ethical orientation among male and female non-practitioner accountants and professional accountants. On the contrary, some researchers found no ethical differences between men and woman (Jones and Kavanagh, 1996; Bass et al., 1999; Shafer et al., 2001)

In Indonesia, Adib (2001), who is also motivated by the study of Ameen et al. (1996), suggested that ethical sensitivity of accounting students in an academic environment between men and women showed the same ethical priorities. Abdurachim and Indriantoro, (2000) showed that there were differences in the attitude of men and women of accountant lecturers in the workplace. However, on examination of the motivations and perceptions of discrimination in the workplace, it is evident there is no difference. Further, it also proved that the females have higher sensitivity rates than males (Ludigdo and Machfoed, 1999; Maryani and Ludigdo, 2001).

Based on the studies mentioned above, there are inconsistencies regarding the ethical behavior between men and women. Therefore, this study proposes the following null hypothesis:

Ho1: there is no ethical behavior difference between male and female accounting students.

Ho2: there is no ethical behavior difference between male and female accounting lecturers.

Ho3: There is no relationship of ethical behavior between accounting students and accounting lecturers.

Ho4: There is no gender interaction on the relationship between ethical behavior of accounting students to accounting lecturers.

Locus of Control and Ethical Behaviour

Locus of control, as a personality variable, defined as someone's view of event – whether he/she feels can or cannot control the events that happened to him/her (Brownell, 1981). A person with internal locus of control believes that what is happening to him/her (positive or negative events) is a consequence of one's own actions. Therefore, he/she always wants to be in control of his/her being and always takes responsibility for any decision-making. A person with an external locus of control believe that events in his/her life is influenced by fate, fortune, and power outside him/herself. Thus, the incident is outside his/her control.

Reis and Mitra (1998) examined the effects of differences in individual factors on the ability to receive ethical or unethical behavior and proved that individuals with internal locus of control tend to be unwilling to accept a less ethical action. In contrast, individuals with an external locus of control tend to

be more willing to accept certain actions that are less ethical. Furthermore, in relation to gender, they showed that women are more ethical than men. Thus gender is a significant factor in determining ethical behavior and women are more ethical than men to perceive situations in business ethics. Based on the theory of locus of control, the behavior of auditors in a conflict situation will be influenced by the characteristics of its locus of control. Individuals with an internal locus of control are more likely to behave ethically in a conflict situations than individuals with external locus of control.

Rogers and Smith (2001) investigate whether locus of control, age, and gender separately and jointly affect ethical decision making. Their results indicated that gender is insignificant in the analysis, while locus of control is significant with the internal locus of control supplying the more ethical responses. In Indonesia, Fauzi (2001) conducted a study on the influence of differences in individual factors on ethical behavior of students. They showed that accounting students with internal locus of control behave more ethically than accounting students with external locus of control. The results of this study support the research of Reis and Mitra (1998) Based on theory and research results mentioned above, we propose the following null hypothesis:

Ho5: There is no ethical behavior difference between the of accounting students with internal locus of control and accounting student with external locus of control

Ho6: There is no ethical behavior difference between the of accounting students with internal locus of control and accounting student with external locus of control

In this study, we added accounting education accreditation to determine whether a higher accreditation level indicated a higher level of ethical behavior. Since accreditation was determined to reflect the quality of the university, we propose the following null hypothesis:

Ho7: There is no ethical behavior difference between accounting students on the levels of accounting education accreditation

Ho8: There is no ethical behavior difference between accounting lecturers on the levels of accounting education accreditation

RESEARCH METHODS

The population in this study is accounting students who have more than 120 credits and accounting lecturers in the faculty of economics of the accounting department at a private university in Surabaya, East Java – Indonesia. Students who have taken over 120 credits are selected because they have taken courses that contain the teaching of ethics such as auditing and managerial accounting and they will soon complete their thesis for a degree in accounting. The number of respondents in the study include 436 accounting student and 112 for accounting lecturers.

Ethical behavior is behavior or a response of someone in his/her environment regarding the rights and moral obligations and true or false values. Accounting student ethical behavior were measured using instruments developed by Ameen et al. (1996). The instruments are grouped into three dimensions: unethical behavior at the time of examination, unethical behavior when conducting task groups or individuals, and unethical behavior when making paper.

Ethical Behavior were measured using instruments developed by the researchers by modifying Ameen et al.'s (1996) instrument. Instruments were grouped into three dimensions, namely: unethical behavior related to the examinations assessment, unethical behavior related to teaching and learning, and unethical behavior related to the research. Questionnaires were given a value of 1 (very fair) to 5 (very unfair).

Ethical behavior of the overall score ranges between 23 (minimum) to 115 (maximum). The minimum score indicates a high level of ethical behavior, while the maximum score indicates a low level of ethical behavior. Gender in this study was based on the concept of sex, a biologically determined nature. Gender is divided into two, male and female with a value of 1 for man and a value of 2 of female.

Locus of control describes the individual's belief that individuals can influence the events associated with his/her life. Locus of Control was measured by using the instrument of Work Locus of Control Scale (WLCs). The instrument consists of 16 question items using a Likert scale of 1 to 4 points. The higher the score indicates an external LOC, whereas the lower the score is an internal LOC. Cut-off point groupings based on the mean score. Internal LOC was given a value of one and external LOC was given a value of zero.

RESEARCH RESULTS

Summary data on the ethical behavior and locus of control variable of accounting students and accounting lecturers are shown in Table 1. Of the gender factors, the table shows the average score of ethical behavior variable of accounting students was 1.94 and 1.18 for accounting lectures in the assessment range criteria 1-5. This indicates that lecturers have better ethical behavior than students. The average score of ethical behavior of female accounting students and lectures is better than male students and lectures. For lotus of control, the average score was 2.94 and 2.92 for accounting students and lectures respectively, which indicate that they are likely to have an internal LOC. While the factors of gender, male students and lecturers on average are more likely to have an internal LOC than female.

Table 1: Description of Ethical Behavior and Locus of Control

No	Respondent	Ethical Behavior			Lotus of Control		
		M	F	Average	M	F	Average
1	Accounting Students	2.01	1.89	1.94	2.93	3.04	2.94
2	Accounting Lecturers	1.16	1.20	1.18	2.98	3.03	2.92

This table shows the average score of ethical behavior and locus of control of accounting students and accounting lecturers. For ethical behavior, the lower the score indicates an ethical behavior, while for locus of control, the lower the score indicates internal locus of control (cut of point 2.96 for accounting students and 2.93 for accounting lecturers).

Comparison between accounting students and accounting lecturers for ethical behavior indicated that on average, accounting lecturers have a higher level of ethical behavior than accounting students. Likewise, on average, accounting lecturers are more likely to be an internal locus of control than accounting students.

Statistical descriptions of ethical behavior according to universities' accreditation (Table 2) showed that ethical behavior of accounting students of "B" accounting education accreditation is higher than "A" and "C" accreditation. On the contrary, ethical behavior of accounting lecturers of "A" accreditation is lower than "B" and "C" accreditation.

Table 2: Ethical Behavior Based on Accounting Education Accreditation

No	Accounting Education Accreditation	Accounting Students			Accounting Lecturers		
		M	F	Average	M	F	Average
1	A	1.97	1.97	1.97	1.15	1.14	1.15
2	B	2.05	1.82	1.93	1.24	1.16	1.19
3	C	2.00	1.88	1.94	1.09	1.29	1.20

This table showed on average the ethical behavior and lotus of control according to accounting education accreditation.

The hypotheses test results in Table 3 indicate that two of the eight of null hypotheses were rejected, which mean that females were as capable as males not only in higher education (students), but also in the work place (lecturers).

The ethical behavior between male and female students are different, with female students have a higher ethical behavior than male. On the contrary, there is no difference of ethical behavior between male and female lecturers. On lotus of control variable, results point out that students with internal locus of control have a higher ethical behavior than students with external locus of control, while for lecturers there was no ethical behavior difference on internal-external lotus of control.

Table 3: Hypotheses Testing

Hypotheses	Respondent	N		Means of Ethical Behavior		F value (correlation)	Sig.	Decision
		M/I	F/E	M/I	F/E			
Gender (Male – Female)								
1	Students	205	214	1.9986	1.8823	7.087*	0.008*	Ho rejected
2	Lecturers	49	59	1.1973	1.1680	0.925	0.338	Ho not rejected
3	Students-Lecturers	254	273	-	-	-0.10	0.920	Ho not rejected
4	Gender -Students-Lecturers	254	273	-	-	-0.15	0.874	Ho not rejected
Locus of Control (Internal – External)								
5	Students	196	223	1.8841	1.9876	5.577*	0.019*	Ho rejected
6	Lecturers	51	57	1.1741	1.877	0.198	0.657	Ho not rejected
Level of Accounting Education Accreditation								
7	Students	218	218	2.0134	1.8942	0.515	0.598	Ho not rejected
8	Lecturers	51	61	1.1625	1.2011	1.199	0.306	Ho not rejected

*This table shows the result of hypotheses testing. Hypotheses 1-2and 5-8 used ANOVA, while hypotheses 3-4 used correlation Pearson test.*significant on the level of 0.05.*

DISCUSSION

These results show that ethical behavior of female accounting students is different from the ethical behavior of male students. Female students have a better ethical behavior than male students. Verification of the ethical behavior of female and male accounting lecturers shows the same results, although the difference was not statistically significant. There was also a difference of ethical behavior between accounting students internal locus of control and accounting students external locus of control. Accounting students with internal locus of control have a better ethical behavior than accounting students external locus of control. Conversely, there was no difference of ethical behavior of accounting lecturers. A person with internal locus of control believe that what is happening (positive or negative events) is a consequence of one's own actions (Brownell, 1981). Therefore, the person must always be in control and always takes responsibility for any decision-making. A person with external locus of control believes that events in his/her life are influenced by fate, fortune, and power outside him/herself.

Four understandings can be derived from the results: first, the results of this study support the theory of gender socialization which argues men and women are fundamentally different in moral development and its tendency to bring different values to the workplace. Based on this theory males put more value on money, advancement, power and measuring the expression of individual performance. Women pay more attention to the harmonious relationship and help people (Eagly, 1987; Gilligan, 1982; Clikeman, 2000). Women are more ethical than men. Thus gender is a significant factor in determining ethical behavior and women are more ethical than men to perceive situations in business ethics.

Second, this study shows no correlation between students' ethical behavior with accounting faculty accreditation and lecturers' ethical behavior. The result is different from the results of research by Suwardjono (1992) which stated that accounting education has a major influence on the accountants' ethical behavior. Accounting education is not only responsible for the teaching of science in business and accounting (knowledge transformation), but also to educate students to be a complete human personality. Accountants as educator, who instill knowledge of ethics, should also have ethical behavior, so that students will be more able and willing to understand and accept that knowledge. Ethical attitude will encourage ethical behavior as well. Therefore, the cultivation of ethical attitudes and ethical behavior of accounting lecturers are expected to encourage accounting students to behave ethically. The lack of correlation between ethical behavior of accounting students and accounting lecturers' ethical behavior may be caused by factors of understanding the questionnaires that were perceived differently among students and lecturers. Respondents may be inclined to fill out questionnaires to give the best answer or it can also be caused by meaningless of the questionnaire, so they cannot measure the ethical behavior of students and lecturers. This maybe possible though the questionnaire used in this study have been used also in previous studies (Ameen et al., 1996; Khomsiyah and Indriantoro, 1998; Abdurachim and Indriantoro, 2000).

Third, the results support the theory of locus of control, where individuals with internal locus of control are more likely to behave ethically in conflict situations than individuals with external locus of control (Rogers and Smith, 2001). The results also support the research by Reis and Mitra (1998) and Fauzi (2001). Reis and Mitra research (1998) on the effects of individual differences factors in the ability to receive ethical or unethical behavior prove that individuals with internal locus of control tend to be unwilling to accept a less ethical action. In contrast, individuals with an external locus of control tend to be more willing to accept certain actions that are less ethical. Fauzi (2001) found that accounting students with internal locus of control behave more ethically than accounting students with external locus of control.

Finally, this study shows that female students have a better ethical behavior than male students, so women should be given the opportunity to obtain higher education levels. In terms of education, the condition and position of women in Indonesia is still far behind men. This should not happen since women play a major role in their children's education. Traditional cultural values that put the main tasks of women in domestic positions should begin to change with the increasing role of women outside home. It is important to realize that although the task of women is in the domestic area, one of their tasks is to educate children and maintain families' welfare; therefore, women should become educated to have the ability to perform the task.

CONCLUSION

The objective of this study is to examine the ethical behavior of accounting students and lectures in terms of individual factors: gender and locus of control. Using a survey method, ANOVA, and Pearson correlation, the result shows that, firstly, female accounting students have a higher level of ethical behavior than male. Even though statistically there is no difference of ethical behavior of accounting lecturers, the mean values indicate that women accounting lecturers have a higher level of ethical behavior than men do. These means that female in Indonesian families should be have a higher degree of education. Secondly, we conclud that individual with internal lotus of control are more reluctant to do unfair and unethical attitude than individual with external locus of control. Finally, accounting programs with better accreditation revealed good ethical behavior, even though the difference was statistically not significant.

Even though the empirical result of this study support the theory of ethics, gender, and locus of control, at least four limitations should be noted. First, the data were collected only at one university in Surabaya

city. The characteristic of this university might be different from those in other areas or countries. Hence, the present result should not be assumed to represent the general case. However, it may provide a fundamental reference for Indonesian accounting education, students, lectures, and family whose environments are similar to those in Surabaya City. Since individual informants provide the empirical data, possible biases or preferences (e.g. learning styles, communication methods, social preferences, etc) may exist due to different personal experiences, family, or educational background. Third, this study didn't control for other variables (e.g. families earning, students or lecturers' age, students or lecturers' background, etc) that may influence the relationship. Finally, this study use ANOVA and Pearson Correlation to test the hypotheses that may have some limitations. Future research may conduct the same research with larger respondents (more than one city), use a control variable as a moderating variable (such as GPA, type of education), and use other analysis like multivariate analysis.

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APPLIED PROJECT LEARNING OUTCOMES: DIFFERENCES BETWEEN UNITED STATES AND INTERNATIONAL STUDENTS

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ABSTRACT

The presence of international students on college campuses has been a significant source of cultural diversity and globalization of college campuses. Therefore, determining factors for successful learning experiences of international students on American campuses could result in better recruitment strategies. This paper investigates the learning experiences of students in applied project courses and compares learning outcomes of international and the U.S. students in applied courses. Results show positive impacts of applied project courses on students' learning outcomes with better results for international students.

JEL: I21, M31, A22

KEYWORDS: Applied Projects, Learning Outcomes, Global Business Education

INTRODUCTION

Globalization and student career preparation are major priorities for business schools, and are critical for hiring criteria by businesses. As an example of this importance, “The impact of both the marketplace and AACSB accreditation has resulted in a substantial interest in ‘internationalizing’ the business curriculum and encouraging student experiences in schools of business across North America and throughout the world” (Gordon, Heischmidt, Sterrett and McMillan, 2009, p. 133). Cultural competency of college students is an important factor for a success in global market place (Zhao, Kuh, Carini, 2005). International students on university campuses create culturally diverse environmental, not only exposes American culture to international students but also introduces other cultures to domestic students (Zhao, Kuh, Carini, 2005). Furthermore, with preparing students for successful careers, specific standards must be met, e.g., assurances of learning (AACSB International Accreditation Coordinating Committee, 2007). Applied teaching-learning strategies have been used to achieve such learning outcomes. For instance, “effective learning occurs when students are actively involved with an experience and then reflect on that experience” (Frontezak and Kelly, 2000, p. 3).

Moreover, active learning projects provide opportunities for culturally diverse students to work together outside of the classroom, e.g., requiring this as a team assignment. As universities provide diversity opportunities for student learning, e.g., recruiting and admitting international students, there is a pedagogical need to determine the impact on the diverse student populations learning outcomes (Geringer, Stratemeyer and Canton, 2009; Grayson, 2005). The purpose of this study is to examine the differences between United States and international students' experiences and the influences on their successful performance in courses that include applied learning projects. Therefore, are there differences between U.S. and international students' learning outcomes? What factors influence their successful applied project performance? This study includes applied projects literature review, the methodology and design, data analysis results, implications of the findings and the conclusions.

APPLIED PROJECTS LITERATURE

Literature supports the positive impacts of applied projects teaching pedagogy in enhancing students' learning and personal growth (Dudderar and Stover, 2003; Easterling and Rudell, 1997; Mastrangelo and Tischio, 2005; Petkus, 2000; Soslau and Yost, 2007; Steinke and Fitch, 2007; Sternberger, Ford and Hale, 2005). Applied project strategies supplement explicit classroom learning objectives by an experiential service project and a reflection assignment for students to bridge theory and application (Dudderar and Stover, 2003). This integration of education, experiment and service not only enhances students' learning, but also provides each student with a sense of achievement, satisfaction and effectiveness as a community member, in addition to fulfilling degree requirements (Easterling and Rudell, 1997; Holland, 2001; Titus and Petroschius, 1993). The continuity of classroom learning to the real world opens up a broader perspective to the students with insights, awareness, involvement and positive change in attitude, behavior, self-esteem and personal growth, which all constitute solid foundation for future career success (Easterling and Rudell, 1997). High schools and colleges have adopted applied projects to their curricula for development of students' knowledge, skill and personality (Butin, 2003; Dudderar and Stover, 2003; Mastrangelo and Tischio, 2005; Steinke and Fitch, 2007; Sternberger, Ford and Hale, 2005; Zlotkowski, 1996). Business programs have also included live project learning pedagogy to their curricula (Geringer, Stratemeyer and Canton, 2009; Klink and Athaide, 2004) for development of the competency of business school graduates, especially for skills such as decision making, problem solving, team work and written and oral communication (Geringer, Stratemeyer and Canton 2009; Lamb, Shipp and Moncrief 1995).

Titus and Petroschius (1993) discuss the beneficial impacts of adding an experiential project to an undergraduate consumer behavior course. Both students and instructor's evaluations of the learning outcomes of the course and implications of the project reveal several benefits to students' learning, including hands-on experience, analytical skill in the market place, synthesizing theory and practice and relating marketing concepts to real world application, design and execution of a marketing project, and appreciation for marketing research. Klink and Athaide (2004) discuss the challenges of implementing service learning into the principles of marketing course because of limited marketing backgrounds of students. However, their assessment of learning and personal outcomes of the principle of marketing courses with a problem-based service learning project indicated positive outcomes. Assessment of the students' project reports and a short questionnaire with semantic differential and open-ended questions indicated enhancement in students' perception of learning, implementation of concepts to real world problems, teamwork and communication skills and social responsibility. Klink and Athaide (2004) recommend incorporating service-learning projects not only to the principles of marketing courses but also to other relevant marketing courses.

Geringer, Stratemeyer and Canton (2009) expand on Klink and Athaide (2004) recommendation by requiring, "the students to look beyond marketing related problems" (2009, p. 4) and allowing for individual work as well as teamwork in a service project. The learning objectives of the service-learning project included academics, skills, attitudes, career development and civic responsibilities. Geringer et al. state that assessment of the learning outcomes of the service learning project indicated that, "all objectives or student learning outcomes were achieved to some extent" (2009, p. 6). Awareness, civic responsibilities and commitment to volunteering of students were impacted the most and career development was impacted to some degree. Assessment results showed enhancement of students' knowledge and understanding of the principles of marketing and leadership and communication skills. However, Geringer et al. (2009) point to relatively large standard deviation of the enhanced learning item on the questionnaire indicating variation in the effectiveness of the service-learning method of teaching for different students. The authors recommend further research on, "how the diverse student populations perform in service learning assignment" (Geringer et al. 2009, p. 9).

Bobbitt, Inks, Kemp and Mayo (2000) describe integration of three courses, principles of marketing, personal selling and sales management with an experiential project. The authors explain that a trade show organized and presented by the students applied to all three courses, but different classes had to develop different projects based on the trade show, such as a new business-to-business product and a marketing strategy, sales training video, and sales calls. The assessment of the integrated experiential project indicated favorable responses of the students to the project, the positive motivational impacts of class rivalry and peer pressure and a more effective teaching and learning method.

Farazmand, Green and Miller (2010) measure the learning outcomes of four marketing courses (Marketing Communications, Global Marketing, Marketing Research, Business Marketing Management) in two different semesters. The courses were taught with a real live project in 2005 and without a real live project in the prior semester. The authors indicate that the students' average course grades were higher for the semester with the live project. In another study, Farazmand and Green (2012) measure and compare the impact of applied project teaching pedagogy between male and female students. The authors identify differences in teamwork and learning by gender. In addition, Green and Farazmand (2012) examine the learning outcomes of courses with live-case study projects for students who have had a prior internship experience and those who have not. They find that prior internship experience does improve applied project learning outcomes. Although, the positive impacts of applied project learning outcomes have been measured for the American students, but the impacts of such pedagogy on learning of the international students have not been examined. Considering significant presence of international students on college campuses, examining the learning experiences of international students in colleges will contribute to success of their recruitment strategies (Grayson, 2005). Grayson (2005) examines the learning differences of 477 international and 781 Canadian freshman students with pre-entry characteristics, formal institutional experience, informal experience as independent variables and GPA measuring the learning outcome as the dependent variable. Grayson (2005) finds no significant differences in the GPA and program success of Canadian and international students. However, he mentions the importance of examining the impact of different policies, teaching strategies and out-of-classroom student activities on international students' skills, retention and specific educational outcomes.

Green and Farazmand (2010) examine the differences in United States and international students' performances in courses with live project. While their study shows the positive effects of applied project on all students' learning outcomes, their results however indicated significantly higher learning outcomes for international students relative to the U.S. students. This study extends Green and Farazmand (2010) work to compare International and United States students' learning outcomes in applied learning courses and determine factors that influence students' success in applied project courses.

The Applied Project Learning Outcomes Study

Lynn University in Boca Raton, Florida is a global university with students from 44 states and 78 nations, and is located in the international South Florida region of the United States. Lynn is an independent, coeducational, residential institution with 2,109 students (1,660 undergraduate and 449 graduates). Lynn University has a low 15:1 student-to-faculty ratio, and offers baccalaureate, master and doctoral degrees. The University has six colleges of which the College of Business and Management is the largest (Lynn University, 2012). Lynn University has been noted for the fifth-straight year for the highest percentage of international students among master's degree-granting institutions in the South (*U.S. News & World Report*, 2011). From the student population, 24% of Lynn University's are students from countries outside the United States (Lynn University, 2012). This research setting provides an opportunity to gain a better understanding of learning outcomes differences, such as for applied projects and between local and international students. The applied projects were conducted during two academic years (Fall 2009 thru Spring 2011), or four semesters in five upper-level Marketing courses. These courses are Consumer Behavior, Marketing Communications, Global Marketing, Marketing Research and Business Marketing

Management in the College of Business and Management. Each course was structured the same with the exception of the type of marketing project. Class sessions were on Tuesdays and Thursdays for 75 minutes. Depending on the semester, examinations were 30% of the course grade, course project ranged from 30% to 50%, and other assignments 20% to 40%. The courses allocated time of approximately 60% classroom meetings and 40% field research and project development.

The College of Business and Management (CBM) has had a long-term relationship with SCORE, a partner of the U.S. Small Business Administration, to provide “real world” learning opportunities for CBM students. Prior to each semester, the course instructor worked with a SCORE Counselor to develop a course project. During the semester, the same Counselor would be a co-instructor for the courses and in the classroom approximately 50% of the class sessions, primarily during the student teams’ project development period. However, the businessperson also would be in class the first week of the semester and a few sessions during the textbook learning period to discuss pre-project topics and answer any questions about the project. During this four-semester period, the same Score Counselor, a highly successful businessperson in manufacturing, provided the business project for and worked with 143 traditional undergraduate students.

METHODOLOGY AND DESIGN

Courses were structured around two areas, or two approaches to learning – textbook (assignments and examinations) and project (field research and presentations). However, each area was integrated with content knowledge and skills development. The first part of the semester was focused on textbook assignments while the second part was only for developing the applied learning project. For instance, the textbook chapter assignments included instructor-developed discussion questions that linked the text to the project. Moreover, each course had instructor-developed project guidelines in which textbook concepts were to be applied to the project. During the project development period, there were no class sessions for one day of the week. The teams used the classroom for meetings with the instructor and/or team members. Business, or project meetings were held with the businessperson and the instructor during the second scheduled class day each week. These meetings were to report (project status) and for informational (ask questions) purposes. During the last week of the semester, teams made an oral presentation using PowerPoints and submitted a written plan to the instructor and businessperson. At the time of the written submission, each team individually rated or evaluated (based on a total of 100%) all team members as to their contribution to the project with no two members having the same rating (percentage). The projects were evaluated (graded) and returned to students during the scheduled Final Week class session. This provided an opportunity for students to ask questions and to make comments for timely feedback. This study includes 143 students who participated in the applied projects during the four semesters. The sample includes 89 U.S. students and 54 international students.

There were 80 males and 63 females. The vast majority was College of Business and Management students (95.1%), and only six students were from the College of International Communications (4.2%) and one for the College of Liberal Studies (0.7%). While there were no freshmen who participated, there were 12 sophomores (8.4%), 80 juniors (55.7%) and 51 seniors (35.7%). More than two-thirds of the students lived off-campus (67.8%) and the remaining students lived on-campus (32.2%). Most students (58.0%) had not taken a required internship course. About one-half of the students (53.8%) did not belong or were associated with a University organization, e.g., student government, fraternity/sorority, athletic team. About four out of ten students did not have a paying Summer job (42.6%) but most of those who did worked 30 or more hours (28.7%). During the semester of the course, most students did not work (73.4%) but most of those who did worked less than 20 hours (18.9%). See Table 1 for specific United States and international student characteristic details.

Table 1: Students' Characteristics: U.S and International Students

Student Characteristics	U.S. Students		International Students		Total Students	
	Number	Percent	Number	Percent	Number	Percent
Total	89	62.2	54	37.8	143	100.0
Gender						
Male	46	51.7	34	63.0	80	55.9
Female	43	48.3	20	37.0	63	44.1
Academic Major						
College of Business & Mgt.	82	92.2	54	100.0	136	95.1
College of Int'l. Comm.	6	6.7	0	0.0	6	4.2
College of Liberal Studies	1	1.1	0	0.0	1	0.7
Academic Year						
Freshman (29 or less credits)	0	0.0	0	0.0	0	0.0
Sophomore (30 to 59 crs.)	9	10.1	3	5.6	12	8.4
Junior (60 to 89 credits)	53	59.6	27	50.0	80	55.9
Senior (90 or more credits)	27	30.3	24	44.4	51	35.7
Residence						
On-Campus	24	27.0	22	40.7	46	32.2
Off-Campus	65	73.0	32	59.3	97	67.8
University Internship						
Yes	36	40.4	24	44.4	60	42.0
No	53	59.6	30	55.6	83	58.0
University Organizations						
None	47	52.9	30	55.5	77	53.8
One	27	30.3	10	18.5	37	25.9
Two	6	6.7	13	24.1	19	13.3
Three	3	3.4	0	0.0	3	2.1
Four of More	6	6.7	1	1.9	7	4.9
Summer Employment (weekly)						
No Paying Job	27	30.3	34	62.9	61	42.6
Job Less than 10 Hours	3	3.4	5	9.3	8	5.6
Job 10 to 19 Hours	8	9.0	5	9.3	13	9.1
Job 20 to 29 Hours	18	20.2	2	3.7	20	14.0
Job 30 or More Hours	33	37.1	8	14.8	41	28.7
Semester Employment (weekly)						
No Paying Job	64	71.9	41	75.9	105	73.4
Job Less than 10 Hours	8	9.0	4	7.4	12	8.4
Job 10 to 19 Hours	8	9.0	7	13.0	15	10.5
Job 20 to 29 Hours	6	6.7	2	3.7	8	5.6
Job 30 or More Hours	3	3.4	0	0.0	3	2.1

This table shows student sample demographic, educational and work experience information. This information is presented in detail (number and percentage) by United States students, international students and total students in the sample.

Students were given three surveys during each semester. First was a pre-project survey (pre-test) at the beginning of the semester. The students provided self-reported demographic information (e.g., gender, citizenship), campus experiences (e.g., student activities), educational experiences (e.g., credits earned, internship completion), and their perception of examinations and applied projects with six 5-point Likert-type scale items. Second was a mid-project survey (mid-term test). This survey was completed after the textbook assignments and before beginning the project in which the six items (5-point Likert scale) was asked again. Third was a post-project survey (post-test) at the end of the semester. The six items were asked but the verb tense was changed from future tense to past tense. See Table 2, Panel A for the six post-test items. As shown in the table, these items were researchers' developed and measures students' applied project perceptions and experiences as (1) knowledge, (2) skills, (3) personal development, or (4)

both knowledge and skills. Additional data were included as to the teams' ranking of each member with no two students in the team having the same ranking and was used to compute the student's applied project score. Furthermore, other data provided for the study were from the instructor or the University, e.g., examination and applied project scores, cumulative grade point average.

RESULTS

The data were analyzed and the results are reported by two methods. First is a comparison between United States students ($n = 89$) and the international students ($n = 54$) using t-Tests. Second determines what significant factors, or variables influence learning outcomes for all students, U.S. students and international students using multiple regression. Learning outcomes (dependent variable) are determined by two measures – the students and the instructor.

The post-project survey (post-test) is used to determine the students' learning outcomes. Students completed a six-item questionnaire that was measured by a 5-point scale (1 = strongly agree to 5 = strongly disagree). All mean scores were lower (more agreeable) for the international students than the U.S. students, as well as for the total mean score (unweighted) for the six items. Four of the six items were significantly different. Knowledge and two skills items were the least significant ($p < 0.05$), and personal development item was the most significant ($p < 0.001$). The total mean score for the six items was significant ($p < 0.01$). Neither of the knowledge and skills items was significant. See Table 2, Panel A. To further examine the comparison between the two groups, an analysis of the project scores (1 = A to F = 5) was completed. The finding shows no significant difference. However, international students performed slightly better (higher grade) than the U.S. students. See Table 2, Panel B.

A bivariate analysis was performed to examine correlations (Pearson) and two-independent variable relationships. The results ranged from .000 (no correlation) for team ranking and learn more with project to 0.596 (moderate correlation) for pre-project survey and mid-project survey. Gender (1 = male, 2 = female) was inversely related to three of the four variables – pre- and mid-project survey (1 = strongly agree to 5 = strongly disagree) and team ranking (1 = highest to 3 = lowest). The other inverse relationship was mid-project survey and team ranking. The gender and team ranking was significant at 0.05 and pre-project survey and mid-project survey was significant at 0.01. See Table 3.

To determine the relationship of the independent variables and the dependent variable of total project score (unweighted mean score of post-project survey and project grade), multiple regression (forward stepwise) was performed for all students, United States students and international students. The independent variable was included in the equation only if it was significant at or less than 0.05. For all students, the explained variance (adjusted R^2) was 21.9%. Three independent variables were included in the model. Mid-project response and team ranking have positive relationships to total project score. However, gender has an inverse relationship. Therefore, the regression equation 1 for all students' project score (Table 4, Panel A) is:

Table 2: Project Score Comparisons: U.S. and International Students

Panel A: Student-Reported (Post-test)				
Items	United States Students Mean	International Students Mean	Standard Deviation	Mean Difference
Learned more about Marketing in this course than a Marketing course without a service (applied) learning project. (<i>Knowledge</i>)	1.82	1.54	0.605	0.28***
Developed better or new skills in this course than a Marketing course without a service (applied) learning project. (<i>Skills</i>)	1.87	1.59	0.659	0.28***
Look forward to doing another service (applied) learning course project in the future. (<i>Personal Development</i>)	2.42	1.59	0.813	0.83*
Look forward to working in a team in the future. (<i>Skills</i>)	2.45	2.00	1.046	0.45***
Did better in this course that had <u>both</u> examinations and a service (applied) learning course project than without such as project. (<i>Knowledge and Skills</i>)	2.17	1.89	0.816	0.28
A service (applied) learning project has benefited me more in meeting my career goals than a course without such a project. (<i>Knowledge and Skills</i>)	1.93	1.74	0.701	0.19
Mean Score for the 6 student-reported items	2.11	1.74	0.528	0.37**
Panel B: Instructor-Reported				
Item	United States Students Mean	International Students Mean	Standard Deviation	Mean Difference
Project grade	2.21	1.94	1.089	0.27

This table presents *t*-Test results by comparing United States students and international students. The significance levels are shown as * $p < 0.001$, ** $p < 0.01$ and *** $p < 0.05$. In Panel A, the self-reported results are from the post-test with six 5-point Likert-type scale items (1 = strongly agree to 5 = strongly disagree). This panel also shows the mean score for the six items. In Panel B, the instructor's project score results (1 = A to 5 = F) are reported.

Table 3: Select Bivariate Correlations

Variables	Gender	Pre-Project Test	Mid-Project Test	Team Ranking	Learn More with Project
Gender	1.000				
Pre-Project Test	-0.003	1.000			
Mid-Project Test	-0.027	0.596*	1.000		
Team Ranking	-0.206**	0.015	-0.077	1.000	
Learn More with Project	0.088	0.139	0.130	0.000	1.000

This table presents the bivariate correlations between the study variables relative degree of association (positive and negative). The significance levels are indicated as * $p < 0.01$ and ** $p < 0.05$.

$$(1) \quad \text{All Students} = 0.917 + 0.341 (\text{mid-project test}) + 0.295 (\text{team ranking}) - 0.160 (\text{gender})$$

For United States students, the explained variance (adjusted R^2) was 24.4%. Three independent variables were included in the equation. Team ranking and mid-project survey response have direct relationships to total project score. Gender again has an inverse relationship. Hence, the regression equation 2 for U.S. students' project score (Table 4, Panel B) is:

$$(2) \quad \text{U.S. Students} = 1.313 + 0.299 (\text{team ranking}) + 0.317 (\text{mid-project test}) - 0.257 (\text{gender})$$

For international students, the explained variance (adjusted R^2) was 34.0%. Two independent variables were included in the equation. Pre-project survey response and learn more with a project have positive relationships to total project score. Hence, the regression equation 3 for international students' project score (Table 4, Panel C) is:

$$(3) \quad \text{International Students} = -0.245 + 0.388 (\text{pre-project test}) + 0.338 (\text{learn more with a project})$$

Therefore, no independent variable was common (the same) for U.S. and international students in predicting applied projects success and their learning outcomes. However, while the mid-project

response was a significant influence for U.S. students' learning outcomes, the pre-project response was for international students.

IMPLICATIONS

The research setting provided an opportunity to examine the differences as to “how the diverse student populations perform in service-learning assignments” (Geringer, Stratemeyer and Canton, 2009, p. 9), e.g., local (United States) and international students' learning outcomes. The results have several implications to learning differences between the two groups. First, there are clearly better international students' learning outcomes. The self-reported mean scores were all lower (better learning) by the international students as applicable to knowledge, skills, and knowledge and skills measures (see Table 2, Panel A). Furthermore, the instructor-evaluated project mean score was lower (better learning) for international students (see Table 2, Panel B). Generally, members were not assigned to teams, and teams were diverse. As a result, these members learn to perform in a diverse setting. Moreover, based on the scores learning might have improved because of this diversity, e.g., international students' commitment to learning and U.S. students becoming competitive by learning.

Second, the influences on the two group's learning outcomes are very different. For the U.S. students, team ranking and mid-project survey responses were positively related, e.g., higher team ranking and better mid-project response indicates a better project grade. In addition, gender was negatively related to the U.S. student learning outcomes, or females learning more than males (see Table 4, Panel B). Similar to international students (37.8% of the sample), females (44.1% of the sample) were a minority group. This could be attributed to having greater commitment and more competitive to learning than males.

Third, international students' learning outcomes were positively influenced by the pre-project survey response and to learn more with an applied course project (see Table 4, Panel C). The implications are that international students know at the beginning of the course that they will learn more and be more successful with an applied learning project. However, the U.S. students' success depends later on in the semester (mid-term response). While the implications may not be clear and with team diversity, the early realization of applied project learning opportunities by the international students (pre-project response) may positively influence U.S. students' learning (mid-project response).

CONCLUSIONS

Globalization and student career preparation are major priorities for business schools, and are critical for hiring criteria by businesses. This study has examined and determined differences between two diverse student groups – United States and international – as to their applied projects' learning outcomes. The sample was from a university with a diverse student population that also encourages applied course

Table 4: Multiple Regression Models for Course Projects for All, United States, and International Students

Panel A: All Students					
$R^2 = 0.236$	Adjusted $R^2 = 0.219$	Std. Error = 0.64022	F = 14.293	Significant F = 0.000	
Variables	Regression Coefficient	Standard Error	Standardized Coefficient	T-Value	Significance
(Constant)	0.917	0.328			
Mid-Project Test	0.415	0.091	0.341	4.574	0.000***
Team Ranking	0.347	0.089	0.295	3.883	0.000***
Gender	-0.233	0.110	-0.160	-2.111	0.037*
Panel B: United States Students					
$R^2 = 0.270$	Adjusted $R^2 = 0.244$	Std. Error = 0.67908	F = 10.460	Significant F = 0.000	
Variables	Regression Coefficient	Standard Error	Standardized Coefficient	T-Value	Significance
(Constant)	1.313	0.424			
Team Ranking	0.361	0.114	0.299	3.156	0.002**
Mid-Project Test	0.380	0.112	0.317	3.405	0.001***
Gender	-0.400	0.147	-0.257	-2.723	0.008**
Panel C: International Students					
$R^2 = 0.365$	Adjusted $R^2 = 0.340$	Std. Error = 0.46602	F = 14.638	Significant F = 0.000	
Variables	Regression Coefficient	Standard Error	Standardized Coefficient	T-Value	Significance
(Constant)	-0.245	0.396			
Pre-Project Test	0.449	0.140	0.388	3.209	0.002**
Learn More with a Project	1.018	0.363	0.338	2.800	0.007**

*This table shows the regression estimates for all students, United States students and international students. The significance levels for each independent variable are indicated as * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$. Panel A shows all students = $0.917 + 0.341$ (mid-project test) + 0.295 (team ranking) - 0.160 (gender). Panel B presents United States students = $1.313 + 0.299$ (team ranking) + 0.317 (mid-project test) - 0.257 (gender). Panel C shows international students = $-0.245 + 0.388$ (pre-project test) + 0.338 (learn more with a project).*

projects and other “real world” learning experiences. The results found significant differences between the two groups (t-Test analysis) and relationships to their learning outcomes (multiple regression analysis). From the students’ self-report and the instructor’s results, international students had higher learning outcomes than U.S. students. However, having diverse teams (U.S. and international students) may have improved both groups’ learning. While this study has answered the call to determine “how the diverse student populations perform in service-learning assignments” (Geringer, Stratemeyer and Canton, 2009, p. 9), it does have certain limitations. This study included a sample from one academic unit at one university, and the results are not applicable or generalizable for other academic units and universities. Furthermore, the participants were undergraduate students, and different results might be found for graduate student learning. An international student was defined as a non-U.S. citizen, and no consideration, or analysis of specific comparisons between and for different global regions, e.g., Latin America, Europe, Middle East, Africa, Asia. However, these limitations offer future research opportunities. For example, “how the diverse student populations perform in service-learning assignments” (Geringer, Stratemeyer and Canton, 2009, p. 9) in non-business academic units? Are there differences in graduate courses? Are there differences between global regions? This study is the beginning, not a conclusion to better understand globalization and student career preparation, and student diversity and applied projects learning outcomes.

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LEARNING SKILLS AND MOTIVATION: CORRELATES TO SUPERIOR ACADEMIC PERFORMANCE

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ABSTRACT

This paper describes a study that was conducted at a mid-sized public state-university in the mid-south, USA, to examine various factors affecting student academic performance. In this study, the 10-scale Learning and Study Strategies Inventory (LASSI) assessment device was administered. This set of scales measures students' receptivity to skills and strategies that purportedly enhance one's ability to learn and successfully perform in an academic setting. Results from this instrument showed that the single most influential learning and study skill promoting positive academic performance was level of intrinsic motivation. To explore the individual aspects of motivation, the 8-scale Downing Self-Assessment Questionnaire was also administered. The Downing questionnaire examines motivational factors, for example, behaviors and beliefs, which might maximize one's potential for positive achievement in college. Along with motivation, the subscale measuring an attitude of life-long learning significantly predicted academic performance. The results of this study have pedagogical implications for helping students maximize their academic performance in college.

JEL: I21; I23

KEY WORDS: Learning Skills, Academic Performance, Student Success, LASSI

INTRODUCTION

At present, it can be safely said without exaggeration that a crisis of sorts currently exists in college education in the United States. As recently as the late 1990s the US led the world in the percentage of students who graduate from college (Abel, 2000). In just a little more than a decade, the US has fallen from first to sixteenth in world college graduation rates (Chalian, 2012). This startling statistic has serious socio-economic implications for the future of the US; and in response, President Obama has urgently expressed the goal of having the US retake the lead in world college graduation rates by 2020 (Carey, 2010). College educators are naturally keenly interested in all aspects of inducing student academic success which would in turn result in higher graduation rates. One area of particular interest to academicians is the question of what personality characteristics, beliefs, and behaviors contribute most positively to student academic performance as measured by student GPA. There is a rich history of academic research on this topic (see the literature review below), but much ambiguity persists. In a recent study (Griffin, MacKewn, Moser & VanVuren, 2012) it was found that amongst learning and study skills, the student's level of motivation is the single most important determinant of superior academic performance. This paper expands upon the earlier Griffin, et al., study by delving more deeply into specific aspects of student motivation.

The specific motivation for this paper was to bring additional clarity to the issue of determinants of superior academic performance in a business school setting. The college or university level of instruction is chosen for examination. In the Griffin, et. al. (2012) study, the Learning and Study Strategies

Inventory (LASSI) (Weinstein, et. al., 1987) assessment device was used to investigate various learning and study skills that arguably should enhance student academic performance. Of the ten subscales comprising the LASSI, the scale dealing with aspects of student's motivation was the scale with the strongest positive correlation with student GPA. Those results beg the question of "just what elements comprise student motivation?" If indeed it is true that a major determinant of superior academic performance is the student's motivation, an in-depth description and understanding of elements of motivation can help academicians in developing pedagogical approaches aimed at helping students maximize their academic performance.

LITERATURE REVIEW

Morrison (1999) examined various student attributes associated with academic motivation. The study drew upon theoretical foundations in the areas of learning, cognitive, sociocultural, and motivational theories (Ames & Ames, 1984; Bandura, 1977; Piaget, 1952; Rotter, 1954; Weiner, 1985). Administering the College Student Inventory (Stratil, 1988), an inventory consisting of 194 items contained in 17 different scales, to entering freshman students at a private liberal arts college, Morrison found that aspects of motivation, such as study habits, academic confidence, family emotional support, and career planning, differed statistically between unconditionally admitted freshman and conditionally admitted freshman. For all of the above-mentioned factors, the unconditionally admitted freshman scored higher than did the conditionally admitted freshman. McKenzie, Gow, and Schwietzer (2004) also used university freshman to examine the relationship between personal attributes and academic performance.

The results of their study found previous academic performance, use of self-regulating learning strategies, and being introverted correlated with successful first year university academic performance. Ridgell and Lounsbury (2004) found that general intelligence, Big Five personality traits, and work drive to be predictors of collegiate academic performance. Previous research by Lounsbury, Sundstrom, Loveland, & Gibson (2003) provided evidence that work drive explained a statistically significant portion of variance, beyond both cognitive ability and Big Five personality measures, in predicting academic performance. In that study, the dependent variable being predicted was the grade in a single course and a hierarchical multiple regression analysis showed that after considering cognitive ability, work drive was a significant predictor of course grade when entered after the Big Five constructs. Interestingly, however, Big Five constructs were not significant predictors when entered after work drive.

The Ridgell and Lounsbury (2004) study had four objectives: 1) to evaluate the effectiveness of general intelligence as a predictor of academic performance; 2) to evaluate the effectiveness of Big Five personality traits as a predictor of academic performance, both individually and in relation to general intelligence; 3) to evaluate the effectiveness of work drive as a predictor of academic performance, both individually and uniquely in relation to general intelligence and Big Five personality traits; and 4) to compare the results of objectives one through three, above, when the dependent variable was an individual course grade versus an overall self-reported GPA. Participants were undergraduate students from a large southeastern USA public university. General intelligence was operationalized by a scale developed by one of the authors (Lounsbury and Gibson, 2002). Big Five personality measures were derived from the Personal Style Inventory (Lounsbury and Gibson, 2002), which was validated in a study by Lounsbury, Tatum, Chambers, Owens, & Gibson (1999). Work drive was operationalized via an 11-item scale also developed and validated by one of the authors (Lounsbury & Gibson, 2002; Lounsbury et al., 2003). The results of the Ridgell & Lounsbury, 2004, study indicated that general intelligence was a statistically significant predictor for both the individual course grade and for overall GPA. Of the Big Five personality traits only one, Emotional Stability, was found to be a statistically significant predictor of a single course grade. However, it did not predict overall GPA with statistical significance. Work drive was also found to predict with statistical significance both individual course grade and overall GPA. And finally, the study results indicated similar validities for both dependent variables – individual course grade

or overall GPA. Bivariate correlations for individual course grade versus overall GPA were similar (i.e., no statistically significant differences) on any of the predictors of general intelligence, Big Five personality traits, or work drive.

Kanfer, Wolf, Kantrowitz, & Ackerman (2010) examined over 25 measures of personality and motivational traits, such as conscientiousness, desire to learn, critical thinking, and goal orientation. This study was predicated on a substantial body of prior research [Hunter & Hunter (1984); Ackerman & Humphreys (1990); Kanfer, Ackerman, Murtha, & Goff (1995); Schmidt & Hunter (1998); Kanfer & Kantrowitz (2002); Kuncel, Hezlett, & Ones (2004)] on the topic of predicting academic and work achievement based on an individual's cognitive abilities or non-ability traits.

This prior research somewhat suggested that either cognitive abilities or non-ability traits can have a strong positive influence on both academic performance and subsequent employment performance. A subsequent study by Crede & Kuncel (2008) indicated that cognitive abilities and non-ability traits have an influence on academic performance. The 2010 Kanfer, et.al., study extended this prior research in at least four ways. First, using a within-subject design, the Kanfer study results confirmed that both cognitive and non-ability traits are significant predictors of academic performance. Furthermore, using a hierarchical regression analysis, results showed that an individual's non-ability traits have statistically significant predictive ability of job performance beyond prediction of academic performance. Secondly, the 2010 Kanfer study utilized factor analysis to specify non-ability traits into seven basic underlying categories: avoidance orientation; learning/mastery orientation; achievement; competitive-other orientation; technical/procedural self-concept; social orientation/communion; and self-management. Using these categories, Kanfer was able to observe a different pattern of results from what might have been expected using just a single generic construct of non-ability trait alone.

Thirdly, the results of the study revealed that the role of the individual and the setting in which they are operating affect the predictive validity of cognitive ability and non-ability traits. In other words, it matters in job performance prediction whether the individual is operating in the role of an intern, versus a full-time entry-level employee, versus an experienced mid-level manager. And finally, the study provided evidence on the effect of different types of specific job knowledge when predicting academic and job performance. Extending on the work of Schmidt, Hunter, Outerbridge, & Tratter (1986); Rolffhus & Ackerman (1999); Ackerman (2000); Ackerman, Bowen, Beier, & Kanfer (2001); Beier & Ackerman (2003) and Kuncel & Hezlett (2007), Kanfer examined the relationship between broad generic knowledge and academic performance and subsequent work performance. The somewhat surprising results from the study were that although positively correlated, preliminary specific job-knowledge was not statistically significant incrementally predictive of either academic or job performance.

Still other studies have looked at such motivational related characteristics such as self-discipline (Mumford, et.al., 1993), best learning styles (Williams, 1992), devotion to study time (Nonis & Hudson, 2006), and commitment to lifelong learning (Kirby, et.al., 2010; and Wielkiewicz, et. al., 2005). Kim, et al., (2010) conducted a study to examine such aspects of motivation as competitiveness, time management, stress management, and involvement in extracurricular activities. All of the above are either aspects of motivation or have implications for motivation. This paper examines more deeply some of these aspects and tries to ascertain with statistical analysis their effect towards inducing superior academic performance of students.

DATA AND METHODOLOGY

Two widely known and statistically validated instruments were used to compile data concerning aspects of motivation. The first, the LASSI, is a series of ten subscales that measure parameters having to do with

learning and study skills and strategies that logically should positively correlate with superior or improved academic performance.

The ten subscales can be summarized as follows: Anxiety (ANX), which addresses the degree to which one experiencing anxiety and stress in pursuing academic endeavors. This subscale is reversed scored, meaning that the lower the indicated anxiety, the higher the score. The logical assumption underpinning this structure is that high anxiety actually is counter-productive to high academic performance, thus reversing the score so that the higher the score, the more favorable the implication for superior academic performance. Attitude and Interest (ATT) measures the degree that one has a positive attitude toward and is interested in academic pursuits. The higher the score on the subscale, the more interest indicated in academic matters, and the greater the level of superior academic performance that should be achieved. Concentration and Attention (CON) addresses the intensity of focus one applies to the pursuit of academic matters. The higher the score on the subscale, the greater the degree of concentration and focus applied. Information Processing (INP) measures the degree that one utilizes such techniques as imagery, verbal elaboration, and reasoning skills in academic pursuits. The higher the score on the subscale, the greater the degree of information processing applied. Motivation (MOT) measures one's diligence, self-discipline, and willingness to exert effort in the pursuit of academic endeavors.

The higher the score on the subscale, the greater the willingness to apply whatever effort is necessary to achieve a given academic goal. Self-testing (SFT) measures the degree to which one applies self-monitoring and review techniques to retain information relevant to a particular task. Selecting Main Ideas (SMI) addresses one's ability to identify main ideas and important points relevant to an academic task. Study Aids (STA) measures the degree to which one utilizes study aids, such as textbook end-of-chapter problems/exercises, PowerPoint slides, within chapter boldfaces and highlights, etc. Time Management (TMT) assesses the efficiency in which one utilizes available time expended in the pursuit of academic endeavors. A high score on this subscale indicates that the student engages in a minimal degree of procrastination and strong control of non-academic distractions. Test Strategies (TST) measures one's ability to effectively prepare for test-taking and then successfully execute the test-taking event. A high score on the subscale is indicative of a high degree of effective test-preparation and test-taking skills.

The average LASSI subscale scores generally range from the low-teens up to about 40, expressed as a percentile. As can be observed from the above subscale descriptions, the higher the score the better in that a high score in each respective attribute should most logically translate into greater/better academic performance. The second instrument used in this study was a questionnaire developed to assess freshman skills (Downing, 2005). The Downing Scale identifies eight key belief/behavioral factors that define a successful student. Distilling, via a factor analysis technique, from 64 individual questions, Downing came up with eight essential factors explaining superior student performance in academic affairs. Those eight factors can be summarized as follows: Accepting Self-Responsibility (APR) which measures the degree to which one accepts personal responsibility for creating the outcomes and quality of their lives. The higher the score on this subscale, the more the student sees themselves as the primary cause of their outcomes and experiences. Discovering Self- Motivation (DSM) measures the degree to which one develops a motivating purpose in life as characterized by personally meaningful goals and dreams.

A student with a high score on this scale finds largely finds purpose in their by discovering personally meaningful goals and dreams. Mastering Self-Management (MSM) addresses the degree to which one consistently plans and takes effective actions in pursuing their goals and dreams. The higher the score on this subscale, the more the student plans and takes purposeful actions in pursuit of their goals and dreams. Employing Interdependence (EMI) is the degree to which one builds mutually supportive relationships that assist in pursuing goals and dreams. Gaining Self-Awareness (GSA) measures whether one gains heightened self-awareness by developing empowering beliefs, attitudes, and behaviors conducive to achieving goals and dreams. Adopting Lifelong Learning (ALL) addresses whether one strives to become

a lifelong learner, striving to find valuable lessons in nearly every life experience. Developing Emotional Intelligence (DEI) – measures the development of one’s emotional maturity as characterized by optimism, happiness, and peace of mind. A high score on this subscale indicates that the student effectively manages their emotions in support of their goals and dreams. Believing in Myself (BIM) measures the degree to which one feels capable, lovable, and unconditionally worthy as a human being. A student with a high score on this subscale has a high level of self-confidence and feeling of self-worth.

The average Downing subscale scores generally range from low teens to around 80. The Downing Survey version used in this study was actually comprised of 64 individual questions – 8 questions each, via factor analysis, loading on the 8 factors or subscales indicated above. The possible response to each question is structured as an 11-point Likert scale ranging from “totally false” to “totally true”. The eight aggregate Downing subscale scores were computed by taking the response values for four individual questions that should logically have a positive correlation with performance outcome, adding them up, adding 40, and then subtracting the sum of the response values for the corresponding reverse-scored individual questions that should have a negative correlation with performance outcome. Thus, the higher the score on the 8 factor subscales the better in that a high score in each respective attribute should most logically translate into greater/better performance outcome.

In this study, the LASSI and the Downing questionnaire was administered to 45 freshman undergraduate students in the Fall 2011 semester at a mid-sized public university in the mid-south, USA. Of the 45 students, 20 were males and 25 were females. Broken down by major, 25 were business majors and 20 were non-business majors. Most recent cumulative GPA was designated as a measure for academic performance. The final GPA was observed at the end of the Fall 2011 semester, the same time the two survey instruments were administered to the students.

RESULTS

The first step in the analysis of factors affecting academic performance was to observe the average scores of the 10 LASSI subscales and 8 Downing subscales. Table 1 shows the means and standard deviations.

Table 1: Means and Standard Deviations of the 10 LASSI and 8 Downing Subscales

LASSI subscale	Mean	SD	Downing subscale	Mean	SD
Anxiety	26.42	6.03	Personal Responsibility	60.15	11.60
Attitude	31.11	4.04	Self-Motivation	55.83	12.19
Concentration	27.53	5.47	Self-Management	56.58	12.35
Info. Processing	27.89	5.67	Interdependence	44.53	10.07
Motivation	32.20	3.92	Self-Awareness	52.11	13.00
Self-Testing	24.89	5.54	Lifelong Learning	48.21	16.85
Selecting Main Ideas	28.16	5.18	Emotional Intelligence	51.09	14.35
Study Aids (Use of)	24.51	5.33	Believing in Myself	58.38	12.19
Time Management	24.67	5.20			
Test Strategies	28.11	3.53			

This table summarizes the means and standard deviations of the 10 LASSI and 8 Downing Subscales.

Remembering that the higher the score the more strongly felt the attribute, the highest LASSI subscale mean (32.20) was Motivation – assessing the student’s diligence, self-discipline, and willingness to exert the effort requisite to achieve superior performance. The lowest/weakest felt subscale mean (24.51) was Use of Study Aids. For the Downing questionnaire, the highest subscale mean (60.15) was Accepting Personal Responsibility and the lowest (44.53) was Interdependence. Aside from the mean scores of the LASSI and Downing subscales, the real issue is which, if any, of these attributes drive positive/improved academic performance? The answer to this question can be inferred by observing bivariate correlations of the LASSI and Downing subscale scores with GPA. Table 2 shows the results.

Table 2: Pearson Correlations with the LASSI and Downing Subscales with College GPA

LASSI subscale	r	p-value	Downing subscale	r	p-value
Anxiety	0.095	0.534	Personal Responsibility	0.233	0.133
Attitude	0.279	0.064	Self-Motivation	0.410	0.007 **
Concentration	0.234	0.123	Self-Management	0.433	0.005 **
Info. Processing	0.140	0.358	Interdependence	0.222	0.152
Motivation	0.404	0.006 **	Self-Awareness	0.331	0.037 *
Self-Testing	0.150	0.326	Lifelong Learning	0.614	0.000 **
Selecting Main Ideas	0.146	0.339	Emotional Intelligence	0.171	0.284
Study Aids (Use of)	0.111	0.467	Believing in Myself	0.291	0.065
Time Management	0.063	0.682			
Test Strategies	0.218	0.151			

*Significant $p \leq .05$ **Significant $p \leq .01$ This table summarizes the results of Pearson correlations with the LASSI and Downing subscale scores with Final Fall GPA. Significant correlations were found between GPA and Motivation (LASSI survey), Self-Motivation, Self-Management, Self-Awareness, and Lifelong Learning (Downing). The * and ** indicate significance at the 5 and 1 percent.

The only LASSI subscale that statistically correlated with GPA was Motivation ($r = .404, p = .006$). The positive correlation suggests that the higher the degree of student motivation, the stronger the academic performance. This is not a surprising result, but a result that also begs for clarification. The LASSI construct of Motivation is somewhat vague; but in that the Downing subscales can be viewed as addressing more detailed aspects of motivation, the Downing subscales can provide some of that clarification. Of the 8 Downing subscales, four of them correlated, with statistical significance, with GPA. Those four correlating Downing subscales were Discovering Self-Motivation ($r = .410, p = .007$), Mastering Self-Management ($r = .433, p = .005$), Gaining Self-Awareness ($r = .331, p = .037$), and Adopting Lifelong Learning ($r = .614, p = .000$). Each of these four subscales, from the descriptions that Downing has chosen to assign them, seem to have something to do with a person’s deep-seated personal beliefs, attitude and motivations. Further analysis would allow for determination as to what these beliefs, attitudes, and motivations might be. Table 3 presents a summary of each of the 64 individual Downing questions correlations with GPA – but due to space considerations, lists only those individual questions that correlate, with statistical significance, with GPA.

Table 3: Pearson Correlations Between the 64 Downing Survey Questions and Fall Final GPA

Q#	Individual Downing Question	r	p
5	When I get off course from my goals and dreams, I realize it right away.	0.326	0.031 *
6	I'm not sure how I learn best.	-0.426	0.004 **
10	If I lose my motivation in college, I know how to get it back.	0.294	0.050 *
13	If I have habits that hinder my success, I'm not sure what they are.	-0.416	0.004 **
14	When I don't like the way that an instructor teaches, I know how to learn the subject anyway.	0.471	0.001 **
16	When I think about performing an upcoming challenge, I usually see myself doing well.	0.329	0.027 *
18	I don't know how to set effective short-term and long-term goals.	-0.494	0.001 **
22	I don't know how to study effectively.	-0.391	0.009 **
25	I make poor choices that keep me from getting what I really want in life.	-0.413	0.005 **
27	I lack self-discipline.	-0.464	0.001 **
29	I'm stuck with any habits of mine that hinder my success.	-0.441	0.003 **
31	I often feel bored, anxious, or depressed.	-0.462	0.001 **
37	I can be off course from my goals and dreams for quite a while without realizing it.	-0.343	0.023 *
38	I know how I learn best.	0.520	0.000 **
44	I know very few people that I can count on for help.	-0.419	0.004 **
46	If I don't like the way that an instructor teaches, I'll probably do poorly in the course.	-0.538	0.000 **
48	When I think about performing an upcoming challenge, I usually see myself doing poorly.	-0.301	0.047 *
54	I've learned to use specific study skills that work effectively for me.	0.379	0.011 *
57	I make wise choices that help me get what I really want in life.	0.323	0.033 *
58	I live day by day, without much plan for the future.	-0.343	0.023 *
59	I am a self-disciplined person.	0.492	0.001 **
62	When I face a disappointment (like failing a test), I feel pretty helpless.	-0.450	0.002 **

*Significant $p \leq .05$ **Significant $p \leq .01$ This table shows the significant Pearson Correlations between the 64 specific Downing subscale questions and Fall Final GPA. The * and ** indicate significance at the 5 and 1 percent.

Of the 64 individual Downing questions, 22 correlated with statistical significance with GPA. The statistically significant correlation coefficients ranged from a high of .538 (Q46) to a low of .294 (Q10). The interesting thing to note from Table 3 is that every statistically significant question that positively correlates with GPA is one that one would expect to logically correlate positively. Likewise, every

statistically significant question that correlates negatively with GPA is one that one would logically expect to have a negative correlation. There are no logical inconsistencies in the direction of the correlations. To add yet further clarity to the analysis, it is helpful to organize by subscale factor the 22 individual Downing questions that correlate with GPA. Table 4 shows the results.

Table 4: Summary of Pearson Correlations between Significant Individual Downing questions and Fall Final GPA

Q#	Individual Downing Question	Mean	SD	p-value	
Downing factor #1 - Accepting Personal Responsibility					
57	I make wise choices that help me get what I really want in life.	8.23	2.38	0.033	*
25	I make poor choices that keep me from getting what I really want in life.	3.67	2.63	-0.005	**
Downing factor #2 - Discovering Self-Motivation					
10	If I lose my motivation in college, I know how to get it back.	8.16	2.11	0.050	*
18	I don't know how to set effective short-term and long-term goals.	3.94	2.60	-0.001	**
58	I live day by day, without much plan for the future.	4.25	3.03	-0.023	*
Downing factor #3 - Mastering Self-Management					
59	I am a self-disciplined person.	8.28	2.68	0.001	**
27	I lack self-discipline.	3.31	2.52	-0.001	**
Downing factor #4 - Employing Interdependence					
44	I know very few people that I can count on for help.	3.43	2.62	-0.004	**
Downing factor #5 - Gaining Self-Awareness					
5	When I get off course from my goals and dreams, I realize it right away.	7.83	2.05	0.031	*
13	If I have habits that hinder my success, I'm not sure what they are.	4.65	3.01	-0.004	**
29	I'm stuck with any habits of mine that hinder my success.	3.55	2.58	-0.003	**
37	I can be off course from my goals and dreams for quite a while without realizing it.	4.25	2.79	-0.023	*
Downing factor #6 - Adopting Lifelong Learning					
14	When I don't like the way that an instructor teaches, I know how to learn the subject anyway.	6.5	2.44	0.001	**
38	I know how I learn best.	7.21	2.76	0.000	**
54	I've learned to use specific study skills that work effectively for me.	7.63	2.73	0.011	*
6	I'm not sure how I learn best.	5.1	3.05	-0.004	**
22	I don't know how to study effectively.	4.38	2.94	-0.009	**
46	If I don't like the way that an instructor teaches, I'll probably do poorly in the course.	4.73	2.89	0.000	**
62	When I face a disappointment (like failing a test), I feel pretty helpless.	4.67	2.97	-0.002	**
Downing factor #7 - Developing Emotional Intelligence					
31	I often feel bored, anxious, or depressed.	4.71	2.98	-0.001	**
Downing factor #8 - Believing in Myself					
16	When I think about performing an upcoming challenge, I usually see myself doing well.	7.37	2.78	0.027	*
48	When I think about performing an upcoming challenge, I usually see myself doing poorly.	3.67	2.61	-0.047	*

*Significant $p \leq .05$ **Significant $p \leq .01$ This table summarizes Pearson Correlations between significant individual Downing questions and Fall Final GPA. The * and ** indicate significance at the 5 and 1 percent.

The results of Table 4 are logically consistent with the results of Table 2, except that now more underlying detail can be observed. The subscale factors of Discovering Self-Motivation, Mastering Self-Management, Gaining Self-Awareness, and Adopting Lifelong Learning were correlated with statistical significance with GPA. From Table 4 it can be readily observed why those four factors fall out with the most statistical significance. For Downing subscale #6, Adopting Lifelong Learning (ALL), seven of the eight individual questions comprising that factor show statistically significant correlation with GPA. With a correlation coefficient of .614, this subscale explains 38% of the variance in GPA (see Table 2). Two of the individual questions comprising ALL had p-values of .000 – Q38, “I know how I learn best” (positive correlation) and Q46, “If I don’t like the way an instructor teaches, I’ll probably do poorly in the course” (negative correlation). The second strongest is Mastering Self-Management (MSM). The correlation coefficient is .433 ($p = .005$) and explains 19% of the variance in GPA. Only two of the eight individual questions comprising this factor show statistically significant correlation with GPA; but those two are both very strongly correlated – Q59, “I am a self-disciplined person” (positively correlated) with a coefficient of .492, and Q27, “I lack self-discipline” (negatively correlated) with a coefficient of -.464. Both of this pair of “reverse-worded” questions has a p-value of .001. Also correlating to GPA with statistical significance is Downing subscale #2, Discovering Self-Motivation (DSM), with a correlation coefficient of .410 and p-value of .007 and explaining 17% of the variance in GPA (see Table 2). Three of the individual questions comprising DSM correlate with GPA with statistical significance, but for only one of the three is the p-value less than .01. That individual question is Q18, “I don’t know how to set

effective short-term and long-term goals” (negative correlation) with a coefficient of -.494 and p-value of .001. From Table 2, it can be seen that the fourth and final Downing subscale to correlate with statistical significance with GPA is subscale #5, Gaining Self-Awareness (GSA).

The correlation for GSA is .331 (p = .037), explaining 11% of the variance. As far as the individual questions comprising this factor, there are four statistically significant correlations, the two strongest of which are Q13, “If I have habits that hinder my success, I’m not sure what they are” (negative correlation) and Q29, “I’m stuck with any habits of mine that hinder my success” (negative correlation). Q13 has a coefficient of -.416 (p = .004) and Q29 has a coefficient of -.441 (p = .003). Thus far the analysis has shown primary correlates to superior academic performance to be motivation, as measured by LASSI subscale five and an array of Downing constructs, but further analysis is warranted. This can be accomplished by running a series of regressions with GPA as the dependent variable with LASSI subscale five and the most statistically significant Downing items as the independent (predictor) variables so the question of which mix of LASSI and Downing subscales are most efficient and effective in predicting superior academic performance can be addressed.

Table 5-1: Multiple Regression with GPA as the Dependent Variable and the Motivation Subscale from the LASSI and the Self-Motivation, Self-Management, Self-Awareness, and Lifelong Learning, from the Downing, as Predictors

Independent Variables	t	sig.	F	sig.		adj. R-sq.
MODEL #1			5.971	0.001	**	0.422
LASSI #5 - Motivation	1.86	0.07				
Downing #2 - Self-Motivation	-0.37	0.72				
Downing #3 - Self-Management	0.70	0.49				
Downing #5 - Self-Awareness	-1.286	0.21				
Downing #6 - Lifelong Learning	3.067	0.005	**			

*Significant $p \leq .05$ **Significant $p \leq .01$ This table shows the regression estimates of the equation: Fall GPA = 0.11 + 0.74 (Lifelong Learning). The first figure in the table shows the t-statistic.

The first regression model loaded all of the subscales of the 10 LASSI and 8 Downing subscales that showed statistically significant correlations with GPA as predictors. Therefore, the independent variables for the first regression model were Motivation (LASSI #5), Discovering Self-Motivation (Downing #2), Mastering Self-Management (Downing #3), Gaining Self-Awareness (Downing #5), and Adopting Lifelong Learning (Downing #6). The following regression equation was used to predict Fall GPA, Fall GPA = 0.11 + 0.74 (Lifelong Learning). results are presented in Table 5-1.

Results of the regression indicate the model to be significant, $F(4, 41) = 5.97, p = .001$. The adjusted R-squared is .42, meaning that 42 percent of the variability of GPA is explained by these five variables. Note, however, that in this model only Downing #6, Adopting Lifelong Learning has statistical significance ($t = 3.067, p = .005$). The Motivation subscale on the LASSI is in the right direction, although non-significant, $t(39) = 1.86, p = .073$. Because Self Motivation, Self-Management, and Self-awareness lack statistical significance in this model they were not be included in the second regression analysis, using the LASSI motivation subscale and the subscale Downing Life Long Learner as predictors. Results are presented in Table 5-2.

The second regression model has a much higher $F(2, 41) = 15.65, p < .05$, however the adjusted R-squared of .435 is only slightly improved from that of the first model. The regression equation was Fall GPA = -0.34 + 0.57 (Lifelong Learner) + 0.30 (Motivation). Recall that the Downing questionnaire starts out as 64 individual questions, which are then factored down to 8 clusters of subcategories via factor analysis. When looking at the structure of the 8 individual questions within each subscale, some are positively correlated and others are negatively correlated to that factor. Since multicollinearity could be a problem, a third regression was performed with the individual questions having statistically significant

positive correlations loaded in as predictors. Results indicated that only one individual question showed statistical significance as a predictor – Q59, “I am a self-disciplined person” ($t = 2.521, p = .017$). A fourth regression was also performed with all the individual questions having statistically significant negative correlations and loaded in as predictors. Again, only one individual question showed statistical significance as a predictor – Q18, “I don’t know how to set effective short-term and long-term goals” ($t = -2.447, p = .022$). Note that Q59 loaded on subscale #3, Mastering Self-Management, and Q18 loaded on subscale #2, Discovering Self-Motivation. Therefore, a third regression model (DV still GPA) was constructed with IVs of the LASSI subscale Motivation, Downing subscale Adopting Lifelong Learning), and Downing individual questions #59 and #18. Results are presented in Table 5-3.

Table 5-2: Multiple Regression with GPA as the Dependent Variable and the Motivation Subscale from the LASSI and the Life Learning Subscale from the Downing as Predictors

Independent Variables	t	sig.	F	sig.	adj. R-sq.
MODEL #2			15.647	0.000 **	0.435
LASSI #5 - Motivation	2.44	0.020 *			
Downing Factor #6 - Lifelong Learning	4.61	0.000 **			

*Significant $p \leq .05$ **Significant $p \leq .01$ This table summarizes the Multiple Regression with GPA as the Dependent Variable and the Motivation subscale from the LASSI and the Life Learning subscale from the Downing as Predictors. Both were significant predictors. The regression estimates of the equation was: Fall GPA = $-0.34 + 0.57$ (Lifelong Learner) + 0.30 (Motivation).

Table 5-3: Multiple Regression with GPA as the Dependent Variable and the Motivation Subscale from the LASSI, and the Subscale Lifelong Learning and Specific Questions from the Downing about Setting Goals and Having Self-discipline as Predictors

Independent Variables	t	sig.	F	sig.	adj. R-sq.
MODEL #3			10.058	0.000 **	0.502
LASSI #5 - Motivation	1.38	0.179			
Downing Factor #6 - Lifelong Learning	2.48	0.019 *			
Q18 - setting goals	-1.22	0.231			
Q59 - having self-discipline	2.04	0.050 *			

*Significant $p \leq .05$ **Significant $p \leq .01$ This table summarizes a Multiple Regression with GPA as the dependent variable and the motivation subscale from the LASSI, and the subscale Lifelong Learning from the Downing, and specific questions from the Downing about Setting Goals and Having Self-discipline as Predictors. The model was significant with Lifelong Learning and Having Self Discipline being significant predictors. The regression estimates of the equation was: Fall GPA = $0.48 = 0.38 + 0.38$ (Lifelong Learner) + 0.328 (Q59 of the downing, having self-discipline).

Model-3 is a substantial improvement over the prior two models in terms of percentage of variance explained, $F(3, 41) = 10.06, p < 0.05$, adjusted $R^2 = .50$. Thus, the independent variables in this model accounted for just over half of the variability observed in GPA. The best predictor of GPA was the Downing subscale #6, Adopting Lifelong Learning ($t = 2.481, p = .019$). The individual Downing question #59, having to do with one’s degree of self-discipline, also has statistically significant predictive ability, ($t = 2.04, p = .050$).

CONCLUDING COMMENTS

In summary, this study accomplishes the goal of adding incremental clarity to the results of the prior Griffin, et. al. (2012). The current study administered the Learning and Study Strategies Inventory (LASSI) and the Downing Self-Assessment Questionnaire to 45 freshman students at a mid-sized southern U. S. public university. The LASSI is a 10-scale instrument that measures students’ receptivity to skills and strategies that purportedly enhance one’s ability to learn and successfully perform in an academic setting. The 8-scale Downing Questionnaire examines motivational factors, which might maximize one’s potential for positive academic achievement in college.

The primary finding of the initial Griffin, et al., (2012) study was that the primary learning and study skill, as defined by the Learning and Study Strategies Inventory (LASSI,) that drives superior academic performance is simply the student's motivation. Not surprisingly, the greater the student's motivation, the better they perform in academic pursuits. This study confirmed that finding and then used the Downing Self-Assessment Questionnaire to delve deeper into aspects of motivation. The results of this study indicate, more specifically, that amongst the strongest predictors of superior academic performance is the student's self-perception of their degree of self-discipline. Again, not surprisingly, the more self-disciplined a student perceives himself/herself, the better they do academically. The Downing data also indicates that the other strongest predictor of superior academic performance is the subscale of Adapting Lifelong Learning (ALL). Examining the detail of the ALL reveals that academic performance is enhanced by identifying a personal best learning style and then knowing specifically how to execute it. Finally, a student's ability to ignore an instructor's teaching style that the student doesn't like, and proceeding to learning the material anyway, is conducive to achieving superior academic performance.

College and university teachers /instructors should emphasize to their students that these are perhaps the key attributes, among numerous other possibilities, that students should develop and pursue if one of their major life objectives is to do well in school. This was an exploratory study; the sample size of 45 was not large enough to provide statistical power usually expected for a study of this nature. Furthermore, the usual reservations concerning insufficient statistical validity and reliability are certainly appropriate regarding this study. One might argue, also, that there are better constructs other than the LASSI and Downing subscales to serve as predictors of academic performance. One might even argue that there are more appropriate measurements other than GPA to serve as proxy for academic performance.

In that the LASSI and the Downing questionnaire are both self-assessment instruments, it should also be pointed out that the study may have been diminished by various response biases. For future study, some of the above limitations can be addressed by replicating the study with a larger sample of respondents drawn from a more diverse population of students. Statistical reliability can be more strongly established by replicating the study with other student sample groups drawn from other universities. The statistically dominant predictors (i.e., student self-discipline, propensity for life-long learning, and ability to identify a personal best learning style) of superior academic performance that were identified by this study can perhaps best studied in the future using experimental study designs and methodologies.

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POSITIONING COMPUTER LITERACY AS A VALUE-ADDED BUSINESS CORE COURSE

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ABSTRACT

Many business students are introduced to information systems via computer literacy coursework and/or assessment tests. Such an introduction can be less than ideal, particularly in a field that suffers from declining enrollment. Introductory computing often is software skills-specific and tutorial-intensive and thus may not offer an engaging view of the field or capture the larger relevance of information technology. In addition, the mere existence of an assessment or “test-out” option can further trivialize the perceived value of the course. This research develops a solid foundation for advancing beyond a focus on computer literacy and software skills to tap the value-added potential of an introductory computing course. The proposed approach ultimately frames the course content around the documentation and presentation of a business plan. A business plan provides an integrative vehicle for teaching information concepts and software applications in the larger context of business analysis and communications. The importance of the framework goes beyond the teaching of skills – it provides for a broadly relevant and engaging approach that promotes a higher level of learning. The direction and implications of the approach are discussed.

JEL: I29, M15

KEYWORDS: Introductory Computing, Computer Literacy, Business Plan, Pedagogical Framework, Business Core

INTRODUCTION

The function and value of an introductory computer literacy course has been debated and analyzed for nearly two decades (e.g., Harris 1993; Gordon and Chimi 1998; Dyer et al. 2004; Wallace and Clariana 2005; Hulick and Valentine 2008; Shannon 2008; Grant et al. 2009; Rondeau and Li 2009; Morris 2010). Along the way, the “IS 2002” curriculum guidelines relegated the “Personal Productivity with IS Technology” course to a discretionary prerequisite status with the use of self-study modules (Davis et al. 2001; Gorgone et al. 2003); and “IS 2010” removed it from its guidelines (Topi et al. 2010). However, not only does research continue to show the need for a personal productivity course (e.g., Grant et al. 2009; Rondeau and Li 2009; Morris 2010), but tutorial-based modules can serve to trivialize the course by considering it primarily with respect to software mastery rather than the use and usefulness of the tools. This paper develops a foundation for viewing the value-added potential of an introductory computing course as more than just limited to computer literacy or software skills proficiency. By advancing beyond content and focusing on context, an introductory computing course can be positioned as a value-added core course for all students and majors regardless of prior levels of computer skills. While value-added positioning can be realized via various contexts, a computer literacy course is particularly fitting to business analysis and communications.

The direction and implications of this type of context are discussed with respect to a framework and coursework centered on the development of a business plan pertaining to the students’ entrepreneurial ideas. Not only does the framework provide for a higher level of learning, but it also can help to personalize interest in the course and in the relevance of technology, which is especially important to a field of study that has experienced declining enrollment (Walstrom et al. 2008). In developing the framework, the paper will proceed with a literature review of research on computer literacy and student

proficiency, followed by a methodology that analyzes the computer literacy course with respect to its content and context, and then a discussion of the resulting framework and conclusions.

LITERATURE REVIEW

Studies (e.g., McDonald 2004; Wallace and Clariana 2005; Hardy et al. 2006; Hulick and Valentine 2008; Shannon 2008; Grant et al. 2009; Rondeau and Li 2009; Morris 2010) of incoming college freshmen continue to show that – despite contrary assumptions – a majority of students have not mastered Microsoft office applications. Perhaps surprisingly, a lack of mastery goes beyond the more complex tools of Excel and Access to include PowerPoint as well as Word. Consistent with these findings, studies show that computer literacy courses add value, with post-course assessments revealing increased literacy (Case et al. 2004; Wallace and Clariana 2005; Shannon 2008) as well as confidence (Smith 2004). The value extends even to the most basic of applications as one survey of students (Dunsworth et al. 2004) rated Word and PowerPoint as the most useful of the content covered, a finding consistent with one faculty survey (Hardy et al. 2006) that ranked them as most important for college students as a whole.

Studies that support the need for a computer literacy course seem to be at odds with other studies and observations acknowledging “increased skill and comfort with computers” (Lee 2002, p.30). In fact, given the changing technological landscape surrounding the increase in computer usage, various curricular and pedagogical changes have been made with respect to teaching computer literacy (Dickerson 2007), including the use of self-study modules (Gorgone et al. 2003) as well as the elimination of the required introductory computing course (Topi et al. 2010). Even for college curricula that continue to require a computer literacy course, proficiency tests are being used to determine the need for taking the course (Cardell and Nickle 2003).

The debate surrounding computer literacy can be explained in part by a gap between computer usage and mastery. While student self-confidence may increase in correlation to the number of computing courses taken in high school (Case et al. 2004; Morris 2010), this self efficacy may not translate to actual achieved literacy (Larres et al 2003; Case et al. 2004; Grant et al. 2009). In addition, even though self efficacy may increase upon taking a freshman-level computer literacy course (Smith 2004; Bartholomew 2004; Morris 2010), students’ confidence and skills – and employer confidence in them – are diminished by graduation, quite possibly due to the lack of reinforcement of the skills in the more applied context of other courses (Bartholomew 2004; Johnson et al. 2006). One explanation for the gap between computer use and mastery stems from a matter of content versus context. More specifically, it has been argued (Dyer et al. 2004) that whereas high school computing courses tend to focus on keystrokes, college-level computing courses tend to place the software skills in the context of computer concepts, thus increasing the educational value of the content. However, computer literacy is not limited just to the context of the “computer.” For example, as noted in one study (Grant et al. 2008, p. 155),

...spreadsheet applications can perform many powerful tasks that require users to not only be familiar with the tool but also be familiar with some basic business, mathematical, and financial problems.

DATA AND METHODOLOGY

Taking computer literacy to a higher level beyond just the context of computer concepts requires an evaluation of the types and functions of office software in order to reveal the application-oriented contexts that can be pursued in an introductory computing course. As such, the development of a framework will proceed with an analysis of the course tools (i.e., the office applications), the course content (including skills, topics, and deliverables), and the course context (based on its dimensions, particularly with respect to information literacy).

The most widely used office application software provides for three types of functions: communicating information, analyzing information, and managing information (see Table 1). While each piece of software can serve multiple purposes, Word and PowerPoint are focused primarily on written and presentational communications, Excel on data analysis, and Access on organizing and managing data. In addition to its number-crunching abilities, Excel also can be readily used for presenting and communicating information in the form of tables and charts, and for processing information in the form of formula and macro-driven spreadsheets.

Table 1: Software vs. Function

<i>S/W</i>	<i>Function</i>	Communicate Information	Analyze Information	Manage Information
Word		✓		
PowerPoint		✓		
Excel		✓	✓	✓
Access			✓	✓

This table notes the functional focus (i.e., communicating, analyzing, and managing information) of the four most common office application software packages (i.e., Word, PowerPoint, Excel, and Access).

With functionality ranging from communications to information management, an introductory computing course could be compatible (at least in part) to the context of a communications course, a business course, or an information systems (IS) course. These contexts can be considered along a continuum, with courses in business communications serving to blend communications skills into a business context, and courses such as systems analysis (as just one example) that blend together business and information systems concepts. In addition, this continuum of courses can serve a range of target student audiences from non-business majors to IS majors. Table 2 considers the continuum of course contexts relative to the primary target audience that would be served.

Table 2: Introductory Computing Context and Target Audience

<i>Context:</i>	Communications Skills	Business Communications	Business Analysis	Systems Analysis	Information Systems
Target Audience:	<i>University-Wide</i>	<i>Non-business and Business Students</i>	<i>Business Core</i>	<i>Business and IS Majors</i>	<i>IS Majors</i>

This table notes the target student audience that would be relevant to each of the potential contexts of an introductory computing course. On one end, with a potential focus on communication skills, an introductory computing course could have university-wide relevance to nearly all students and majors. On the other end, with a potential focus more purely on information systems, an introductory computing course could be most relevant to IS (or other technology-related) majors.

Dependent upon the context and the audience, an introductory computing course can focus on different combinations of software applications for different purposes (see Table 3). The skills-based tasks tend towards computer literacy course content, while the systems-oriented tasks tend towards management information systems (MIS) course content. Although certain software is more compatible to certain contexts, each application can serve multiple purposes; so the grouping together of a set of software skills or tasks within or across contexts would benefit from an integrative framework. The importance of this type of framework was emphasized in a redesign of the core MIS course that organized the content around a semester-long series of integrated assignments, in this case pertaining to web and database prototyping (Grenci 2005). Likewise, a redesign of the introductory computing course can provide a complement to an MIS course by focusing on a business analysis and communications approach to computer literacy.

Table 3: A Closer Look: Content vs. Context

<i>S/W</i> \ <i>Context</i>	Business Communications	Business Analysis	Systems Analysis	Information Systems
Word	<i>Memos, Reports</i>	<i>Diagrams, Deliverables</i>		
PowerPoint	<i>Presentations</i>	<i>Executive Summaries</i>		
Excel	<i>Tables, Charts</i>	<i>Number Crunching</i>	<i>Prototyping</i>	<i>Decision Support</i>
Access		<i>Queries</i>	<i>Data Structures</i>	<i>Database Systems</i>
Computer Literacy Course Content			MIS Course Content	

This table considers four contexts of an introductory computing class (e.g., Business Communications), and provides examples of the types of content or deliverables (e.g., Tables and Charts) that would be relevant to each context. The content and deliverables also are organized with respect to the relevant office application software (e.g., Excel).

While some academicians (e.g., Hershey 2003; Grecni 2005) have proposed approaches that move away from a more purely IS-focused course in the business core, others (e.g., Salisbury et al. 2004) reject such a move and tout the benefits of maintaining an IS perspective. Although these arguments have been made in reference to the MIS course, the same debate could apply to the introductory computing course (see Table 4 for the difference between these two courses as per the IS 2002 recommendations). Furthermore, it has been noted that “some business school academicians and administrators ...do not see a need for a separate Introduction to IS course” (Salisbury et al. 2004, p. 129). However, the choice of context can differentiate and position an introductory course to serve as a value-added prerequisite or complement to an MIS course. Ultimately, an argument can be made for a compromise to introductory computing that provides for an IS-related foundation while maintaining differentiation from the MIS course.

Table 4: Introductory Computing vs. MIS (Gorgone et al. 2003)

IS 2002.P0 – Personal Productivity with IS Technology
This prerequisite course enables students to improve their skills as knowledge workers. The emphasis is on personal productivity concepts using functions and features in computer software such as spreadsheets, databases, presentation graphics, and Web authoring. Although identified as a course, this material can be delivered as self-study modules, as modules associated with other courses using the software, or as a full course.
IS 2002.1 – Fundamentals of Information Systems (<i>Prerequisite: IS 2002.P0</i>)
This course provides an introduction to systems and development concepts, information technology, and application software. It explains how information is used in organizations and how IT enables improvement in quality, timeliness, and competitive advantage.

This table compares the content/focus of two IS-related classes that are commonly taught in business curricula. “Personal Productivity” describes an introductory computing or computer proficiency type of course; and “Fundamentals of Information Systems” describes a principles or introduction to MIS type of course.

Whereas the MIS course refers to systems concepts and is concerned with how information is managed in an organization, the introductory computing course refers to personal productivity concepts and is concerned with the software skills of knowledge workers. Given this difference and in order to delineate the courses, it can be argued that database concepts and applications (including Microsoft Access) should be covered in the MIS course rather than in introductory computing. At a broader level, while many (e.g., Dyer et al. 2004) may view the context of computer concepts (see Table 5) as a value-added framework for teaching computer literacy, that context (as a whole) also may be a better fit with the MIS course. The same argument applies to introductory computing courses that are focused on other systems-oriented concepts such as the Internet (Hoffman and Blake 2003) or security (Werner 2005) – again, a systems focus may not be the best fit with the typical software applications covered in introductory computing. Ultimately, the challenge is to frame computer literacy and software skills within a larger context while maintaining a value-added positioning and differentiation relative to the MIS course.

Table 5: Example of Computer-Focused Concepts Covered in Introductory Computing (Dyer et al. 2004)

<ul style="list-style-type: none"> • Computer hardware (input, output, storage, and processing devices) • Computer software (application software, system software, user interfaces, etc.) • Networking technologies (LAN vs. WAN, communication protocols, wireless, etc.) • Data and databases (DBMSs, relational databases, queries, primary keys, etc.) • Internet concepts (URLs, search engines, e-commerce, Internet services, etc.) • Computer security (cryptography, piracy, data privacy, cybercrime, viruses, etc.) • System development (development processes, programming languages, etc.) 	
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This table lists example topics that might be taught in a computer concept focused introductory computing course. Note: introductory computing classes are not necessarily computer concept focused – some for example, have more of a business application focus.

As an alternative to a computer-concept intensive course, the relevance of IS can be maintained in introductory computing by focusing on information concepts, the significance of which is emphasized at a definitional level in this encyclopedic abstract (Blackwell 1997b):

Processing, delivering, and communicating information are essential objectives of the management information system of an organization. The system employs information and communications technology in achieving these objectives. The concept of information is therefore fundamental to the design of an information system.

Consistent with this emphasis, information problem-solving was put forth (by Eisenberg and Johnson 2002) as a basis for teaching computer skills in context. Characterized in terms of “information literacy,” information problem-solving begins with task definition and then proceeds to the seeking, use, synthesis, and evaluation of information. The goal is to advance beyond a “laundry list of isolated skills” towards an integrated approach where students:

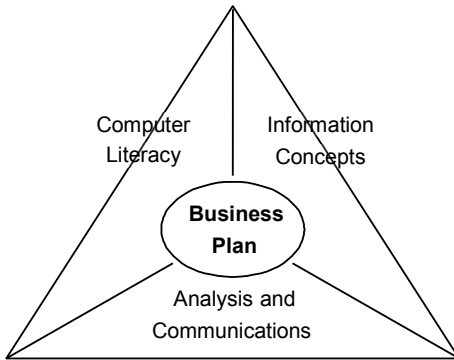
...should be able to recognize what they need to accomplish, determine whether a computer will help them to do so, and then use the computer as part of the process of accomplishing their task (Eisenberg and Johnson 2002, p. 3).

Information literacy also was considered in a curricular effort (Johnson et al. 2006) to integrate computer skills throughout the business core so as to ensure the computer literacy of graduates. In addition to its fit with information problem-solving, a computer literacy course is inherently relevant to the business analysis and communications context previously discussed. The underlying basis of a computer literacy course is concerned with “knowledge work” (Gorgone et al. 2003) and thus – by definition – with the “processing of information in order to solve problems” (Blackwell 1997a). In turn, knowledge work is at the crux of consulting, which relies on information technology, analytical thinking, and communications (Nord 1996; Fincham 2006). Ultimately, all of these dimensions (i.e., analysis and communications, information concepts, and computer literacy) can be integrated and framed in introductory computing by organizing the course content and assignments around the development, documentation and presentation of a business plan, a vehicle that serves both business analysis and communications purposes (see Figure 1). Business plans have been employed as pedagogical vehicles in various courses and disciplines.

Perhaps not surprisingly, a business plan provides a commonly-used focal point for teaching entrepreneurial concepts (Fregetto 2005; Solomon 2007); and it can be used effectively for courses in finance (Goetz, Tombs, and Hampton 2005), accounting (Hand 1998; Tschopp 2004; Nickolai 2006), and economics (DeBoer 1998). In addition to entrepreneurial and financial applications, the cross-functional nature of a business plan makes it a useful tool for an introductory business course (Mattei and Hall 2006; Basile and Knopik 2011) as well as a capstone strategy course (Schinski, Malik, and Morse 2000). Perhaps most important to this discussion, a business plan – while useful for covering business concepts –

is meant to convey information; and as such, it can be used in a communications context (Mahin 2004; Nicosia 2005) and to provide a reference point for teaching information concepts.

Figure 1: Dimensions of Introductory Computing as a Value-Added Core Course



This figure identifies the Business Plan as having dimensions related to Computer Literacy, Information Concepts, and Analysis and Communications. As such, the Business Plan can provide a framework for teaching an introductory computing class.

RESULTS

The development and communication of a business plan can provide a reference point for teaching concepts relevant to organizing, analyzing, summarizing, and presenting information with the assistance of computer software applications. All of these elements can be combined in an introductory computing course by having students propose, research, construct, and present a business plan (or parts thereof) related to an entrepreneurial activity of their choosing. As a semester-long series of assignments, the approach would provide for an interesting context to engage and inform the students. At the same time, it would provide an integrative context for introducing and discussing various business functions and disciplines, thus reinforcing its value as a core course.

The elements of a business plan can provide the basis for several application-oriented exercises (see the Appendix for an outline of a typical structure of a business plan). As numerous studies have put forth detailed descriptions of business plan exercises and deliverables (see Nickolai 2006 for a comprehensive example with pedagogical methods), such details will not be presented here. While business plans take on many forms, they consistently include a section on the business description and a section on financial analyses. Within these sections, an integrated set of exercises (see Table 6 for examples) can be constructed to employ features and functions of the office applications that are customarily covered in a computer literacy course. It is important to note that despite its roots in business curricula, the business plan context can be applied within any discipline. No matter the entrepreneurial interests, students can take on the roles of inventor or philanthropist or business owner, each making use of the same framework. In essence, a business plan can inform any entrepreneurial activity, including those related to the “diverse world of social enterprise” (see Thompson and Doherty 2006 for profiles of social enterprise).

In fact, one of the primary goals of a business plan – to obtain financing – also is a “major challenge facing social entrepreneurship” (Tyson 2004, p. 32). That relevance extends to the business plan elements outlined in Table 6. For example, a break-even analysis can look at donations and donors (instead of sales and customers); and a pro-forma is not limited to Income Statements – it also can be applied to a Statement of Revenue and Expense, which is commonly reported for non-profit organizations. Such variations do not change the content or goals of the course as the focus remains not on the specific context nor on teaching the nuances or details of financial analysis, but rather on the application of software tools as framed by the general context.

Table 6: Example Business Plan Elements

Section	Element/Task	Functional Area	Software
Business Description	<ul style="list-style-type: none"> - Mission Statement - Organization Chart - Operating Procedures (Process Diagram) - Marketing Plan - Competitor Analysis 	Marketing and Management	Word
Financial Analysis	<ul style="list-style-type: none"> - Break Even Analysis - Start-up Budgets <ul style="list-style-type: none"> Sales Purchasing Operations - Pro Forma Statements <ul style="list-style-type: none"> Cash Flow Income 	Finance and Accounting	Excel
Presentation Summary	and <ul style="list-style-type: none"> - Product/Service Presentation - Final Presentation - Executive Summary - Web Synopsis 		PowerPoint (and Word)

This table lists examples of typical business plan elements categorized into two major sections – business description and financial analysis. The business plan elements also are categorized with respect to the relevant functional area as well as the office application software that would be primarily used to produce the element.

A business plan starts with a description of the business that can include a mission statement, marketing analysis, operating procedures, and an overview of the personnel. There are various informational dimensions relevant to this description, ranging from audience analysis; summarization; use of outlines and appropriate organization; and use of charts (such as an organization chart or a process decomposition diagram, the latter of which can summarize operating procedures). In addition, other elements that are not traditionally found in a business plan can be created in conjunction with the description. In particular, a marketing brochure (which provides for lessons pertaining to information summarization and layout) can be used to describe the business, service, or products. All of these elements can be pieced together into a Word document, providing an integrated perspective to the information that can make use of document sections, headers and footers, hyperlinks, and embedded objects.

Financial analyses – including break-even, budgetary, and pro-forma projections – also are a major part of a business plan. While a computer literacy class might consider financial analysis as beyond its scope, numerous available Excel templates can allow for simple introductions and examples to such analyses while still focusing on the application. With or without the use of templates, Excel can be used to crunch the numbers, employ formulas, and vary assumptions for what-if analyses. A break-even analysis is an ideal vehicle for creating best and worst case scenarios by varying assumptions related to price, profit, number of customers, etc. Excel also can be used to summarize analyses via charts. Different chart formats (e.g., line, column, and pie charts) and their variations can be used for different informational purposes for different types of data and thus can provide for lessons pertaining to effective data summarization. The details and mechanics of these charts also can be embellished and then integrated into an executive summary that references them as exhibits.

In addition to an integrative executive summary, the development of a business plan allows for two major presentation opportunities: one earlier in the process whereby the proposed product or service (as well as a marketing or competitor analysis) are presented to the class for peer review; and a final integrated presentation at the end of the semester. Obviously, PowerPoint presentations offer their own type of information summarization and lessons relevant to oral and visual communications that can be enhanced by features and functions of the software. Furthermore, if the computer literacy course includes a web component, a web summary can be constructed using Word and saved as an html document. Such a web synopsis would be “written for the web” based on online readability factors that emphasize conciseness,

use of lists, use of headings and subheadings, use of font styles and colors, spatial positioning, and perhaps most importantly, the ability to use hyperlinks to link to or “drill down” for more information.

While a web component may fit with a focus on communications, the business plan framework calls into question the relevance of a database component. Should Access be covered as part of computer literacy, or are the complexity and IS-intensive context of database software a better fit with the MIS course and its focus on organizational computing? The question goes beyond a matter of fit – it also is a point of practicality. Of the office application skills, not only is database mastery considered (by both employers and faculty) to be the least important to students as a whole (Bartholomew 2004; Hardy et al. 2006), but it also is ranked less than the other skills in terms of student and employer confidence (Bartholomew 2004). In fact, one study (Simis and Hoong 2001) showed that even after taking a computer literacy course, two thirds of the students still scored less than 70% on an Access proficiency test. Nevertheless, some coverage of Access may be value-added to introductory computing if placed in the context of how and why databases differ from spreadsheets; and to this end, a simple exercise (that can include forms and queries) geared towards the creation and management of a contact database (e.g., of potential customers) could be employed as a tangential but relevant component in the business plan framework.

Regardless of the breadth of applications covered, a business plan framework is a natural vehicle for using Word, PowerPoint, and Excel in an integrative context that adds value to an introductory computing course beyond the objectives of computer literacy and software proficiency. Part of this value is in introducing business and information concepts to students early in their studies, providing an important role in the business core curriculum. The relevance of the content also is enhanced by an integrative approach that can serve to relate various business functions and disciplines. However, the idea is not to focus on the mechanics and correctness of the business plan assignment, but rather to use it to advance to a higher-level of thinking and to focus on the “application” of information and technology. By advancing beyond software skills towards an attention to a higher-level context, the introductory computing course provides for more broadly applicable lessons and implications.

For example, the different types of summaries (executive, presentation, and even web) provide for value-added lessons pertaining to information problem solving. In particular, students can be instructed on concepts such as the coordination and subordination of topics and subtopics while learning how to fully use Word to take advantage of advanced formatting and structuring techniques relevant to such concepts. Likewise, students can be instructed on data summarization and the uses and functions of charts while learning how to build them with spreadsheet software. In addition to using software tools to analyze and present information, students also can use tools for information seeking (an early stage in information problem solving); and they can be instructed on online research methods for using databases and other web resources to collect information relevant to their business plan, especially with respect to a market/competitor analysis. Such instruction is especially important early in a student’s studies.

One of the benefits of the business plan framework and an information problem solving approach is that they provide for a better understanding of the larger picture and the relevance of the content. Perhaps the most important competency in a systems class is to learn to think like an analyst and to understand the relevance and role of technology. In introductory computing, that competency would translate into an understanding of how to analyze and present information to solve an organizational need, and how to support that analysis with software tools. By going beyond a focus on software skills towards a higher-level context, the learning also can be shifted to a higher level. In addition, a transfer of ownership of the learning (in this case, by allowing students to develop their own entrepreneurial ideas and interests) likewise can support a shift to a higher level of thinking (Athanasiou, McNett and Harvey 2003). In terms extended from Bloom’s Taxonomy, the focus is shifted from factual to procedural to strategic knowledge (Anderson 2005). Examples of this progression are described in Table 7.

Table 7: Example Competencies at Different Levels of Knowledge

Factual Knowledge (“What”)	Procedural Knowledge (“How”)	Strategic Knowledge (“Why”)
Students will learn the: <ul style="list-style-type: none"> • functions of the software packages • components of a document • use of different graphs • the elements of Web pages 	Students will learn how to: <ul style="list-style-type: none"> • use and navigate the various software packages, and to use Help functions in that process • create well-organized, integrated documents • summarize information (in graphs, tables, etc.) so as to effectively convey ideas • to effectively present information via Web pages 	Students will learn to: <ul style="list-style-type: none"> • analyze and present information to address an organizational need • recognize and understand what makes analysis or presentation more effective • use software tools to make analysis or presentation as effective as possible • extrapolate beyond common features of a software tool so as to fully utilize its capabilities

This table identifies examples of different levels of competency that might be expected from an introductory computing course.

The objectives of introductory computing tend to focus on factual knowledge. Universities use computer based training (CBT) tools and assessment as a primary indicator of assurance of learning (Murphy et al. 2012). Tools such as MyITLab, SAM, and SimNet are among the most popular CBT computer proficiency assessment tools (Hill 2011). As these tools run office applications in a simulated environment, tasks can be defined and directly and definitively tested. Proficiency is determined by the successful completion of a certain percentage (e.g., 70%) of defined tasks. Table 8 provides two examples of assessed Excel skills (see Grant et al. 2009 for examples of assessed Word skills).

Table 8: Examples of Assessed Excel Tasks

murphy et al. (2012) ...using myitlab	grant et al. (2009) ...using sam 2003
Compute the Gross Pay Use the IF Function Start Microsoft Office Excel 2007 Apply Number Formatting Copy the Formulas with the Fill Handle Insert a Row and Compute Totals Change the Chart Type	Merge cells Copy cells Center across selection Insert worksheets into a workbook Locate and open existing work Create formulas using the Sum function Use fill handle to copy a cell Create formulas using the If function Use absolute references

this table identifies examples of excel tasks that are assessed by cbt tools such as myitlab and sam. such assessments are implemented via simulations that score the percentage of tasks that are successfully completed.

With the introduction of the business plan framework, factual-based skills/tasks as described above still can and should be assessed. In addition, some higher level of learning can be assessed with respect to meeting, exceeding, or failing to meet established expectations. In the case of Excel, for example, procedural levels of knowledge could include the ability to: Create a spreadsheet using appropriate cell and page formatting; Use a spreadsheet to solve complex mathematical analyses; Use advanced functions to build logic into spreadsheet models; Create a graph to effectively communicate data and information

Furthermore, higher levels of assessment can be focused on the context of the tasks; and in the case of Excel, for example, could include the more strategic ability to: Create an effective sales budget; Create an effective break even analysis; Create an effective cash flow statement

Similar types of expectations can be established for Word and Powerpoint.

CONCLUDING COMMENTS

As a skills-based course focused on the teaching of software applications (i.e., focused on factual and/or procedural knowledge), introductory computing has embraced tutorials and computer-based training (CBT) and assessment. While the automated nature of these mechanisms allow for consistency and

scalability, it has inherent problems. To begin with, when compared to more traditional or interactive methods, the more mechanized CBT methods were found to be less effective (Simis and Hoong 2001; Merchant, Kreie and Cronan 2001) and less favorable to business school faculty (Kaupins 2002). The mechanized uniformity of CBT also can create problems when students come to a course with varying levels of skill (for example, students who are somewhat proficient can become bored with tutorials that sometimes are described as “painful”). Although introductory computing often employs procedures to “test out” the more proficient students, an assessment option can trivialize the necessity or value of the course. Furthermore, such an option signifies that the course’s value lies solely at the level of computer literacy and software skills proficiency, which becomes problematic when studies (e.g., Bartholomew 2004; Johnson et al. 2006) show that the acquired proficiency is short-lived.

Although some might argue that the purpose of an introductory computing course is to focus on lower-level factual and/or procedural knowledge, it is the lack of emphasis on the higher-level knowledge that has created an arguably problematic course characterized (and perhaps trivialized) by computer based training and test-out options, and ultimately by questions of relevance. If brought to a higher level, introductory computing can become a meaningful course for all students, regardless of their level of software skill expertise. The course would no longer be focused on software skills but rather on the effective application of those skills in a larger context. Perhaps more importantly, that context – exemplified here with respect to the business plan framework – can position and differentiate introductory computing as a value-added core course in the business curriculum.

APPENDIX

Appendix A: Guide for Writing a Business Plan

...from <http://www.sba.gov/content/templates-writing-business-plan> as retrieved August 2012

Elements of a Business Plan

1. Cover sheet
2. Statement of purpose
3. Table of contents
4. Body of the document
 - A. The Business
 1. Description of business
 2. Marketing
 3. Competition
 4. Operating procedures
 5. Personnel
 6. Business insurance
 - B. Financial Data
 1. Loan applications
 2. Capital equipment and supply list
 3. Balance sheet
 4. Breakeven analysis
 5. Profit & loss statements
 - Three-year summary
 - Detail by month, first year
 - Detail by quarters, second and third years
 - Assumptions upon which projections were based
 6. Pro-forma cash flow
 - C. Supporting Documents

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INTEGRATING THE OUTPUT AND SUBSTITUTION EFFECTS OF PRODUCTION INTO THE INTERMEDIATE MICROECONOMICS TEXTBOOK

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ABSTRACT

Intermediate microeconomics textbooks employ indifference curve analysis to explain the income and substitution effects of a change in the price of a good x on the demand for it, holding other variables constant. Further, they demonstrate how the shape and slope of the demand curve changes depending on whether good x is defined as normal, inferior, or Giffen. This analysis in turn enables an evaluation of public policies aimed to increase consumer welfare. Unfortunately, these textbooks do not apply a parallel analysis in production theory, creating an analytical vacuum at the undergraduate level. This paper develops a model to analyze the output and substitution effects in production when the price of one input (labor) changes, holding technology, resource availability, and the price of the other input constant. This study will also address the production equivalents of normal, inferior, and possibly Giffen inputs affecting the shape and slope of the input demand curve. Such an exercise may allow students to gain a better understanding of producer and consumer theories, and encourage them to employ these concepts to real economic problems such as the effect of wage subsidies on labor demand. It should therefore be included in intermediate microeconomics textbooks.

JEL: A22, D11, D24

KEYWORDS: Substitution Effect, Output Effect, Isoquants, Consumer Theory, Producer Theory

INTRODUCTION

Every intermediate microeconomics textbook devotes substantial attention to the income and substitution effects of a change in the price of a good on a consumer's demand for that good using indifference curve analysis. The good in question may be defined as a normal good, an inferior good, or a Giffen good. While these are rather tricky concepts for students to understand, the reward for understanding them is considerable. For example, knowledge of these effects have allowed students to better understand how and why the labor supply curve may be backward bending, or why an increase in income taxes may cause some people to decrease their labor supply, while others may work more. Further, because of its subtle insights economists have debated many policies, among them, whether the food stamp voucher system or a cash subsidy is more effective in increasing the welfare of its recipients (Pindyck and Rubinfeld, 2013; Perloff, 2012; Salvatore 2008; Browning and Zupan, 2004; Nicholson, 2002; Mansfield and Yohe, 2003).

The production equivalent of the income and substitution effects, namely the output and substitution effects, using isoquant analysis is rarely if ever adopted in intermediate microeconomics textbooks (e.g., Salvatore 2008; Mansfield and Yohe, 2003; Varian, 2010; Pindyck and Rubinfeld, 2013; Perloff, 2012) to analyze the labor demand curve for an individual firm. In addition, neither general nor academic Internet sites (About.com Economics, 2012; Resources for Economists on the Internet, 2012) cover such analyses. It is the contention in this paper that integrating these effects into intermediate textbooks will provide a service to the discipline. These concepts may not only be useful to those preparing for graduate school; they may also facilitate a better learning in the intermediate macro and other advanced economic courses, such as industrial organization and public finance, at the undergraduate level. Further, it may stimulate

research, such as the impact of wage subsidies on labor demand that has hitherto been ignored. This paper develops a framework to integrate the output and substitution effects of price changes on labor demand into the intermediate microeconomics curriculum and textbooks.

The rest of this paper is organized as follows. In the next section, we provide a brief review of the literature, after which we analyze the substitution and output effects of a change in the price of labor on employment and output. We do this in different stages: we first assume that labor is a normal factor, after which we tackle the analysis assuming labor is inferior, and finally we take the logical next step with a comment on labor taking on Giffen characteristics. In the section thereafter, we briefly describe learning outcomes from such integration into the curriculum. The paper concludes with possible empirical applications in producer theory.

LITERATURE REVIEW

Whereas the most commonly used intermediate microeconomics textbooks do not analyze the substitution and output effects of a change in the price of an input (either capital (K) or labor (L)), several empirical studies have employed isoquant analysis for this purpose under different economic regimes. For example, Makin and Strong (2013) employ a Sato production function to explain the elasticity of substitution between labor, capital, and factor productivity for Australia during the 1980s economic reform era that substantially increased the flexibility of labor markets. Their study reveals that Australia's labor productivity and substitution elasticity rose significantly from the 1980s to the mid-1990s, during which time labor and product markets became highly flexible. This economic liberalization period also coincided with increased international trade, greater integration of financial markets into the global economy, and privatization. Chow (1990) shows that with rapid industrialization in Taiwan between the 1960s and 1980s, there has been a shift in labor demand from the primary sector to the secondary and tertiary sectors, even as wages increased. The author argues that during rapid industrialization, the economy witnessed increasing returns to labor, and hence a positive relationship between labor price and demand. Rapid export growth and capital accumulation further stimulated labor demand, thus reinforcing an upward sloping demand curve for labor during this era.

Other studies (Zind, 1979; Kako 1978) explore the effect of technical change on the rate of substitution between capital and labor. For example, Zind (1979) argues that while capital accumulation tends to depress the value of the elasticity of substitution between labor and capital, technical change will increase it and offset capital's negative impact on labor value. Kako (1978) investigates the process of rice production expansion in Japan between 1955-1970 using the Allen partial elasticities of substitution and other factors from the translog cost function, and isoquants analysis. The author decomposes a change in factor input demand into three analytical components, namely output changes, factor substitution along an existing isoquant, and technical change, which shifts the isoquant function. Kako concludes that the increase in labor demand, despite higher wages, during rapid economic growth in the Japanese economy, may be attributed primarily to technical change and declining capital prices.

Miller (1987) develops a model using new capital and old capital in replacement theory to explain that the demand curve for capital may be upward sloping. He argues that contrary to standard production theory that assumes there exists substitution between capital and labor, in reality, capital may be a substitute for other factors, and in this case, old capital. A relative fall in the price of capital could cause a replacement of old capital-intensive technology with less capital-intensive technology so that employers demand less capital at lower prices, creating a positively sloping capital demand. By implication, it may be argued that if the relative price of labor increases, but not substantially, as economies become more sophisticated, employing labor-enhancing rather than capital-intensive technology may yield a positively sloping labor demand curve.

One innovative study employs the output and substitution effect in production to explain labor discrimination. Galchus (1970) calculates the degree of labor substitutability between nonwhite and white workers in different occupations to analyze the degree of racial discrimination towards nonwhites. According to the study, employer discrimination manifests as the difference between the total and money costs imposed on an employer in hiring a nonwhite person, while worker and customer discrimination are integrated into the firm's isoquant. Based on the extent of labor substitutability, the author derives the demand curve for nonwhite labor, and concludes that in the absence of differences in worker traits by race, there is a perfect substitution of labor between whites and nonwhites, yielding a zero discrimination coefficient, and an integrated labor market.

Other studies (Gallagher and Hackleman, 1979; Killingsworth, 1985) investigate the impact of public policy on labor demand in terms of the substitution and output effects. Killingsworth (1985) considers the consequence of direct and indirect taxes and subsidies on the demand for private sector employment. Assuming labor is a normal factor, a positive subsidy and/or reduction in labor taxes will increase output due to the output effect. This would decrease product prices, which in turn would, after a series of adjustments, decrease output, and therefore, decrease employment, which defeats the purpose of the subsidy or decline in taxes. However, Killingsworth does not consider conditions in which the substitution effect may outweigh the output effect so the net result of a subsidy or tax reduction (usually administered during economic downturns or election cycles) may be an increase in output, albeit at falling product prices. It is likely that falling output prices may further stimulate the demand for labor as employers meet the increased demand for their products.

Studies on labor supply may have its parallels in labor demand theory. One such example involves a study by Nakamura and Murayama (2010) who demonstrate that under certain conditions the labor supply curve may resemble an inverted S-shape rather than the conventional backward bending curve that economists accept as true. In addition to the backward bend above the conventional upward slope reflecting a condition in which the income effect outweighs the substitution effect, a forward-falling segment below the conventional segment exists at extremely low wage levels where individuals operate at the subsistence level of consumption - the inverted s-shape. The authors reveal that such an inverted s-supply curve is observed in developing countries where the majority of the population operates at the subsistence level of consumption. However, it is also evident in developed countries in the presence of secondary workers such as spouses and dependents of primary breadwinners in the labor market.

The above literature reviewed underscores the importance of studying the output and substitution effects of a change in the price of labor (and capital) on production. For example, based on the results by Nakamura and Murayama (2010), it is not unreasonable to infer the existence of an S-shaped demand curve for labor, especially relevant to newly emerging economies, where the segments above and below the conventional segment of the labor demand curve reflect conditions in which the output effect outweighs the substitution effect. Similarly, in the politicized era of lower taxes and greater employment subsidies, studies of these effects on the intended outcome of higher demand for employment may be studied as Killingsworth did in 1985. Further, without too great a stretch of the imagination, the degree of labor substitutability between white (black) male and white (black) female (or between black and white) workers in executive positions may be analyzed to determine the existence of a glass ceiling coefficient. In this case, values equal to zero would reveal an integrated labor market with no glass ceiling, and values closer to one would reveal a strong segmented market. In the spirit of these possibilities for research, the following sections develop a model integrating the substitution and output effects of a change in the price of labor on the demand for labor.

SUBSTITUTION AND OUTPUT EFFECTS OF A CHANGE IN THE PRICE OF LABOR AS A NORMAL FACTOR

Underlying Assumptions and Properties of Isoquants

In developing a working model that describes how the output and substitution effects in production may be analyzed, we make ten simplifying assumptions: 1) The perfectly competitive firm is rational, profit-maximizing, and operates at efficiency; 2) Two homogenous inputs namely, capital (K) and labor (L), are utilized in producing good x, defined as a normal good; 3) Wages (P_L) is the only cost of labor, while the interest rate (P_K) is the only cost of capital; 4) P_L changes while P_K remains constant at \bar{P}_K , and total expenditure on K and L is held constant; 5) K is a normal factor of production whereas L can be normal, inferior, or Giffen; 6) Our analysis is situated in the long run so that all inputs are variable, allowing us to employ isoquant analysis; 7) Isoquants are negatively sloped indicating that for the same level of output, an increased usage of one of the factors necessitates a decrease in the use of the other factor; 8) Isoquants are convex to the origin, revealing a declining marginal rate of technical substitution of labor for capital ($MRTS_{LK}$) as more labor is hired; 9) The further isoquants are from the origin, the greater the output; and 10) Technology and the regulatory environment are held constant.

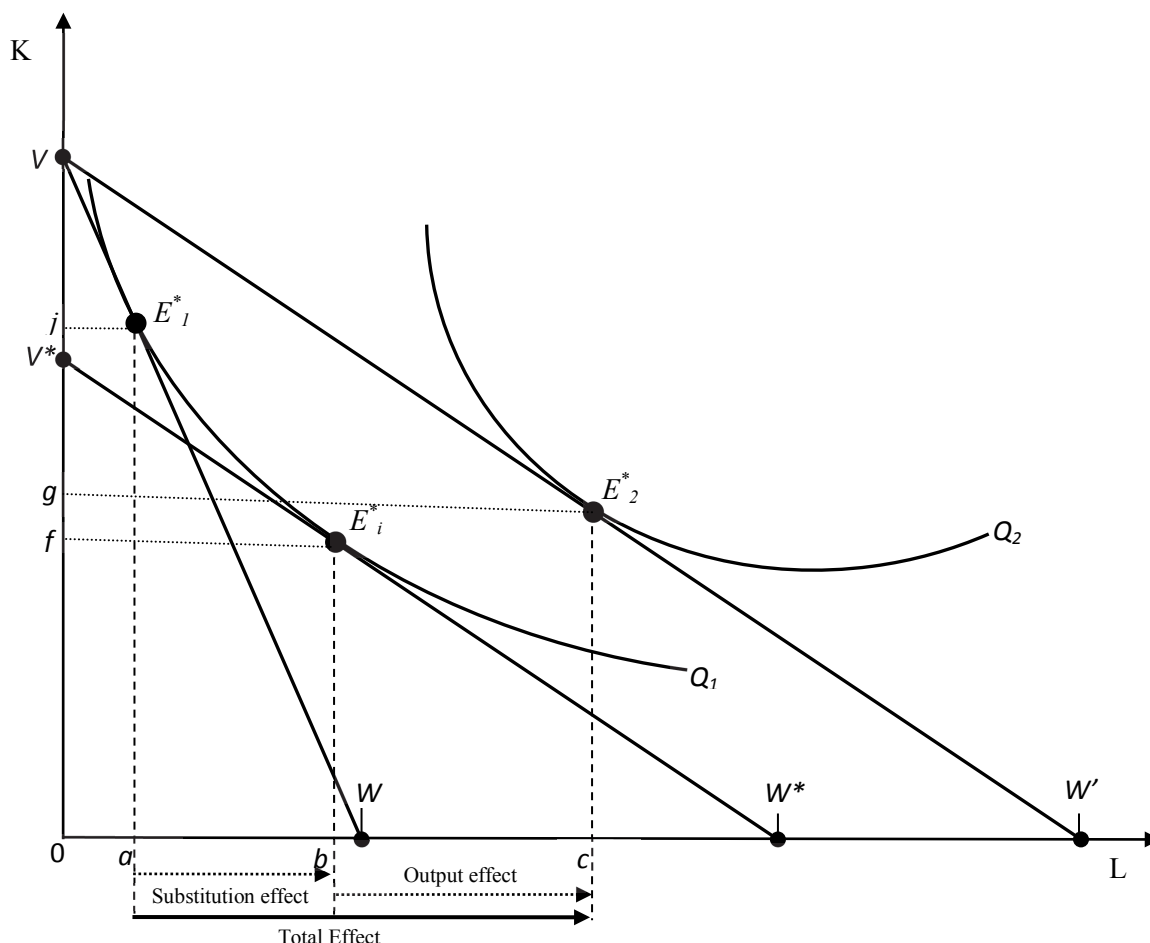
The labor demand curve conforms to the law of demand, which specifies an inverse relationship between the price of labor (P_L) and the quantity demanded of L *ceteris paribus*. The law of demand itself operates because of three factors, namely, the substitution effect, output effect, and diminishing $MRTS_{LK}$, and these in turn influence the price elasticity of labor demand. To understand the impact of a change in the price of labor on its quantity demanded, we separate the substitution effect from the output effect. This separation into the two effects presents an important analytical tool that is used to determine labor demand elasticity, as well as to examine the exception to the downward sloping labor demand curve for an individual firm, as in the case of a Giffen factor.

We know that when P_L falls, *ceteris paribus*, the firm hires more labor. In Figure 1, isocost curve VW represents the firm's expenditure on L and K, and isoquant Q_1 represents the firm's optimal output level given its expenditure. Initial equilibrium, where $MRTS_{LK} = P_L/\bar{P}_K$, exists at E^*_1 with *oa* of L and *oj* of K employed to produce Q_1 level of output. When P_L falls, holding \bar{P}_K constant, the isocost curve pivots outwards from VW to VW' , and a new equilibrium is now located at E^*_2 . This change from E^*_1 to E^*_2 is the result of two separate forces at work: L has become cheaper relative to K, triggering the substitution effect; and the firm's expenditure power has gone up or real costs have gone down, enabling the firm to increase output without increasing expenditure on inputs. This is the output effect.

A Graphical Representation of the Substitution and Output Effects at Work

The Substitution Effect may be defined as the change in quantity demanded of labor because of a change in the P_L/\bar{P}_K ratio, leaving output (or firm welfare) unchanged at the level before the price change. To identify the substitution effect we explore the impact of the new lower P_L on the firm's use of K and L without changing output from its original level. This amounts to returning the firm to the original production level (Q_1) at the new price ratio P_{L2}/\bar{P}_K . Graphically this involves a parallel shift of the VW' isocost curve to a fabricated isocost curve, V^*W^* as shown in Figure 1. The new imaginary equilibrium is located at E^*_i where V^*W^* is tangent to isoquant Q_1 , and the $MRTS_{LK} = P_{L2}/\bar{P}_K$. The movement from E^*_1 to E^*_i , distance *ab*, is the substitution effect of a decrease in the relative price of labor, holding cost constant. Notice that the firm remains on the same level of production, Q_1 , as before the decrease in P_L , but more L (distance *ab*) is employed by the substitution effect. At the same time, a negative cross elasticity of substitution between the price of L and K utilization leads to lower use of K (distance *jf*). Because the typical isoquant is convex to the origin, the substitution effect of a decrease in demand for L will always be opposite to the change in the P_L whether L is a normal or inferior input.

Figure 1: The substitution and output effect of a decrease in the price of labor as a normal factor



Starting from original equilibrium at E^*_1 , the substitution effect is identified by drawing V^*W^* tangent to Q_1 at E^*_i and parallel to VW' . The movement along Q_1 from E^*_1 to E^*_i (horizontal distance ab) is the substitution effect. The movement from E^*_i on Q_1 to E^*_2 on Q_2 (horizontal distance bc) is the output effect. Since the output effect reinforces the substitution effect, the net effect, which is the movement from E^*_1 on Q_1 to E^*_2 on Q_2 , is larger than the substitution effect, and conforms to the law of demand.

Having identified the substitution effect, we now turn to the output effect, which is defined as the change in the demand for L arising from an increase in the firm's expenditure power after a decrease in P_L . Graphically this signifies a rightward parallel shift of the fabricated isocost curve from V^*W^* back to the new isocost curve, VW' in Figure 1, leaving the new price ratio unchanged at P_{L2}/\bar{P}_K . This shift in the isocost curve reveals the increase in available funds to buy more L and K. Final equilibrium is at E^*_2 where the isocost curve VW'' is tangent to the isoquant Q_2 . The movement from E^*_i to E^*_2 , distance bc , is the output effect of a decrease in the relative price of labor, *ceteris paribus*. Because L and K are normal factors, the firm's additional expenditure power spurs it to hire more labor as shown by distance bc , and more K as shown by distance fg in Figure 1.

The total effect of a reduction in P_L is the movement from E^*_1 to E^*_2 , or distance ac in Figure 1, where the substitution (ab) and output (bc) effects reinforce each other. In this case, the substitution effect is smaller than the output effect, but in reality, the magnitude and direction of each effect depends upon the degree of substitutability between L and K, and the greater it is (the gentler the slope of the isoquant), the greater the substitution effect. Without complication, one can easily analyze the output and substitution effects of an increase in the relative price of L on output (Q) and employment of L and K. While in the real world,

we can only observe the total effect, analytically understanding the different effects allow for more informed decision-making at both the private and public policy levels.

If fixed proportions in production exist because perfect complementarity between K and L forces each to be used in fixed proportion to the other, the isoquants in Figure 1 will be right-angled at equilibrium E_1^* and E_2^* , and there will be no substitution effect. Any decrease in the relative price of labor will result in only the output effect due to the firm's increased expenditure power.

Whereas the substitution effect will always be opposite to the change in P_L , the same cannot be said of the output effect. When labor is a normal factor, the output effect reinforces the substitution effect, but when labor is considered an inferior factor, the output effect opposes the substitution effect and negates the law of demand. Examples of production functions where labor is inferior is evident in high tech industries, large-scale commercial farming, and in industries, mostly in poorer economies, that are forced to be labor-intensive due to foreign exchange restrictions on imported capital. Therefore, we turn next to an analysis of the output and substitution effects of labor as an inferior factor.

OUTPUT AND SUBSTITUTION EFFECTS OF A CHANGE IN THE PRICE OF LABOR AS AN INFERIOR FACTOR.

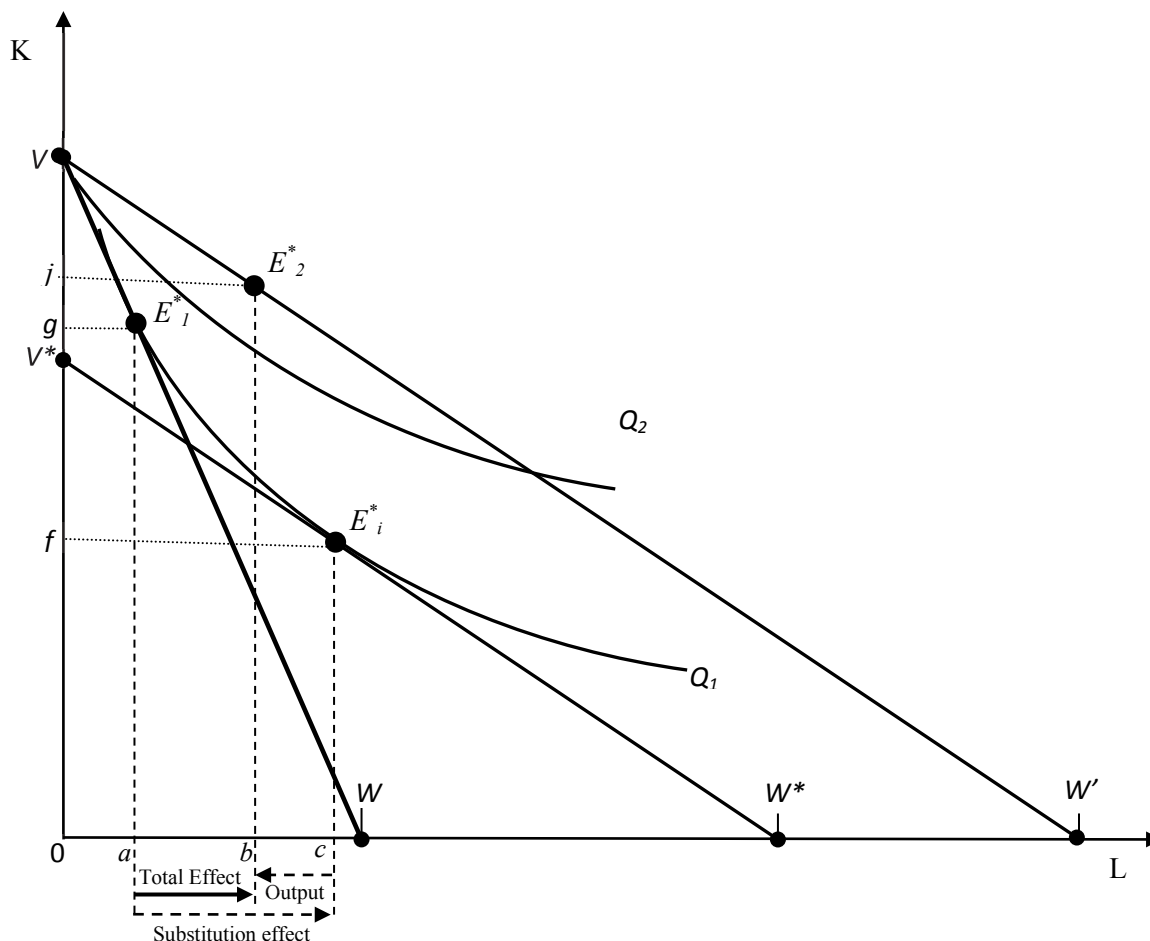
When L is a normal factor, the output and substitution effects reinforce each other, leading to a greater increase in labor demanded when P_L decreases, and vice versa. In the case of an inferior factor, however, the output effect negates the substitution effect. Nevertheless, in most production functions, the magnitude of the substitution effect is greater than that of the output effect, so the net effect of a decrease in P_L still yields an increase in labor demand, which is in harmony with the law of demand. While the L demand curve's negative slope is retained, it is steeper than under conditions of normality.

Figure 2 demonstrates the output and substitution effects of a decrease in P_L when labor is an inferior factor. Initial equilibrium exists at E_1^* . When P_L falls, holding P_K constant, the isocost curve pivots outwards from VW to VW', and the new equilibrium moves to E_2^* and the demand for L increases by ab . Notice that this increase in labor employed attributed to a lower P_L is less than in Figure 1 when labor is a normal factor.

As we did when labor was defined as a normal factor, we identify the substitution effect by analyzing the impact of the lower P_L on the firm's use of K and L without changing output from its original level at Q_1 . This amounts to returning the firm to the original production level (Q_1) at the new price ratio P_{L2}/\bar{P}_K . In Figure 2 this manifests as a parallel shift of the VW' isocost curve to a fabricated isocost curve, V^*W^* . The new imaginary equilibrium is located at E_i^* where the fabricated isocost curve is tangent to the original isoquant Q_1 , and $MRTS_{LK} = P_{L2}/\bar{P}_K$. The movement from E_1^* to E_i^* , or distance ac , is the substitution effect where more L (distance ac) and less K (distance gf) are employed. Here, even though labor is an inferior factor, the substitution effect of a decrease in P_L nevertheless prompts an increase in L demanded from oa to oc .

Having isolated the substitution effect, we now turn to the output effect (movement from Q_1 to Q_2 in Figure 2) due to the firm's increased expenditure power. To demonstrate, we leave the relative price of labor unchanged at the new price ratio, P_{L2}/\bar{P}_K , leading to a parallel rightward shift of the isocost curve from V^*W^* to VW' in Figure 2. This shift signals an increase in funds available to employ more L and K without actually increasing its total expenditure on these factors. The new final equilibrium occurs at E_2^* where isocost curve VW' is tangent to isoquant Q_2 . The leftward movement from E_i^* to E_2^* , vector cb , is the output effect of a decrease in the relative price of labor, *ceteris paribus*. Because L is considered an inferior resource, the increased expenditure power from a lower P_L leads to lower employment of L (distance cb), and greater K utilization (distance jf). The obverse holds true for an increase in the P_L .

Figure 2: The substitution and output effect of a decrease in the price of labor as an inferior input



Starting from original equilibrium at E^*_1 , the substitution effect is identified by drawing V^*W^* tangent to Q_1 at E^*_i and parallel to VW . The movement along Q_1 from E^*_1 to E^*_i (horizontal distance ac) is the substitution effect. The movement from E^*_i on Q_1 to E^*_2 on Q_2 (horizontal distance cb) is the negative output effect of an inferior factor, L . Since the output effect works in opposition to the substitution effect, the net effect is the movement from E^*_1 on Q_1 to E^*_2 on Q_2 , which is smaller than the substitution effect, but still conforms to the law of demand.

The combined output and substitution effect of the reduction in P_L , is the movement from E^*_1 to E^*_2 , or distance ab , in Figure 2 when labor is defined as an inferior factor of production. Notice that even though the substitution and the output effects work in opposite directions, the former outweighs the latter. The net effect, therefore, of a decrease in P_L is an increase in the quantity demanded of labor according to the law of demand, but this increase is at a smaller rate than if L were a normal factor. When L is inferior, the downward sloping demand curve is steeper, and the price elasticity of demand for labor is lower than if labor is a normal factor. At the same time, the cross elasticity of substitution between the price of labor and capital demand is positive, as can be observed by the increased use of capital after the price change.

In the event the substitution effect of a decrease (or increase) in P_L of an inferior factor is overwhelmed by the opposing output effect, the L demand curve yields a positive slope with a direct relationship between P_L and the demand for labor, negating the law of demand. Under such circumstances, labor is defined as a Giffen factor. While a Giffen factor is a theoretical reality, it is more likely that the L demand curve will be positively sloping only at very low price levels. This situation prevails mostly in very poor developing countries, where a combination of no government regulations on wage and employment and limited foreign exchange for capital imports may create such an outcome.

LEARNING OUTCOMES

After eight years of teaching intermediate microeconomics, in 2000 I decided to integrate an analysis of the output and substitution effects of production into the course. There were two compelling reasons for this decision: First, I had been pondering for a while over the importance of this exercise in student thinking about the application of isoquants to production theory. After all, while numerous studies (among them, Autor and Duggan, 2007; Dalamagas, 2005; Ragan, 1994; Renaud and Siegers, 1984; Hanoch and Fraenkel, 1979; Hamermesh, 1977) have employed the income and substitution effects in consumption to empirically analyze labor supply and its implications for policy, only a few studies (Killingsworth, 1985; Gallagher and Hackleman, 1979; Galchus, 1970) have employed isoquant analysis to investigate the labor demand curve and its associated policy implications. Second, and more practically, students' low test grades on the income and substitution effects in consumption led me to wonder if analyzing the concept from a different angle, namely from the production perspective, would reinforce their understanding of both consumption and production theory. As an experiment in 2000, after completing consumer theory and testing students, I transitioned to producer theory. After analyzing isoquant analysis, I assigned students a team project where they were required to apply the income and substitution effects learned in consumer theory to production theory. What I found was that not only did the students come up with a parallel analysis, but they also performed much better in their exam on these topics, increasing their grade average by 5% that semester. Since then, grades have been higher on average than before, by between 5% and 10%. What has been more surprising, however, is that students have developed creative ideas in applying consumer and producer theories over the years. For example, one team in 2003 considered the possibility of a forward bending labor demand curve, parallel to the backward bending labor supply curve. Another team in 2006 applied the output and substitution effect to developing countries' decisions to employ different combination of L and K in the production process, depending on their level of integration into the market economy. One team in 2010 applied these effects to healthcare, erroneously arguing that an increase in nurses' pay increased the demand for nurses. In reality, it is true that nurses' pay have increased at the same time that the demand for them has increased in recent years, but these increases have been attributed to various other factors, among them, the greater utilization of nursing staff in medical facilities, while reducing the use of doctors. This mistake provided the perfect opportunity to remind students of the *ceteris paribus* assumption that students so often forget about. Overall, however, it seems as if a better understanding of the core material engenders creative applications of the subject matter. In addition, teaching these concepts in class has become an exciting adventure on my part as it has for my students, hence the need to share this model with other intermediate microeconomics professors.

CONCLUSION

This study has extended the analysis of the income and substitution effects in consumer theory to the output and substitution effects in producer theory, the analysis of which has been ignored for the most part in intermediate textbooks and in the classroom. This oversight may have led to the sparse empirical applications of the substitution and output effects on the demand for inputs, as indicated by Makin and Strong (2013), Chow (1990), Miller (1987), Killingsworth (1985), Gallagher and Hackleman (1979), Zind (1979), Kako (1978), and Melvin (1971). However, important insights into the factors influencing the production process may be derived from such studies, among them, the power of old capital versus new technology (Miller, 1987), and the role of urbanization and rapid economic growth (Makin and Strong, 2013; Chow, 1990; Kako, 1978), in the production process.

That no research exists on the output and substitution effects of a change in the price of labor when labor is an inferior (including Giffen) factor, may be because most theoretical research in this domain took place until the 1970s when economists focused mostly on developed countries. Since then, with the integration of poorer developing countries into the market economy, and the exponential growth of high-

tech capital-intensive industries amidst foreign exchange scarcity, the reality of labor as an inferior factor has become very real. An important question for consideration here, as students have asked, is “Could the labor demand curve for an individual firm be forward-bending at very low labor prices (in very poor countries and in developed countries with a large secondary labor market)?” Or, parallel to the existence of an inverse S-shaped labor supply curve, could the labor demand curve be S-shaped? The implication of such a curve has enormous implications for employment and public policy in an ever-changing global economy, and now that this globalized world has spawned considerably more economic and financial data, especially on developing economies, such hypotheses are more conducive to empirical investigation. It is therefore imperative for economists to integrate such studies in the intermediate microeconomics curriculum. Such analyses may also feature in labor and development economics, public finance, and even financial economics courses.

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INTRAPORTFOLIO CORRELATION: AN APPLICATION FOR INVESTMENTS STUDENTS

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ABSTRACT

Intraportfolio correlation (IPC), a measure of portfolio diversification, is becoming increasingly popular among investment practitioners. However, despite the assertions of these adherents, IPC is far from a free lunch. Instead, it is a simplistic and flawed measure that ignores material information about the relationships among portfolio assets. Deconstructing the IPC therefore can be a productive and educational exercise (and a cautionary tale) for students of portfolio theory. In this paper, we describe IPC and offer suggestions for incorporating it into an introductory investments course.

JEL: G10, G11

KEYWORDS: Portfolio Theory, Diversification, Finance Pedagogy

INTRODUCTION

Introductory courses on investments are almost certain to cover the portfolio theory of Markowitz (1952) and the Capital Asset Pricing Model of Sharpe (1964), Lintner (1965), Mossin (1966), and Treynor (1961). However, the theory students tackle in the classroom may have morphed into something quite different by the time they encounter it in the “real world.” In this paper, we consider one such transformation: a metric called “intraportfolio correlation” (IPC, or “Q”), a “weighted average intraportfolio correlation that translates the range of correlations to percentage values” (Damschroeder, 2010). It is a weighted, standardized correlation coefficient. This measure has recently found favor with some practitioners, who assert that it easily quantifies a portfolio’s diversification. However, confounding these claims are inconsistencies in various definitions of IPC and apparent confusion about basic mechanics of portfolio variance. These inconsistencies invite critical examination by investments students.

We discuss the claims made for intraportfolio correlation, then describe ways instructors can incorporate investigation of those claims into basic investments courses. The paper proceeds as follows. In the next section, we briefly review the literature underlying traditional approaches to teaching portfolio theory in introductory investments courses. We then turn to the intraportfolio correlation measure, first defining it, then exploring its applicability to two- and three-asset portfolios. Finally, we propose some ways that students could enhance their understanding of portfolio theory by evaluating the IPC.

LITERATURE REVIEW

Our goal is to demonstrate how investments instructors can incorporate an analysis of Q into the traditional curriculum. Thus, we are concerned with the concepts making up this curriculum and with the pedagogical approaches to teaching it. In this section, we consider both. We will show that, on the conceptual side, Q integrates easily into discussions of portfolio theory and market efficiency; as for pedagogy, Q fits seamlessly into applied spreadsheet projects. Markowitz (1952) derived the portfolio theory concepts that underlie the curriculum in investments courses. Students of portfolio theory—and therefore students of Q—are by definition students of Markowitz, and, while they may not recognize his notation, students should be very familiar with his development of portfolio expected return and variance. He starts by defining the mean and variance for random variables, moves to weighted sums of those variables (i.e., “[t]he expected value of a weighted sum is the weighted sum of expected values”) and to

the definitions of covariance and correlation, then finishes by identifying efficient portfolios. This has become the standard development in investments courses.

The distillation of Markowitz's work into textbooks has become so standardized, in fact, that serious students would benefit from reconciling the differences between the modern treatments and Markowitz's original graphs. For example, textbooks routinely illustrate the efficient set of risky assets as a parabola in $[\sigma_p, E(R_p)]$ space. Markowitz presents the same concept first with these axes reversed—with expected return on the x axis, so that the efficient set curves up from the southwest to the northeast—and then, more interestingly, on $weight_1$ and $weight_2$ axes. In the latter case, he is presenting results for three-asset portfolios, and the efficient set is the line traced out by the tangencies of isomean lines and isovariance curves. (See also Tobin, 1958.) Markowitz's graphs underscore points obscured in the basic parabola graphs: the dependence of both $E(R_p)$ and σ_p on the portfolio weights, rather than of $E(R_p)$ directly on σ_p ; the elliptical nature of the isovariance curves; the linearity of the efficient set in the $[w_1, w_2]$ space. We use this type of graph when discussing three-asset portfolios and Q, in a later section.

Markowitz's portfolio solutions were revolutionary, but were also extremely difficult to *use*. Identifying the efficient set requires quadratic programming, since portfolio variance is not a linear function of the assets' weights; this was a decidedly complex task in the computing environment of the 1960s and 1970s. Practitioners and academics soon began searching for an efficient, simple algorithm for identifying efficient portfolios. (Rubenstein, 2006, summarizes much of this research.) Q is just a very recent entrant into a crowded market of basic approximations to the efficient frontier. Understanding the earlier methods will help us evaluating Q's contribution.

Sharpe's single index model is the foundation for many of the early approximations. This model assumes that the covariance between the returns of a pair of assets is explained only by their individual relationships with a third factor, significantly simplifying the determination of the covariance matrix. For example, Sharpe himself (1967) suggests a linear approximation for portfolio variance, based on the single index model. (See also Sharpe, 1971.) Since mutual funds may hold no more than 5% of their portfolios in any single security, he proposes that asset weights are small enough to justify a linear estimate. His empirical results demonstrate a good fit: "For any given average rate of return, the portfolio selected using linear approximation had variance less than 1% greater than that of the most efficient portfolio (i.e., the one selected using the full covariance matrix)." The results were especially good for more aggressive portfolios (according to Sharpe, expected return—which is exact, not approximated—is relatively more important than variance for these portfolios). Despite the fit of this linear approximation, the search for quick solutions to Markowitz's equations continued.

To derive closed-form expressions for the optimum portfolio's assets and weights, Elton, Gruber, and Padberg (1976) start with Sharpe's single index model (as do Treynor and Black, 1973), then assume that all assets' correlations are the same and that a risk-free asset exists. Their "simple" solutions do not require parametric quadratic programming. As we will see, they nonetheless are vastly more complex than Q. Unlike Elton, Gruber, and Padberg's solution, Q ignores borrowing/lending possibilities, the distinction between market and unique risk, the possibility for short selling, and the identification of the available security set. It ignores return. It takes the correlation matrix as given. Combining Q with other metrics, as GSphere does, admits some of these defects. However, Elton, Gruber, and Padberg's equations clarify at least two things for students of Q: first, the search for simple portfolio solutions is as old as portfolio theory itself; and second, even "simple" solutions in highly stylized scenarios will be vastly more complex than intraportfolio correlation. Markowitz's diversification results lead investments students to ideas of market efficiency. How do his insights affect our understanding of the potential for active management? Since Q is marketed as a portfolio-evaluation tool, it is a useful addition to discussions of efficiency, and the extensive literature in this area can help us appreciate its contribution.

Treynor and Black (1973) is an early example of this literature. These authors consider the incorporation of active management into the “essentially objective, statistical approach to portfolio selection of Markowitz” and Sharpe (1964). They propose a tripartite model of returns, modeling return as the sum of a riskless component, a premium for market exposure, and an “independent return.” They call the expected value of the independent return the “appraisal premium”; it represents the return to the actively managed part of the portfolio.

Given this framework, Treynor and Black describe an approach in which managers act on their unique information and insights about stocks, accumulating an active position. Managers then adjust for the market risk of this position by buying or selling the market portfolio in the passive part of their portfolio. In this world, a “perfectly diversified” portfolio is one with no nonmarket risk. However, such a portfolio is not risk-free, and, more importantly, may not be “optimally balanced.” Instead, an optimally balanced portfolio takes full advantage of opportunities to accept asset-specific risk profitably: “any improvement in the quality of security analysis, or in the number of securities analyzed at a given level of quality, can only cause an optimally balanced portfolio to become less well diversified... In general it is not correct to assume that optimal balancing leads either to negligible levels of appraisal [active] risk or to negligible levels of market risk.” Thus, Treynor and Black (1973) suggest that effective active managers would have no use for a metric like Q. For decades, finance professors have built investments courses around the concepts of market efficiency and portfolio theory, based on the literature we have just discussed. Only recently, however, have they been able to have students explore these ideas using sophisticated spreadsheet applications. We turn now to the relatively recent pedagogical literature outlining these sorts of projects. Students who have done a spreadsheet project—who can optimize, run regressions, and perform simulations—are unlikely to see the need for a simplistic metric like Q.

There are many examples of investments projects incorporating spreadsheets. For example, Kalra and Weber (2004) outline a basic task-based investments project covering the standard metrics for a single stock. Kish and Hogan (2009) present an expanded project allowing students to practice basic portfolio theory using multiple assets. These basic approaches are easy to extend. For example, Neumann (2008) motivates his project using the *Wall Street Journal's* long-running dartboard contest, and Girard, Pondillo, and Proctor (2005) incorporate performance attribution analysis. For more academically rigorous courses, Carter, Dare, and Elliott (2002) show how students can find mean-variance efficient portfolios using Excel’s Solver; Johnson and Liu (2005) extend this procedure to allow for short sales. Pushing the use of technology even farther, the most recent papers incorporate Monte Carlo simulations. For example, Ammar, Kim, and Wright (2008) demonstrate simulations using both Excel’s built-in functions and Crystal Ball add-ins. The resulting histograms—the products of many hundreds of trials on many different portfolios—clarify the abstract concept of portfolio risk. These sorts of projects and applications are becoming the norm in investments classrooms. It is to students in these modern courses that we wish to introduce intraportfolio correlation.

Defining The Intraportfolio Correlation

According to adherents, intraportfolio correlation *defines* diversification (see, for example, Hedge Funds Consistency Index, http://www.hedgefund-index.com/d_diversification.asp). However, there are competing definitions for IPC, which complicates evaluation. One definition that comes up frequently is:

$$Q = \sum_i \sum_j w_i w_j \rho_{ij}, \quad (1)$$

$i \neq j$, where w_i is the fraction of the portfolio invested in asset i , w_j is the fraction of the portfolio invested in asset j , and ρ_{ij} is the correlation between assets i and j . (See, for example, EconomicExpert.com and Gravity Investments’ “GSphere” optimization platform. Interestingly, Gravity Investments says that it

“invented and patented diversification optimization, measurement, search and visualization.”) Q , the intraportfolio correlation, then feeds into a calculation for the “percent of diversifiable risk removed”:

$$\% \text{ of diversifiable risk removed} = \frac{(1-Q)}{2} \quad (2)$$

For example, if $Q = 1$ (its highest possible value), diversification is zero, while if $Q = -1$ (its lowest possible value), diversification is perfect. However, there is a problem with this definition. Consider an equally weighted portfolio of two assets i and j , where $\sigma_i^2 = \sigma_j^2$. If assets i and j are perfectly negatively correlated, this portfolio would have a Q of $2*(.5)^2*(-1) = -.5$, implying that the percent diversified is $(1+.5)/2 = .75$, or 75%. However, in fact, this equally weighted portfolio actually would *eliminate* risk. Therefore, we will use an alternative definition of intraportfolio correlation (found, for example, at Hedge Fund Consistency Index, 2011 and WordIQ, 2011):

$$Q = \frac{\sum_i \sum_j w_i w_j \rho_{ij}}{\sum_i \sum_j w_i w_j} \quad (3)$$

$$= [W'W]^{-1}W'[R - \text{Diag}(R)]W,$$

where W is the $nx1$ vector of weights, R is the nxn correlation matrix, and $\text{Diag}(\bullet)$ is the nxn matrix of the diagonal elements of the target matrix. Using (3), Q equals -1 for the equally weighted equal-variance portfolio, so that the percent diversified is 100%, as it should be. Unfortunately for Q adherents, defining the metric to be consistent with (2) does not mean that Q is actually helpful. For our two-asset, perfectly negatively correlated portfolio, for example, Q will *always* equal -1, even though portfolio variance, σ_p^2 , is zero only when the assets are weighted equally. Q always sends the same signal, so it is not providing an adequate measure of true diversification. In the next section, we will examine these sorts of problems with Q in the context of two-asset portfolios; we will then go on to consider them in the more generalizable case of three assets.

Q And Two-Asset Portfolios

The two-asset case is an important starting point for students of portfolio theory. It is not just that the math is most tractable for this case; it is that two-asset portfolios have some interesting characteristics. Unfortunately for students, however, Q will not help them appreciate these features. Two-asset portfolios are unique in that all two-asset portfolios are minimum-variance—they all offer the lowest-variance way to deliver a given expected return. That is, there is only one combination of weights that delivers a specified expected return, since:

$$w_i = \frac{[E(R_p) - E(R_j)]}{[E(R_i) - E(R_j)]} \quad (4)$$

(where $E(R)$ is expected return), and $w_j = (1 - w_i)$. However, while all two-asset portfolios are minimum-variance (having the lowest variance for a given expected return), they are not all efficient (having the highest expected return for a given variance). To find the efficient set, we first find the portfolio that has the global minimum variance; portfolios that lie below this point (in $[\sigma, E(R)]$ or $[\sigma^2, E(R)]$ space) are inefficient. We can easily find the global minimum-variance portfolio. Differentiating the portfolio

variance equation with respect to w_i , we find that $d\sigma_p^2/dw_i = w_i*[\sigma_i^2 + \sigma_j^2 - 2*\sigma_{ij}] - \sigma_j^2 + \sigma_{ij}$, where σ_{ij} is the assets' covariance. Setting this equal to zero and solving for w_i , we find that we can minimize portfolio variance by setting w_i as:

$$w_i = \frac{\sigma_j^2 - \sigma_{ij}}{\sigma_i^2 + \sigma_j^2 - 2*\sigma_{ij}}. \tag{5}$$

(See, for example, Martin, Cox, and MacMinn, 1988, Chapter 8, and Bodie, Kane, and Marcus, 1993, Chapter 7.) Now, equating (4) and (5), we can find the expected return for the global minimum-variance portfolio as:

$$E(R_p)_{min-var} = E(R_j) + \frac{\sigma_j^2 - \sigma_{ij}}{\sigma_i^2 + \sigma_j^2 - 2*\sigma_{ij}} * [E(R_i) - E(R_j)]. \tag{6}$$

As equations (5) and (6) make clear, the variance of a two-asset portfolio depends upon the weighting scheme chosen, and there is only one *global* minimum-variance portfolio. However, the dependence of σ_p^2 on w_i is obscured by the intraportfolio correlation measure. In fact, Q is invariant to w_i in the two-asset case, as we can see in the equation below, and in Figure 1:

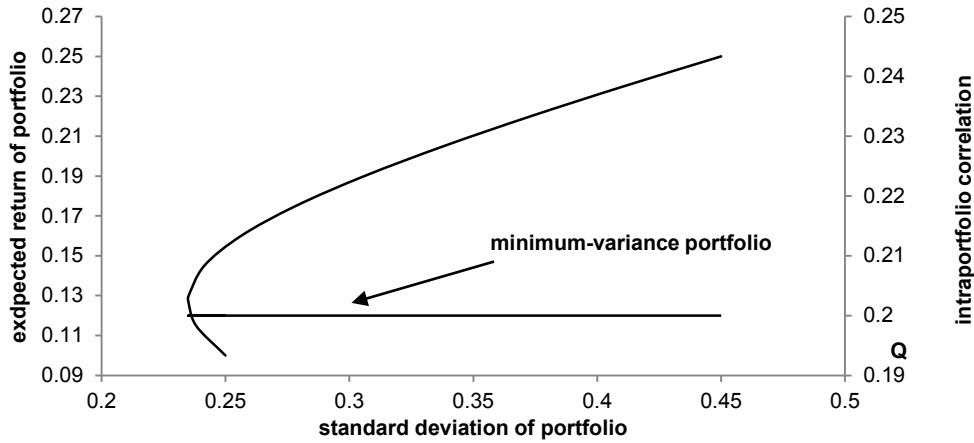
$$Q = \frac{2w_iw_j\rho_{ij}}{2w_iw_j} = \rho_{ij}. \tag{7}$$

All Q tells us is the correlation coefficient—which we already knew—not the amount of realized diversification in a specific portfolio. (This can also be true for the *n*-asset case. For example, in their approximation, Elton, Gruber, and Padberg, 1976, assume of equal correlations for all asset pairs—an assumption they say “produces better estimates of future correlation coefficients than do historical correlation coefficients or those produced from the single index approximation.” Given this assumption, Q again equals ρ .) By returning us to the correlation coefficient, Q simply reminds us of the *potential* for diversification. It certainly does not, as proponents such as Gravity Investments claim, lead us directly to the “percent of diversifiable risk removed.” Of course, it is difficult to imagine what a concept like “percent of diversifiable risk removed” even means within a two-asset context. Given that all portfolios are minimum-variance, every expected return is delivered with the lowest possible risk, given ρ_{ij} . However, it might be instructive for students to try to develop their own interpretation. For example, given that $Q = \rho$, perhaps its boosters are looking for a measure more like the following:

$$\text{relative diversification effectiveness} = \frac{[\sigma_p | \rho_{ij} = 1] - [\sigma_p | \rho_{ij}]}{[\sigma_p | \rho_{ij} = 1] - [\sigma_p | \rho_{ij} = -1]}. \tag{8}$$

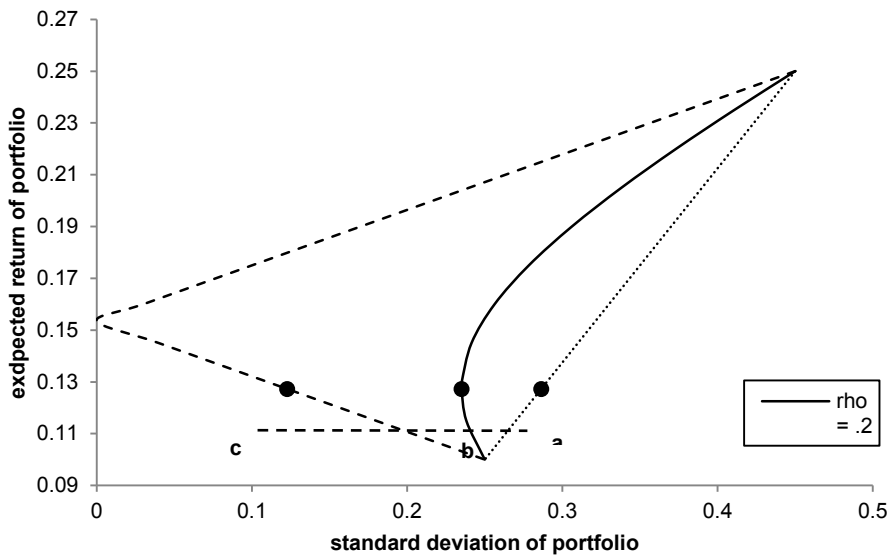
That is, for any level of expected return, how much diversification does the portfolio offer, given the actual correlation between the assets, relative to the worst-case correlation scenario ($\rho_{ij} = 1$) and the best-case scenario ($\rho_{ij} = -1$)? Figure 2 illustrates the concept, which we will call Z.

Figure 1: Q in the Standard Two-Asset Case



This figure shows the standard $[\sigma_p, E(R_p)]$ bullet-shaped relationship for the two-asset case (assuming $E(R_i) = 10\%$, $\sigma_i = 25\%$, $E(R_j) = 25\%$, $\sigma_j = 45\%$, and $\rho_{ij} = .2$). Note that Q does not change as the relative weights of the two assets change: it always equals ρ .

Figure 2: Correlation and Diversification Potential in the Two-Asset Case



This figure illustrates the diversification potential from various values of ρ_{ij} . The solid curve is the same as that from Figure 1, and assumes a correlation of 0.2. The dotted line assumes that the two assets are perfectly positively correlated; the dashed lines assume perfect negative correlation. Points a, b, and c all lie at the same level of $E(R_p)$; point b is the global minimum-variance portfolio from Figure 1. Equation (8) measures the distance from a to b, relative to the distance from a to c: $(a-b)/(a-c)$. Larger values for this ratio imply more effective diversification.

Since the standard deviation for a two-asset portfolio is a simple linear combination of the assets' standard deviations when $\rho_{ij} = 1$ ($\sigma_p = \sigma_j + w_i^*[\sigma_i - \sigma_j]$) or when $\rho_{ij} = -1$ ($\sigma_p = w_i^*[\sigma_i + \sigma_j] - \sigma_j$), we can rewrite (8) as:

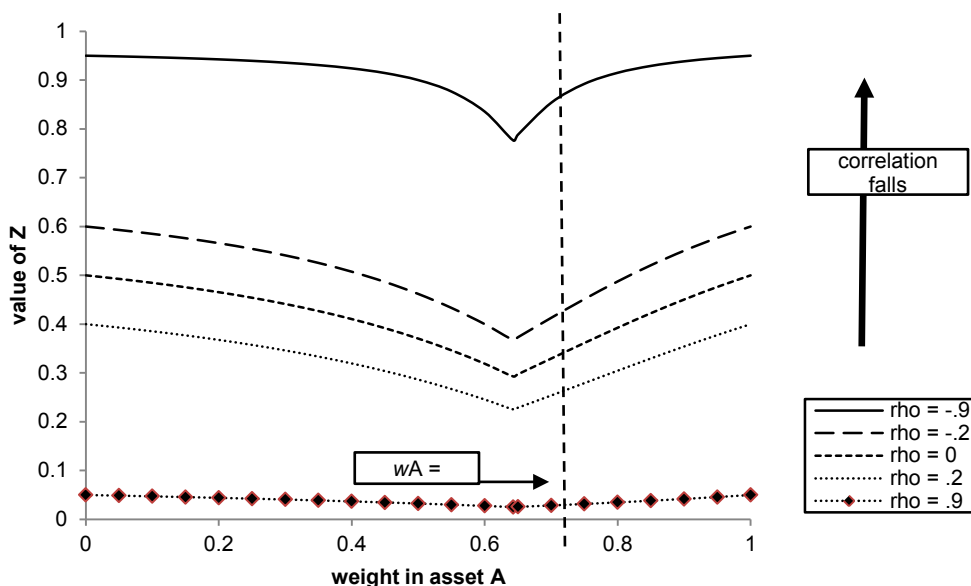
$$Z = \frac{\sigma_j + w_i * (\sigma_i - \sigma_j) - \sigma_p}{2 * \sigma_j * (1 - w_i)}, \tag{9}$$

for $1 \geq w_i \geq \sigma_j / (\sigma_i + \sigma_j)$. (These are the weights of asset i for which the $\rho = -1$ relationship is shown as a line segment with a positive slope. For these weights, the σ_p expression for $\rho = 1$ is positive. There is a comparable simplified version of (8) corresponding to the weights generating the negatively sloped line segment.) The behavior of Z is shown in Figure 3. Note that Z rises as the assumed correlation between the two assets falls. As shown in Figure 3, Z is minimized when $w_i = \sigma_j / (\sigma_i + \sigma_j)$: that is, when the $\rho = -1$ curve hits the y axis (so that $\sigma_{p|\rho=-1} = 0$). It is maximized as w_i or w_j approach 1:

$$\lim_{w_i \rightarrow 1} Z_{w_i \rightarrow 1} = \lim_{w_i \rightarrow 1} Z_{w_i \rightarrow 1} = \frac{1 - \rho_{ij}}{1 - (-1)} = \frac{1 - \rho_{ij}}{2}. \tag{10}$$

Note that (10) is equivalent to (2) in this case: since $Q = \rho$ when there are 2 assets, the “percent of diversifiable risk removed” measure, $(1-Q)/2$, is the same as the limit for Z . However, unlike Q , Z assumes a range of values for any given correlation, corresponding to the actual weighting scheme assumed for a portfolio. The equivalence of Z ’s maximum and Q ’s “% diversified” highlights the drawbacks of both measures. We obviously would not set a goal of maximizing Z , since Z is largest when diversification is lowest—that is, when the portfolio’s weighting scheme simply plunges into one of the two assets. In these extreme cases, there is no realized diversification at all, regardless of the correlation, so the behavior of the actual portfolio most closely mimics that of the idealized portfolio (the $\rho = -1$ case). While we can adjust our use of Z to recognize this issue (we are not required to assume that we wish to maximize Z), we have no such flexibility for Q , a constant. Q adds no value, even in interpretation, to analysis of the two-asset case.

Figure 3: An Alternative Measure of Diversification Effectiveness



This figure illustrates the behavior of our “Z” measure for relative diversification effectiveness. This metric measures the actual diversification at any weighting scheme relative to the maximum possible diversification (that is, the reduction in portfolio standard deviation at that E(R) between the worst-case scenario of $\rho = +1$ and the best case of $\rho = -1$). Z is maximized at $(1-\rho)/2$ when the weight in either asset approaches 1, and is minimized when $[\sigma_p = 0 | \rho = -1]$. Z rises when correlation falls: with lower correlations, the actual reduction in portfolio standard deviation from a given weighting scheme more closely mirrors the maximum possible reduction.

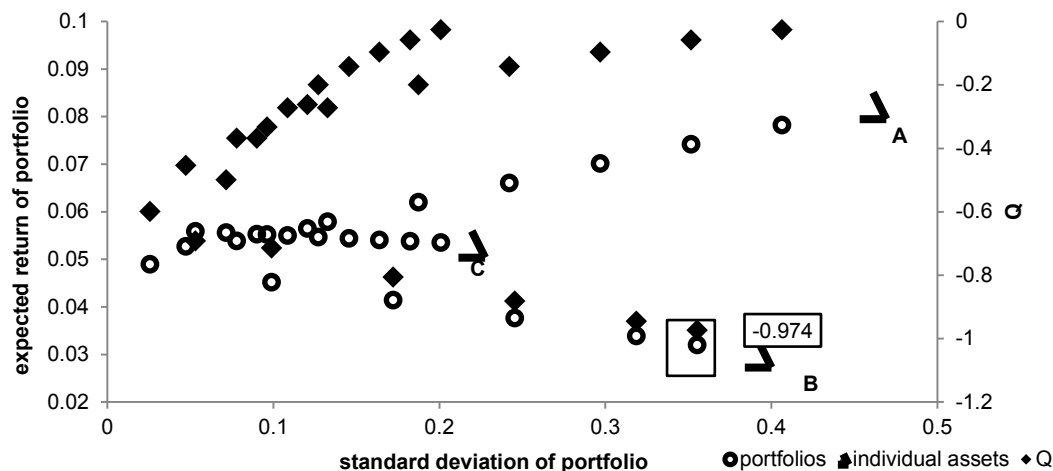
However, Q’s adherents would no doubt say that they never intended to use Q in such a simple, unrealistic case. Thus, we turn now to a more general situation: the case of three assets.

Q And Three-Asset Portfolios

One of the claims related to the IPC is that “[t]o eliminate diversifiable risk completely, one needs an intraportfolio correlation of -1” (“Diversification: Finance,”

<http://en.academic.ru/dic.nsf/enwiki/2310801>). We have already discussed this contention for two-asset portfolios; since $Q = \rho$ in this case, what the statement should assert is that complete diversification is possible, given perfect negative correlation, but the correct weighting scheme must be used (i.e., $w_i = \sigma_j / (\sigma_i + \sigma_j)$). In the three-asset (and n -asset) case, the interpretation of the assertion is more involved, as we now discuss. (We will ignore the fact that some proponents of IPC insist on applying their diversification assertions to market risk; see, for example, GSphere’s discussion. Since Q can lie outside its purported $[-1, 1]$ bounds if short-selling is allowed, and since short-selling is required to “eliminate” market risk [see, for example, Treynor and Black, 1973], we will assume that Q’s diversification relates to nonsystematic risk.) Is a Q value of -1 optimal? Let us consider a simple example of three assets, cleverly named A, B, and C. B is perfectly negatively correlated with both A and C ($\rho_{AB} = -1$ and $\rho_{BC} = -1$), while A and C are perfectly positively correlated ($\rho_{AC} = 1$) (Note that, contrary to the apparent claim on some IPC-boosting sites—e.g., Gravity Investments’—not all of the off-diagonal elements can be -1. Beyond the mathematical impossibility, we also have the practical: as Markowitz, 1952, notes, “[t]he returns to securities are too intercorrelated. Diversification cannot eliminate all variance.” We consider this further in the next section.) It is impossible to obtain a Q of -1 with these correlations, if we require all three assets’ weights to be positive. However, in Figure 4 we plot various portfolios of the three assets (assuming $[\sigma_i, E(R_i)]$ values of [46%, 8.2%], [39%, 3%], and [22%, 5.3%], respectively) that can be created with positive weights in each. We can come arbitrarily close to $Q = -1$ by increasing the weight in B. The figure highlights a portfolio with 95% in B and 2.5% in A and C; this portfolio has a Q value of -0.974.

Figure 4: An Example of Q in the Three-Asset Case

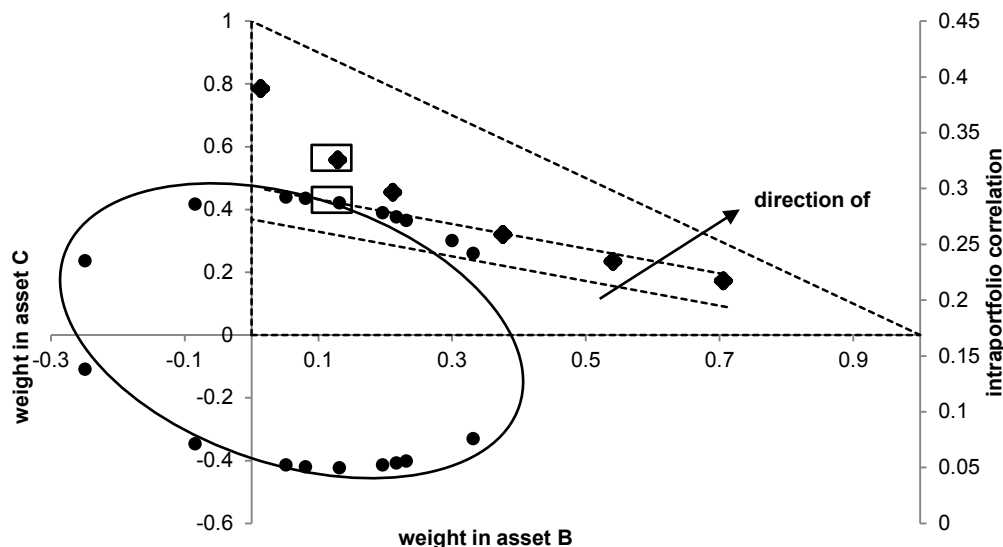


This figure plots various portfolios of assets A, B, and C, along with their corresponding Q values. The highlighted portfolio has the lowest Q—the closest to the purported optimal value of -1—yet is clearly a dominated portfolio.

In the figure, Q values are plotted as circles, using the right-hand axis; portfolios are squares, plotted on the left. The portfolio whose Q is -0.974—supposedly the “best” value of Q—is dominated by almost every other portfolio shown. The Q values for the undominated portfolios tend to rise steadily as expected return rises. We cannot say which of these undominated portfolios is “best,” since a choice among them depends on the investor’s preferences. (As Markowitz notes: “There is a rate at which the investor can gain expected return by taking on variance, or reduce variance by giving up expected return.”) However, we can say that any investor—risk averse by definition—will not prefer the portfolio with the lowest Q. We can also say that that having a Q of (approximately) -1 does not imply that diversifiable risk is eliminated: the highlighted portfolio is so heavily weighted in B that it barely begins to take advantage of its perfect negative relationship with A.

Of course, the situation depicted in Figure 4 is artificial and unrealistic. Since all of the assets are perfectly correlated, our “three asset” case behaves like a series of two-asset cases (as evidenced by the almost linear portfolio curves). In Figure 5, we present a less contrived illustration of a problem with Q. Figure 5 is based on the basic three-asset analysis of Markowitz, as depicted in his Figure 2 (Markowitz, 1952, page 85). (See also Sharpe’s 1967 Figure 1, drawn in $[E(R_p), \beta_p]$ space.) The three underlying assets in Figure 5 are all positively correlated ($\rho_{AB} = \rho_{BC} = 0.2$; $\rho_{AC} = 0.4$). As Markowitz does, we restrict ourselves to nonnegative weights; the dashed triangle that traces the axes from the origin to (0, 1) and (1,0), and whose hypotenuse stretches between those two points, outlines the set of possible weighting schemes. Markowitz shows that the tangency points between isovariance curves (ellipses in $[w_i, w_j]$ space that link portfolios with equal variances) and isomean lines (lines linking portfolios with equal expected returns) trace out the efficient set of portfolios. This set starts at the point of minimum possible portfolio variance, then moves linearly in the direction of increasing expected return until it hits the boundary of the opportunity set (in his case, the hypotenuse of the weighting triangle). (Thereafter, the set is either coincident with an axis or with the boundary.) Investors, being risk-averse return lovers, wish to be on the efficient set.

Figure 5: Q in Markowitz’s Isovariance Ellipse/Isomean Space



This figure is based on Markowitz’s (1952) Figure 2. The dashed triangle outlines the possible weighting schemes; it assumes no short-selling. The ellipse, outlined with dots, is one of a series of concentric isovariance ellipses. The lines are isomean lines; expected return rises as these lines move to the northeast. Investors choose points on the efficient set, which is determined by the tangencies between isovariance curves and isomean lines. One such point is highlighted, at (.13, .42). However, the Q value for this efficient portfolio (boxed diamond) is not the lowest Q value possible for this level of expected return. Minimizing Q cannot therefore be an appropriate decision rule for a risk-averse investor. ($E(R_A) = 45.5\%$, $\sigma_A = 11\%$; $E(R_B) = 50.3\%$, $\sigma_B = 281\%$; $E(R_C) = 57.7\%$, $\sigma_C = 25\%$.)

In Figure 5, we plot one isovariance ellipse, stretching across all four quadrants and outlined by dots. The isomean lines are downward-sloping, given our assets' expected returns, with higher $E(R)$ values to the northeast. One tangency is highlighted, at approximately (.13, .42). The linear efficient set (not pictured) would start at the minimum variance portfolio (also not pictured, but which lies at the center of a system of concentric isovariance ellipses, one of which we have) and pass through this tangency point. According to Markowitz, investors would choose portfolios on this line, within the nonnegative-weight boundaries, according to their preferences. However, this is not what we would expect, given the Q criterion; instead, investors should choose the portfolio with the lowest Q , since it will be the most effectively diversified. Figure 5 plots the values of Q (as diamonds) for portfolios on the same isomean as the given tangency portfolio. The Q value for the tangency portfolio is highlighted—this is the Q corresponding to the point on the efficient set. However, it is not the lowest Q from this isomean; we find lower values of Q as we increase the weight in asset B. These lower Q values must correspond to portfolios with higher variances than the tangency portfolio's: the farther a point is from the center of the ellipses, the higher is its level of variance. Investors would not choose such inefficient points, so they would not want to make their decisions by minimizing Q .

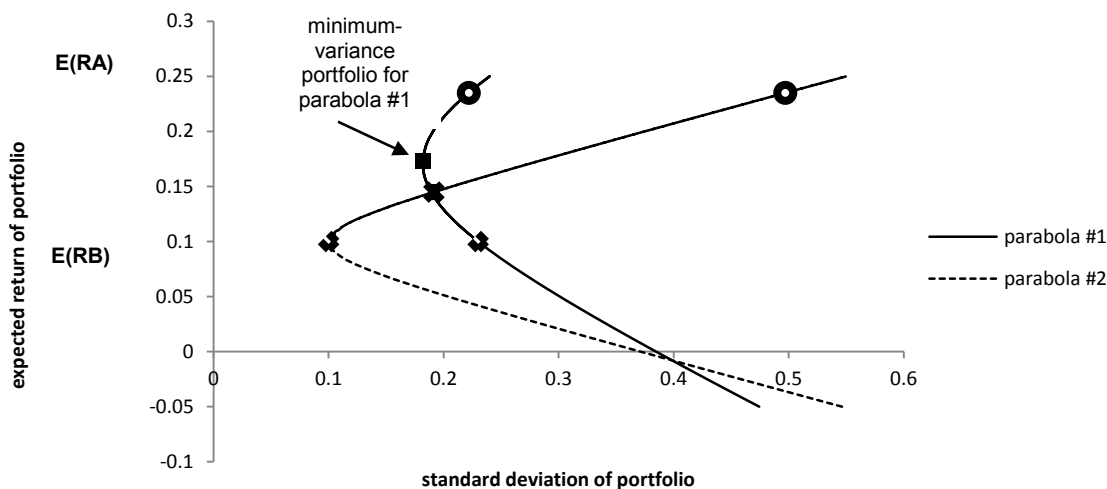
The problem with Q is that it abstracts from the variances of the underlying assets. Figure 6 gives us one more way to think about this problem. In the figure, we show the portfolio parabolas (possible portfolios, plotted in $[\sigma_p, E(R_p)]$ space) for two sets of assets A and B. The assets A and B used to create the two parabolas have the same expected returns in each case. (Asset A is depicted with circles; asset B by diamonds.) The correlation between the assets is also the same in both cases: 0.2. In neither case is A or B dominated when held in isolation. However, asset A has a higher standard deviation in parabola #2 than in parabola #1, while asset B has a lower standard deviation. Consider the upper point at which the two parabolas cross, which is marked by a star. At this point, both the portfolio on parabola #1 and the portfolio on parabola #2 have the same weighting schemes for A and B, the same expected return, and the same standard deviation. Given the common correlation coefficient, these two portfolios also have the same value for intraportfolio correlation, Q . However, an investor clearly would not be indifferent between the two portfolios—despite the common Q , $E(R_p)$, and σ_p —since the portfolio, while efficient on parabola #2, is *dominated* on parabola #1. Again, these parabolas were constructed using assets differing only on standard deviation, the information Q ignores; they share the same weighting scheme, ρ , and expected returns. Intraportfolio correlation cannot distinguish between them since it abstracts from critical information concerning their relative risk. Yet Q purports to be a risk measure!

Having discussed several problems with Q , we now consider how to incorporate its study into investments courses.

Applications Of Q To Investments Courses

Since portfolio theory and the efficient set are fundamental concepts in investments courses, instructors can find many opportunities to evaluate a portfolio metric like intraportfolio correlation. In this section, we point out just a few of the more obvious examples. We begin with opportunities to augment theoretical discussions, then consider the empirical. The most straightforward theoretical application relates to the discussion of the Capital Asset Pricing Model. After introducing the Capital Market Line (CML), the instructor could ask students to consider the intraportfolio correlation for a portfolio of n assets lying on the Capital Market Line. Since all assets on the CML are perfectly positively correlated, the Q value would be 1, implying that there was no diversification whatsoever. However, since all assets on the CML are already perfectly diversified—they have no systematic risk, by definition—this is clearly a nonsensical implication.

Figure 6: Q and Dominance in the Two-Asset Case



This figure shows two portfolio curves made up of two assets A and B. For both curves, $E(R_A) = 25\%$ and $E(R_B) = 10\%$. In parabola #1, the assets' standard deviations are 24% and 23%, respectively; in parabola #2, they are 55% and 10%. Consider the crossover point marked by a star: this portfolio has the same Q on both parabolas, but is dominated on parabola #1. Q cannot distinguish between acceptable and unacceptable (dominated) cases.

A second theoretical link occurs when considering naïve diversification. Studying the portfolio variance effects of setting all weights to $(1/n)$, where n is the number of included securities, gives students an early appreciation for the relative inconsequence of individual asset variances and the importance of covariances. Bodie, Kane, and Marcus (2011) provide an example in which they assume that all correlations and variances are the same ($\text{var}(i) = \sigma^2$ for all i ; $\text{corr}(i,j) = \rho$, $i \neq j$). In this case, portfolio variance equals:

$$\sigma_p^2 = \frac{1}{n} \sigma^2 + \frac{(n-1)}{n} \rho \sigma^2 \tag{11}$$

(see their equation 7-21). As n increases, it is easy to see that the first term—the contribution of the individual asset variances—goes to zero, while the second term approaches $\rho \sigma^2$. Portfolio variance therefore approaches the common covariance. This is a simple algebraic way to appreciate diversification, and is a nice companion to examination of the covariance matrix. However, what would we learn from Q, given Bodie, Kane, and Marcus's assumptions? Since all pairs of assets have the same correlation, Q becomes simply ρ , as it does for the two-asset case (see equations (3) and (7)). Again, the measure degenerates into something we already knew, and we miss the point of the example—that even naïve diversification diminishes the influence of unique risk.

Moving beyond these theoretical evaluations of Q, investments professors may also introduce IPC in more applied topic areas. We will now consider incorporating Q into a basic course project, into simulations, and into discussions of the Arbitrage Pricing Theory (APT).

As noted earlier, it is common for investments professors to incorporate spreadsheet projects based on real data. Kish and Hogan (2009) stress the need for such a project to allow students to link theory and practice. They suggest having students assume the role of consultants, going through a qualitative and quantitative exercise that culminates with a portfolio recommendation. The focus throughout their project is diversification, so an analysis of Q would fit seamlessly. For example, Kish and Hogan ask students to answer questions like “What insight did you obtain from the correlation matrix,” as well as a whole series on estimating the mean-variance efficient portfolios. Students could extend their answers to these sorts of

questions by evaluating Q . (For example, when estimating with a scatterplot, as in Kish and Hogan's question #5, students could utilize a plot like our Figure 5.) Kish and Hogan assert that their project embodies a cognitive learning strategy; introducing the analysis and interpretation of intraportfolio correlation would enhance the "elaboration" phase of that strategy.

Other authors' projects offer further opportunities for Q . For example, Ammar, Kim, and Wright's (2008) project incorporates a simulation exercise focused on correlation. Using an equally weighted two-stock portfolio, they demonstrate the power of low correlations to reduce portfolio risk. They suggest—but do not perform—extensions, such as allowing rebalancing. This type of extension could provide an opportunity for students to explore intraportfolio correlation. While Q would not be a sufficient treatment, it would at least open the conversation about the importance of the weighting scheme, which is currently missing from Ammar, *et al.*'s simulation.

More interesting evaluations of Q are possible when students actually set out to find the efficient set. Since identifying mean-variance efficient portfolios is straightforward with Excel, students who learn the process should be easily convinced that a simplistic metric like Q is unnecessary. Carter, Dare, and Elliott (2002) provide a template for finding mean-variance efficient portfolios using Excel's Solver tool. With Solver, students can generate efficient frontiers for n -asset portfolios, which they can then compare to reference portfolios (as the authors do with the equally weighted portfolio). Using a graph like Carter, Dare, and Elliott's Figure 10 (a plot of portfolios in [standard deviation, expected return] space), students can easily compare efficient and dominated portfolios, and their Q s, as we did for random portfolios in Figure 4. Students will see Q adds nothing to their appreciation for portfolio diversification.

Students who wish to go further with Excel can follow Arnold's (2002) approach for finding efficient portfolios using the program's matrix multiplication functions. Arnold advocates for introducing students to efficient set mathematics using linear algebra, both to enhance their appreciation for the meaning of efficiency in the n -asset case and to link portfolio theory solutions to regression analysis. (See also Martin, Cox, and MacMinn, 1988, p. 682-687.) Given the generality of the templates he provides, he asserts that, "[p]articularly with the aid of a spreadsheet program, multiple asset portfolios are not beyond the comprehension of undergraduate students." Why then, would they need Q ?

Tarrazo (2009) reinforces Arnold's emphasis on the relationship between portfolio optimization and linear regression. He notes that both procedures "optimize a quadratic form to minimize the variance of the estimate" (i.e., either minimum squared errors or minimum portfolio variance), and asserts that the only real difference between the two procedures is that portfolio optimization requires full investment (that the sum of the assets' weights is 1), while regression does not. Regression also makes error terms explicit, unlike portfolio optimization—even though the equivalence of the two methods demonstrates that the "financially feasible" portfolios that result from portfolio optimization will "miss their mark."

If students are familiar with these links between portfolio theory and regression (and they undoubtedly will be familiar with regression, given the standard undergraduate business curriculum), then they will be well prepared to evaluate the following assertion by one promoter of intraportfolio correlation:

[We] created dimensionality to represent the total diversification of a portfolio. More dimensions = more diversification. Normally, we think of having three dimensions to our world plus time as the fourth dimension. In mathematics, there are no limitations to the dimensionality. For example, the branch of physics investigating string theory has discovered that it takes 13 dimensions to attain harmony among their calculations. Every extra dimension that a portfolio has allows it to perform in a simultaneous and independent direction. A perfectly undiversified portfolio is one-dimensional. Think of a dot on a line. The dot can only move up the

line or down the line. Now imagine a dot placed in a 5 dimensional space. That dot now has freedom to move up or down along each of the five directions. The direction it goes along one axis (dimension) does not connote anything about how it moves along another axis. The measure is patent pending.

Would anyone familiar with regression be startled to learn that many independent variables (or dimensions) may be used to describe the behavior of a dependent variable? Q can also help students studying the Arbitrage Pricing Theory (APT). The APT expands the number of factors used to describe security returns from the CAPM's single factor (in fact, the CAPM is a special case of the arbitrage pricing model), so that students of the APT are quite familiar with the idea of a k -factor model. They also should be able to assess the IPC promoter's apparent assertion that more dimensions are better. The APT requires that k be less than the number of securities (although that is not much of a constraint in the real world!), and early empirical tests estimated that the number of factors was about four (see the literature summarized in Martin, Cox, and MacMinn, 1988, Chapter 9). More recent empirical work, however, has led the number of applied factors to "explode," according to Huberman and Wang (2005). Since the APT does not specify the return factors—since they are assumed to be common knowledge—researchers are inserting their judgment into the void. (Of the three methods cited by Huberman and Wang to determine factors, one employs a purely mathematical approach—principal component analysis—while the other two involve variations of the researcher's "primarily us[ing] his intuition to pick factors.") The end result is that there are now so many factors that have been used to explain asset returns that Huberman and Wang do not even attempt to list them all. Their assessment of the state of the art is that "[t]he multiplicity of competing factor models indicates ignorance of the true factor structure and suggests a rich and challenging research agenda." But does it also suggest that mere recognition of the potential of multiple factors—the recognition of the IPC promoters—deserves a patent?

CONCLUDING COMMENTS

Intraportfolio correlation is a relatively new metric being advanced by some practitioners as a valuable measure of portfolio diversification. However, it does not appear to live up to its hype. Markowitz notes that his expected value/variance hypothesis implies the "‘right kind’ of diversification for the ‘right reason’." It is not the *number* of securities in a portfolio that generates efficient diversification—it is the *relationships* among those securities. This is undoubtedly the insight driving the advocates of intraportfolio correlation. However, by focusing only on correlation, the standardized measure of comovement, Q ignores the rest of covariance: the standard deviations. In this paper, we evaluated Q using both two-asset and more general three-asset cases. These cases are part of the basic investments curriculum, so should be easily accessible to undergraduate students. Nonetheless, these cases suffice to demonstrate the problems with Q; students will be able to determine that Q is not able to identify optimal portfolios—which is its job. Neumann (2008) reminds us that "[m]any students expect to come out of an investments class with investing advice." If so, and if students want to be able to bridge theory and practice, then a study of Q, an increasingly popular portfolio metric, is appropriate. Familiarity with Q's failings is the kind of practical investing advice budding investors can really use.

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TRADITIONAL VERSUS ONLINE INSTRUCTION: FACULTY RESOURCES IMPACT STRATEGIES FOR COURSE DELIVERY

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ABSTRACT

Advances in communication technologies have provided alternative ways to deliver instruction to learners. With the availability of the Internet as a learning tool, educators are able to use this instrument for course delivery. This study takes an empirical look at course design and delivery factors that impact student perceptions of learning and course satisfaction. Students completed surveys addressing a variety of topics as they relate to traditional classroom and Internet courses. Results of the study suggest that online learning is a viable alternative to traditional classes in the information systems discipline. Students were active participants in the evaluation and comparative analysis of an undergraduate business course delivered in an online format for the first time. Implications of the results are discussed.

JEL: I20

KEYWORDS: Information Systems; Online Learning; Traditional Course

INTRODUCTION

In the debate over online versus traditional classroom courses, the decision is often predicated on faculty resources. In 2008, the United States experienced the worst economic recession since 1930. As a result, this crisis greatly affected colleges and universities. Many institutions have been forced to find alternatives to “business as usual” to maintain their academic standards. According to an article in U.S. News & World Report, several universities have “frozen construction, cut employees’ pay and laid off instructors” (Clark, 2009, p. 1). To mitigate the resulting economic challenges Hampton University’s School of Business decided to explore other avenues that would allow them to sustain the quality of learning and maintain enrollment for the Management Information Systems course offered in the Department of Management. The information systems professors chose this course because they were eager to gain valuable insights into how this instruction method affects learning in the information systems discipline.

Hampton University’s Management Information Systems (MGT 323) class is a required course for all business majors. Four sections of this course are provided each semester and each section is always filled to capacity. The decision was made to convert two sections of the Management Information Systems course to an online format. The customary enrollment cap for the course is 25 however; student need influenced the decision to increase the enrollment cap to 35. The enrollment cap was increased to 35 because a large number of seniors needed the course that semester to graduate. Students met face-to-face the first day of class with the instructor. During this meeting, the students were made aware that their sections would be held entirely online. The notification was met with mixed reactions, some students preferring an online class were excited and others were disappointed. Students were given the syllabus and directions to access their class section online. The Blackboard platform was used to transmit course information, assignments, e-mails, and discussion posts.

The remainder of this paper discusses the business department's experience with online learning and the implications for inclusion of this approach within the curriculum. The study begins by describing the literature surrounding online learning. Next, a pilot study was conducted, followed by current research. Last, general implications are provided about online learning as an alternate means of instruction.

LITERATURE REVIEW

Traditional classroom teaching focuses on a number of elements where learning is conducted in a synchronous environment. The instructor and the students must be in the same place at the same time in order to derive motivation and instruction from the teacher as well as from the other students. This has been a customary teaching method because "sharing one's own ideas and responding to others' reactions improves thinking and deepens understanding" (Chickering & Gamson, 1987, p.76). In this environment educators have the opportunity to identify the needs of students and motivate them on an individual basis.

Online Course Delivery

As the popularity of the Internet has grown so has the potential to learn online. Online learning is a method of studying in which lectures are broadcast or classes are conducted by correspondence or over the Internet. Online learning combines various types of online technology such as multimedia, video streaming, virtual classroom, and e-mail (Thorne, 2003). Since this type of education has evolved over the past decade "studies that explore issues of differences in learning between traditional and non-traditional students are now coming to the forefront" (Ravai and Gallen, 2005, p. 53). Although online learning has lower retention rates than face-to-face classes traditionally, (Diaz, 2000; Parker, 1995; Snyder 2001) each year the number of students taking online courses continues to increase. Allen and Seaman found that "nearly 3.2 million students were taking at least one online course during 2005, which was a substantial increase over the 2.3 million reported the previous year" (Senn, 2008, p. 268). The latest Sloan Survey reveals that enrollment has risen by almost one million from prior years (Sloan, 2010). Though there has been a continued increase in the number of students taking online courses, students' perceptions associated with online courses have been mixed (Smart and Cappel, 2006).

Online versus Traditional Course Delivery

Spiceland and Hawkins (2002) performed a study to evaluate students' perceptions of the value of online asynchronous-based courses compared to conventional classroom courses. A study was conducted employing a 12-item survey instrument. The population chosen for this study consisted of students attending The University of Memphis from four sections of an accounting course. The study was given to 70 students and completed by 66. It examined how the differences of an online course could affect student's ability to learn given that the environment lacks the traditional components of the classroom such as a structured environment, a specific class meeting time and the interaction of the instructor and other students. In addition, the study looked at the influence of the types of material learned and the types of students taking the course.

This study was organized into four areas: interaction, active learning, student perceptions and learning outcomes. Numerous educators believe interaction is a required element of learning. According to Jaffe (1997), "Learning is an essential social process which requires interaction for the purpose of expression, validation, and development of one's self as a knowledgeable learner" (p.70). In the traditional classroom, participation can be carried out by the same students, thereby alleviating most students from participating. Conversely, in an online course active learning occurs because each student must demonstrate writing and literacy skills. The results of the study indicate that although students have a more positive attitude regarding online computer courses, they expressed difficulty learning the material

outside of a traditional classroom setting. The results also show that the direction of recent research in online learning has changed from focusing on technology to understanding the effects on students.

Lim, Morris, & Kupritz (2006), conducted a study, which consisted of a group of 125 undergraduate students at the University of Tennessee of whom 36 were male and 86 female. 59 of the students took an information systems course in an online format. The remaining 69 students took the same course in a blended format that included classroom instruction in addition to online instruction. Eighty percent of the students had previously taken an online course. A questionnaire using open-ended and closed-ended questions was used to measure the perceptions and satisfactions of the students.

According to the data, online learners did not show any major differences between traditional learners and blended learners. Nevertheless, students' perceptions revealed that blended courses provided the opportunity to obtain regular support and interact with the instructor and their peers. This interaction increased students' feelings of belonging. The findings of this study were in line with previous research performed by (Laine, 2003; Reeves et al., 2003; Willis & Cifuentes, 2005).

Researchers Larson and Sung (2009) conducted a study to determine if online, blended, or face-to-face learning contributed to a higher rate of success among students. In this study, face-to-face learning involved a format using a textbook and lectures for the primary mode of instruction. The online course required students to use a textbook and view lecture notes via a course management system. The blended learning model employed a combination of the face-to-face and online formats. The study was conducted using 168 students presently enrolled in an introductory Principles of Management Information Systems course. The study included 63 students who took the course in a face-to-face format, 22 students who took the course online, and 83 students who took the course in a blended format. The courses were taught by the same instructor using the same textbook and supporting materials. No differences in the homework assignments between the face-to-face, blended, and online sections of the course were found. The three courses were compared using data from examination scores, final class grades, and student evaluations.

Regardless of the delivery method student satisfaction with the course was positive. Learning effectiveness was measured by the student's perception of an increase in critical thinking and work motivation. Students believed the online and blended courses provided a higher level of critical thinking and work motivation compared to face-to-face courses. The researcher believed this response might have been because students in the face-to-face course were not required to prepare responses to discussion questions. In contrast to face-to-face courses, students tend to give the first answer that comes to mind and fewer students participate.

The research concluded there is no significant difference among the three modes of delivery. The article concluded that the lack of difference among the analyzed data of the three modes of delivery indicate that new methods of teaching students are as effective as the previous methods used for teaching.

Blended Learning

Blended learning, also referred to as hybrid learning, combines online education with traditional education, (Finn & Bucci, 2004). This method of course delivery provides an environment where the learners can study regardless of time and place restrictions according to their learning speed. Learners who have difficulty in establishing communication in the classroom environment may find it easier to communicate through an electronic platform. McCampbell (2001) emphasizes that blended learning is a suitable approach for incorporating online applications into an existent course program for the first time. Since the hybrid classroom incorporates characteristics of both the traditional and online classroom settings, learning occurs in both synchronous and asynchronous modes and teachers can determine what aspects of the course are best suited to online delivery modes.

Online material is viewed as an extension of the classroom. Students receive the benefit of face-to-face interaction with faculty and students while being exposed to web-based learning paradigms simultaneously. Many programs are taking an interest in blended courses because it is this belief in the human contact element of teaching that leads many skeptics to discount the possibility that asynchronous online learning can be as effective as the traditional method of information delivery (Black, 2001). Along with overcoming the “faceless classroom” Swan (2001), adapting to student-centered teaching, managing time and techniques, and establishing the learning community are challenges that plague online learning. To ensure the satisfaction of students in online environments, instructors need to be sure to focus on these obstacles.

Methodology and Results

To explore the challenges stated above, a pilot study was conducted to determine if online instruction would be a feasible and sustainable avenue for the Hampton University’s Business Management Department. Pre and post surveys were created to capture the perceptions of an online course. Thirty-six students were included in the pilot study from once section of the MGMT 323 course. The pre-test asked nine questions about experience with technology in general and experience with an online learning platform. The post-test asked eight questions, specifically about the online learning experience after taking a course online and the perceptions of online learning after taking the information systems class in this format.

The pilot study results indicated that although students did not sign up for an online class the majority could adapt to the online environment and be successful. Seventy-eight of the participants had never taken an online course previously. However, 92% expected to receive or better than a C in the course. The results reflect 97% of participants said that they felt comfortable using the computer and learning new technologies however, 33% of the students reported that they were not familiar with navigation and using the tools in the Blackboard environment.

One hundred percent of the students claimed to be comfortable using applications such as Word, PowerPoint, Excel, and Windows Media tools and 97% of the students completed work using these applications without problems. Since the university requires that during freshman year all students pass a computer literacy course that covers these applications, students are expected to have a sufficient understanding of how to use these applications prior to taking this course. Fifty-eight percent of students were familiar with the discussion forum and navigation tools in Blackboard however 52% would prefer not using these features, even as a supplement to a traditional course.

The number of students that had ever taken an online class was only 22% and only 32% of the class said that their experience in taking this course online was good. Fifty-two percent of the class said that they would have still taken this class if they had known that it was online. Some of the reasons given were (1) “Online fits better into my busy schedule.” (2) “You can work at your own pace.” A summary of the comments in support of taking MGT 323 online was implicit through one participant who wrote, “Since this is a computer information systems class I feel like taking it as an online class enables students to feel comfortable and familiar with their own technology while learning new strategies. I also feel as though some of the topics discussed such as increased awareness of online safety help students to see things in a more accessible situation while actually conducting the assignments online.”

Thirty-six percent would not have chosen to take the MGT 323 class online and some of the reasons given were (1) “It is hard to keep up with when the assignments are due.” (2) “I get confused easily.” A summary of the comments in support of not taking MGT 323 online was implicit through one participant who wrote, “I like the in-classroom setting. I don't like blackboard, even though it's a tool that helps track and maintain a digital record of teacher and student materials. I guess I'm just old fashion in that regard.”

Fifty percent of the class thought 10 hours a week would be a sufficient amount of time to study and complete class assignments. Five hours was suggested in the expectations portion of the syllabus. Thirty-three percent of the participants actually spent 20 hours a week. When students were asked if they thought the expectations were fair 89% agreed. One hundred percent of the class responded positively to having the ability to problem solve and work independently and only 33% thought that they spent less time completing the course material than if they were in a traditional class. This suggests that this method of instruction can be designed as a rigorous alternative or supplement to traditional instruction.

Eighty percent of the students specified that they had a good experience in the information systems class. Twenty percent thought their experience was fair and one percent had a bad experience. Twenty-five percent did not answer this question. This is interesting considering that 92% of the class expected to respond that they were successful in the course. Ten hours appeared to be the amount of time the majority of the class spent completing class work. It is not clear if this is due to issues within the online environment or with the coursework itself. To determine the nature of the reasons the study time was double what had been suggested in the syllabus needs further investigation.

After reviewing the pilot study data, the online course was posted as such in the registration catalog and students were able to decide for themselves the method of instruction for the class. The following year, the surveys were administered to 50 students in the MGT 323 online information systems course. These surveys were administered in two sections of an online information systems class. The surveys' questions and response calculations can be found in Appendix A. Sixty-eight of the participants had never taken an online course previously. However, 96% expected to receive better than a C in the course. The results revealed that 100% of the online students were comfortable using the computer and learning new technologies however, 82% of the students reported that they were successful learning the class material in the Blackboard environment. Eighty-six percent of the participants felt comfortable using applications such as Word, PowerPoint, Excel, and Windows Media tools. Ninety-five percent were able to get their work completed using these applications without problems. This suggests that the introductory computer course provides a sufficient foundation of applications that can be incorporated into the information systems course curriculum.

Ninety-two percent of the students taking the MGT 323 course stated that they were already familiar with the Blackboard tools however 38% would prefer not using these features, even as a supplement to a traditional course. Eighty percent of the participants specified that they had a good experience in the information systems class. Fourteen percent thought their experience was fair and 6% had a bad experience.

Although 80% of the students were successful in the course, only 40% of the class would still take the class again online. Some of the reasons given for taking the course in this format were (1) "It fit better into my hectic schedule and being able to do my work on my own time suited me better." (2) "I can have extra time to study for other courses." (3) "The information needed was provided and I am not good at taking notes." (4) "A lot of the homework and tasks are online so it makes sense to have the class online." A summary of the comments in support of taking Mgmt 323 online was implicit through one participant who wrote: "Although classroom discussions are helpful, an online class provided me with the same benefits as in class."

Sixty percent would not have taken the class again online. Some of the reasons given were (1) "There was not enough student teacher interaction. I was not able to ask questions about the material as consistently as I would have liked and there weren't any real office hours and not enough feedback on my work." (2) "Doing the assignments with a class helps me to understand the material more." (3) "I can't keep up." (4) "Some of the cases needed explanation." A summary of the comments in support of not taking Mgmt 323 online was implicit through one participant who wrote: "The course material was difficult to teach

myself. The assignments were not explained thoroughly and not having a teacher to see made it hard to receive responses in a timely manner.”

Forty-six percent of the students thought that 10 hours a week would be a sufficient amount of time to study and complete class assignments and 92% actually spent that amount of time. Sixty percent thought that they would spend less time in the online class versus a traditional course however; the results show that the time spent was comparable to that of a traditional course. This data supports that this method of instruction can be designed as a rigorous alternative or supplement to traditional instruction. Ninety-eight percent of the class responded positively to having the ability to problem solve and work independently and 96% thought the expectations of the course were fair.

The results of the actual study indicated a preference for a blended format of instruction for the course. The researchers find it interesting that the study participants, undergraduate level students, were successful in the course but still felt as though “they were to some degree teaching themselves”. They also expressed a preference for “more student professor interaction”. This intangible factor should not be minimized in assessing contributing factors for ongoing student course satisfaction. This variable can be isolated for further study to obtain feedback on students’ perception of lasting value of the teaching format. Survey results indicated that a fair amount of students were not comfortable with the Blackboard platform for course instruction and delivery of assignments. This variable needs closer attention to ferret out if the issue is with the technical performance of the system or with students’ lack of adequate orientation to using the Blackboard format. The results seemed to indicate that heavy reliance on the content management system reduced overall course satisfaction. The study results were positive enough to continue offering the MGT 323 Data Information Systems course in a blended format. Future evaluation of the course will include a concentrated focus on the issues that came to the forefront of the results.

CONCLUDING COMMENTS

This study took an empirical look at course design and delivery factors impacting student perceptions of learning and course satisfaction. To explore these factors a pre and post survey was administered to students to determine if online instruction would be a feasible and sustainable avenue for Hampton University’s Business Management Department. The surveys consisted of eight questions designed to obtain the perspectives of students currently enrolled in an online course. The results of the surveys revealed a preference for a blended format of instruction. This suggests that platforms such as Blackboard are useful instructional tools; however they should not take the place of the professor’s role in the learning process. Today online learning is becoming a widely used mode of instruction. While there are still mixed perceptions on this method of learning, it appears that interaction with content, interaction with instructors, and interaction with classmates are of significant importance to those who take courses using this method.

By using multiple exercises the instructor can measure how well the information is being learned utilizing different methods. Hands-on problems allow students to perform applications that will further instill the concepts being learned. Online instruction allows the learner the opportunity to slow down or speed up the pace of instruction, depending on the students’ needs. Frequent testing provides an ongoing measurement of the student’s progress in the course. Clear feedback supplies students with the direction needed to progress in the course. Consistency in the layout of a course eliminates the need for students to obtain knowledge on how to maneuver through a course and clear navigation supplies a roadmap similar for each course. Having help screens or tutorials available allow students the opportunity to research questions or problems they may be encountering. Although asynchronous learning may produce the same desired learning outcomes as a traditional learning environment, it appears that a level of maturity

and self-discipline is required for success. Therefore, blended learning is being used to enhance current course offerings and increase student satisfaction.

This study was restricted to the MGMT323 course within the business department; therefore the findings cannot be generalized. The study was limited further by surveying only two sections of the MGMT323 course. However, the study can be used as a model to expand the current research, review additional courses in the department, and other courses throughout the university. In today’s information age, research exploring online education benefits in STEM areas is extremely important (Flowers, Moore, and Flowers, 2009); therefore future research should also include an in-depth investigation on the responsibilities of the professor when conducting a blended learning environment in technical courses. Exploring which concepts can be taught virtually versus face-to-face can be beneficial when designing curricula for technical disciplines such as information systems.

APPENDICES

Appendix A: Participant responses before taking the Management 323- Info/Dp Systems Management course.

Questions	Reply	Responses	% of Responses
Q1.) I am comfortable using the computer and enjoy learning new technologies	No	0	0.00%
	Yes	50	100.00%
Q2.) I am comfortable using Word, PowerPoint, Excel, and Windows Media Player tools.	No	7	16.28%
	Yes	43	86.00%
Q3.) I am familiar with Blackboard discussion forums and navigation tools provided.	FALSE	4	8.00%
	TRUE	46	92.00%
Q4.) Have you taken an online class before?	No	34	68.00%
	Yes	11	22.00%
	Unanswered	5	10.00%
Q6.) As a student, how much time do you feel is the minimum amount of time necessary to put into an online class?	20 hours	7	14.00%
	5 hours	14	28.00%
	10 hours	23	46.00%
	More than 20 hours	3	6.00%
	Unanswered	3	6.00%
Q7.) After reviewing the Instructor's expectations of the course, how do you think that you will be in this online environment?	Above a C	48	96.00%
	with at least a C	2	4.00%
Q8.) I am a student who can problem-solve and work independently.	Yes	49	98.00%
	No	1	2.00%

Students enrolled the Mmgt 323 Information Systems courses were asked to take a survey the first day of class. This table shows the average for each question in the survey. The first column show the questions asked in the survey. The second columns show the selection of responses that could be given for each question. The third column shows the Number of response for each question. The fourth column shows the percentage of response for each type of response given.

Appendix B: Participant responses after taking the Management 323- Info/Dp Systems Management course.

Questions	Reply	Responses	% of Responses
Q1.) I was successful learning the course material in this type of environment.	No	10	20.00%
	Yes	40	80.00%
Q2.) I was able to use Microsoft applications in order to get my work done.	No	3	6.00%
	Yes	47	94.00%
Q3.) I was familiar with Blackboard discussions and navigation tools however; I would like to use this platform as a supplement (only) to this course.	No	19	38.00%
	Yes	31	62.00%
Q4.) I would have still taken this class online. If the answer is no explain why. (refer to text for explanations)	No	30	60.00%
	Yes	20	40.00%
Q5.) How was your experience?	Poor	3	6.00%
	Fair	7	14.00%
	Good	40	80.00%
	Very Good	0	0.00%
Q6.) How much time did you spend per week completing coursework for this class?	10 hours	46	92.00%
	5 hours	3	6.00%
	20 hours	0	0.00%
	More than 20 hours	1	2.00%
	Less than 5 hours	2	4%
Q7.) Do you think that the expectations for this course were fair? If the answer is no explain why. (refer to text for explanations)	No	2	4%
	Yes	48	96.00%
Q8.) Do You feel that you spent (or would spend) less time in an online class for this course?	Answer 11	Total	
	No	20	40.00%
	Yes	30	60.00%

Students enrolled the Mmgt 323 Information Systems courses were asked to take a survey the last day of class. This table shows the average for each question in the survey. The first column show the questions asked in the survey. The second columns show the selection of responses that could be given for each question. The third column shows the Number of response for each question. The fourth column shows the percentage of response for each type of response given.

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SEMANTIC MAPPING OF LEARNING ASSETS TO ALIGN CURRICULUM AND EVIDENCE LEARNING EFFECTIVENESS IN BUSINESS EDUCATION

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ABSTRACT

Ensuring the alignment of course content against desired goals and objectives has always been at the core of effective instructional course design—whether the instruction is delivered face-to-face, or via the support of distance technologies. Nonetheless, with the latter delivery of instruction, two distinct challenges have recently emerged, thus prompting the need to re-examine the term “quality” as it relates to accreditation. The first challenge lies within the ability to locate and/or create and align digital learning objects to course goals and objectives. The second challenge lies within the ability to demonstrate learning effectiveness from learning management system metadata. A research and development team at American Public University System addressed these challenges by employing an open source repository and semantic engine for analysis and alignment of content, materials, and learning activities to goals and objectives across all courses within the School of Business. The result was a highly detailed, accurate mapping of the programs' knowledge base to established goals and objectives. As an added benefit, resources were disaggregated to a very granular level and sorted into taxonomies that can be independently referenced and utilized for cross-curricular consumption.

JEL: I23, O31, O32

KEYWORDS: Accountability, Accreditation, Business Education, Quality, Excellence, Online Learning, Semantic Mapping, Semantic Analysis, Learning Assets, Learning Management Systems, Goals and Objectives

INTRODUCTION

Defining, assessing, and evaluating the term “quality” continues to be a challenging and evolving task for all sectors in society. Whether a good or service, defining quality has been heavily reflective of current economic and societal trends; therefore establishing definitions and associated indicators continues to be a highly fluctuant undertaking.

In recent years, however the field of higher education has been abruptly faced with the task of re-defining, re-assessing, re-evaluating, and re-evidencing quality in terms of: (1) online learning objects; and (2) accreditation. Ensuring the alignment of course content against desired goals and objectives has always been at the core of effective instructional course design—whether the instruction is delivered face-to-face, or via the support of distance technologies. Nonetheless, with the latter method of instructional delivery, the architecture of a Learning Management System (LMS) challenges online instructors and Information Technology (IT) departments to locate and/or create digital learning objects that align to goals and objectives.

This challenge is further compounded by increased pressure for accountability and demonstration of learning effectiveness at institutions of higher education. From the organizational perspective, the overwhelming amount of information stored within internal and/or external systems presents a significant

challenge when codification of tacit knowledge is required for accreditation purposes. While keyword and metadata strategies have provided some benefit, these methods suffer from a lack of robustness. As such, they provide only incremental improvements to what remains a highly manual process.

A research and development team at American Public University System addressed these challenges by employing an open source repository and semantic engine for analysis and alignment of content, materials, and learning activities to goals and objectives across all courses within the School of Business. The result was a highly detailed, accurate mapping of the programs' knowledge base to established goals and objectives. As an added benefit, resources were disaggregated to a very granular level and sorted into taxonomies that could be independently referenced and utilized for cross-curricular consumption.

The article is presented in the following sequence: (1) a review of research related to semantic mapping and accreditation; (2) the methodology used to collect and analyze the pertinent data; (3) a discussion of the results, followed by concluding comments and possibilities for further research in semantic mapping in terms of fulfilling accreditation requirements.

LITERATURE REVIEW

Accreditation and Quality

Developed over 100 years ago, accreditation has been a long-standing pillar in education. Narrowly defined, accreditation is a set of standards and competencies used to evaluate an institution's overall organizational effectiveness. Definitions of educational quality and measurement have historically evolved around changing socio-economic forces, thus prompting continual changes and adaptations in institutional practices and policies. It is likely these continuous transformations have contributed to negative perspectives of accreditation as being a cumbersome and obligatory process (Lejeune and Vas, 2009). Viewed in a more positive light, accreditation has the transformative ability to raise institutions to exceeding levels of excellence in teaching and learning.

Accreditation of institutions of higher education are governed by six regional accrediting bodies (Middle States Commission on Higher Education (MSCHE); New England Association of Schools and Colleges Commission on Institutions of Higher Education (NEASC-CIHE); North Central Association of Colleges and Schools Higher Learning Commission (NCA-HLC); Southern Association of Colleges and Schools (SACS); Western Association of Schools and Colleges Accrediting Commission for Community and Junior Colleges (WASC-ACCJC) ; and Western Association of Schools and Colleges Accrediting Commission for Senior Colleges and Universities (WASC-ACSCU) who grant accreditation against overarching criteria including: (1) Mission and Integrity; (2) Preparing for the Future; (3) Student Learning and Effective Teaching; (4) Acquisition, Discovery, and Application of Knowledge; and (5) Engagement and Service. Recent innovative developments against a grim economic backdrop have led to extensive policy changes regarding accreditation criteria. These policy changes have had far-reaching effects for higher education institutions and have also extended to organizations accrediting programs *within* an institution. For online programs, these policy changes have additional implications in terms of aligning content to goals and objectives and for evidencing learning effectiveness.

Online Content Alignment to Goals and Objectives

The rapid growth of a technologically-driven society has triggered limitless opportunities in the areas of teaching and learning—particularly in distance education. Online learning has increasingly become the preferred method of instructional delivery among learners worldwide (Allen and Seaman, 2011). Due to a myriad of components and tools that allow for effective teaching and learning, learning management

systems (LMS) have primarily been the platform of choice for online learning. Nevertheless, this disruptive technology (Christensen, Baumann, Ruggles, & Sadtler, 2006) has also prompted educational leaders who implement learning management systems to determine institutional best practices and policies for this mode of instructional delivery (Anthony, Johnson, Sinfield, & Altman, 2008). Moreover, the unique architecture of a learning management system, has presented new challenges in terms of defining and evidencing instructional quality that starkly contrast traditional definitions and measures.

At the program level, curriculum alignment has always been a critical component for effective face-to-face learning for centuries (Marzano, 2004; Merrill, 1994). Alignment of online learning assets to goals and objectives, however, has necessitated the exploration, evaluation of online learning content (Kay & Knaack, 2007; Krauss & Ally, 2005; Nesbit, Belfer & Vargo, 2002) and how this digital content can be matched to goals and objectives. Historically, this charge has been largely the responsibility of the instructor; however, considered a disruptive technology (Garrison & Kanuka, 2004), online learning has rapidly proliferated and become a priority for several--if not all, areas of higher education.

Online course creators have commonly labored over locating content pertinent to the course(s) they teach. Some may also opt to use packaged educational materials tailored to their specific discipline. Content, or digital objects used to deliver instruction in an LMS are commonly referred to as a *learning object*. The Institute of Electrical and Electronic Engineers broadly defines a learning object as “any entity, digital, or non-digital, which can be used, reused, or referenced during technology supported learning” (IEEE Learning Technology Standards Committee, 2002). Albeit there are many high quality learning objects available, learning objects designed within an institution’s LMS are not reusable (as originally meant to be) as they are either stored privately and/or they are not visible to external systems (Mohammed & Mohan, 2007). The reusability issues, which are common to many IT departments have primarily been due to: (a) misaligned metadata standards (Mohan & Greer, 2003); (b) learning objects that are only reusable within the systems for which they were built and reside; and (c) the lack of semantic metadata. These issues require semantic analysis to efficiently and effectively manage and align digital content; however, this approach has been largely unexplored.

Semantic Mapping Analysis

In the Learning or Content Management System environments, content management frequently translates into a single-purpose allocation of content resources, with cataloging and meta-tagging being a haphazard affair. The amount of stored, yet accessible information is so substantial, that IT departments consistently seek efficient and effective ways to manage and make use of this abundance of information (Gartner Inc. Predicts, 2012). This focus has led to the need to efficiently and effectively design and update online courses. As with any pedagogically-sound instruction, a core requirement in course design must be the alignment of goals and objectives to formative and summative learning activities (Combs, Gibson, Hays, Saly & Wendt, 2008). By automating the meta-tagging and gap analysis process, semantic analysis allows one to not only smartly survey existing learning objects in a specific curriculum area, but also to examine more learning objects across unrealized curriculums. The ability to determine content interrelationships through the mapping of assets across the content universe enables one to effectively and efficiently facilitate object reusability towards curricular goal and objective fulfillment. This process allows for the actualizing of opportunities to locate learning objects to fulfill course level objectives for alignment across course level objectives, programmatic outcomes and industry standards. Improvement of instructional outcomes, through the ingestion of work products from implementation of content distillation and semantic analysis, ultimately increases return on investment and time on task.

Similar to contemporary object oriented programming language, semantic analysis is reliant on defining data in terms of classes with attributes and instances. The vision of the semantic aware applications builds upon this concept by refining these ontologies through comparisons of associated metadata. Currently,

there are two approaches for developing semantic applications; the bottom-up approach and the top-down approach. The bottom-up approach is problematic in that it assumes metadata will be added to each piece of content to include information about its context; tagging at the concept level, if you will. The top-down approach appears to have a far greater likelihood of success, as it focuses on developing natural language search capability that can make those same kinds of determinations without any special metadata (Johnson, Levine, Smith, 2009).

American Public University System (APUS) School of Business

American Public University System (APUS) is a regionally and nationally accredited, private, fully online university offering an extensive variety of fully online academic programs that do not require students to physically attend classes. Demonstrating a commitment to a high quality education for its students, APUS strives “to provide quality higher education with emphasis on educating the nation’s military and public service communities by offering respected, relevant, accessible and affordable, student-focused online programs, which prepare them for service and leadership in a diverse, global society” (APUS website, 2012). The institution’s core values support this mission in the following areas: (a) learning quality; (b) integrity; (c) diversity; (d) freedom of inquiry and expression; (e) accountability; (f) access to underserved; (g) adaptive and responsive; (h) innovation; and (i) collaboration. The institutional mission, vision, and core values support and guide all APUS academic programs, thus demonstrating a continual commitment to quality and excellence in student learning.

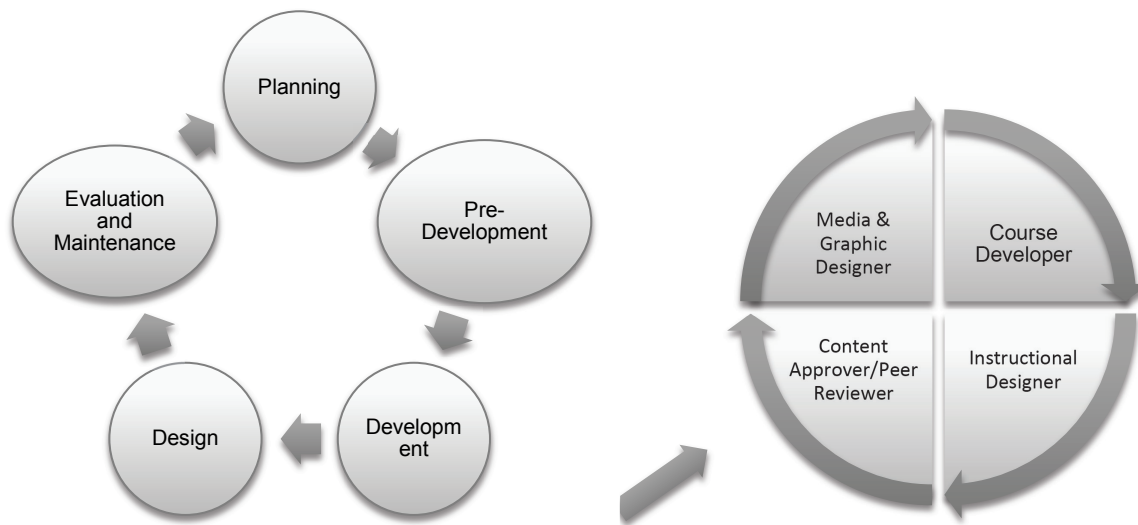
The APUS School of Business offers degrees at the Associate, Bachelor, and Masters levels in Business Administration, Marketing, and Accounting. Accreditation support for these programs is provided by both the Accreditation Council for Business Schools & Programs (ACBSP) and the North Central Association Higher Learning Commission (NCAHLC) in their Business Administration and Marketing academic programs. The ACBSP is a leading accreditation business education association that establishes standards and criteria for demonstrating excellence in baccalaureate/graduate degree programs and schools. Each of the 11 Common Professional Components (CPC) must receive at least the equivalent of two-thirds of an entire course to be considered compliant and include: (1) Learning-Centered Education; (2) Leadership; (3) Continuous Improvement and Organizational Learning; (4) Faculty and Staff Participation and Development; (5) Partnership Development; (6) Design Quality; (7) Management by Fact; (8) Long-Range View; (9) Public Responsibility and Citizenship; (10) Fast Response; and (11) Results Orientation (ACBSP, 2011).

The value of ACBSP accreditation is evidenced in the quality of the programs and the faculty who are attracted to accredited programs. For students enrolled in these programs, accreditation provides two overarching advantages, it: (a) creates the impetus for relevancy and currency of faculty, programs and courses to best serve students; and (b) enhances the ability to serve students by assuring a focus on quality performance. To ensure exceeding levels of academic quality, the APUS Instructional Design department commissioned an outside entity to provide an unbiased and rigorous assessment of Common Professional Components (CPC) coverage in two baccalaureate programs: Business Administration and Marketing. Specifically examined were program- and course-level estimates of instructional time spent on each CPC. In past years, providing evidence of student learning derived from online learning systems has typically been a difficult and time-consuming process—largely due to the inconsistencies in online course design and misalignment of course goals and objectives. Therefore, the results of this study could have substantial implications for managing, streamlining, and refining the process of providing accrediting entities with the required information they need to award initial or renewal accreditation.

APUS ID Process Model

At American Public University System (APUS) the Instructional Design and Development (IDD) Team created an Instructional Design Process Model to design and develop curricula. The APUS ID Process Model is a continuous course development process allowing for the collaboration with Subject Matter Experts (SMEs), Instructional Designers (IDs), Graphic and Media specialists, and Content Area experts both internal and external to the institution. A derivative of the ADDIE model (Molenda, 2003), the APUS Instructional Design Process Model also integrates the foundational principles of the Community of Inquiry (CoI) (Arbaugh, Cleveland-Innes, Diaz, Garrison, Ice, Richardson, & Swan, 2008) and was applied to every step of the process; planning, pre-development, development, design, and evaluation, and maintenance as shown below in Figure 1.

Figure 1: APUS Instructional Design Model



This balanced, six-phase process model is an architecture which enables the team to focus on three important elements of the courseware development. First, the team implemented accepted best practices in online Instructional Design (ID) systems pedagogy, andragogy, and heutagogy modeling to structure overall courseware development. Next, the CoI was applied to the online learning framework in the courseware to ensure successful student outcomes. Finally, the team utilized agile project management principles to allow for collaboration and communication, both internally and with subject matter experts, while still maintaining discipline, quality, and rigor throughout the project’s lifecycle (Staley, Gibson, Ice, 2010).

Three Issues, Three Solutions

Though highly efficient and effective in rapidly creating quality content across a network of over 130 geographically dispersed contributors, the APUS IDD team remains confronted with three problems consistently confounding the field. First, content and learning activities created with the premise that SMEs have a mastery of their area and will ensure that goals and objectives are met through tacit embedding of area knowledge within course structures. However, subject matter experts are human and prone to the same tendency to have expert blind spots; a phenomenon long noted in the traditional classroom (McKeachie, 1986). Second, meta-tagging data is a time intensive process that even when executed with a high degree of accuracy provides little more than key word associations. Finally, because all contributors have knowledge of the underlying taxonomies or common vernacular that the information

is based upon, it is difficult for organizations to survey their content universe for existing objects that can be incorporated into emerging workflows.

As with all institutions, APUS is also confronted with the issue of providing adequate data for accreditation by external entities. Within the accreditation process is the task of demonstrating that curricula fulfills both course level and program level goals and objectives. While the IDD process, described above, is designed to help expedite goal and objective alignment, the limitations previously described still limit the robustness of execution. To solve this problem, APUS investigated the feasibility of using semantic analysis to: (a) match program and course level goals and objectives to course content and activities; (b) create a gap analysis to note where additional resources should be applied to meet goals and objectives; and (c) create robust content repositories that have granular associations between course components and over-arching ontologies that can be applied in a cross-curricular fashion.

Interestingly, the NMC/ELI Horizon Report (2009) indicates that semantically aware applications are not likely to become standard for four to five years, however, a few innovative prototypes are currently being utilized. Even as these applications are still undergoing refinement, the prototypes demonstrate the potential power of semantic applications for both formal and informal learning. The IDD team at APUS vetted several of these cutting edge solutions, both open source and proprietary for the purposes previously described. The Common Library solution, an open source repository available under an Apache 2 license on Source Forge, was ultimately selected.

The Common Library

Developed from the ground-up to address specific needs in education, Common Library (<http://commonlibrary.org>) is the first standards-based content management system to enable true collaborative potential through the integration of content development and social networking. The Common Library latent semantic search engine defines a unique and powerful aspect of the application. In the current 2.0 implementation of the system, the metadata and content of each learning object are compared against defined standards systems. As shown below in Figure 2, the higher-order logic of the Learning Object Lifecycle enables the Common Library to dynamically suggest interconnections between content items and applicable state standards, providing immediate value for users in the K-12 educational market. This functionality also defines the potential for constructing dynamic relationships between state standard systems that evolve over time.

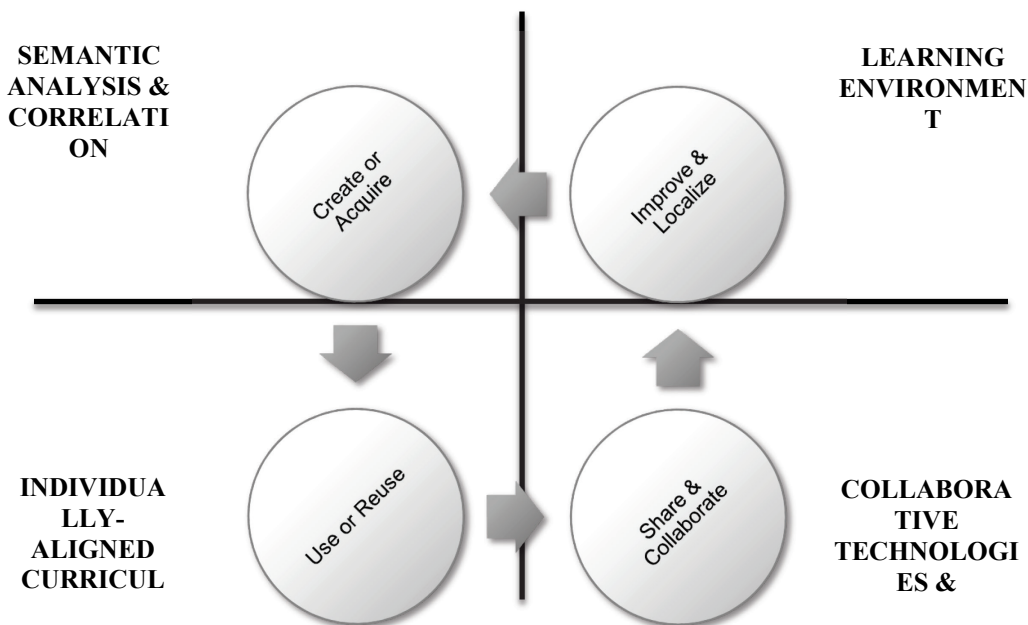
Implementation of search and aggregate technology generates references that feed new granularly addressable connections between content and curriculum structures as new knowledge of individual user requirements is acquired.

METHODOLOGY

An instance of this solution was stood up for the APUS IDD team and all course components for the APUS Business Program were federated during the fall 2010 academic semester. As semantic analysis is an emerging technology it is still considered somewhat suspect in the realm of higher education. To assess efficacy, random sampling of Common Library output--both matching and gap analysis, was compared against human to Common Library agreement, as well as human to human agreement. An interrater reliability analysis using the Kappa statistic (Landis & Koch, 1977) was performed to determine consistency among raters. The first test (human to Common Library interrater reliability) was established at $Kappa = .90$ ($p < 0.001$). For the second instance (human to human agreement), the interrater reliability was established at $Kappa = .93$ ($p < 0.001$). Thus, following values of Kappa ranges: (a) 0.40 to 0.59

(moderate); (b) 0.60 to 0.79 (substantial); and (c) 0.80 (outstanding), the reliability of the Common Library analysis would be considered outstanding when compared to human analysis.

Figure 2: The Learning Object Lifecycle



This figure shows the processes of a learning object lifecycle according to the four areas in which each process correlates. The higher-order logic of the Learning Object Lifecycle enables the Common Library to dynamically suggest interconnections between content items and applicable state standards, providing immediate value for users in the K-12 educational market.

After disaggregation of the materials, a granular analysis was conducted using Common Library's underlying latent Dirichlet analysis engine (Neal, 2000; Ramamoorthi & Srikanth, 2007; Yu, Yu, Volker Tresp, 2005). The Granularity Model (Figure 3) demonstrates the full mapping of program goals and objectives that were created across the content universe. Where incidents of deficiency were noted, remedial action was taken to provide additional resources.

RESULTS AND DISCUSSION

Content and activities from 29 courses in the APUS Business Program were federated in Common Library. Disaggregation of content yielded 5227 granular level assets and ontological ordering, using Dirichlet analysis, was conducted and categorical structuring was implemented using an iterative, multi-pass approach. A total of 538 goals and objectives, from both the program and course level, were input into the system. Using a natural language approach, these goals and objectives were specified as being representative of over-arching ontological structures. From this point, information from the granular asset analysis was converged on the goals and objectives.

Of the 538 goals and objectives, matches were identified among 465 respective assets. The asset match ranged in scope from between two and 38 assets per goal. With respect to identification of gaps, 73 goals and objectives were identified for which there were no corresponding assets. These areas were noted and recommendations were made to the School of Business. Subsequent content development, which was added to the existing repository, resulted in a second run in which all but three goals and objectives could

clearly be mapped to corresponding course content and activities. Application of this technique allows for large-scale analysis of correlations between goals / objectives and associated course assets. In turn, the ability to identify areas of deficiency and construct learning pathways ensures that all desired goals / objectives are addressed in a timely and thorough fashion. While not yet implemented, the ability to aggregate student work products, as well as discussion threads, also exists. Using this approach the power of semantic analysis can be extended to include relating learning outcomes back to goals / objectives, providing a complete map of the learning cycle.

Figure 3: Granularity Model

MODEL HIERARCHY	Outcome Based Curricula
	Course of Instruction
	Content Source
	Course Concepts
	Concept Component - Chapter
	Concept Sub-Component
	Concept Element
	▼ Molecular Learning Object
	Concept Content Asset
REPRESENTATIVE DETAIL	Masters of Science Integrated Marketing Communications
	MKT 300 Marketing Management
	Principles of Marketing
	Understanding Marketing & the
	+ Creating Customer Value
	-What is Marketing
	Case Study
	<ul style="list-style-type: none"> • Marketing Case Summary • Need Questions for Discussion • Value Questions for Review
	<ul style="list-style-type: none"> Suggestions for Further Study Additional Exercises Objective Class Plan Take-home Assignment In-class Case Discussion Role-play Assignment Analysis etc.
	-Marketing Management
	-Marketing Philosophy
	-Modern Marketing
	+ Strategic Planning
	+ Marketing Environment
Developing Marketing Opportunities	

The ability to rapidly map assets to goals and objectives is significantly more effective when using a semantic engine than when similar processes are implemented by human coders. For this implementation, 137 hours were required from the IDD Team, project management, and technical personnel. A corresponding test case revealed that mapping one course against goals and objectives required 64 hours. When expanded to the 29 course sequence that was reviewed the mapping process would have translated into 1856 hours. Thus, the application of semantic analysis resulted in a 92.7% reduction in human labor. Translated into monetary terms the savings, including fringe benefits would be approximately \$80,000 (U.S.).

Notably, standing up the instance of Common Library required 32 hours which will not be required in future mapping initiatives. Given the demands of mapping for both internal and external purposes, and including multiple programs, it is easy to visualize how this technique could result in savings of over \$200,000 per year while drastically streamlining institutional course review and development processes.

The ROI on this later aspect should be the subject of more comprehensive program evaluations for instance of implementing this technique.

Evidence illustrates that the ability to roundtrip content and goals / objectives is a key benefit of this process. In other words, a content universe can be checked for assets that are linked to goals and objectives or individual assets may be viewed and their correlation to goals and objectives are then identified.

CONCLUDING COMMENTS

From an ID perspective, semantic analysis of content allows for confirmation that all goals and objectives have been fulfilled, as well as identification of existing gaps and the need for generation of other materials. In addition, instructional designers can rapidly identify existing assets that can be repurposed for use in new courses or programs; thus delivering on the concept of highly reusable learning objects. This latter capability is especially useful in instances where unrealized cross-curricular content may have already been developed but not realized due to programmatic silo effects and the related lack of awareness on the part of subject matter experts.

At the institutional level, this technique provides administrators the ability to rapidly assess existing materials and effectively plan for future staffing and development needs. When approaching accreditation, either regional or program specific, institutions become empowered to designate only those resources necessary to insure success, as opposed to current models in which countless hours are spent by faculty and staff checking and rechecking documentation to avoid potential lack of compliance. Presently APUS has engaged full time staff to extend upon this study by systematically applying semantic analysis to over 1500 courses, with the intent of facilitating continuous quality improvement across the institution.

With respect to the accreditation process itself, governing bodies can leverage semantic analysis to make processes far more transparent and efficient. On demand any goal or objective can be produced and corresponding content reviewed, alleviating the need for countless hours of spot checking manually compiled materials. However, it should be noted that this process also brings with it virtually unlimited transparency into any organization, thus increasing the level of scrutiny evaluators may apply.

Moving forward, semantic analysis has to potential to allow for round-tripping of student data. In other words, student work products could be ingested into semantic engines in the same fashion as content. Goal matching could then be applied to each students work and correlations that demonstrate fulfillment of objectives identified. When this process is achieved the ability to assess learning outcomes will be automated in the same fashion as content alignment, shedding complete transparency upon the academy.

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