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### **\*\*2018 NABET CONFERENCE – BEST PAPER**

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# **Journal of Business, Economics and Technology**

Journal of the National Association of Business, Economics and Technology

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The continuing goal of the *Journal of Business, Economics and Technology (JBET)*, formerly the Journal of the Northeastern Association of Business, Economics and Technology, is the publication of general-interest business and economics articles that demonstrate academic rigor, while at the same time are readable and useful to others in academia. Consistent with these goals, this and future issues of JBET presents authors' papers in the three research categories recommended by AACSB: Research that advances the knowledge of business and management theory (Theoretical), Research that advances the practice of business and management (Practice), and Research that advances learning/pedagogy (Pedagogical).

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The current acceptance rate for JBET is roughly 35%. We have striven to accept only high-quality research, while at the same time maintaining JBET as a realistic publishing outlet for business, economics and Information Technology faculty throughout the United States. Key to this process is our referees who have worked hard to help "grow" papers that have significant potential by providing authors with critical review comments. We generally require two to three rounds of review prior to accepting articles for publication. At the same time, we are attempting to shorten the average review time for each article to less than three months.

In the current issue, among other excellent papers, we are pleased to publish the Best Paper Award winner from the 2018 NABET Annual Meeting: *Patents, Technology, Downsizing and Changes in Idiosyncratic Risk*. This fine paper has been authored by three professors from Fairleigh Dickinson University: Dr. Xiaohui Yang, Dr. Karen C. Denning and Dr. E. James Cowan.

**JBET Research Notes** include, but are not limited to updates to previous work, additions to established methods, relatively short articles, research where the thesis is narrow in scope, null results, case series, research proposals, and data management plans: Articles of good quality which cannot be considered as full research or methodology articles. Further, each article in the Research Notes category has undergone the same double-blind peer review process as all articles that are published in JBET. For the papers in the Research Notes section of the 2019 Issue, we encourage further development of those articles. At JBET, we support the research community across all of the disciplines of Business, Economics, and Information Technology by providing this forum for sharing information and data regarding the works-in-process of our constituents.

We thank the officers of the National Association of Business, Economics and Technology, the NABET Executive Board, as well as all of the referees who reviewed articles for this issue.

Norman C. Sigmond, Editor  
Kutztown University of Pennsylvania

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# EARNINGS PERSISTENCE AND LEVELS OF THE ACCRUAL RATIO AND DISCRETIONARY ACCRUALS

Kwadwo Asare, Bryant University

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## ABSTRACT

This paper evaluates how persistent earnings and its accrual and cash flow components are conditional on the modified Jones Model discretionary accruals and the accrual ratio. Consistent with prior research cash flows are more persistent than both earnings and the accruals component of earnings. While the difference in persistence of the extreme deciles of Discretionary Accruals are not very large, those of the Accrual Ratio are much larger, suggesting that the Accrual Ratio can be a simple but effective gauge of earnings persistence and can complement Discretionary Accruals as a measure of the persistence dimension of earnings quality.

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## INTRODUCTION

The accrual ratio is the ratio of the accrual component of earnings scaled by average net operating assets. Since earnings backed by cash are deemed more sustainable than those backed by accruals, larger accrual ratios denote lower quality earnings (e.g., CFA Institute, 2018). While discretionary accruals as a measure of earnings quality has been extensively studied in the accounting literature (some popular examples include Sloan 1996, Dechow & Dichev 2002, Collins et al., 2003, Graham et al. 2005, and Dichev et al, 2013), the accrual ratio, favored by analysts and other investment practitioners, has been less examined in the accounting literature<sup>1</sup>.

The accounting and investing professions have long been buffeted by how best to gauge the quality of a publicly traded firm's earnings. The academic profession has relied largely on measures of "discretionary accruals", gauges of accruals that are beyond the norm given a firm's operations. But each of those measures is wrought with its own unique limitations (see for example, Hribar and Collins 2002, Ball and Shavikumar 2006, Owens et al., 2017.)

Furthermore, as business models have changed in an increasingly global world, the relation between accruals and cash flows have declined (Bushman et al., 2016). This trend potentially reduces the descriptive power of discretionary accrual models based largely on working capital accruals. Leuz and Wysocki (2016) emphasize the importance of evaluating alternative means of gauging earnings and disclosure. While the Accrual Ratio may not have the statistical sophistication of discretionary accrual models, it is apparent from the CFA Institute and CFA exam review materials that the Accrual Ratio is an important practitioner tool for gauging earnings quality. The CFA Institute review materials for the CFA exams emphasize the importance of assessing earnings quality generally and the importance of the accrual ratio as a measure of the quality of earnings (CFA Institute, 2018).

Both academic and practitioner gauges of earnings management (e.g., the accrual ratio and discretionary accruals respectively) are measured with error because managed earnings are unobservable. Given the imperfection in both measures, each measure can complement the other to help investors improve their evaluation of earnings quality.

This study is important for several reasons. First, discretionary accruals are not as easy to estimate as the accrual ratio, making it less accessible to the larger investment community including even sophisticated market participants like analysts. For example, analysts would not only require access to large data sets of firm financial data but would also have to be well trained in estimating and interpreting economic models like the Jones and Modified Jones Models used to calibrate discretionary accruals. No such access to large data sets and training is required to estimate and interpret the accrual ratio.

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<sup>1</sup> For example, a Google search of the term "accrual ratio" yields links to Investopedia, CFA Institute and the CFA exam-related materials. An identical search on Google Scholar yields links to accrual and earnings quality-related studies but none explicitly mentions the Accrual Ratio. Thus, the Accrual Ratio is primarily a practitioner measure. For example, it is the primary measure of earnings quality in review materials for Level II of the CFA series of exams (e.g., CFA Institute 2018).

Second, the accrual ratio can provide complementary information to academic measures like discretionary accruals (and vice versa), helping refine and improve investment decisions, which in turn helps improve capital allocation in the economy. This paper responds to Leuz & Wysocki's (2016) call for complementary measures of the quality of disclosure. Since accruals that are more difficult to map to cashflows are less transparent (e.g. discretionary accruals), improving gauges of accrual quality contributes to reducing information asymmetry in the capital markets.

Finally, while prior literature has decomposed earnings into accrual and cash flow components to gauge their differential persistence and valuation implications (e.g., Sloan, 1996, Fairfield et al. 2004, Richardson et al., 2005), I am unaware of any paper that has explicitly evaluated the Accrual Ratio or compared it to discretionary accruals, the preferred academic measure of earnings quality. Specifically, this is the first paper of which I am aware that compare the properties of earnings based on the levels of these two disparate measures of earnings quality in the context of persistence. While Richardson and Tuna (2008) explore the Accrual Ratio in a chapter of "International Financial Statement Analysis", it is a text of the CFA Institute, focused on training analysts, not a research paper.

In this study, I evaluate the relative informativeness of the two measures – discretionary accruals and the accrual ratio – in the context of persistence. I demarcate my sample into increasing deciles of Discretionary Accruals (measured using two-digit SIC codes) and regress year  $t$  earnings and earnings components on year  $t-1$  earnings and earnings components respectively. I run the same regressions for the middle six deciles that serve as a holdout sample for comparison. I estimate identical regressions after demarcating the same sample of firm-years into deciles based on increasing measures of the Accrual Ratio<sup>2</sup>.

I find that cash flows are more persistent than both earnings and accruals, consistent with Sloan (1996). While the difference in persistence between the top and bottom two deciles of Discretionary Accruals is not very large, that between the corresponding Accrual Ratio deciles is much larger. This suggests that the Accrual Ratio may be an overlooked, simple, but effective gauge of earnings quality.  $\chi^2$  tests of the coefficients of the top two and bottom two deciles of the Accrual Ratio and Discretionary Accruals confirm that while there are significant differences in persistence between the top and bottom two deciles of both measures, the difference for the Accrual Ratio is much larger. When earnings are decomposed into their accrual and cash flow components the differences in  $\chi^2$  statistic between the Accrual Ratio and Discretionary Accrual sorting of the data suggest that virtually all the difference in persistence are driven by differences in persistence of the accrual component of earnings, suggesting that the Accrual Ratio holds incremental complementary information about earnings quality.

The rest of the paper is organized as follows. I present the literature and hypotheses in the next section, the research design and data in Section 3 and the results in Section 4. I discuss the results and conclude in Section 5.

## LITERATURE AND HYPOTHESES

Top gauges of earnings quality in the accounting literature include level of accruals, persistence and smoothness. Persistence, how well an accounting number in year  $t$  predicts the same number in year  $t+1$ , is an important criterion for evaluating the quality of inputs to equity valuation<sup>3</sup>. Examples of such studies include Sloan (1996), Finger (1994), Xie (2001), and more recently, Richardson et al., (2006) and Allen et al., 2013. The idea behind using persistence as an earnings quality gauge is that a more persistent number is more predictable for a longer period into the future, making it a better input to valuation (Dechow et al. 2010).

Accrual accounting helps accounting to match the economic benefits and costs that entities derive from economic events to the periods in which those benefits and related costs occur. However not only are accruals prone to manipulation, especially when management faces pressures to meet earnings targets, but also, economic models that attempt to capture the earnings process face challenges that threaten their reliability. For example, to model the tendency of accruals to reverse and for earnings to map into future cash flows, Dechow & Dichev (2002) propose an accruals model that is a function of past, current, and future cashflows. Dechow & Dichev (2002) restrict their model to working capital accruals and so excludes long-term accruals, while Richardson et al. (2006) find that accruals that are unrelated to sales growth are more easily manipulated and are less persistent. Recently, Bushman et al. (2016)

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<sup>2</sup> I present details of how the Accrual Ratio is calculated in the Appendix.

<sup>3</sup> These are primarily earnings and its cash flow and accrual components.



have contended that the relationship between accruals and cashflows over the last several decades have declined, making Leuz et al.'s (2011b) call for alternative measures of earnings quality even more prescient.

Another issue that challenges the validity of models of discretionary accruals is the conditional conservatism of accounting, where losses are recognized in a timely manner, but gains are not (e.g. Ball & Shavikumar 2006). Still, the extent to which losses and gains are differentially recognized in practice as well as the role non-working capital accruals play in accrual quality are relatively less explored.

Similarly, increased mergers and acquisitions introduce random shocks that can distort models of discretionary accruals. For example, Hribar and Collins (2002) document that mergers and acquisition activity that are correlated with the partitioning variable of earnings management can bias empirical results toward presence of earnings management when there is none if accruals are measured from the balance sheet. More recently Owens et al. (2017) make a similar finding that random shocks introduced by mergers, acquisitions and divestitures, for example, make it difficult to refine models of abnormal accruals.

Furthermore, Bushman et al., 2016 reinforce this sentiment of the difficulty of economic models of abnormal accruals capturing the appropriate relation between accruals and cash flows by documenting that the explanatory power ( $R^2$ ) of regressing accruals on cash flows have declined from about 90% in the 1960s to about 20% in recent years. Similarly,  $R^2$  of regressing changes in accruals on changes in cash flows have declined from about 70% in the 1960s to about zero in recent years.

Given the challenges of capturing accurately the economic relation between accruals and cash to gauge managed versus unmanaged accruals, an alternative measure of earnings quality is more likely to complement existing models of earnings quality.

Furthermore, since the Discretionary Accruals has been documented as being exploited by institutional investors (Collins et al., 2003), it is more likely that the Accrual Ratio, a less popular measure, would be a stronger differentiator of earnings quality.

This study extends the earnings quality literature by evaluating the relative information content of discretionary accruals and the accrual ratio by demonstrating that the accrual ratio can be a complement to discretionary accruals when measuring the quality of earnings. The paper's hypothesis reflects this.

**H:** The Accrual Ratio is a stronger distinguisher of earnings quality as measured by persistence than is Discretionary Accruals.

## RESEARCH DESIGN AND DATA

I obtain company accounting information from Compustat. I require each firm to have sufficient data to calculate discretionary accruals based on the Modified Jones Model (Jones 1991, Dechow et al., 1995), the Accrual Ratio, and related control variables. I require at least nine observations per two-digit SIC code to be included in the discretionary accrual estimation. Customarily, I exclude the highly regulated financial and utility industries. The final sample has 62,298 firm-year observations spanning 1988 to 2014<sup>4</sup>. I sort the data into deciles of discretionary accruals estimated based on two-digit SIC codes as well as on accrual ratios<sup>5</sup>.

### Choice of Accrual Measure

I use the Modified Jones Model Discretionary Accruals for two reasons. First, though Dechow & Dichev (2002) improve the  $R^2$  of prior discretionary accrual measures by mapping accruals into past, current and future cash flows, their measure is unsigned and excludes long term accruals such as those linked to Property Plant and Equipment (PPE).

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<sup>4</sup> While I attempt to include as much firm years in my analysis as possible, only data through 2014 was available in all the databases I used when the foundational analysis was done.

<sup>5</sup> The data are sorted cross-sectionally. That is, the first level of sorting is the accrual measure, the second, is the unique firm identifier, and finally the year.

Second, according to Dechow et al., (2010), the Kothari et al., (2005) performance-matched Jones Model is more likely to add noise to the abnormal accrual measure as the matched firm's ROA could also be managed.

I evaluate if persistence varies by level of discretionary accruals and the accrual ratio by estimating the following models for the top two, bottom two and middle six deciles of the Accrual Ratio and Discretionary Accruals.

$$ROA_t = \alpha + \beta ROA_{t-1} \quad (1a)$$

$$ROA_t = \alpha + \beta_1 ACCRUAL_{t-1} + \beta_2 CFO_{t-1} \quad (1b)$$

$$ACCRUAL_t = \alpha + \beta_1 ACCRUAL_{t-1} \quad (2)$$

$$CFO_t = \alpha + \beta_1 CFO_{t-1} \quad (3)$$

Where

$CFO_t$  = Cash Flow from Operations for year t,

$ACCRUAL_t$  = Net Income – Cash Flow from Operations for year t.

Both CFO and ACCRUAL are scaled by Average Total Assets and t is a time subscript in years. The definitions of the Accrual Ratio and Discretionary Accruals are in the Appendix .

All regressions are estimated cross-sectionally by firm year and with White-corrected heteroscedasticity-consistent (i.e., robust) standard errors, which should make inferences from them appropriate (Greene, 2003).

## RESULTS

### Univariate Statistics

The data spans a wide spectrum of industries, covering 62 two-digit SIC codes. There is also wide variability in the data and the average size of firms in the data skews small, with average total assets and market value in the \$2.2 billion range, the corresponding standard deviations in the range of \$4.4 billion to \$5 billion reinforces the point of wide variability in the data (Table 1a). I compare the descriptive statistics of the top and bottom two deciles of the Accrual Ratio in Table 1b and those based on Discretionary Accruals in Table 1c.

Unsurprisingly the mean of signed discretionary accruals is much smaller than that of absolute discretionary accruals. Correlations among the primary variables used in the paper are in Table 2. As expected, the correlation between Total Accruals and Accrual Ratio is high, at .34 ( $p < .05$ ) but that between Discretionary Accruals and the Accrual Ratio, at .07, is low but significant ( $p < .05$ ). The low correlation suggests that Discretionary Accruals and the Accrual Ratio are likely to be complementary rather than substitutes. While most of the other pairwise correlations are significant, the coefficients tend to be small. To allay any related concerns, I estimate all regressions with White-corrected robust standard errors helping ensure that regression coefficients are unbiased.

These comparisons suggest that the Accrual Ratio likely conveys incremental information beyond that contained in Discretionary Accruals. Table 1b shows that firms with high Accrual Ratios tend to have higher incomes and tend to be larger (Average Total assets of \$1.26 billion versus \$1.17 billion). On the other hand, firms with low Discretionary Accruals tend to earn less income and tend to be larger (\$6.4 billion versus about \$1.8 billion in Average Total Asset) (Table 1c). What is common between both sorts of the data is that in both cases, high accrual firms tend to have higher Z-scores' suggesting they face higher levels of financial distress compared to their low accrual counterparts.

[See Tables 1: a, b and c; and Table 2 at the Appendix]

### Multivariate Results

I first run persistence tests that are not conditioned on the level of accruals. Those results (see Table 3a) show that cash is the more persistent, and accrual-based income the least. Consistent with accruals being designed to smooth out the potential for wide variability in cash flows (e.g., Dechow 1994), net income is a blend of both. Next, I include the deciles of Accrual Ratio and Discretionary Accruals in the earnings persistence model (Table 3b).

The positive coefficients on Accrual Ratio Decile and the interaction of the Accrual Ratio Decile and lagged ROA suggests that firms with large accrual ratios tend to have more persistent income (Column 1, Table 3b). This can be explained by the facts that the Accrual Ratio captures both managed and unmanaged earnings and accruals can be managed to achieve higher persistence. On the other hand, the combined coefficients of Discretionary Accrual Decile and the interaction of lagged ROA and Discretionary Accrual Decile is negative, suggesting that lower discretionary accruals tend to be associated with incrementally higher persistence (Column, 2, Table 3b). This result is consistent with Discretionary Accruals being designed to capture only managed earnings, albeit with some error.

When earnings are decomposed into their accrual and cash flow components, higher levels of accruals are associated with incrementally lower persistence (columns 3, 4 and 5, Table 3b) but the results for cash flows (last two columns, Table 3b) are consistent with the results for overall net income (ROA). That is high Accrual Ratios are associated with incrementally higher persistence while high discretionary accruals are associated with incrementally lower persistence. In the next two sub-sections, I evaluate persistence of income and income components after sorting the data by the levels of Accrual Ratio and Discretionary Accrual respectively.

[See Tables 3a and 3b at the Appendix]

### **Persistence based on Accrual Ratio Sorting**

Persistence tests of the bottom two deciles of Accrual Ratio are in Table 4a, the middle six in Table 4b, and the top two in Table 4c. The persistence of earnings (ROA) increases as Accrual Ratio increases (Column 1, tables 4a, b and c) -- .599, .639 and .841 respectively. When earnings are decomposed into their accrual and cash flow components (Column 2 tables 4a, b and c), the monotonic increase in earnings persists in both the accrual and cash flow components. The accrual components are .314, .454, and .495 respectively while the cash flow components are .821, .822, and 1.022. This confirms the results from the Table 3b: the increasing persistence of earnings and its components as accrual ratio increases reflects that the Accrual Ratio captures both managed and unmanaged earnings and that earnings can be managed to achieve high persistence.

When the persistence of the accrual and cash flow components of earnings are estimated separately (Column 3 of Tables 4a, b, and c), the persistence of accrual increases monotonically in Accrual Ratio from bottom two to top two deciles -.129, .222, and .348 while cash flows persist at the rates of .814, .747, and .864 from bottom two through middle 6 to top two deciles of the Accrual Ratio.

[See Table 4a, b, c at the Appendix]

### **Persistence based on Discretionary Accrual Sorting**

The bottom two deciles of Discretionary Accruals are in Table 5a, the middle six in Table 5b, and the top two in Table 5c. Earnings (i.e., ROA), persists at the rates of .753, .759 and .648 from the lowest to the top deciles of Discretionary Accruals (Column 1 of Tables 4a, b and c). When earnings are decomposed into their accrual and cash flow components, accruals persist at the rates of .602, .449 and .510 while the persistence of cash flows decline monotonically from 1.112 for the bottom two deciles, through .956 for the middle six deciles to .824 for the top two deciles (Column 2 of Tables 5a, b, and c).

When the persistence of the accrual and cash flow components of earnings are estimated separately (Column 3 of tables 5a, b, and c), there does not appear to be any systematic pattern in persistence of both accrual and cash flow from bottom two to top two deciles of Discretionary Accruals. Accruals persist at the rates of .389, .232, and .302 while cash flows persist at the rates of .678, .830 and .785.

[See Table 5a, b, and c at the Appendix]

### **Test of difference in persistence of earnings and earnings components of top and bottom two deciles of Accrual Ratio and Discretionary Accruals**

It is estimated that Seemingly Unrelated Regressions (SUR) of the persistence models to evaluate the differences between top and bottom deciles of the two measures of earnings quality. The test statistic for the null hypothesis that

$\beta_{\text{TOP2}} - \beta_{\text{BOTTOM2}} = 0$  follows a  $\chi^2$  distribution with 1 degree of freedom. As Table 6 shows, almost all coefficients show significant differences between the top two and bottom two deciles but those based on the Accrual Ratio sorting display much larger differences (evidenced by the larger test statistics and significance levels). When earnings are decomposed into their accrual and cash flow components the differences in  $\chi^2$  statistics between the Accrual Ratio and Discretionary Accrual sortings of the data suggest that virtually all the difference in persistence are driven by differences in persistence of the accrual component of earnings (compare statistics in Panel A to those of Panel B of Table 6). These results suggest that the Accrual Ratio bears incremental information that can complement Discretionary Accruals to help investors evaluate earnings quality more rigorously in their investment decisions.

[See Table 6 at the Appendix]

Collectively these results suggest that the Accrual Ratio holds information content incremental to Discretionary Accruals. Importantly firms with low accrual ratios tend to have lower earnings persistence than firms with higher Accrual Ratios. The higher persistence of earnings and the accrual component of earnings of high Accrual Ratio firms reaffirms that accruals can be used to achieve higher earnings persistence. The smaller differences found for bottom and top two deciles of Discretionary Accruals may be a result of sophisticated investors' attempts to arbitrage on the accrual anomaly since the publication of Sloan (1996) (Collins et al., 2003). This in turn makes the case for using the Accrual Ratio as a complementary measure of earnings quality.

## DISCUSSION AND CONCLUSION

In both sorts of the data, the cash flow component of income is the most persistent and income itself is more persistent than accruals as it is a combination of cash flows and accruals. However, whereas the Accrual Ratio sort shows a monotonic increase in persistence as the ratio increases, the opposite is the case for the Discretionary Accrual sort, though the persistence of income increases slightly in the middle deciles. Also, the difference in persistence between the top and bottom two deciles of the Discretionary Accrual sort is not very large. Again, this partly reflects the effect of arbitrageurs. Still, the larger differences between the top and bottom two deciles of Accrual Ratio in the persistence regressions suggest that the Accrual Ratio can provide information that can complement Discretionary Accruals as an earnings quality gauge.

Recent research on earnings management has documented that to circumvent being “caught” top management is structuring real economic transactions to achieve specific near-term earnings goals (e.g., Graham et al., 2005, Dichev et al. 2013). This may be contributing to the higher persistence of firms with high Accrual Ratios. Future research can explore the extent to which real transaction designed to achieve specific earnings goals map into the Accrual Ratio and Discretionary Accruals respectively. The challenge is identifying which transactions were motivated by earnings management. Since the research that have identified real earnings management have largely been achieved through surveys, using the survey approach can help researchers to understand better the timing and types of such transactions as a first step to the mapping to the gauges of earnings quality.

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## APPENDIX

### 1. Estimation of Discretionary Accruals (DISC-ACCRUAL)

I estimate Discretionary accruals using the Modified Jones Model proposed by Dechow et al. (1995, restated here as Equation 6).

$$\text{TOTACC}_t = \alpha + \beta_1(\Delta\text{SALES}_t - \Delta\text{REC}_t) + \beta_2\text{PPE}_t + \varepsilon_t \quad (6)$$

Where

$\text{TOTACC}_t$  = Total Accrual, measured as Net Income – Cash Flow from Operations

$\Delta\text{SALES}_t$  = Change in Sales from the prior year

$\Delta\text{REC}_t$  = Change in Receivables from the prior year

$\text{PPE}_t$  = Property, Plant and Equipment

$\varepsilon_t$  = Error term (residuals) representing the measure of discretionary accruals, DISC-ACCRUAL.

Equation 6 is estimated at the 2-digit SIC code level and I require there to be at least nine observations per SIC code to enter the sample.

### 2. Calculation of the Accrual Ratio

I estimate the Accrual Ratio as follows:

Total Operating Assets = Total Assets – Cash – Marketable Securities – Cash Equivalents

Total Operating Liabilities = Total Liabilities – Long Term Debt – Short Term Debt

Net Operating Assets = Total Operating Assets – Total Operating Liabilities

Total Accruals<sup>CF</sup> = Net Income – Cash Flow from Operations – Cash Flow from  
Investing Activities

Total Accrual<sup>BS</sup> = Net Operating Assets<sub>END</sub> – Net Operating Assets<sub>BEG</sub>

Accruals Ratio<sup>CF</sup> = Total Accruals<sup>CF</sup> / (NOA<sub>END</sub> + NOA<sub>BEG</sub>) / 2

Accruals Ratio<sup>BS</sup> = Total Accruals<sup>CF</sup> / (NOA<sub>END</sub> + NOA<sub>BEG</sub>) / 2

Where

NOA<sub>END</sub> and NOA<sub>BEG</sub> are ending and beginning Net Operating Assets respectively,

Total Accruals<sup>CF</sup> is Total Accrual calculated from the Statement of Cash Flow,

Total Accruals<sup>BS</sup> is Total Accrual calculated from the Balance Sheet,

I use the Statement of Cash Flow based Accrual Ratio due to the risk of the effect of non-articulation events such as mergers and acquisitions on the Balance Sheet (Hribar and Collins 2002). Larger Accruals Ratios denote lower earnings quality.

**Table 1a**

	Mean	1st Quartile	Median	3rd Quartile	Std. Dev.
ROA	-0.0	-0.02	0.04	0.09	0.19
Book-to-Market	0.6	0.27	0.46	0.75	0.48
Discretionary Accruals	\$-64.6	\$-46.99	\$-0.25	\$26.89	\$283.17
Absolute Discretionary Accruals (\$millions)	\$148.7	\$10.36	\$33.96	\$114.99	\$307.44
Accruals Ratio (Cashflow-based)	0.0	-0.02	0.01	0.05	0.14
Accrual Income / Avg TA	-0.1	-0.10	-0.05	-0.01	0.11
CFO / Avg TA	0.1	0.02	0.08	0.14	0.15
Loss Year	0.3	0.00	0.00	1.00	0.46
Net Income (\$millions)	\$93.5	\$-3.83	\$10.29	\$66.84	\$250.45
Average Total Assets (\$millions)	\$2,210.9	\$103.43	\$367.43	\$1,555.52	\$4,824.02
Market Value of Equity (\$millions)	\$2,208.7	\$109.52	\$409.20	\$1,650.61	\$4,475.85
Total Assets (\$millions)	\$2,296.3	\$107.42	\$383.58	\$1,626.52	\$5,002.14
<i>N</i>	62,298				

Table 1a: Descriptive Statistics - Primary Variables



**Table 1b:** Mean and Median Difference Tests of Top and Bottom Two Deciles of the Accrual Ratio

	Mean (Bottom 2 Deciles)	Mean (Top 2 Deciles)	p-value	Median (Bottom 2 Deciles)	Median (Top 2 Deciles)	p-value
ROA	0.02	-0.16	0.00	0.07	-0.11	0.00
Book-to-Market	0.43	0.60	0.00	0.34	0.44	0.00
Discretionary Accruals (\$millions)	-3.91	-89.89	0.00	7.63	-8.62	0.00
Absolute Discretionary Accruals (\$millions)	\$98.73	\$135.93	0.00	\$25.77	\$25.87	0.84
Accruals Ratio (Cashflow-based)	0.17	-0.18	0.00	0.12	-0.11	0.00
Accrual Income /Avg TA	-0.02	-0.16	0.00	-0.02	-0.14	0.00
CFO / Avg TA	0.03	-0.01	0.00	0.07	0.04	0.00
Loss Year	0.24	0.71	0.00	0.00	1.00	0.00
Net Income (\$millions)	75.10	-5.37	0.00	11.52	-12.10	0.00
Average Total Assets (\$millions)	\$1,264.10	\$1,169.33	0.03	\$219.62	\$171.39	0.00
Market Value of Equity (\$millions)	\$1,756.69	\$1,034.11	0.00	\$382.06	\$169.68	0.00
Total Assets (\$millions)	\$1,417.16	\$1,142.15	0.00	\$253.87	\$162.94	0.00
<i>N</i>	62,298					

**Table 1c: Mean and Median Difference Tests of Top and Bottom Two Deciles of the Disc. Accruals**

	Mean (Bottom 2 Deciles)	Mean (Top 2 Deciles)	p-value	Median (Bottom 2 Deciles)	Median (Top 2 Deciles)	p-value
ROA	0.05	0.01	0.00	0.06	0.04	0.00
Book-to-Market	0.65	0.52	0.00	0.52	0.42	0.00
Discretionary Accruals	157.02	-371.52	0.00	100.66	-181.46	0.00
Absolute Discretionary Accruals	205.96	396.28	0.00	100.66	181.46	0.00
Accruals Ratio (Cashflow-based)	0.03	-0.01	0.00	0.02	-0.00	0.00
Accrual Income /Avg TA	-0.02	-0.11	0.00	-0.03	-0.08	0.00
CFO / Avg TA	0.06	0.11	0.00	0.08	0.11	0.00
Loss Year	0.19	0.29	0.00	0.00	0.00	0.00
Net Income (\$millions)	\$102.85	\$246.66	0.00	\$20.96	\$97.10	0.00
Average Total Assets (\$millions)	\$1,766.22	\$6,363.86	0.00	\$468.71	\$2,950.65	0.00
Market Value of Equity (\$millions)	\$1,754.03	\$6004.02	0.00	\$437.34	\$2,951.60	0.00
Total Assets (\$millions)	\$1,855.73	\$6,582.81	0.00	\$496.62	\$3,038.70	0.00
<i>N</i>	62,298					

**Table 2: Correlation of Primary Variables**

Table 2: Correlation of Primary Variables	1	2	3	4	5	6	7	8	9	10	11
Cumulative Annual Returns, 1	1										
ROA, 2	0.16**	1									
Number of EPS Estimates, 3	-0.00	0.19**	1								
Inst. Share Ownership, 4	0.06**	0.27**	0.43**	1							
Zmijewski's Z-score, 5	0.20**	0.27**	0.06**	0.08**	1						
Book-to-Market, 6	-0.26**	-0.02**	-0.19**	-0.14**	-0.25**	1					
Discretionary Accruals, 7	0.02**	0.01*	-0.40**	-0.15**	0.09**	0.06**	1				
Accrual Ratio, 8	0.06**	0.26**	0.05**	0.06**	0.16**	-0.08**	0.07**	1			
NI-based Accrals/Avg TA, 9	0.07**	0.49**	-0.01	0.06**	0.19**	-0.02**	0.19**	0.34**	1		
CFO / Avg TA, 10	0.14**	0.79**	0.24**	0.29**	0.21**	-0.01**	-0.13**	0.10**	-0.08**	1	
Loss Year, 11	-0.16**	-0.70**	-0.18**	-0.24**	-0.20**	0.13**	-0.01**	-0.25**	0.41**	-0.54**	1

**Table 3a: Unconditional Persistence of Components of Income & Components of Income**

	ROA	ROA   CFO & ACC	Accrual Income	CFO
Intercept	0.006*** (0.000)	-0.020*** (0.000)	-0.048*** (0.000)	0.017*** (0.000)
ROA <sub>t-1</sub>	0.748*** (0.000)			
Accrual Income <sub>t-1</sub> /Avg TA		0.496*** (0.000)	0.290*** (0.000)	
CFO <sub>t-1</sub> /Avg TA		0.942*** (0.000)		0.823*** (0.000)
<i>N</i>	62298	62298	62298	62298
Adj R-squared	0.508	0.562	0.080	0.605

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; CFO = Cashflow from Operations, ACC = Accrual Income;  
format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested.

**Table 3b:** Persistence of Income, Accrual Income, and Cash Income | AR & DA

	ROA AR	ROA DA	Acc   AR	Acc DA	Acc  AR&DA	CF AR	CF DA	CF AR&DA
Intercept	0.005*** (0.000)	0.006*** (0.000)	-0.048*** (0.000)	-0.047*** (0.000)	-0.047*** (0.000)	0.017*** (0.000)	0.017*** (0.000)	0.017*** (0.000)
ROA <sub>t-1</sub>	0.706*** (0.000)	0.794*** (0.000)						
ROA <sub>t-1</sub> X Accrual Ratio (AR) Decile	0.011*** (0.000)							
ROA <sub>t-1</sub> X Disc. Accrual (DA) Decile		-0.011*** (0.000)						
Accrual Income <sub>t-1</sub> /Avg TA			0.345*** (0.000)	0.568*** (0.000)	0.600*** (0.000)			
Acc. Inc. <sub>t-1</sub> /Avg TA X AR Decile			-0.012*** (0.000)		-0.009*** (0.000)			
Acc. Inc. <sub>t-1</sub> /Avg TA X DA Decile				-0.068*** (0.000)	-0.066*** (0.000)			
CFO <sub>t-1</sub> /Avg TA						0.812*** (0.000)	0.884*** (0.000)	0.870*** (0.000)
CFO <sub>t-1</sub> /Avg TA X AR Decile						0.003** (0.045)		0.004*** (0.007)
CFO <sub>t-1</sub> /Avg TA X DA Decile							-0.014*** (0.000)	-0.015*** (0.000)
N	62298	62298	62298	62298	62298	62298	62298	62298
Adj R-squared	0.510	0.509	0.088	0.124	0.129	0.605	0.607	0.607

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; Acc. = Accrual; Inc. = Income; CFO = Cashflow from Operations; AR = Accrual Ratio; DA = Discretionary Accruals; format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested. For example, “ROA|AR” means that ROA is the dependent variable and the Accrual Ratio (AR) is the earnings quality feature being evaluated.

**Table 4a:** Persistence of Components of Income - Bottom 2 Deciles of Accrual Ratio

	ROA	ROA   CFO & ACC	Accrual Income	CFO
Intercept	-0.085*** (0.000)	-0.111*** (0.000)	-0.146*** (0.000)	0.010*** (0.000)
ROA <sub>t-1</sub>	0.599*** (0.000)			
Acc. Inc. <sub>t-1</sub> // Avg TA		0.314*** (0.000)	0.129*** (0.000)	
CFO <sub>t-1</sub> /Avg TA		0.821*** (0.000)		0.814*** (0.000)
<i>N</i>	11064	11064	11064	11064
Adj R-squared	0.376	0.448	0.016	0.598

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; Acc. = Accrual; Inc. = Income; CFO = Cashflow from Operations; AR = Accrual Ratio; DA = Discretionary Accruals; format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested. For example, “ROA|AR” means that ROA is the dependent variable and the Accrual Ratio (AR) is the earnings quality feature being evaluated.

**Table 4b:** Persistence of Components of Income - Middle 6 Deciles of Accrual Ratio

	ROA	ROA   CF & ACC.	Accrual Income	CFO
Intercept	0.021*** (0.000)	-0.003*** (0.006)	-0.042*** (0.000)	0.030*** (0.000)
ROA <sub>t-1</sub>	0.639*** (0.000)			
Acc. Inc. <sub>t-1</sub> / Avg TA		0.454*** (0.000)	0.222*** (0.000)	
CFO <sub>t-1</sub> /Avg TA		0.822*** (0.000)		0.747*** (0.000)
<i>N</i>	37668	37668	37668	37668
Adj R-squared	0.443	0.513	0.080	0.514

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; Acc. = Accrual; Inc. = Income; CFO = Cashflow from Operations; AR = Accrual Ratio; DA = Discretionary Accruals; format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested. For example, “ROA|AR” means that ROA is the dependent variable and the Accrual Ratio (AR) is the earnings quality feature being evaluated.

**Table 4c:** Persistence of Components of Income - Top 2 Deciles of Accrual Ratio

	ROA	ROA   CF & ACC	Accrual	CF
Intercept	0.031*** (0.000)	0.008*** (0.000)	-0.006*** (0.000)	0.003*** (0.007)
ROA <sub>t-1</sub>	0.841*** (0.000)			
Acc. Inc. <sub>t-1</sub> / Avg TA		0.495*** (0.000)	0.348*** (0.000)	
CFO <sub>t-1</sub> /Avg TA		1.022*** (0.000)		0.864*** (0.000)
<i>N</i>	13566	13566	13566	13566
Adj R-squared	0.578	0.621	0.103	0.630

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; Acc. = Accrual; Inc. = Income; CFO = Cashflow from Operations; AR = Accrual Ratio; DA = Discretionary Accruals; format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested. For example, “ROA|AR” means that ROA is the dependent variable and the Accrual Ratio (AR) is the earnings quality feature being evaluated.

**Table 5a:** Persistence of Components of Income - Bottom 2 Deciles of Discretionary Accruals

	ROA	ROA   CF & ACC	Accrual	CF
Intercept	-0.010*** (0.000)	-0.055*** (0.000)	-0.084*** (0.000)	0.051*** (0.000)
ROA <sub>t-1</sub>	0.753*** (0.000)			
Acc. Inc. <sub>t-1</sub> /Avg TA		0.602*** (0.000)	0.389*** (0.000)	
CFO <sub>t-1</sub> /Avg TA		1.112*** (0.000)		0.678*** (0.000)
<i>N</i>	15975	15975	15975	15975
Adj R-squared	0.349	0.429	0.112	0.431

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; Acc. = Accrual; Inc. = Income; CFO = Cashflow from Operations; AR = Accrual Ratio; DA = Discretionary Accruals; format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested. For example, “ROA|AR” means that ROA is the dependent variable and the Accrual Ratio (AR) is the earnings quality feature being evaluated.

**Table 5b:** Persistence of Components of Income - Middle 6 Deciles of Discretionary Accruals

	ROA	ROA   CF & ACC	Accrual	CF
Intercept	0.005*** (0.000)	-0.019*** (0.000)	-0.045*** (0.000)	0.013*** (0.000)
ROA <sub>t-1</sub>	0.759*** (0.000)			
Acc. Inc. <sub>t-1</sub> /Avg TA		0.449*** (0.000)	0.232*** (0.000)	
CFO <sub>t-1</sub> /Avg TA		0.956*** (0.000)		0.830*** (0.000)
<i>N</i>	34632	34632	34632	34632
Adj R-squared	0.554	0.610	0.063	0.627

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; Acc. = Accrual; Inc. = Income; CFO = Cashflow from Operations; AR = Accrual Ratio; DA = Discretionary Accruals; format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested. For example, “ROA|AR” means that ROA is the dependent variable and the Accrual Ratio (AR) is the earnings quality feature being evaluated.

**Table 5c:** Persistence of Components of Income - Top 2 Discretionary Accruals

	ROA	ROA   CF & ACC	Accrual	CF
Intercept	0.034*** (0.000)	0.014*** (0.000)	-0.008*** (0.000)	0.006*** (0.000)
ROA <sub>t-1</sub>	0.648*** (0.000)			
Acc. Inc. <sub>t-1</sub> /Avg TA		0.510*** (0.000)	0.302*** (0.000)	
CFO <sub>t-1</sub> /Avg TA		0.824*** (0.000)		0.785*** (0.000)
<i>N</i>	11691	11691	11691	11691
Adj R-squared	0.412	0.461	0.089	0.489

*p*-values in parentheses; \* *p* < 0.10, \*\* *p* < 0.05, \*\*\* *p* < 0.01; Acc. = Accrual; Inc. = Income; CFO = Cashflow from Operations; AR = Accrual Ratio; DA = Discretionary Accruals; format of columns headings: Dependent Variable | Earnings Quality feature (AR and/or DA) whose persistence is being tested. For example, “ROA|AR” means that ROA is the dependent variable and the Accrual Ratio (AR) is the earnings quality feature being evaluated.

**Table 6:** Test of Difference in Persistence

- Top 2 Versus Bottom 2 Deciles of Earnings Quality

Panel A: Sorting by Accrual Ratio

**Section 1: Dependent Variable = Total Net Income ( $ROA_t$ )**

Variable	$\chi^2$ Statistic	P-value
$ROA_{t-1}$	255.07	0

**Section 2: Decomposition of Earnings into Accrual and Cash Flow**

**Components: Dependent Variable = Total Net Income ( $ROA_t$ )**

Variable	$\chi^2$ Statistic	P-value
Accrual Income $_{t-1}$	55.54	0
CFO $_{t-1}$	148.91	0

**Section 3: Dependent Variable = Accrual Income $_t$**

Variable	$\chi^2$ Statistic	P-value
Accrual Income $_{t-1}$	137.63	0

**Section 4: Dependent Variable = CFO $_t$**

Variable	$\chi^2$ Statistic	P-value
CFO $_{t-1}$	18.71	0

**Panel B: Sorting by Discretionary Accruals**

**Section 1: Dependent Variable = Total Net Income ( $ROA_t$ )**

Variable	$\chi^2$ Statistic	P-value
$ROA_{t-1}$	11.46	0.0007

**Section 2: Decomposition of Earnings into Accrual and Cash Flow**

**Components: Dependent Variable = Total Net Income ( $ROA_t$ )**

Variable	$\chi^2$ Statistic	P-value
Accrual Income $_{t-1}$	11.47	0.0007
CFO $_{t-1}$	71.25	0

**Section 3: Dependent Variable = Accrual Income $_t$**

Variable	$\chi^2$ Statistic	P-value
Accrual Income $_{t-1}$	16.85	0

**Section 4: Dependent Variable = CFO $_t$**

Variable	$\chi^2$ Statistic	P-value
CFO $_{t-1}$	22.96	0

# ADAPTING TO THE ERA OF FAST-MOVING MARKETS WITH COMPETITIVE ADVANTAGES BECOMING TRANSIENT

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## ABSTRACT

This paper establishes a practical procedure for a firm to transit smoothly into the era of fast strategic changes while its once sustainable competitive advantages have become transient. To accomplish this goal, this work first establishes two theoretical results by employing systemic thinking and traditional logic of microeconomic reasoning. The first result shows under what market conditions new competitions will naturally appear within an established market; the second result demonstrates why competitions within any business organization always exist inevitably. By combining previously published conclusions derived by using anecdotes and inductively reasoning and these theoretical results, this paper advances the systemic reasons for why a list of time-honored steps would practically work so that firms could successfully surf through waves of transient competitive advantages.

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## INTRODUCTION

In theory change is good. However, to most people change is difficult to cope with. Generally, change means and brings forward uncertainty, with which challenges to status quo could easily appear and do occur. Nevertheless, the modern world of business is changing fast, and evolving faster than ever before. And competition is intensifying due to the globalization of international economies and unification of international finances. With these accelerating change and development, once-sustainable competitive advantages have become transient, short-lived (McGrath, 2013). In other words, if a business organization does not or cannot transform itself along with the shifting landscape of the business world, it will be obsolete and become history in no time.

In the 1980s, Michael Porter (1998) defined competitive advantage as a function of either providing comparable buyer value more efficiently than competitors (low cost), or performing activities at comparable cost but in unique ways that create more buyer value than competitors and, therefore, command a premium price (differentiation). His theory has been one of the most commonly used by managers over the past few decades to assist business professionals in finding “a way to conceptualize the firm that would expose the underpinnings of competitive advantage and its sustainability.” Has the growth of using technology created a business environment where competitive advantages have become transient and short-lived?

Looking at the long list of once-storied business organizations that are either gone or no longer relevant, a natural question arises: Are there necessary steps that a firm should go through in order for the firm to potentially ready itself for successfully riding waves of transient competitive advantages? To address this question, this paper establishes the following results by employing the intuition of systemic thinking and the rigor of game theory: (1) In an oligopoly market that satisfies certain conditions (see Section 3 for details), a sufficient and necessary condition for at least one firm to enter the market profitably, as a competitor of the incumbent firms, is that the consumer surplus  $\beta = 1 - \alpha > 0$ ; and (2) competitions always exist within any organizational system that has at least two employees.

By applying these theoretical results and by relying on what has been derived inductively by McGrath (2013), this paper discusses four conditions that are necessary for a firm to meet in order to ready itself for successfully riding waves of transient competitive advantages. After establishing the underlying connections among the four conditions by employing systemic thinking, one case of success is analyzed to validate the established theory of this paper.

In terms of the literature, Duez (2012) derives a new paradigm for strategic management thought from the school of economic proximity. Saeidi, et al., (2015) consider sustainable competitive advantage, reputation, and customer satisfaction as three probable mediators in the relationship between corporate social responsibility and firm performance. These authors find that corporate social responsibility indirectly promotes firm performance through enhancing reputation and competitive advantage while improving the level of customer satisfaction. In the context of Chinese-like emerging economies, from a strategic process perspective, Li and Liu (2014) define the concept of a firm's dynamic capability as the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely decisions, and to implement strategic decisions and changes efficiently to



ensure the right direction. Then they explore the relationship between dynamic capabilities and competitive advantage and the role environmental dynamism plays based on a sample of 217 enterprises from China.

Moustaghfir (2012) explains how knowledge assets provide firms with a competitive advantage and shows how organizational capabilities have the potential to produce long-term superior performance. Makadok (2010) predicts a negative interaction effect on profits of simultaneously restraining firms' rivalry and increasing competitive advantage. Carpenter, et al., (2014) use the video games industry as an ideal laboratory to investigate the consequences of hyper-competition and implications of either maintaining competitive advantage or developing temporary advantages. By realizing the fact that our understanding of competitive advantage draws mostly upon the experience of Western firms, Peng, et al. (2001) uses the massive Japanese investment in an effort to replicate *keiretsu* (interfirm) networks in Asia since the 1980s to shed new light on the sources of competitive advantages. These authors develop a multilevel perspective by focusing on how competitive advantage is preserved and strengthened for firms, networks, and nations involved.

By developing a preliminary theory based on the literature of corporate innovation, social innovation, and corporate social innovation, Herrera (2015) uses case studies to build a framework that describes factors leading to successful corporate social innovation, which in turn creates opportunities for co-creation, thereby leading to shared value and enhancing competitive advantage if it is integrated into strategy and operations. Fronmueller (1996) builds a theory and uses a sample of large firms to test the relationship between backward vertical integration and low cost and that between forward vertical integration with differentiation-based competitive advantage. Peterson (2013) addresses the question of whether deploying compliance and ethics programs would assist U.S. organizations in implementing internal mechanisms necessary to achieve a competitive advantage from the law. By looking at exporting manufacturers, Leonidou, et al., (2015) examine the external and internal determinants of green export business strategy and its effects on export competitive advantage and performance. Their result confirms the instrumental role of both external forces (i.e., foreign environmental public concern and competitive intensity) and internal factors (i.e., top management green sensitivity and organizational green culture) in crafting an environmentally friendly export business strategy.

Hence, comparing what this paper develops and what has been established in the literature, it can be readily seen that this work enriches the relevant knowledge with new conclusions at the height of theoretical abstraction and a potential of much wider range of practical applications.

The rest of the paper is organized as follows. Section 2 introduces the basics of systems thinking and systemic intuition needed for the rest of the paper. Section 3 establishes two main theoretical results and their systemic intuition that lay down the foundation for the discussions of the following sections. Section 4 is the main section of this paper that details the steps needed for a firm to adapt to the era of transient competitive advantages. Section 5 looks at a case of success by focusing on a nearly two-century old firm, known as W. R. Grace. Section 6 concludes the presentation of this work.

## SYSTEMS SCIENCE AND SYSTEMIC THINKING

To make this paper self-contained, this section introduces the basic ideas and a brief development history of systems science, how this science complements the conventional science to form a two-dimensional spectrum of knowledge, and the systemic yoyo model as the playground and intuition of systems science and applications. Because business scholars are quite familiar with game theory, the less relevant details of game theory are omitted.

Historically, von Bertalanffy (1924) pointed out that because the fundamental character of living things is their organization, the customary investigation of individual parts and processes cannot provide a complete explanation of the phenomenon of life. Since then, this holistic view of nature and social events has permeated the spectrum of science and technology (Lin, Y., 2009). And in the past 90 some years, studies in systems science and systems thinking have brought forward brand new understandings and discoveries to some of the major unsettled problems in science (Klir, 1985; Lin, Y., 1999). Because of the proliferation of studies of wholes, parts, and their relationships, a forest of interdisciplinary studies has appeared, revealing the development trend in modern science and technology of synthesizing all areas of knowledge into a few major blocks, and the boundaries of conventional disciplines have become blurred ("Mathematical Sciences," 1985). Underlying this trend, one can see the united effort of studying similar problems in different scientific fields on the basis of wholeness and parts, and of understanding the world in

which we live by employing the point of view of interconnectedness. As tested in the past 90 plus years, the concept of systems and results of systems research have been widely accepted (Blauberg, et al., 1977; Klir, 2001).

Systems thinking is different from traditional thinking as it examines the linkages and interactions between the components that comprise the entirety of that defined system (Aronson, 1996; Lin, 1988). Each whole system consists of a basic unit, which in turn contains components, such as policies, processes, procedures and people, and may be divided into subsystems. Some consider systems as having clear external boundaries—closed systems—or connecting to its environment as an open system, which is the more common and realistic (Tate, 2009; Lin, 1999). This thinking methodology models the components of a system while connecting “the inputs and outputs among those components into a sensible whole that reflects the structure and dynamics of the phenomenon observed” (Kroenke and Boyle, 2016; Lin and Ma, 1987).

As a result of the technological revolution and increasing globalization, many business professionals say that systems thinking is one of the core competencies of 21<sup>st</sup> century leaders. Because of this, individuals need to become “system wise” in order to start applying systems thinking principles and practices to the firm. Individuals should understand that all parts of a system are interrelated and interdependent in some respect and without the interdependencies, the system would just be a collection of parts (Kim, 2016).

In terms of the concept of systems, similar to how numbers and algebraic variables are theoretically abstracted, systems can also be proposed out of any and every object, event, and process. For instance, behind collections of objects, say, apples, there is a set of numbers such as 0 (apples), 1 (apple), 2 (apples), 3 (apples), ...; and behind each organization, such as a business firm, a regional economy, etc., there is an abstract, theoretical system within which the relevant whole, component parts, and their interconnectedness are emphasized. As a matter of fact, it is because of these interconnected whole and parts, the totality is known as a firm, market, industry, economy, etc. In other words, when internal structures can be ignored, numbers and algebraic variables can be very useful; otherwise the world consists of dominantly systems (or structures or organizations). In other words, systems thinking is different from traditional thinking as it examines the linkages and interactions between the components that comprise the entirety of that defined system (Aronson, 1996; Lin, 1999). Each whole system consists of components such as policies, processes, procedures and people, and may be divided into subsystems. Some consider systems as having clear external boundaries—closed systems—or connecting to its environment as an open system, which is the more common and realistic (Tate, 2009; Lin 1999).

When the traditional science is joined with systems science that investigates systemhood, that collectively gives rise of a 2-dimensional spectrum of knowledge, where the traditional science, which is classified by the thinghood it studies, constitutes the first dimension, and the systems science, which investigates structures and organizations, forms the genuine second dimension (Klir, 2001). In other words, systems research focuses on those properties of systems and associated problems that emanate from the general notion of structures and organizations, while the division of the traditional science has been done largely on properties of particular objects. Therefore, the former naturally transcends all the disciplines of the classical science and becomes a force making the existing disciplinary boundaries irrelevant and superficial.

The importance of this second dimension of knowledge cannot be in any way over-emphasized. By making use of this extra dimension, the exploration of knowledge has gained additional strength in terms of the capability of solving more problems that have been challenging the very survival of the mankind since the beginning of time. Such strong promise that systems research holds relies materialistically on the particular speaking language and thinking logic – the systemic yoyo model (Lin, Y., 2007), Figure 1, similar to how the Cartesian coordinate system plays its role in the development of modern science (Kline, 1972).

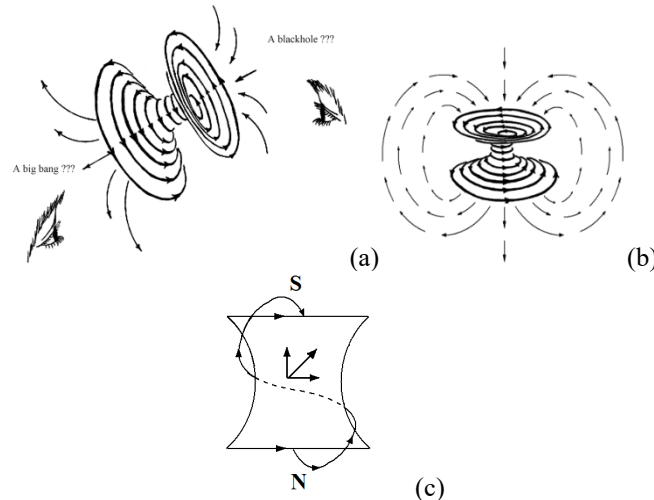


Figure 1. (a) Eddy motion model of the general system; (b) The meridian field of the yoyo model; (c) The typical trajectory of how matters return

Specifically, on the basis of the blown-up theory (Wu and Lin, 2002) and the discussion on whether or not the world can be seen from the viewpoint of systems (Lin, Y., 1988; Lin, et al., 1990), the concepts of black holes, big bangs, and converging and diverging eddy motions are coined together in the model shown in Figure 1 for each object and every system imaginable. That is, each system is a multi-dimensional entity that spins about its axis. If we fathom such a spinning entity in our 3-dimensional space, we will have a structure as artistically shown in Figure 1(a). The black hole side pulls in all things, such as materials, information, energy, profit, etc. After funneling through the “neck”, all things are spit out in the form of a big bang. Some of the materials, spit out from the end of big bang, never return to the other side and some will (Figure 1(b)). For the sake of convenience of communication, such a structure as shown in Figure 1(a), is referred to as a (Chinese) yoyo due to its general shape.

What this systemic model says is that each physical or intellectual entity in the universe, be it a tangible or intangible object, a living being, an organization, a culture, a civilization, etc., can all be seen as a kind of realization of a certain multi-dimensional spinning yoyo with an eddy field around. It stays in a constant spinning motion as depicted in Figure 1(a). If it does stop its spinning, it will no longer exist as an identifiable system. What Figure 1(c) shows is that due to the interaction between the eddy field, which spins perpendicularly to the axis of spin, of the model, and the meridian field, which rotates parallel to axis of spin, all the materials that actually return to the black-hole side travel along a spiral trajectory.

As expected, this yoyo model has successfully played the role of intuition and playground for scholars who investigate the world and explore new knowledge holistically, just as what the Cartesian coordinate system did for the traditional science (Lin, Y., 2009; Lin and Forrest 2011; Forrest 2013; 2014; Forrest and Tao, 2014; Ying and Forrest, 2015). In particular, this yoyo model of general systems has been successfully applied in the investigation of Newtonian physics of motion, the concept of energy, economics, finance, history, foundations of mathematics, small-probability disastrous weather forecasting, civilization, business organizations, the mind, among others. Along this same line of logic, in this paper we will use this model as our intuition to establish our conclusions.

## COMPETITIONS BOTH INTERNAL AND EXTERNAL TO A BUSINESS ORGANIZATION

To lay down the theoretical foundation for the rest of this paper, this section establishes two theorems on the basis of the systemic intuition of the yoyo model and on the rigor of game theory.

First, let us look at market competitions that are external to any incumbent firm of an established market. To this end, assume that the oligopoly market of our concern consists of  $m$  firms,  $m = 1, 2, \dots$ , providing consumers with mutually substitutable products, with their respective shares of loyal consumers. To protect their turfs while potentially increase their consumer bases, they compete over the switchers with adjustable prices charged to their customers in order to deter the potential entrance of new competitions (Forrest, et al., 2017). So, assume that these firms produce their horizontally differentiated products at constant marginal costs, which is set to zero without loss of generality. Assume

consequently the managements of these  $m$  firms are well aware of the pricing strategies of the other firms and have established their best responses by playing the Nash equilibrium through pure self-analyses.

Speaking differently, the market is in a state of mutual forbearance, where incumbent firms mitigate rivalry by dividing markets in proportion to firm strength (Bernheim and Whinston, 1990). They cede dominance to their stronger competitors in those market segments where they are less efficient, while in exchange the latter do the same in segments where the former are more efficient (Li and Greenwood, 2004). The firms' codependence gradually motivates them to de-escalate rivalry (Yu and Cannella, 2012). Eventually, the rates of entry and exit in the market decrease (Fuentelsaz and Gómez, 2006), and interfirm hostility declines (Haveman and Nonnemaker, 2000). So, without loss of generality, let us consider the aggregate of the incumbent firms as one firm, whose share of occupancy of the market is  $\alpha$  so that  $\beta = 1 - \alpha$  represents the size of the market segment of switchers who base their purchase decision on which price is lower. Then, the following result holds true:

**Theorem 1.** In the afore-described oligopoly market, at least one firm profitably enters the market to compete with the incumbent firms, if and only if the size of the market segment of switchers is greater than zero.

The previously assumed market condition generally means that the technology involved and the relevant business operations have been standardized. So, for a new small firm to enter such a market with profit potential, it is reasonable to assume that this firm has come up with a more efficient technology and/or operation that can greatly reduce the overall business expenditure. Further assume that this small entrant uniformly randomizes its price  $P$  over the interval  $[0,1]$  as long as the firm could make profits on the average. Again, the constant marginal costs of this small entrant are set to zero without loss of generality.

Before we provide a detailed proof for this theorem, let us first see intuitively why such a result holds true. To this end, let us fathom the market place is as an abstract yoyo field, and we look at the multi-dimensional yoyo body at a distance from above either the convergent side or the divergent side, while imagine that everything here takes place in our 3-dimensional space. That is, we are looking at a pool of spinning fluid, where the word “fluid” is an abstraction of movement of all kinds of media, such as goods, information, money, credit, etc., that appear and exist in business activities. In other words, graphically one is looking at the market of concern as the pool of spinning fluid shown in Figure 2.

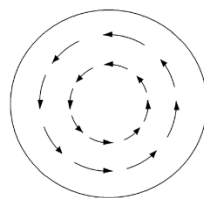


Figure 2. The systemic birds-eye view of our marketplace of a previously prosperous market

Associated with this end of intuition, the well-known dishpan experiment, which was initially conducted successfully by Raymond Hide (1953) of Cambridge University, England, and then by Dave Fultz and his colleagues of University of Chicago (1959) independently, shows that when the movement of the fluid within the rotational dish is under enough pressure created by either the sufficient speed of rotation or sufficient difference in the temperature between the center and the periphery of the dish, the pattern of uniform movement, as shown in Figure 2, will develop into the chaos, as shown in Figure 3. The number of local eddy leaves is determined either by the rotational speed or by the temperature difference or both and increases with the speed and the temperature difference.

Now, the systemic modeling and laboratory experiment suggest that the fluid nowhere within this spinning dish could avoid being disturbed by the flows, either orderly or chaotically, of the pan. And being disturbed regionally means that a local flow pattern will appear inevitably.

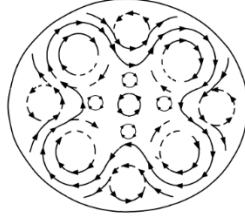


Figure 3. Asymmetric flow observed in Fultz's dishpan experiment

Proof of Theorem 1. ( $\Rightarrow$ ) Suppose that by randomizing its price over the interval  $[0,1]$  a small firm enters into the oligopoly market of  $m$  firms, which are collectively seen as one aggregate firm, because these  $m$  firms are in a state of mutual forbearance. So, the consumer surplus must satisfy  $\beta = 1 - \alpha > 0$ .

( $\Leftarrow$ ) Assume that the consumer surplus satisfies  $\beta = 1 - \alpha > 0$ . Firstly, let  $\alpha_0$  be a real number so that  $\beta = 1 - \alpha > \alpha_0 > 0$ , and  $\alpha = \ell \alpha_0$ , where  $\ell$  is a large natural number, indicating that the market has been largely taken by the incumbent firms.

Secondly, let us imagine that the aggregate firm is divided into  $\ell$  many identical "firms", named  $i, i = 1, 2, \dots, \ell$ . Each of them provides consumers with identical products and enjoys the market share  $\alpha_0 = \alpha/\ell$  of loyal consumers. These imaginary firms compete over the switchers with adjustable prices. Because these imaginary firms are really equal partitions of the same aggregate firm, they have the same constant marginal cost, which is set to zero without loss of generality, the managements of these firms are fully aware of the pricing strategies used by all the firms (because the firms are managed by the same administrative unit), and they establish their best, identical responses by playing the Nash equilibrium through their unified self-analyses.

Thirdly, these  $\ell$  imaginary firms do not have any symmetric pure strategy Nash equilibrium. (For the setup here, there is no need to consider asymmetric pure strategy Nash equilibrium, because all these imaginary firms take identical actions). In fact, for any symmetric pure strategy portfolio  $(x_1, x_2, \dots, x_\ell)$ , where  $x_i = x_j$ , for  $i, j = 1, 2, \dots, \ell$ , a randomly chosen Firm  $j$  ( $\in \{1, 2, \dots, \ell\}$ ) can slightly lower its price from  $x_j$  to  $x'_j$  to produce additional profits for all the firms as long as  $x'_j \beta > (x_j - x'_j)\alpha$ , which is possible to do by adjusting  $x'_j$  sufficiently close to  $x_j$ . So,  $(x_1, x_2, \dots, x_\ell)$  is not a Nash equilibrium. Even so, (Forrest, et al., 2017) shows that these  $\ell$  firms do have a symmetric mixed-strategy Nash equilibrium.

For the rest of this proof, it suffices to show that there is one small firm that will be expected to profit by entering this market through uniformly randomizing its price strategy over the interval  $[0,1]$ .

Let  $F(P)$  be the price distribution of Firm  $j$ , one of the imaginary firms of the aggregate firm. The aggregate firm or equivalently each of the  $\ell$  imaginary forms sets its price after taking into account the price of the new firm and those of all other imaginary firms. Hence, the profits for Firm  $j$  from its loyal consumers is  $\alpha_0 P$  and those from its share of the switchers is  $\sum_{i \neq j}^\ell (1 - P)[1 - F(P)] \beta P = \beta P(1 - P)[1 - F(P)]^{\ell-1}$ . Hence, the profits  $\Pi$  Firm  $j$  generates when the firm sells its product at price  $P$  are  $\alpha_0 P + \beta P(1 - P)[1 - F(P)]^{\ell-1}$  and the objective function of Firm  $j$  is  $\max_{F(P)} E(\Pi) = \int_{-\infty}^{+\infty} \{\alpha_0 P + \beta P(1 - P)[1 - F(P)]^{\ell-1}\} dF(P) = \int_0^1 \{\alpha_0 P + \beta P(1 - P)[1 - F(P)]^{\ell-1}\} dF(P)$ , where  $E(\Pi)$  stands for Firm  $j$ 's expected profits for all possible prices, and the objective for Firm  $j$  is to maximize its expected profits by choosing its price distribution  $F(P)$ . The reason why the upper and lower limits of the integral are changed respectively from  $+\infty$  and  $-\infty$  to 1 and 0 is because when  $P < 0$  or when  $P > 1$ , the profits are zero. The equilibrium indifference condition of Firm  $j$  is

$$\alpha_0 \times P + \beta \times P(1 - P)[1 - F(P)]^{\ell-1} = \alpha_0 \times 1 \quad (1)$$

So, for the  $\ell$  imaginary firms, solving equation (1) leads to their symmetric equilibrium pricing strategy as follows:

$$F(P) = 1 - \left(\frac{\alpha_0}{\beta P}\right)^{\frac{1}{\ell-1}} \quad (2)$$

From  $\beta > \alpha_0$ , it follows that  $\alpha_0/\beta < 1$ . So, for any Price  $P$ , satisfying  $1 \geq P \geq \alpha_0/\beta$ , equation (2) is a well-defined probability distribution. This end implies that for the  $\ell$  imaginary firms, or equivalently, the aggregate firm, the lowest allowed price is  $\alpha_0/\beta$ .

This proof is complete from the fact that the profits of the small entrant

$$E(\Pi) = \int_0^{\alpha_0/\beta} \beta P dP + \int_{\alpha_0/\beta}^{+\infty} \beta P [1 - F(P)]^\ell dP \quad (3a)$$

$$= \int_0^{\alpha_0/\beta} \beta P dP + \int_{\alpha_0/\beta}^1 \beta P [1 - F(P)]^\ell dP + \beta \left(\frac{\alpha_0}{\beta}\right)^{\ell/(\ell-1)} \quad (3b)$$

is positive, where the first term in the right-hand side of equation (3a) stands for the expected profits of the small entrant when it charges the lowest price in the marketplace and captures the entire segment of the switchers, the second term is the small entrant's expected profits when it is in direct competition with the  $\ell$  incumbent firms, and the third term in equation (3b) comes from the mass point of size  $(\alpha_0/\beta)^{1/(\ell-1)}$  of  $F(P)$  at the reservation price  $P = 1$ . This end implies that if the consumer surplus  $\beta = 1 - \alpha > 0$ , there will be at least one small entrant that will enter the market to compete with the incumbent firms. QED

The result in Theorem 1 indicates that although the  $m$  incumbent firms are risk neutral and want to continuously reap in their respective profits by securely defending their established turfs, they still have to fight over the switchers of the marketplace in order to eliminate the switcher segment. Otherwise, new competition(s) will inevitably enter the market with potential of making good profits.

Next, let us look at competitions that materially exist within any organizational entity with at least two employees as reflected by the individual value systems of employees.

Generally, no matter which business entity is concerned with, there are competitions in terms of how the organization should be managed, how the detailed operations should be carried out, and how employees' efforts and devotions should be directed. And each stakeholder of the organization always seems to have ideas about how things could improve.

One reason why we discover abundant competitive situations is because each person, as a living being that is severely limited by its sensing organs, looks at the world with a pair of colored eyes. The word "color" in the literature is also known by such terms as personal values and/or philosophical assumptions about the world (Lin and Forrest, 2011; Villalobos and Vargas, 2015; Terán, et al., 2015). In other words, because philosophical assumptions and value systems vary from one person to another, from one people to another, from one culture to another, ..., the same physical world becomes extremely beautiful and multi-colored when people individually try to describe what they see and what the world is really about.

By underlying assumptions and values of philosophy, we mean the value system of a person that consists of his/her beliefs about how the world functions and his/her moral codes with which he/she is recognized with his/her particular identity and integrity (Lin and Forrest, 2011). From the systemic yoyo model, it follows that each human being lives in a vast ocean of spinning yoyo fields, which consists of the fields of other people, physical objects, abstract thoughts, and myriad of other things and matters. Soon after a person is born, he/she starts to interact with the world. It is these interactions with people, physical objects, abstract thoughts, and the myriad of other things and matter that shape the person's philosophical assumptions and values, similar to how a civilization formulates its value system (Lin and Forrest, 2011). Because of the subtle differences between the interactions experienced by one person from those by another person, each person has his/her own set of very specific philosophical assumptions and values, which dictate the behaviors and decision making of the person for the rest of his/her life. Although the differences might be "subtle" when seen from the angle of the magnificent scale of the entire ocean of spin fields, they are generally major to the individuals involved, causing important differences in the relevant personal value systems. That actually explains why children who grow up in the same household may have quite different personalities, characteristics, and thinking processes. And that explains why different people have different underlying philosophical assumptions and values (the value systems), because firstly no two people grow up within a perfectly identical environment, and secondly with age people's philosophical assumptions and values evolve according to their respectively changing environments. For a more in-depth discussion, see (Forrest and Orvis, 2016).

**Proposition 1.** Competitions always exist within any organizational system that has at least two employees.

In fact, because no two employees share the same system of values, any two employees will look at many aspects of the organizational system differently. That difference between their value systems leads to competitive consequences of the two employees.

## **MAKING THE FIRM ADAPT TO THE ERA OF TRANSIENT ADVANTAGES**

Based on the systemic thinking, as presented in Section 2, and the theoretical results in Section 3, this section is the main theory of this work that develops a detailed procedure of particular steps necessary for the firm to acclimate to and succeed in the era of transient competitive advantages.

To lay down the common ground as our reference point for discussion, Section 4.1 describes the elementary characteristics of the firm that operates within the old strategic framework of sustainable competitive advantages. Then we look at the steps necessary for the firm to successfully ride the waves of ephemeral advantages in Section 4.2 by emphasizing on the critical significance of having a long-term, unwavering ambition, the importance of having stable relationships both internally and externally, the absolute need to stay strategically agile, and the necessity of making innovation the norm.

### **Characteristics of the Firm**

Historically, the firm was initially a family workshop that produced whatever the family needed and then some additional products desired by the neighbors. With increasing demand from outside the family, some unskilled and uneducated labors of the neighborhood families were hired during their idling times and off seasons from their land works. Over time, the family-based workshop evolved into a factory with the original raw labors becoming skilled, organized, full-time factory workers. As the average income of the population grew, the increasing purchasing power of the market gradually transformed the family-controlled factory of primitive technologies into a prospering, powerful modern industrial organization. For an excellent presentation on how business firms evolve over time, see (Wen, 2016).

In its successful evolution, the firm has excelled in every stage of development in terms of its organizational structure and culture, and its competition with other players within the same industry. The firm recognizes that its success has been heavily relied on finding a favorable position in a defined industry and then exploiting its long-term competitive advantages, while using innovations, although they are separate from the firm's core activities, to create new business opportunities. Since advantages are long-term and sustainable, as soon as the firm has achieved a solid position within its industry, it optimizes its people, assets, and systems around its advantages, while promotes people who are good at running big businesses, operates with greater efficiency, and minimizes costs. The management structure directs resources and talent to strong core businesses, which are associated with high performance. In other words, the firm optimizes its systems and processes around a set of sustainable advantages.

For decades, due to various barriers of entry, such as colossal expenses, technological sophistication, regulatory limitations, etc., this business model has been working wonders; and the firm has dominated the market. That further ratifies the firm's beliefs that each industry consists of enduring and stable competitive forces and the interactive pattern of these forces could be extrapolated into the future with sustainable benefits.

However, in recent years, the constraints that held this business model in place have eroded. Boundaries between industries have become blurred, the mass market fragmented, ample varieties of the same product introduced. Additionally, the advent of internet has facilitated an explosion of seemingly infinite possibilities for meeting the demand of consumers. This relaxation of constraints has fundamentally undermined the established business mode. Furthermore, many firms' advantages have become standards in the industry, such as online package tracking, making it difficult for the firm to maintain a competitive advantage for any length of time. And, the most important dynamic the firm experiences is no longer intra-industrial competition but rather regular invasions of players from other industries. So, the firm realizes that traditional approaches to strategy and innovation are no longer keeping pace with the speed of change of the markets in which it is competing. Nonetheless, the advantages' past sustainability has led to the build-up of inertia and power along the lines of the existing business model. It has allowed people to fall into

routines and habits of mind, resulting in the conditions for turf wars and organizational rigidity. While innovation has become more restricted, the firm has fostered denial reactions rather than proactive designs of strategic next steps. Because of its preference for equilibrium and stability, many shifts in the marketplace have met by the firm's leaders denying that these shifts mean anything negative for them.

The accelerating speed of the new economy has made the firm face situations in which advantages are copied quickly, technology changes rapidly, while customers seek other alternatives. Such new market dynamics make the firm believe that it doesn't have time to implement management tools, and feels understaffed so that it consequently is sticking increasingly to tools it has already had experience with. Ironically, at the same time, despite a lot of innovations in management tools and approaches, the firm is increasing its reliance on strategy tools that it had inherited from the past. As the sustainable competitive advantages of the past are replaced with transient ones, the deeply ingrained structures and systems designed to extract maximum value from a competitive advantage have turned out to be liabilities when the environment requires instead the capability to surf through waves of short-lived opportunities. Evidently, to compete in such more volatile and uncertain environments, the firm needs to do things and conduct its business differently.

Because of the digital revolution, instead of within-industry competition being the most significant competitive threat, the firm faces competitions from other industries, and even from different business models. So, in order to adequately analyze what is really going on at the level that decisions need to be made, the firm has to conduct its analysis at a more granular level of arenas (McGrath, 2013) that reflects the connection between market segment, offer, and geographic location and connects customers and solutions beyond the conventional description of offerings that are near substitutes for one another. In other words, the firm needs to analyze how to meet the challenge of particular rivals in specific geographic locations with certain technology.

The firm faces with the necessity to produce the outcomes that particular customers seek and alternative ways those outcomes might be met in order to continue its success. It is because the most substantial threats to the firm's advantages could potentially appear in nonobvious locations. In other words, the firm has to learn to leverage such ephemeral matters as deep customer relationships and the capability to design irreplaceable experiences across multiple arenas, because advantages based on product features, new technologies, the "better mousetrap", etc., are shown to be less durable than once believed. In fact, short-term advantages only provide a snapshot of a firm's strengths and weaknesses, as well as the competitive "battlefield" they are moving toward (Maxwell, 2010). The firm will have to focus on creating capabilities and skills that will be relevant to whatever arenas it happens to find itself operating in. And it may even have to be more relaxed about traditional protections and barriers to entry, because competition will devolve around highly intangible and emotional factors.

Instead of focusing on its relative position with respect to other players in the same industry, its market share, and traditional kinds of competitive threats, such as product introduction, pricing, promotions, and so on, the firm has to spend additional time and energy to think about creating products and services in multiple industries in order to succeed with the concept of arenas. For example, the firm should consider establishing a cash management account, as Merrill Lunch did in the 1980s when no money-center bank realized what was going on, or move into telephone operating systems and online video, as Google did recently, or edge into health care, as retailers, such as Walmart, are doing. The idea is that the firm should aim at producing outcomes that are arena based instead of industry based.

### **Steps Needed for the Successful Transition**

When companies' competitive advantages were sustainable in the past, the emphasis of strategic decision making was to invest in capabilities to spot industry trends and design the corresponding strategy so that decent payoffs could be obtained. The underlying assumptions behind this practice, which had been taken as gospel, were that each industry is relatively stable, consists of relatively enduring and stable competitive forces, and that the interactive pattern of these forces could be extrapolated into the future. From that derived were the beliefs that industry matters most and that when the existing forces are deeply understood, one can create a road map for other decisions that would last for at least some time. In other words, the major assumption was that the world of the near future, such as five years from now, was, to some extent, comprehensible today.

However, with the world economy increasingly globalized, the sustainable competitive advantages of the past have become transient, market conditions evolve much, much faster, and customers become less and less patient than ever



before. So, a real challenge all successful companies face today is how to adjust themselves to effectively ride evolutionary waves of competitive advantages, where each wave consists of the following phases: launch, ramp-up, exploitation, and disengagement. In particular, during the launch phase, new opportunities are identified, resources re-allocated, and a team of people with different expertise is assembled to create something new. This phase emphasizes on innovation and consequent discovery of new development directions. During the ramp-up phase, if an opportunity gets traction, then the newly developed advantage starts to expand from the initial few segments into more and more market areas. The business gains ground; systems and processes for getting the business to scale are implemented; the initial experiments become full-scaled market introductions. If the ramp-up phase is successful, the company will enjoy a period of exploitation when the business is doing well and generating good profits. During this phase, the firm establishes a clear, advantageous differentiation from competitors, its market share and profitability expand with attractive prices and profit margins. When an advantage is exhausted, the profitable opportunity will undergo a process of erosion. By disengaging, the firm disposes of its assets and other capabilities that are no longer relevant to its future. Here, disengagement is not the same as business failure. As a matter of fact, disengagement starts to take place when the business is still profitable (McGrath, 2013).

McGrath (2013) looks at every publicly traded company globally with a market capitalization of over \$1 billion U.S. dollars as of the end of 2009, which totals 4,793 firms. Then she examines the number of these firms that had been able to grow revenues by at least 5% annually for the proceeding five years from 2004 – 2009, where 5% was the least whole percentage number above the global gross domestic product growth ( $\approx 4\%$ ) during this time period (Mahanta, 2012). As the result, she identifies ten growth outliers. Based on what is summarized by McGrath from studying these ten growth outliers and based on what is established in the previous section, one can see that to prepare a firm effectively riding evolutionary waves of transient competitive advantages, the following steps need to be followed:

- Aim at realizing a long-term, unwavering ambition;
- Stabilize relationships;
- Foster strategic agility; and
- Make innovation the norm.

We will next dive into details of these steps in the following subsections.

### **A Long-Term, Unwavering Ambition**

The first and foremost step for the firm to become successful in riding waves of transient competitive advantages is to establish a long-term, unwavering public commitment to the ambition of becoming world class, the best of the world; and such ambition is embraced, endorsed, and sought after by the leadership of the firm. With such an outsized ambition (relative to competitors) in place, the leadership will have to naturally set the bar high while have a clear sense of strategic direction in every endeavor. It will also promote common key themes that are the results of compelling strategy diagnoses in its attempt to steer the firm's development in the desired direction.

Here, the leadership commitment is the key. As a matter of fact, leadership is one of the most salient aspects of the organizational context. It is the process of social influence in which one person or a small group of people can enlist the aid and support of others in the accomplishment of a common task (Chemers, 2001), or ultimately it is about creating a way for people to work together and to make something extraordinary happen (Kouzes and Posner, 2007). When the firm desires to be the best, its selected leaders would most likely possess the following key traits and demonstrate a pattern of motives (Kirkpatrick and Locke 1991; McClelland, 1975): drive (a broad term which includes achievement, motivation, ambition, energy, tenacity, and initiative), motivation (the desire to lead but not to seek power as an end in itself), honesty, integrity, self-confidence (which is associated with emotional stability), cognitive ability, and knowledge of the business. For a systematic analysis on the concept of leadership, see (Lin and Forrest, 2011).

As for why leadership is important in terms of the systemic yoyo model, it is because leadership stands for one's capability to adjust his underlying field structure so that many other neighboring fields would spin in similar fashions without much difficult readjustment. In particular, if one can utilize a process of social influence to obtain aids and supports of others in accomplishing a common task (Chemers, 2001), it implies that there has appeared a big whirlpool (the ambition). This pool might initially be conceptual and physically invisible. However it does cover a large territory, within which many smaller fields (individual people) are located. Now, the leader is the person who can realign all

the individual eddy fields in such a way that the conceptual large field becomes a visible reality. In this systemic modelling, the initially invisible large field is the expected something extraordinary (Lin and Forrest, 2011).

To showcase the firm's achievements to the world, not surprisingly, references to awards and recognitions need to be literally festooned on its corporate website. The key here is that whatever venture the firm is engaged in and whichever strategy the firm employs are grounded in a compelling ambition. That provides an aiming point for the employees within the firm to work towards and a comforting point for customers outside the firm to buy the products and use the service the firm produces and provides.

Notice that the ultimate ambition of the firm needs to be stretch so that its attainment and maintenance cannot be easily accomplished. For example, being the "world class, the best" represents a dynamic state that can only be attained and maintained through continuous effort and trying. This end is important to long-term reconfiguration of the firm, and will help prevent the firm from becoming complacent and content to pursue yesterday's advantages. At the same time, what are important are particular mechanisms that will keep complacency at bay, such as moving people around within the company in order to facilitate their looking at the business in different ways from different vantage points.

Accompanying the stretch ambition, the firm needs to invest in creating an organizational identity, culture, and commitment to leadership development by paying considerable attention to values, codes, and alignment (Proposition 1). The ambition plays the role of the conceptual starting point for all activities, while the investment aims at establishing a practically useful foundation for materializing the goal by providing trainings, because the necessary cultural foundation would allow the firm to make changes when it needs to. A desirable culture is the foundation of success for the firm, represents a very important process to the long-term health and success of the company.

As implied by Proposition 1, in order for the firm to move from one set of advantages to another, the firm has to consciously set out to educate and up-kill its people. To make this end practically possible, the firm has to hire employees based on their ability to learn new things, or their learnability. And to avoid having to fire people when competitive conditions shift, the firm must continuously train and develop its people. In other words, when the firm is ambitious with the goal of becoming the best, it has to prepare itself to ride with the tide of market waves. To make this possible, training people to be able to move from one advantage to another becomes a cost of doing business. It is just as important a bill to pay as the one the firm pays to keep the lights on and computers running. Investing in employees' capacity to move around eliminates a tremendous barrier to change and emphasizes the creation of transition capability.

### Stable Relationships

The second most important step for the firm to successfully ride waves of transient competitive advantages is to maintain an endogenous stability in terms of the firm's ambition and relevant strategy statements no matter how chaotic the external world could be or how the firm is in the midst of major change. In other words, the firm needs to be so sufficiently stable endogenously that it does not internalize any chaos from its environment, and does not alter its predetermined, conceptual path of development even when the internal affairs are difficult due to either changes in adopted strategies, or disengaging from old advantages and launching new advantages.

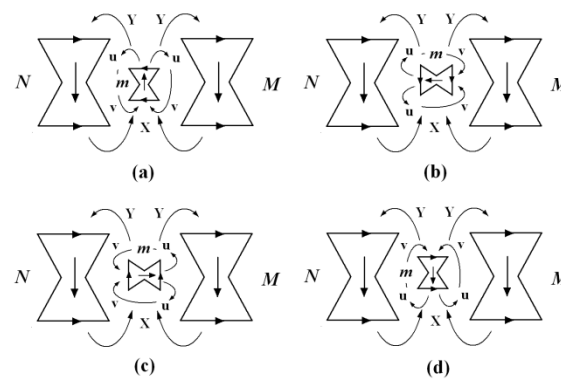


Figure 4. The fate of yoyo  $m$  within the conflict between  $N$  and  $M$ , whose meridian and eddy fields spin harmonically. Cases (a) – (d) provide respectively different positions of  $m$  within the meridian fields of  $N$  and  $M$

In terms of systemic thinking, the yoyo field of the firm is always located within the conflicts of much large yoyo fields (of other entities in the environment). If we model the field of the firm as  $m$  in Figure 4, then for the scenario in Figure 4(a), small yoyo  $m$  will be pushed upward by the meridian fields of  $N$  and  $M$  along the direction of  $X \rightarrow Y$ . If the meridian field  $Y$  of  $N$  is much stronger than that of  $M$ , then the majority of the yoyo structure of  $m$  will be pulled into the field of  $N$ . On the other hand, if the meridian field of  $M$  is much stronger, then the majority of the yoyo structure of  $m$  will be pulled into the field of  $M$ . If the meridian fields  $Y$  of both  $N$  and  $M$  are roughly the same strength, then the existing yoyo structure  $m$  will be torn apart into pieces, some of which will be absorbed by either  $N$  or  $M$ . For the situation in Figure 4(b), the meridian field  $u$  of  $m$  is pushed upward by the meridian field  $X$  of  $N$ , and the meridian field  $v$  of  $m$  is attracted downward due to the fact that the same polarities repel and opposite attract. So, yoyo  $m$  will spin clockwise in order to reposition itself as in that of Figure 4(a). If when it reaches the top of the combined meridian field of  $N$  and  $M$ , it is still in a position as shown in Figure 4(b), then it will be absorbed by  $N$ ; if at that moment, it is positioned like in Figure 4(a), then it will be destroyed as described in the analysis of Figure 4(a).

For the scenario in Figure 4(c), once again due to the property that the like polarities repel and opposite attract, the small yoyo  $m$  will experience counterclockwise spin in its general upward movement. If at the top of the combined meridian field of  $N$  and  $M$ , yoyo  $m$  is still in its position as in Figure 4(c), then it will be absorbed into  $M$ ; if it is poisoned as in Figure 4(a), it then will be destroyed by the meridian fields of  $N$  and  $M$ . For the situation in Figure 4(d), yoyo  $m$  experiences an extreme instability due to its positioning of the polarities. If the field intensity of  $N$  and  $M$  working on  $m$  are the same, the general upward movement of  $m$  will be sped up. If one of meridian fields of  $N$  and  $M$  is stronger, then yoyo  $m$  will be lifted further upward on that side, causing  $m$  to spin either clockwise (if the meridian field of  $N$  is stronger) or counterclockwise (if the meridian field of  $M$  is stronger). In either case,  $m$  will be repositioned as in Figure 4(b) or (c).

Similarly, the survival of the much smaller yoyo field  $m$  within the interaction between two relatively greater yoyos  $N$  and  $M$  as shown in Figures 5 and 6 can be analyzed. These figures depict the three most general scenarios of how the much greater yoyos  $N$  and  $M$  can be interacting with each other.

To materialize the established stretch ambition, the firm has to first stay viable as a system (or endogenous stability). So, these systemic analyses imply that to achieve the needed endogenous stability, which is fundamental for the firm to stay as a viable system, the executive team of the firm needs to create a tremendous force for stability by sticking to the pre-determined simple strategic priorities, by building culture and developing talent, and by leveraging a few core capabilities. And to maintain the operational consistency and stability in the leadership, the most senior executive of the firm should be promoted from an internal position. Otherwise the needed consistency and stability in leadership will be most likely interrupted by white knights and outside-the-industry saviors. And because achievements of the firm could only be consequences of collectively works of all stakeholders, the most senior leaders should generally be kept in low profiles instead of being high-profile public figures, although they need to be respected, acknowledged for their contributions, and somewhat visible in the press.

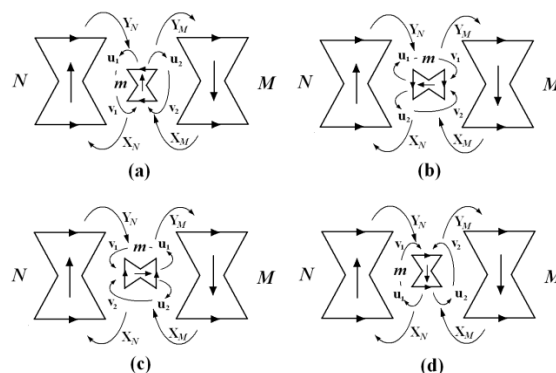


Figure 5. The fate of yoyo  $m$  within the conflict between  $N$  and  $M$ , whose meridian fields spin in opposite directions while eddy fields harmonically. Cases (a) – (d) provide respectively different positions of  $m$  within the meridian fields of  $N$  and  $M$

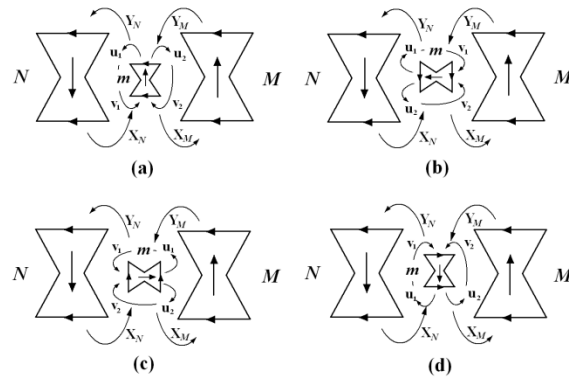


Figure 6. The fate of yoyo  $m$  within the conflict between  $N$  and  $M$ , whose meridian fields spin in opposite directions while eddy fields harmonically. Cases (a) – (d) provide respectively different positions of  $m$  within the meridian fields of  $N$  and  $M$

The analyses of Figures 4 – 6 also indicate that to stay viable within the turbulent conflicts of  $N$  and  $M$ , the firm  $m$  has to keep its input-output flows stable. That implies that the firm has to maintain extremely stable relationships with its clients and ecosystem partners, otherwise these relationships would be difficult to re-establish as indicated by Theorem 1. In other words, the firm changes in an evolutionary manner as its customers' preferences and needs change; and that in fact aligns the interests of the firm's clients and service firms rather than pitting their against one another. The fact that some outputs in Figure 1(a) do not return back into the system as inputs means that when it becomes obviously clear that some employees can no longer be redeployed or retrained, then a parting of the ways is necessary. And when this is the only option, the firm should well manage these separations so that those, who are either fired or laid off, maintain good relationships with the firm.

### Strategic Agility

In the previous subsection, we discussed the important step of creating internal stability over time in terms of the firm's vision, management strategy, organizational culture, and leadership. However, equally important to these established internal systems and structures are well-developed and sophisticated approaches to fostering strategic agility to sparking change routinely and consistently in order to avoid as much downsizing, restructuring, or sell-offs as possible.

Instead of having processes for major downsizing, dramatic restructuring, and otherwise getting out of declining areas in a big way in the face of ephemeral competitive advantages, the firm should embed changes in its normal routines, reallocate resources flexibly and on an ongoing basis. The firm should redeploy resources and shift emphases by accepting industry evolution, especially regarding technology, and by embracing the changes in order to enter new markets instead of cutting costs, divesting, and taking sudden, wrenching exits. In particular, the firm should use industry changes as opportunities to disengage and exit old businesses and enter new market segments with higher growth potential, and to integrate their old technologies into new waves instead of divesting completely. By accepting the evolution of its industries, the firm should choose to upgrade for the purpose of moving up the value chain.

When exiting an area, the firm should follow an evolutionary path by slowing down the allocation of resources to the area. So, instead of chopping off the area, it lives its life and the related activities find their way to insignificance in a period of time. At the same time, the relevant leadership and talent are repurposed for other efforts and people are assigned to other responsibilities. To achieve such desirable outcome, the budgeting and the allocation of major resources need to be fast, flexible, and have to be managed centrally in order not to be held hostage by powerful executives. In many companies resources are trapped (or held hostage) at the divisional or business unit level. When one area of the business is under pressure or an opportunity falls between units, it is generally difficult for a company to respond effectively because incumbent executives regard change as a threat.) To successfully ride waves of transient competitive advantages, the firm has to centrally coordinate its decision making with respect to major strategic challenges, while giving considerable latitude for action at the business unit level.

In terms of the systemic yoyo model, what previous subsection discussed is how to keep the yoyo field of the firm as solid as possible so that it can readily change its orientations and positions with the evolving environment. And in this

subsection, we look at how the yoyo field of the firm  $N$  should be managed so that a profitable, but eroding, business area should be disengaged with resources reallocated. Figure 7 shows how the process of disengagement takes place. In particular, the firm is the yoyo field  $N$  in the scenario in Figure 7, where the competitive advantage of business area  $d_2$  is eroding although it is still profitable. By isolating  $d_2$  out from the rest of the operation,  $d_2$  is split out from the yoyo field of the original yoyo field  $N$  of the firm into the independent yoyo field  $E$ , while the firm's allocation of resources is divided into two portions labelled by  $u$ . One of these portions represents resources available for exploring new opportunities.

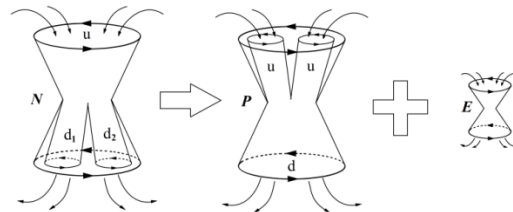


Figure 7. A profitable business area is disengaged

The evolution from the original yoyo field  $N$  into  $P + E$  can be detailed as follows. One of the  $d$ -quarks in  $N$  is split off and becomes  $E$  (Lin and He, 2010). Without loss of generality, assume that  $d_2$ -quark is split off from  $N$ . When  $d_2$ -quark leaves  $N$ , it takes a piece of the  $u$ -quark with it. Right before the piece of the  $u$ -quark leaves  $N$  (Figure 8(a)), the original even flow of materials in the black-hole side of  $N$  is greatly affected. In particular, into area A in Figure 8(a) no more material is supplied so that a relative vacuum is created, while due to conflicts in spinning directions, area B is jammed with extra materials. At the same time, when the original spinning flows plus the accumulated strength of pushing in area B throws the newly formed regional  $u$ -quark out of the eddy field of  $N$  along the direction of the arrow T, the congestion in area B and the vacuum in area A establish a new  $u$ -quark on the left-hand side to these areas. So, the flow pattern in Figure 8(b), as shown from above the black-hole side of the original yoyo  $N$ , is formed, where the local eddy motion on the right-hand side is the residual pool left behind by the departed  $u$ -quark in Figure 8(a).

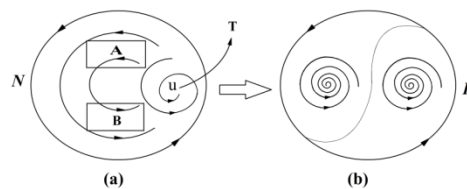


Figure 8. The mechanism for the formation of two converging sub-eddies

Similarly, we can analyze the scenario that an opportunity during a ramp-up phase gets some traction, but not sufficient enough for the firm to bring the newly developed opportunity up to scale. In this case, the firm could conveniently spin off the opportunity into an independent entity, while still use its outputs as those of the firm.

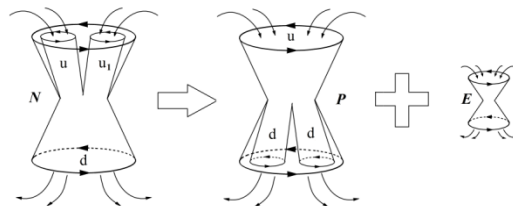


Figure 9. A non-profitable resource allocation is disengaged

In particular, Figure 9 shows the process of the split of the firm  $N$  into  $P$  and  $E$ , where the  $u_1$ -quark is split off to become  $E$ , while the original  $d$ -quark in  $N$  evolves into the structure of 2  $d$ -quarks in  $P$ . The appearance of the 2  $d$ -quarks in  $P$  is analyzed in Figure 10 similar to that is done with Figure 8 above. All the details are omitted here.

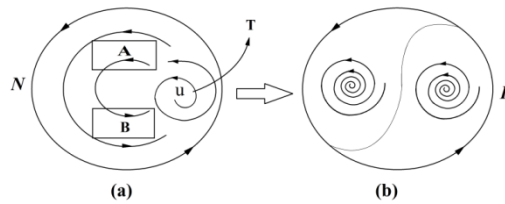


Figure 10. The mechanism for the formation of two diverging sub-eddies

### Making Innovation the Norm

As discussed in Subsection 4.2.1, having the stretch ambition of becoming “world class and the best of the world” means that the firm has to keep up with the most recent developments in the industries it competes in and find ways to lead in at least some of the developments. In other words, the firm needs to make considerable investments in flexibility and innovation.

In terms of flexibility, it means the capability for the firm to readily adopt new procedures and systems that will increase the situation at hands. For example, if the traditional annual budgeting processes and efficiency-oriented values no longer work efficiently, then the firm needs to enthusiastically modify the processes and values, even if this might lead to a small degree of sub-optimization. To reflect the unwavering commitment to the established ambition, the firm should go as far as to create a corresponding award system in which the employees who best exemplify the firm’s values are rewarded.

The key principle behind flexibility is that the adjusted pace of operations allows the firm to be extremely responsive to changes in the environment, and to catch the need to make changes and adapt earlier than other companies. To practically implement this principle, of course, the firm has to deal with a major barrier to effective change, the fear and sense of career risk that often lead managers to cling onto eroding businesses long after they should have moved on.

In terms of innovation, it represents the firm’s attempt to lead in at least some of the developments in the industries it competes in. So, rather than being an episodic, on-again, off-again endeavor, innovation has to be continuous, mainstream, and part of everyone’s job. To candidly echo the culture of innovative spirits, innovation and opportunity recognition processes should appear unequivocally and unendingly on the firm’s website, be featured in its recruitment materials, and reinforced by investment. In particular, the firm should proudly list how much it is investing in new activities, such as R&D, international expansion, etc.

Because the connotation of innovation in our context stands for creating new ways to lead industrial developments, the effort has to be companywide; and the firm should correspondingly have well-establish processes for managing the entire innovation pipeline that cut across business units. For example, if the firm decides to pursue growth strategies, it could introduce firstly ways for users to have easy access from everywhere; secondly a media platform for user interactions that adds information from users to other data that can be found on the firm’s site to make the site and the firm’s products and services more valuable; thirdly, individualized information that focuses on developing offerings for specific individuals and parties based on their interests and needs; and finally, open network partnerships, which seek to offer businesses solutions to their problems. Within each of these areas, managers need to regularly identify where they think the next set of promising opportunities will be and how resources could be dedicated to the opportunities that appear most compelling. At the same time, the firm’s leaders need to continually monitor the usage of key services and their impact on relations with key partners to determine when a service should no longer be offered.

For example, the senior executive team of the firm could task each division every year to articulate one or two big things they are going to do that will dramatically and in real time move their business forward, and then go public with that declaration. That is, the firm is continuously thinking of new things as part of everybody’s day job.

To summarize, what is discussed in this subsection is really natural consequences of the theory developed in the previous subsections. It ties different aspects of the firm into practical details in terms of flexibility and innovation.

## A CASE OF SUCCESS

In this section, let us look at a case of success where the company of our focus has stood the test of time for nearly two hundred years. Although the chosen company does not satisfy the criteria used in McGrath's (2013) study when she selected her outlier companies, it does present us a perfect business organization that repeatedly went through all the necessary steps for it to be successful in riding the waves of transient competitive advantages, as listed in the previous section, even when other named companies still treated competitive advantages as sustainable.

By clicking the link <https://grace.com/en-us/Pages/About-Grace.aspx> (accessed on July 22, 2017), we see the following message: A Global Leader in Specialty Chemicals and Materials. Under this title, we read: "Grace Catalysts Technologies and Grace Materials Technologies provide innovative products, technologies and services that improve the products and processes of our customer partners around the world." That is then followed with vision, purpose, and values as follows.

- Vision: Grace strives to be a premier specialty chemical and materials company. We provide innovative technologies and value-added products and services around the world to enhance the quality of life.
- Purpose: We are dedicated to our customers. They trust us to provide products, knowledge, technologies, services, and the people to make their products work better.
- Values: (1) Teamwork: Treat each other with respect. Work safely and effectively with each other to win in the marketplace. Communicate openly and candidly; (2) Performance: Provide products and services that will make our customers successful; (3) Integrity: Maintain and expect the highest level of ethical behavior; (4) Speed: Work with a sense of urgency to meet our customers' needs. Move quickly to seize opportunities in the marketplace. Anticipate market shifts and respond before our competitors; and (5) Innovation: Encourage people to constantly look for new ways to create value.

By clicking the link entitled "Our History," we find that the past of the company can be traced back to as far as 1832, nearly two hundred years ago. During the past two centuries, this business entity has taken different forms, gone through many evolutionary vicissitudes, and successfully ridden the tidal waves of shifting competitive advantages. That is, this business entity, among very few of similar business organizations, has splendidly stood the test of time.

In the rest of this section, let us look at the development history starting with William Russell Grace who founded W. R. Grace & Co. in Peru in 1854. Although the history of our focus organization traces back to Davison, Kettlewell & Co. in Baltimore, Maryland, of 1832, it is W. R. Grace that eventually took over the business of the former in W. R. Grace's business evolution.

### The Start of W. R. Grace

William Russell Grace left Ireland during the potato famine of the 1840s and bounced around the world as a sailor. In 1851 he shipped out to Calleo, Peru, then in the midst of a boom in the guano trade, and after a brief apprenticeship W. R. entered that business. However, harvesting and sale of bird droppings for fertilizer was only one of his many interests. He was bold in vision and daring in execution. He would go wherever profits were to be made purchasing or founding projects and then discarding them when they lost their glow. In 1854, when it suited his needs, he organized W. R. Grace & Co. as the vehicle through which most of his efforts would be channeled.

W. R. owned and ran Peruvian textile mills and sugar estates, a rubber industry in a Brazilian jungle, and a nitrate business in the Chilean desert. There were Grace constructed railroads in the Andes, and he introduced American agricultural and electrical equipment to the west coast of South America. He was involved in a scheme to dig a canal across Nicaragua that preceded the Panama Canal. When Peruvian finance was in shambles, W. R. and his brother, Michael, were asked to help reorganize it and put the country back on its feet.

Although deeply involved in South America, W. R. pursued holdings in other parts of the world. He founded Grace Brothers & Co. of London and then went on to the Far East. Within two decades, he had accumulated trading interests that stretched from Peru to Tokyo, from the Baring Sea to the Straits of Magellan. In 1865, W. R. relocated to New York to become the mayor of the city. Afterwards, he returned to the business world and started some companies in the United States.

## **The Second Generation at W. R. Grace**

W. R. suffered a stroke in 1898 and died in 1904 when his nephew Edward Eyre was serving as the president of the business organization. In 1936, W. R. Grace was still heavily involved in South America trade and in a wide variety of businesses. It owned and operated sugar plantations in Peru, refineries, a paper plant, and a facility that produced caustic soda, chlorine, and muriatic acid. The company made rum from molasses at Cartavio in Peru. There were tin, wolfram, lead, zinc mines, and textile mills in Colombia, Peru, and Chile. And oilseed operation, a coffee plantation in Guatemala. A trading business in East Indian Coffee and cocoa. The ship agency operations in 30 or so ports. Cotton mills. Woolen mills. And much more.

Other than handling the company's business, the Grace bank was known as the savviest financial institution in its special niche. The Grace Line was one of America's most renowned carriers, taking cargoes and passengers to and from the United States to ports along the west coast of Latin America. Panagra was the major air carrier from the United States to points south. A popular radio program of the time, *Nights in Latin America*, spun visions of the exotic southern continent, along with playing native music. In 1936 there were several coffee roasters near Hanover Square, where W. R. moved his New York Headquarters in 1885, which provided the district with an aroma.

The Grace offices were populated mostly by men who had served for many years in one or more of the Grace casas in Peru, Ecuador, Chile, and Bolivia. As was the case with all new hires, after graduating from Yale, Peter Grace began in the mail room. With the obligation of following the company's rigorous training regimen, Peter moved from one division to another, from New York to Peru, Chile, and beyond in order for him to become a generalist and develop the necessary commitment to business. In 1940, as Peter was involved with the company's burgeoning South American trade, he travelled to Chile and met Raul Simon, who headed the company's Chilean operations. Before working for the Grace, Simon had served in government, worked as a journalist, and authored a few books. In other words, Simon was one of the very few Grace executives who could be considered an intellectual. In his conversations with Peter, Simon predicted that the United States would enter the European war then raging. Latin American countries would sell a great deal of raw materials to the United States and come out of war quite prosperous, which would prove their undoing. Simon believed that demagogues would come to power throughout Latin America, promising the people endless prosperity. In time all foreign investments would be taken over, while inflation would destroy values. He convinced Peter that the company would have to leave South America before this happened.

As predicted by Simon, the South American trade was enormously profitable. In 1938, the last full prewar year, W. R. Grace had revenues of \$1.7 million; in 1941, they came to \$9.1 million and reached just under \$12 million in 1945. That year, Peter became the president of W. R. Grace.

## **Peter Grace: The Leader of the Third Generation**

During the war Peter Grace developed a three-part plan. In addition to taking the company out of South America, he needed to unearth other businesses for it to enter. Instead of starting companies, it made more sense to make purchases, because the company lacked requisite expertise and knowledge to operate anything but those Latin American enterprises and would need managers and technicians from the acquired companies. The third part of the strategy was to transform W. R. Grace into a public company in order to ease the task of raising funds, and have stock options to keep and attract talents for managing the acquired businesses.

The implementation of the plan had to be slow because the board still didn't take Peter seriously, see him as a menace to their dividend payments, and consider W. R. Grace as the family preserve. Additionally, the program had to be carried out carefully so as not to upset the existing operations. As board members retired or died, Peter would replace them with new people who agreed with his vision for the company. In 1952, just before the diversification started and when Peter got into a car accident and spent three months in the hospital, Andrew Shea, the number two man of the company, went after Peter and tried to get him fired. Shea was one of the Latin American hands, and felt he had to save the old company. After surviving the challenge, Peter got W. R. Grace listed on the New York Stock Exchange in early 1953, while perfecting his plans for diversification.

From three promising areas, petroleum, chemicals, and electronics, chemicals was chosen because of the scale of the area and the existence of many niches, some of which resembled several of W. R. Grace's old businesses. Through using his connections, Peter acquired the proper talent, although he had to make some bright young men without much



experience in chemicals to be executives. Because petrochemicals were considered most promising, Peter acquired Davison Chemical by late 1953, then Dewey & Almy, and then on to more deals in chemicals. By 1957, chemicals grew to 55% of the company's assets from 3% in 1950, making W. R. Grace one of the ten largest chemical companies in America. At the same time period, revenues rose from \$265 million to \$460 million and earnings from \$8.5 million to \$15.5 million.

Starting in early 1960s, Peter started to lose his sense of direction, while by then he had accumulated sufficient power to do anything he wanted to do. Other than notoriously shortened attention span, Peter attempted to micromanage and displayed a compulsive concern with information.

In terms of disengagement, the Grace Bank was sold in 1965; Panagra sold in 1967; the Grace Line in 1969. Then in that year, a Peruvian military junta started expropriating foreign properties. Disgusted, Peter ordered the wholesale divestiture of all South American companies often at prices below what they should have fetched.

By then Peter was more secure in his position and was prepared to act boldly and to purchase companies in industries he found interesting. From this period onwards to 1990, Peter purchased massively in food industry, restaurants, specialty department stores, petroleum firms and drilling companies, health care industry, etc. Because many of these purchases mandated borrowing, by the end of 1985, the company's long-term debt reached \$1.6 billion. The need to cut back on the debt and failures of several aspects of the new W. R. Grace motivated Peter to exit from the failed ventures smoothly. By the year of 1991, specialty retailers and restaurants were sold off. For a more detailed account on what had gone wrong with Peter Grace's later career, see (Sobel, 1999).

### **Leadership at Grace beyond Grace Family**

In 1992, due to Peter's illness, J. P. Bolduc became the president and chief operating officer of the company. After relocating to Boca Raton, Bolduc restructured the company, sold off additional properties, and gave W. R. Grace a more focused appearance than it had before. And as of this writing this focused appearance has continued.

In the following, let us fast forward from 1995 to 2016 and focus on major events of business expansions only.

After J. Peter Grace died in 1995, Albert J. Costello became the next leader of the Grace organization. In this year, Grace acquired Cormix Construction Chemicals, and expanded market penetration in the United Kingdom, Middle East, and Asia Pacific. In 1996, while disposing several noncore businesses, Grace built its first packaging and silica products plant in Malaysia and expanded construction products business into India and Vietnam. In 1997, Grace introduced Procor™ fluid-applied waterproofing, a liquid alternative to sheet membrane waterproofing. In 1998, Grace merged its Cryovac packaging business with Sealed Air Corporation, making the business organization a global specialty chemicals company, focusing on catalysts and silica products, specialty construction chemicals and building materials, and container protection products. And in this year, Paul J. Norris became the CEO. In 1999, Grace formed the Performance Chemicals unit, comprising construction chemicals and materials, and Darex Container Products. In 2000, Grace continued successful bolt-on acquisition strategy with the Crosfield Groups' hydro-processing business, the International Protective Coatings firestop products and systems business, the LUDOX® colloidal silicas business, and the Hampshire Polymers business. In 2001, Grace Performance Chemicals acquired Pieri SA's construction chemicals business, while Grace Davison Catalysts entered into a joint venture, Advanced Refining Technologies, for hydro-processing catalysts with Chevron Products Company. And Grace Davison Silicas acquired The Separations Group, as well as the precipitated silicas business of Akzo-PQ Silica. In 2002, Grace Davison Catalysts acquired the catalyst manufacturing assets of Borealis A/S, while Advanced Refining Technologies acquired an exclusive license for the hydro-processing catalyst technology of Japan Energy Corporation. Grace Performance Chemicals acquired Addiment, Inc., a leading supplier of specialty chemicals to the concrete paver and masonry industries. In 2003, Grace Davison Silica Products acquired MODcol Corporation, a manufacturer of preparative chromatography columns and provider of custom column packing services. Silica Products strengthened its European presence with its acquisition of the high-performance liquid chromatography business of Argonaut Technologies. And Grace Performance Chemicals acquired certain assets of Tricosal Beton-Chemie GmbH & Co., a leading supplier of specialty chemicals and materials to the European construction industry. In November, Fred Festa became the President and Chief Operating Officer of W. R. Grace & Co.

In 2005, Grace acquired Midland Dexter Venezuela, S. A., a supplier of coatings and sealants for rigid packaging in the local and export markets of Latin America; Perstorp Peramin Ab, a concrete admixture business in Sweden; The assets of Single-Site Catalysts, LLC, a supplier of organometallic catalysts; and Flexit Laboratories Pvt. Ltd., an Indian chromatography company, through Grace subsidiary, Alltech Associates Applied Science Limited (UK). It opened a new office in Shanghai and a technical service center in Beijing and reached an agreement for the Kuwait Catalyst Company to manufacture Advanced Refining Technologies catalysts for the petroleum refining industry in the Arabian Gulf region. In 2006, Grace opened a manufacturing facility in Tennessee to produce products for residential and commercial construction, a new Discovery Sciences technical center in Shanghai and a marketing office in Moscow. The company acquired a catalyst components business and custom catalyst assets in order to expand existing polyolefin catalysts manufacturing capabilities. In 2007, Grace Davison opened a new facility in Surat, India, focused on manufacturing columns and cartridges for chromatography applications. Grace expanded its R&D capabilities in Europe with the official opening of an innovation center in Poznan, Poland, and opened a new facility manufacturing cement processing additives and concrete admixtures in the Hoc Mon District of Ho Chi Minh City, Vietnam. In 2009, Grace opened a Customer Centre of Excellence near Barcelona, Spain and a manufacturing facility in Chennai, India for the production of specialty chemicals used in commercial, infrastructure and residential construction. In 2010, Grace acquired Wuhan Meilixin New Building Materials Co., Ltd., a manufacturer of waterproofing products located in China, and Synthetech, Inc., a manufacturer of fine chemicals specializing in organic synthesis, biocatalysis and chiral technologies.

In 2011, Grace opened a cement additives and concrete admixtures facility near Delhi, India, received a three-year, \$3 million grant from the U.S. Department of Energy to develop advanced post-combustion technologies for capturing carbon dioxide (CO<sub>2</sub>) from coal-fired power plants. Gregory E. Poling became Grace's President and Chief Operating Officer. In 2012, Grace succeeded (jointly with Formac Pharmaceuticals) with human clinical trial demonstrating the novel use of silica for drug delivery. It acquired the assets of Noblestar Catalysts Co., Ltd., a manufacturer of fluid catalytic cracking (FCC) catalysts, catalyst intermediates and related products used in the petroleum refining industry and located in Qingdao, China, and signed a multi-year agreement with Braskem to develop process technologies and catalyst solutions to produce green chemicals. In 2013, Advanced Refining Technologies LLC<sup>®</sup> (ART) signed an agreement with Chevron Lummus Global (CLG) for the exclusive right to sell CLG's hydrocracking and lube hydroprocessing catalysts to CLG's licensees and other petroleum refiners for unit refills. Grace acquired Chemind Construction Products, located in Brisbane, Australia, and the assets of the Polypropylene Licensing and Catalysts business of The Dow Chemical Company, and entered into a joint venture with Al Dahra Agricultural Company to build and operate the first fluid catalytic cracking (FCC) catalysts and additives plant in the Middle East. In 2016, Grace separated into two independent public companies, where Catalysts Technologies and Materials Technologies remained in Grace while a new entity, named GCP Applied Technologies, Inc., focusing on Construction Products and Darex Packaging Technologies businesses. On July 1, Grace acquired the BASF Polyolefin Catalysts business with production facilities in Pasadena, Texas and Tarragona, Spain, making Grace the #1 worldwide in polyolefin catalysts.

## CONCLUSION

Through employing the rigor of game theory and the intuition of systems science, this paper establishes a general theory on how a firm could successfully transit into the new era of transient competitive advantages. Beyond listing the necessary steps for the desired transition, this work institutes the systemic reason to explain why these steps are practically important and how they are fundamentally connected.

Beyond using anecdotes and data mining this paper attempts to rely on theoretical reasoning and systemic logic to derive conclusions and provide guidelines. Such effort and its consequent effect cannot be overemphasized considering the fact that with the globalization of the world economy, the once sustainable competitive advantages of the business world have become transient so that new decisions are made under ever increasingly tight and high pressures (McGrath, 2013).

We hope that this work will play the role of a flying pebble that will attract many theoretical and empirical gem stones in the years to come.

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# THE INNOVATIVENESS OF MANUFACTURING FIRMS FROM THE ANGLES OF ORGANIZATIONAL CULTURE, STRUCTURE AND LEADERSHIP

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## ABSTRACT

This paper employs a method of holistic thinking to see which of the twenty plus internal factors empirically identified in the literature are primary forces underlying the innovativeness of a manufacturing firm and which ones are secondary or appear naturally after the primary forces are created. Based on how organizational culture is formed in general, the effects of firms' culture on innovation are analyzed. By using a general cost-benefit analysis, the effects of firms' general characteristics on innovation are studied. Though modelling a firm systemically, the effects of firms' structure on innovation are seen clearly. With the concept of leaders well explained, the effects of firms' leadership on innovation are shown. At the end, practically useful recommendations for managerial decision making are provided.

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## INTRODUCTION

Due to the practical importance and theoretical significance, this paper investigates the following question by using the holistic thinking of systems science: How do manufacturing firms' culture, structure and leadership affect the innovativeness of the firms? The importance of innovation in terms of wealth creation has been noted more than two hundred years ago since the time of Adam Smith (1776). The currently increasing intensity of competition of the world economy is also making innovation an unavoidable issue for each company to consider (Stock et al., 2002). That is why it is quite urgent for managers and scholars to answer the question just posted, because for any existing firm, its culture, structure and leadership represent some of the most essential aspects of the organization.

In the past decades, many scholars have empirically checked the effects of various culture, structure and leadership related factors on innovation (Darroch and McNaughton, 2002; Francois, Favre & Negassi, 2002; Jung, Chow & Wu, 2003; Keizer, Dijkstra & Halman, 2002; Koberg, Uhlenbruck & Sarason, 1996; Papadakis and Bourantas, 1998; Parthasarathy and Hammond, 2002; Souitaris, 2002; Veugelers and Cassiman, 1999). However, limited by the methods employed, all the established associations between these factors, as explanatory variables, and innovation, as the dependent variable, experience a large range of varying degrees. So, to overcome this problem in order to produce practically reliable conclusions, we will base our investigation on a different methodology of reasoning and analysis so that the effects of the factors identified in the literature, which are culture, structure and leadership related, on the innovativeness of manufacturing firms can be better understood.

Specifically, this paper will address the question posted earlier by applying the thinking logic and the yoyo model of systems science. After developing a general theory on how philosophical and value systems are formed for individuals and organizations, we discuss how organizational culture is formed, why mission and ambition are two powerful unifying forces of organizational culture, and then why, theoretically, organizational culture represents a significant determinant of the innovativeness of the firm, total quality management is one strategic implementation of the ambition of the organization, any resistance to change is against the firm's ambition and culture, and the perception of support for innovation is positively correlated to the innovativeness of the firm. To study the effects of leadership on innovation, we first construct a systemic model for the concept of leadership, from which we illustrate why leadership commitment is the essence for success in the promotion of innovation. Then we demonstrate why such leadership related variables as 'presence of a project leader', 'CEO's characteristics', 'CEO change', and 'CEO's qualification and experience', are all secondary when compared to having a long-term, unwavering ambition. To investigate factors related to manufacturing firms' general characteristics, we analytically show that such variables as 'firm size' and 'past performance' are indicators of innovativeness of the firm, although they are only secondary when compared to the mission and global strategies of the firm, while 'age of the firm' and 'ownership structure' are not. By modeling manufacturing firms' structures systemically, we show that such firms'-structure related factors as 'formal structure', 'flexible structure', 'centralization of decision making', 'empowerment of employees', and 'interaction between firm's units', are all secondary and practical implementations of the long-term, unwavering ambition.

Beyond the previously listed accomplishments, the most significant contribution this work makes is the introduction of the methodology of systems science into the investigation of innovation. Such an approach helps us derive practically usable managerial recommendations. In other words, all the results established in this paper hold true generally. That is what makes this work fundamentally different from the existing literature, where conjectures and suggestions (instead of recommendations) are developed based on data analysis, data mining, and anecdotes. Because of the logic reasoning and holistic thinking employed in this paper, our established results do not suffer from the methodological weaknesses of the past data- and/or anecdote-based works that prevent decision/policy makers from making generalizations. For more details on this end, see (Lin and OuYang, 2010).

The rest of the paper is organized as follows: The following section views the relevant literature and shows the main contribution of this work. Then presented are the necessary background information needed for the rest of the paper in three parts: a brief introduction to systems logic of thinking, the concept of innovation in the manufacturing sector, and market invitation for innovation. For the effects of firms' culture on innovation, after establishing the facts on how individuals' philosophical and value systems are developed, the concept of organizational culture is constructed, and an explanation on why mission and ambition represent two powerful unifying forces of the organizational culture is provided. With all these preparations in place, the effects of firms' culture on innovation are insightfully shown. In terms of the effects of firms' leadership on innovation, we study first the concept of leadership and second how leadership commitment is the essence for success. In the next three sections, we investigate the effects of firms' general characteristics on innovation, the effects of firms' structure on innovation, and provide the managerial recommendations derived from the theory established in this paper. And the last section concludes this presentation.

## LITERATURE REVIEW

Because this paper investigates the effects of manufacturing firms' culture, structure and leadership on their innovativeness, this section reviews the literature in two different but related areas. One area is about the studies on what explanatory variables explicate the dependent variable innovation, and the other on issues related to competitive advantages, where each competitive advantage is innovation based.

For the literature on innovation, Adam Smith (1776), over two hundred years ago, acknowledge the importance of innovation in creating wealth. And the concept and topic of innovation in the manufacturing sector represents a traditional field of study that has been well investigated through the years by many scholars (Aas et al. 2015), due to its close connection with the prosperity of manufacturing firms (Adner and Levinthal 2001) and its being a critical factor for these firms' survival and growth (Damanpour 1991; Visnjic, Wiengarten & Neely, 2016). In the world of business, innovation is characterized by introducing original products and processes (Becheikh, Landry & Amara, 2006) that enable manufacturing firms to competitively enter or create new markets (Smith and Tushman 2005).

Innovation has been treated by many as a factor of long-term performance (Kanter 2001). For example, Daft (1978), Damanpour (1987) and others investigate administrative innovations and organizational processes accompanying technical developments. Utterback and Abernathy (1975) study the innovation of products and processes. Ettlie, Bridges and O'Keefe (1984) and Nord and Tucker (1987) consider issues related to incremental and radical innovations. Amara and Landry (2005) examine how information sources firms use to develop or improve their products or manufacturing processes affect the novelty of innovation. They find that manufacturing firms prefer to use a large variety of research sources to develop or improve their products or processes. Becheikh, Landry and Amara (2006) demonstrate that product and process innovation are closely associated to the manufacturing environment with product innovation receiving more attention.

Alegre and Chiva (2008) study how organizational learning capability affects product innovation performance. Lin, Tan and Geng (2013) consider the increasing importance of green products and if and how green product innovation can affect firm performance. They find that this market demand is positively correlated to both green product innovation and firm performance, and surprisingly leads manufacturing firms to a better performance. De Massis et al (2015) show that family businesses are different from nonfamily firms in product innovation strategies and in the organization of innovation processes. They find that manufacturing family firms focus on incremental product innovations by using more external sources, while nonfamily firms more on breakthrough and radical innovation through a predominantly closed approach.



With the economic globalization and the advent of internet-based technologies, manufacturing firms experience increasing pressures to become more competitive and innovative than ever before (Buffington 2016; Caputo, Marzi & Pellegrini, 2016; Zollo et al. 2016), leading to the emergence of new manufacturing philosophies (Caputo, Marzi & Pellegrini, 2016; Holmstrom et al. 2016). These new philosophies have redefined the concept of manufacturing and innovation in the manufacturing field (Roos 2015; Wu et al. 2015). The most famous ones are Industry 4.0 and China's manufacturing 2025 (Lee et al. 2015; Li, 2017).

For the literature on competitive advantage, it is defined by Porter (1985) as a function of either providing comparable buyer value more efficiently than competitors (low cost), or performing activities at comparable cost but in unique ways that create more buyer value than competitors and, therefore, command a premium price (differentiation). In this regard, Saeidi, et al., (2015) consider sustainable competitive advantage, reputation, and customer satisfaction as three probable mediators in the relationship between corporate social responsibility and firm performance. In the context of Chinese-like emerging economies, Li and Liu (2014) define the concept of a firm's dynamic capability as the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely decisions, and to implement strategic decisions and changes efficiently to ensure the right direction. Moustaghfir (2012) explains how knowledge assets provide firms with a competitive advantage and shows how organizational capabilities have the potential to produce long-term superior performance.

Makadok (2010) predicts a negative interaction effect on profits of simultaneously restraining firms' rivalry and increasing competitive advantage. **Carpenter, Daidj and Moreno (2014)** use the video-games industry to investigate the consequences of hyper-competition and implications of either maintaining competitive advantage or developing temporary advantages. Peng, Lee and Tan (2001) uses the massive Japanese investment in an effort to replicate *keiretsu* (interfirm) networks in Asia since the 1980s to study the sources of competitive advantages. Herrera (2015) build a framework that describes factors leading to successful corporate social innovation, which in turn creates opportunities for co-creation, thereby leading to shared value and enhancing competitive advantage if it is integrated into strategy and operations. Fronmueller (1996) studies the relationship between backward vertical integration and low cost and that between forward vertical integration with differentiation-based competitive advantage.

Peterson (2013) addresses the question of whether deploying compliance and ethics programs would assist U.S. organizations in implementing internal mechanisms necessary to achieve a competitive advantage from the angle of law. (Forrest and Nightingale, 2017) establish a practical procedure for a firm to transit smoothly into the era of fast strategic changes while its once sustainable competitive advantages have become transient. These authors advance the systemic reasons for why a list of time-honored steps would practically help firms successfully surf through waves of transient competitive advantages by combining previously published conclusions derived on anecdotes and data mining.

In comparison, this work contributes to the relevant literature in different ways. First, after developing a general systemic theory of organizational philosophical and value systems and culture, this paper shows the absolute necessity for a manufacturing firm to have clearly stated missions and a long-term, unwavering ambition. Second, by insightfully explaining the concept of leaders, this paper is able to show how the firm's leadership affects its innovation. Third, this paper holistically demonstrates how firm's organizational culture fundamentally affects its innovativeness. Fourth, in its attempt to investigate the effects of firms' general characteristics on innovation, this paper establishes an analytical model that can be more widely employed for other purposes. Fifth, though modelling a firm systemically, the effects of firms' structure on innovation are seen clearly. Six, practically very useful recommendations for managerial decision making are provided.

In particular, the most important contribution of this paper is of the following two details. First, instead of employing anecdotes and various methods of data analysis and data mining, as what has been mostly done in the past, this work employs systems science as the methodology and logic of reasoning. That explains why conclusions developed in this paper can be materialistically applied to guide relevant practices in real life. Second, this research convincingly

demonstrates that the effects of firm's size on innovation, as respectively claimed by Schumpeter in 1934 and 1942, are not contradictory as many scholars had thought (Damanpour, 1992; Majumdar, 1995; Stock et al., 2002; Tsai, 2001).

## PRELIMINARY INFORMATION

In this section, we look at several matters needed for the rest of this paper: the basics of systems science, the general concept of innovation in the manufacturing sector, market characteristics that invite and stimulate innovation in the manufacturing sector, and environmental forces that dominantly affect innovative activities of manufacturing firms.

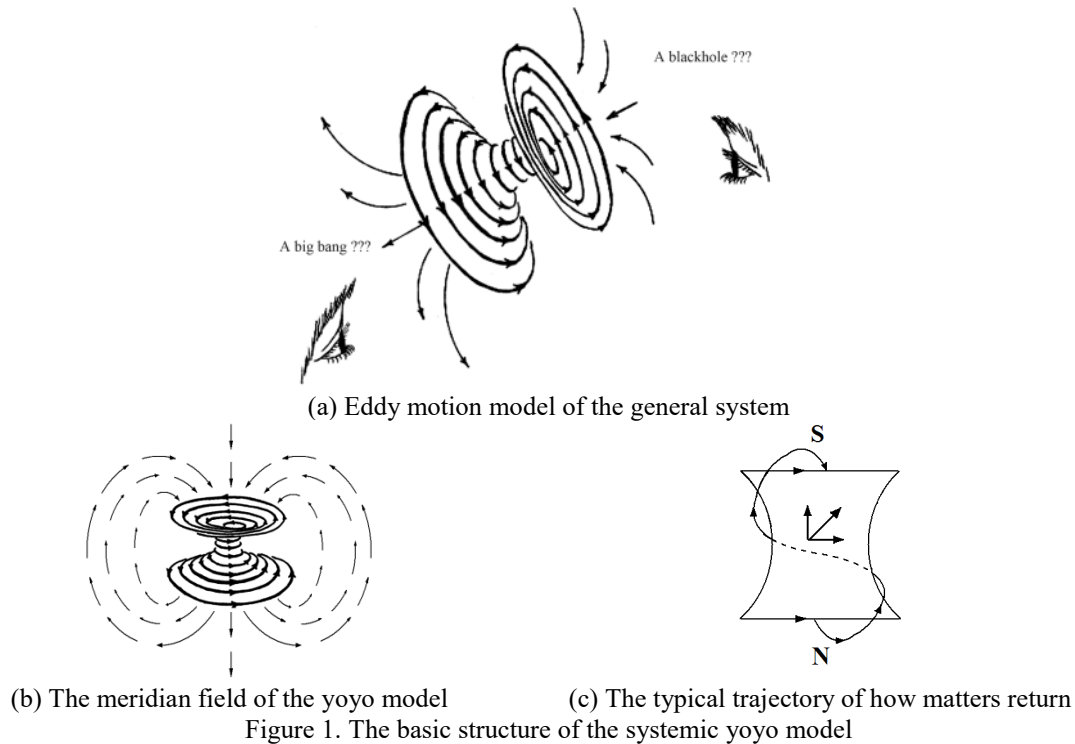
### Systems Logic of Thinking

System exists everywhere, especially in the investigations of issues of economics and business decision making. For example, each person is a complex biological system, made up of many smaller systems. At the same time, she is also a member of many social and economic systems, such as a family, neighborhoods, communities, etc. And each day she interacts with a range of various systems, such as a car, an ATM machine, retail stores, the company she works for, etc. These systems interact with each other constantly. Hence, other than using numbers and variables to investigate problems and issues of business and economics, which is what is mostly done in the literature, there is an urgent need for us to employ the concept of systems and relevant methods to study economic phenomena in order to obtain brand new understandings and conclusions.

Historically, the concept of systems has been directly or indirectly introduced by scholars in different disciplines. For example, in the area of economics Rostow (1960) wrote that: The classical theory of production is formulated under essentially static assumptions ... to merge classical production theory with Keynesian income analysis ... introduced the dynamic variables: population, technology, entrepreneurship, etc. But ... do so in forms so rigid and general that their models cannot grip the essential phenomena of growth ... We require a dynamic theory ... which isolates not only the distribution of income between consumption, savings, and investment (and the balance of production between consumers and capital goods) but which focuses directly and in some detail on the composition of investment and on developments within particular sectors of the economy. In the area of biology von Bertalanffy (1924) pointed out that because the fundamental character of living things is their organization, the customary investigation of individual parts and processes cannot provide a complete explanation of the phenomenon of life. And many others, such as Porter (1985), Klir (1985), Lin (2009), etc., also demonstrated how powerful holistic way of thinking and relevant methodology could be in terms of producing conclusions that are realistically reliable and practically usable regarding organizations, such as business entities, and how these organizations, such as economies or markets, etc., interact with each other. As a matter of fact, since the 1920s, such a holistic view of nature, organizations, and social events has permeated the spectrum of knowledge (Lin, 2009).

Numbers and systems are abstracted out of the physical world from two different and harmonizing angles. When an organization is seen as a collection of unrelated people and properties, numbers come into play, such as  $n$  employees,  $m$  copy machines, etc. When the organization is seen holistically, then the concept of systems emerges, where such elements as employees, capital, properties, etc., form an organic whole through various relationships, without which the organization does not exist. In other words, all studies in business related disciplines are essentially about systems, be they individuals, see as economic agents, firms, markets, industries, economies, etc. The major differences between numbers and systems include: 1) the former is a small-scale local concept, while the latter a large-scale organizational concept (Lin, 1988; 1999); and 2) numbers exist only post existence, while systems emerge at the same time when physical or intellectual existence comes into being (Lin, 2009). That is the reason why systems methodology is a more appropriate tool than all theories developed on numbers and variables for the investigation of economic entities when their internal structures are concerned with and why the Wall Street still cannot successfully make advanced predictions for imminent economic disasters.

By systems science, it means the totality of all studies of various kinds of systems. In the past 90 some years, the methods of systems science has been widely employed in different disciplines (Klir 2001). Similar to how the Cartesian coordinate system – consisting of the crossing of two or more number lines – plays its role in the development of the traditional science (Kline, 1972), in systems science the role is played by the systemic yoyo model (Lin, 2007) in Figure 1.



Specifically, on the basis of the blown-up theory (Wu and Lin, 2002), a general theory of development, and the discussion on whether or not the world can be seen from the viewpoint of systems (Lin, 1988; Lin, et al., 1990), the concepts of black holes, big bangs, and converging and diverging eddy motions are coined together in the model shown in Figure 1 for each object and every system imaginable. That is, each system is a multi-dimensional entity that spins about its axis. If we fathom such a spinning entity in our 3-dimensional space, we have such a structure as artistically shown in Figure 1(a). The black hole side pulls in things, such as materials, information, investment, profit, etc. After funneling through the “neck”, things are spit out in the form of a big bang. Some of the materials, spit out from the end of big bang, never return to the other side and some will (Figure 1(b)). Due to its general shape, such a structure is referred to as a yoyo.

What this systemic model says is that each physical or intellectual entity in the universe, be it a tangible or intangible object, a living being, an organization, a market, an economy, etc., can all be seen as a kind of realization of a certain multi-dimensional spinning yoyo with an eddy field around. It stays in a spinning motion as depicted in Figure 1(a). If it does stop its spinning, it will no longer exist as an identifiable system. What Figure 1(c) shows is that due to the interaction between the eddy field, which spins perpendicularly to the axis of spin, of the model, and the meridian field, which rotates parallel to axis of spin, all the materials that are either new to the yoyo body or returning to the black-hole side travel along a spiral trajectory.

To conclude this subsection, let us see how the systemic yoyo model has been successfully applied to address the question of why firms should somehow make private cost information of their sales associates known to their respective members, and what incentive weights a firm should give to its individual sales associates in order to optimize its profits. The compensation problem of sales force represents an area of research with a great potential of direct applications in real life. And a good number of scholars have contributed to this important research (Forrest and McCarthy, 2017). Assume that the firm of concern consists of two sales associates  $A_1$  and  $A_2$ . Then the competition between these associates can be modelled by the yoyo field in Figure 2, where the overall spinning field stands for the operation of the firm, and when one of the associates, say  $A_i$ , grows larger, then the out of proportional growth of  $A_i$  will definitely affect the development of  $A_j$ . On top of this intuition, the following propositions are shown by Forrest and McCarthy (2017):

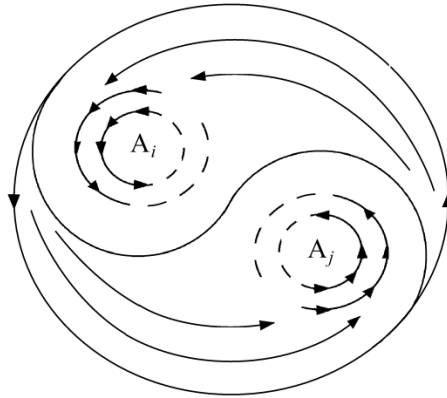


Figure 2. Competition between sales associates within a firm

- (1) At Cournot equilibrium, the amount of associate  $A_i$ 's sales is an increasing function of  $\lambda_i$  and decreasing function of  $\lambda_j$ , where  $\lambda_k$  is the commission of  $A_k$  as a percentage of her completed sales,  $k = 1, 2$ .
- (2) When the associates  $A_i$  and  $A_j$  are Cournot competitors, making the private cost information of  $A_i$  known to associate  $A_j$  does expectedly increase the incomes of  $A_i$  ( $= 1, 2, i \neq j$ ).

In this example, the firm is seen systemically as an abstract spinning yoyo with local eddy leaves representing the sales associates respectively. The competitive interactions of the two associates make the yoyo field of the firm spin. For example, associate  $A_i$  tries marketing strategy X while  $A_j$  tries strategy Y. When the sales of  $A_i$  are ahead,  $A_j$  will adjust her marketing strategy by adopting some of the successful aspects of  $A_i$ 's strategy so that her sales look better. Consequently,  $A_i$  will adjust her strategy by referencing what  $A_j$  seems to have done right. In other words, the constantly changing strategies of the sales associates evolve around each other and become better and more efficient. In this systemic yoyo field, the axis of spin is the ultimate revenue generated by the sales associates, the 'black hole' the firm's inputs, such as information, investments, knowledge, revenue, etc., and the "big bang" the firm's outputs, such as goods and services sold. And when the firm is seen from different angles, the meanings of "black hole" and "big bang" are different. But, together these different "black holes" and "big bangs" make the firm alive. Without the totality of the inputs – the "black holes", and the outputs – the "big bangs", the firm cannot be physically standing.

Relating to what we study in this paper, each human organization, be it a firm, a market, or an economy, as a whole is made up of its physical body, internal structure, and its interactions with the environment. According to the systemic yoyo model, this whole is a high dimensional spin field, where the internal structure and interactions with the environment affect each other and change the characteristics of the physical body. Because the body is the carrier of all other aspects of the organization, in theory the body is a pool of 'fluid' realized through human sensing organs in the three-dimensional space. The concept of "fluid" here is an abstract term totalling the flows of information, resources, profits, investments, etc., circulating within the inside of, going into, and giving off from the body. So, each economic entity, such as a firm, a market and an economy, represents spinning yoyo field that is located within an ever-evolving and constantly changing ocean of eddies, interacting with the yoyo fields of other economic and non-economic entities persistently. As a matter of fact, this end is also recognized by the contingency theory and supported by empirical evidence: Each organization is above all an adaptive system which evolves by reacting to its environment; and indeed, environment has a determining impact on firms' strategies, structuring and behaviors (Burns and Stalker, 1961; Chandler, 1962; Lawrence and Lorsch, 1967; Woodward, 1970).

### The Concept of Innovation of a Manufacturing Firm

Because of the theoretical and practical importance of innovation in the manufacturing sector, the notion has been conceptualized by many authors (Becheikh, Landry & Amara, 2006; Camison-Zornoza et al. 2004; Crossman and Apaydin, 2010; Hobday 2005; Lansisalmi et al. 2006; Peres, Muller & Mahajan, 2010; Pittaway et al. 2004; Schumpeter, 1934) and by the Organization for Economic Cooperation and Development (OECD, 1997). However, with the constant change of the business world, the meaning of innovation has been evolving with new particulars added over time.

Considering the unfolding Industry 4.0 and China's manufacturing 2025, new meanings are expected to be added to the concept. In order to make the value of this work long lasting, let us look at the concept of innovation in the manufacturing sector as generally as possible below:

Innovation in the manufacturing sector is such a set of activities – which could be just one particular activity or several – that leads to exceptionally added value to the company when compared to other activities that take place in the same sector.

Because of the abstraction and emphasis on the comparatively added value, this definition of innovation implies many facets of the concept. For example, any practical generation of exceptionally added value implies that

- 1) An extraordinary level and/or quality of creativity has to be involved;
- 2) The creativity has to be both internally conceived and externally adopted;
- 3) Relevant new processes have to be developed in order to develop and push the new or improved products or services onto the market to realize the said value;
- 4) Intended benefits are materialized;
- 5) Other than inventions this definition also emphasizes on the translation of inventions into marketable new or improved products or processes;
- 6) The definition leaves open the possibility of relative newness; and
- 7) Although not particularly mentioned, the definition includes potential roles of relevant processes and outcomes.

What is very important and different from the earlier definitions of innovation in the manufacturing sector introduced by various authors is that our definition excludes those activities or innovations that only keep the companies afloat when compared to others in the same industries. For example, in the rivalry between Montgomery Ward and Sears, the former surely identified and invested in resources and capabilities while monitored and took actions against what Sears was doing in order to fence off the competition of the latter. However, its efforts of innovation led Montgomery Ward to a wrong direction. That explains why Montgomery Ward has disappeared from the market place (Sobel, 1999), and why our condition of exceptionally added value is important in defining what innovation in the manufacturing sector truly is.

By knowing the significance of our definition of innovation in the manufacturing sector, a parallelism can be drawn between the study of disaster predictions and that of innovation in the manufacturing sector. The reason why a specific event becomes a disaster and causes major losses is because the occurrence of the event is unexpected and the consequent losses are beyond what is imagined (Lin and OuYang, 2010). Similarly, the reason why an innovation creates exceptional added value is because the particular innovation is not expected by the market to be significant (Christensen, Anthony & Roth, 2004).

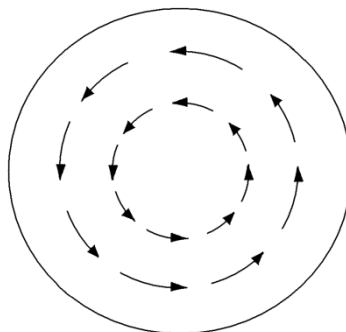


Figure 3. A birds-eye view of our marketplace

### Market Invitation for Innovation

First and foremost, important theoretical results are that before a new or improved product or service is introduced, the market actually invites and stimulates innovation and additional competition. Intuitively, let us model the

marketplace is as an abstract yoyo field, and we look at the multi-dimensional yoyo body at a distance from above either the convergent side or the divergent side, while imagine that everything here takes place in our 3-dimensional space. So, we are looking at a pool of spinning media, Figure 3, that appear and exist in business activities, such as goods, information, money, credit, etc.

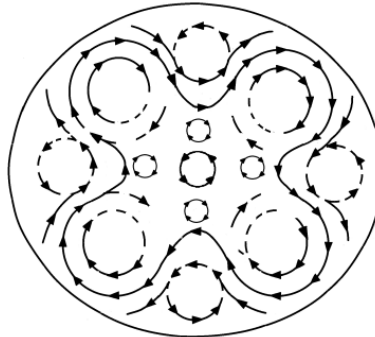


Figure 4. Asymmetric flow observed in Fultz's dishpan experiment

Associated with this end of intuition, the well-known dishpan experiment, which was initially conducted successfully by Raymond Hide (1953) of Cambridge University, England, and then by Dave Fultz and his colleagues of University of Chicago (1959) independently, shows that when the movement of the fluid within the rotational dish is under enough pressure created by either the sufficient speed of rotation or sufficient difference in the temperature between the center and the periphery of the dish, the pattern of uniform movement in Figure 2 will develop into the chaos, as shown in Figure 4. The number of local eddy leaves is determined either by the rotational speed or by the temperature difference or both and increases with the speed and the temperature difference.

This systemic modeling and laboratory experiment suggest that the fluid nowhere within this spinning dish could avoid being disturbed by the flows, either orderly or chaotically, within the dishpan. And being disturbed regionally means that a local flow pattern will appear inevitably.

Based on this intuition, the following results are shown (Forrest, et al., to appear):

**Theorem 1.** Assume that there are  $m$  incumbent firms,  $m = 1, 2, \dots$ , in the oligopoly market such that

- 1) They provide consumers with mutually substitutable products;
- 2) Each of them has developed its respective share of loyal consumers who purchase the products from their respective firms only as long as the price is not more than their reservation price, which is set to be 1;
- 3) They compete over the switchers in the market with adjustable prices charged to their consumers, where the switchers purchase their products depending on whose price is most competitive;
- 4) The firms' managements are well aware of the pricing strategies of the other firms and have established their best responses by playing the Nash equilibrium through pure self-analyses.

Then in the Nash equilibrium, if the magnitude  $\beta$  of the market segment of switchers is greater than 0, then at least one new firm would profitably enter the market; and the aggregate scale of the entering firms in terms of their operations in this market is proportional to the magnitude of  $\beta$ .

**Theorem 2.** Assume the same conditions as given in Theorem 1. If the market experiences an increasing number of profitable entrants, then consumer loyalty in the marketplace will diminish overtime.

Jointly these two theorems imply that if a market is either emerging or expanding, then all firms, be they startups or incumbents, have to constantly strive for newer and better products because they cannot depend on the so-called loyal consumers to maintain their business. On the other hand, if the market is quite stable and the incumbent firms do not continuously introduce new products or better versions of their products, then the consumers' evolving desire and taste will lead to a growing market segment of switchers, which in turn will invite new competition from outside the

stable market. In other words, as long as the market is not located within a planned economy, then the evolution of market activities will naturally stimulate innovation in manufacturing firms.

Based on these two results and the thinking logic of systems science (for more details, see the following section), (Forrest, et al., to appear) identify ‘demand growth’, ‘proximity’, ‘networking’, and ‘government and public sector policies’ from a set of near 20 environmental determinants on innovation of manufacturing firms, as studied in the literature by a good number of different authors, as dominating.

## EFFECTS OF FIRMS’ CULTURE ON INNOVATION

In this section, we first carefully study how individual and organizational philosophical and value systems are formed, what organizational culture embodies, and why organizational mission and ambition represent two powerful unifying forces that suppress inconsistencies that exist in individuals’ philosophical assumptions and values. Based on such a general theory of organizational culture, we analyze the following variables: ‘resistance to change’, ‘total quality management (TQM)/ continuous improvement’, and ‘culture of support for innovation’.

### Formation of Individual Philosophical and Value Systems

First, let us look at how personal values are formed by addressing why different individuals have different underlying assumptions and values of philosophy and why it is extremely difficult for us to find two individuals with the same, identical value system. By underlying assumptions and values of philosophy, we mean the value system of a person that consists of his/her beliefs about how the world functions and his/her moral codes with which he/she is recognized with his/her particular identity and integrity and by which his/her behaviors are judged by his/herself.

The systemic yoyo model of systems implies that each human being lives in a vast ocean of spinning fields or yoyo bodies of various systems. That ocean consists of the yoyo fields of other individuals, physical objects, abstract thoughts, and myriad of other things and matters. As soon as a person is born, he/she starts to interact with the world or the yoyo fields of other systems. It is these interactions with different people, physical objects, abstract thoughts, and the myriad of other things and matter that they shape the person’s philosophical assumptions and values, similar to how a civilization formulates its value system (Lin and Forrest, 2011). Because of the differences, be they subtle or not, between the interactions experienced by one person from those by another person, each person has his/her own set of very specific philosophical assumptions and values. These assumptions and values dictate the behaviors and decision making of the person for the rest of his/her life. Although the differences in personal experiences might be ‘subtle’ when seen from the angle of the magnificent scale of the entire ocean of spin fields, they are generally major to the individuals involved. That is why important differences exist between the relevant personal philosophical and value systems. This end explains why children who grow up in the same household may have quite different personalities, characteristics, and thinking processes.

In the following, let us look at some details along this line of reasoning.

When a system is seen as a living yoyo body, its holistic being systemically looks like the entity shown in Figure 1. No matter how the holistic being is seen from one of the angles listed in Figure 1, nonlinearity is involved due to the everywhere existence of curved or non-straight-line trajectories of movement. To this end, the important Bjerknæs’ circulation theorem (Hess 1959; Wu and Lin 2002) shows how nonlinearity mathematically stands (mostly) for singularities, and in terms of physics represents eddy motions. Such motions represent structural evolutions, a natural consequence of uneven evolutions of things, information, energy, etc. In particular, a circulation means a closed contour in a fluid or fluid-like flows of visible or invisible things. That can be generally understood either as fluids in the conventional sense or as information, knowledge, money, etc., because the movement of information, knowledge, money, etc., possesses the basic characteristics of fluid. This theorem reveals from another angle the commonly existing and practically significant eddy effects of fluid motions and that uneven eddy motions are the most common form of movements observed in the universe. Because uneven densities create twisting forces, fields of spinning currents (of water, information, knowledge, money, etc.) are naturally created. Such fields do not have uniformity in terms of types of currents. Clockwise and counter clockwise eddies always co-exist, leading to destructions of the initial smooth, if any, fields of currents.

Now, let us look at the questions posed at the beginning of this subsection: Why do different individuals have different underlying assumptions and values of philosophy? And, why is it extremely difficult for us to find two individuals with the same, identical value system?

At the beginning of a new life, due to the existing conditions of disability and limited available resources within the environment, the new born gradually over time forms his/her elementary beliefs, basic values, and fundamental philosophical assumptions, on which he/she sends out signals, such as crying initially, to acquire what is needed, reasons and explains whatever inexplicable, develops approaches to overcome hardships, and establishes methods to manage personal affairs. With age, the person grows with increasing physical and mental capabilities. So, he/she is becoming able to handle more advanced tools, innovative thoughts, and intelligent methods to deal with personal and interpersonal affairs.

The natural desire for better conditions, more control and recognition (due to the increasing strength of suction and emission power of the yoyo field of the person) paves the way for the person to invent new tools to handle issues with the environment, discover new methods to reason, and introduce more efficient ways to deal with various affairs through interactions with the environment. That is, a circulation of information, knowledge, money, natural resources, etc., starts to form within and around the person.

Along with the rapidly growing awareness of the environment and the world within the person, practical skills also become parts of the circulation. As such circulation starts to appear, Bjerknæs' circulation theorem guarantees the appearance of abstract eddy motions within the mind of the person, consisting of the appearance of new acquaintances, expansion of knowledge, improvement of old skills, acquirement of new skills, and accumulation of wealth. That is, with age the person gradually forms his/her underlying assumptions and values of philosophy on how the world functions, what kinds of behaviors are acceptable, how he/she should interact with others and the environment in order to achieve better results.

As the personal yoyo field gradually matures over time, it makes the person more able to fight off different beliefs and value systems that potentially pose the danger of destroying the yoyo structure of his/her own beliefs and values. At the same time, the person enriches his/her philosophical assumptions and values and redefines his/her identities throughout life by slowly and consciously modifying some of the established assumptions and values and by introducing new ones. Here, the person's basic philosophical assumptions and values are reflections of the fundamental structure and evolution of his yoyo field. Although they change and evolve with time and environment, its basic characteristics will stay the same throughout the lifespan of the yoyo structure of the person.

**Proposition 1.** Different individuals have different underlying philosophical assumptions and values (or the value systems).

In fact, the reason why this result holds true is because firstly no two individuals grow up within a perfectly identical environment, and secondly with age individuals' philosophical assumptions and values evolve according to their respectively changing environments. For related discussions regarding the four human endowments – self-awareness, imagination, conscience, free will – and related concepts, see (Lin and Forrest, 2011).

Although the literature of economics considers the concept of leisure (Becker, 1991), the concept of personal values and that of value systems are much more general than that of leisure. As a matter of fact, as how it is used in the literature of economics, leisure is only a minor reflection of the underlying personal value system. For example, two individuals with different value systems could all be working hard in their works. However, differences in their personal value systems can naturally lead to drastically different consequences. That is one of the many differences between craftsmen and innovators, where, for example, the former strive to make what they produce finer and better quality while the latter endeavor to make what they create possess additional functionalities.

### **Formation of Organizational Culture**

With the knowledge of how personal value systems develop and mature over time, we can see how organizational value systems are formulated. In particular, for each functional organization in the business world, its value system is generally reflected in its mission statements, which are collectively articulated by various leaders, both official and informal. In other words, the organizational value system is a collection of all the commonly accepted aspects of the



individual value systems of the majority of the employees of the company. Its development and evolution also follow that path described above for individuals.

As for the culture of the organization, it involves values and ideals, norms, institutions, modes of thinking, and the higher intellectual, artistic, moral qualities to which successive generations in the organization have attached primary importance (Bozeman 1975; Lin and Forrest, 2011). Therefore, once again, the so-called organizational culture is just another embodiment of the organizational value system, as it is reflected in the daily operations of the organization's business.

Associating the concept of organizational culture and firms' performance, McGrath (2013) finds that the ten best performing firms in the world invest heavily within their respective organizations in creating a common identity, culture, and alignment in order to create the right cultural foundation that allows for changes to happen. That discovery is well confirmed by Bob Best, CEO of Atmos energy, "Culture is the foundation for all success. This has been a very important process to the long-term health and success of our company," (Senn-Delaney Leadership Consulting Group).

### **Mission and Ambition – Two Powerful Unifying Forces of Organizational Culture**

Generally, there are always competitive disagreements among employees on how the organization should be directed and managed, how the detailed operations should be carried out, and how employees' efforts and devotions should be channeled. And each and every stakeholder of the organization tends to have ideas about how things could improve.

As implied by our earlier discussions, one reason why such competitive scenarios exist is because each person looks at the world through his/her distinct value system. The distinctions between one person's philosophical assumptions and values from another make the same physical world look extremely different. Because no two individuals grow up within a perfectly identical environment and because with age individuals' philosophical assumptions and value systems evolve according to their respectively changing environments, it explains why different individuals have different underlying philosophical assumptions and value systems. For a more in-depth discussion, see (Forrest and Orvis, 2016).

**Proposition 2.** Philosophy and value-system based competitions always exist within any organizational system that has at least two employees.

This result is a natural consequence of how individuals' philosophical assumptions and value systems are formed initially and revised periodically over time. So, the fact that no two individuals can practically have an identical set of philosophical assumptions and values – Proposition 1 – implies that inconsistencies in opinions regarding the organization always exist. Consequently, any two chosen employees look at many aspects of the organizational system differently. That difference between their philosophical assumptions and values leads to competitive consequences of the two employees, although in most circumstances one of them stays quiet without bringing his/her disagreement to the extreme of a fierce power struggle.

The results in Propositions 1 and 2 imply the necessity for any functional business organization to clearly state its missions; otherwise its daily operations will be torn apart by the inconsistent individuals' philosophical assumptions and value systems. In particular, for the minimal business desire of survival, each long-lasting business organization needs to have a clearly stated and strictly practiced mission. Additionally, if a company desires to be a business leader that successfully rides waves of transient competitive advantages, which generally has to be innovation based, then it has to develop such a mission that clearly establishes a long-term, unwavering public commitment to the ambition of becoming world class, the best of the world. And in practice, such ambition needs to be embraced, endorsed, and sought after by the leadership of the firm through setting the bar high while having a clear sense of strategic direction in every endeavor, and through promoting common key themes.

In terms of the systemic yoyo model, this discussion means that the established long-term, unwavering ambition specifies the direction of the axis of spin for the underlying yoyo structure of the firm (Figure 5). When this direction is determined, supported and promoted by the leadership and throughout the organization, all layers of the eddy pool (or the culture of the organization) that spins around the axis can now focus their efforts on how to interact with the environment. In other words, when the necessary culture is carefully developed and nurtured, employees at different

positions can focus on what is important for the organization instead of worrying about potential change in the business direction of the organization. As a matter of fact, the importance of creating and maintaining a common identity and culture for a firm to be health and prosperous is theoretically supported by Proposition 2.

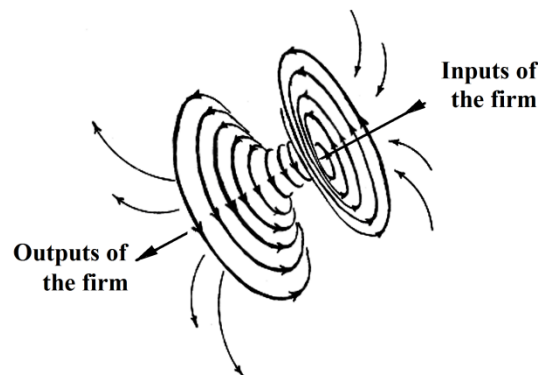


Figure 5. A systemic structure with the axial direction fixed

In summary, what is discussed here leads naturally to the following general conclusions, as empirically confirmed by Baldwin and Johnson (1996), Francois, Favre and Negassi (2002), Motwani et al (1999), Veugelers and Cassiman (1999), and Jung, Chow and Wu (2003), respectively:

- (1) Organizational culture represents a significant determinant of the innovativeness of the firm;
- (2) Total quality management, as a mechanism of quality control and realization of the continuous improvement culture within the firm, is one strategic implementation of the long-term, unwavering business ambition of the organization;
- (3) Any resistance to change is against the firm's ambition and culture, and the spirit of innovation; and
- (4) The perception of support for innovation is positively correlated to the innovativeness of the firm.

### EFFECTS OF FIRMS' LEADERSHIP ON INNOVATION

This section first looks at the definition of leadership, and second why leadership commitment is the essential key for the innovativeness of the firm and third the effects of the following variables on the innovativeness of the firm: 'presence of a project leader', 'CEO's characteristics', 'CEO change', and 'CEO's qualification and experience'.

#### The Leadership – Defined and Systemically Modelled

In the organizational context leadership represents one of the most salient aspects and a difficult concept to define. Chemers (2001) defines it as the process of social influence in which one person can enlist the aid and support of others in the accomplishment of a common task; Kouzes and Posner (2007) describe it as ultimately creating a way for people to work together and to make something extraordinary happen.

In the research of leadership, many different theories have been developed by various authors. For example, the trait theory attempts to identify talents, skills, and physical characteristics of men that are associated with effective leadership (Carlyle, 1841; House, 1996). Facing criticism, recent studies of this theory identify leadership skills, not simply a set of traits, but as a pattern of motives suggesting that successful leaders tend to have a high need for power, a low need for affiliation, and a high level of self-control (McClelland, 1975).

Spencer (1841) argues that it is the times that produce leaders and not the other way around. This theory maintains that different situations call for different leadership characteristics. According to this group of theories, no single optimal psychographic profile of a leader exists, and what an individual does, while acting as a leader, is in large part dependent upon characteristics of the situation in which he functions (Hemphill, 1949). Van Wormer, Besthorn and Keefe (2007) find three leadership styles: the authoritarian leadership style, the democratic leadership style, and the laissez faire leadership style, each of which has advantages and disadvantages and works only under specified circumstances.

According to the functional theory (Wageman, et al., 2008), the leader is responsible for making sure that his group's needs is taken care of. So, he/she is detrimental for the group's effectiveness and cohesion. According to this theory, when the leader promotes his/her unit's effectiveness, there are five broad functions he/she provides: environmental monitoring, organizing subordinate activities, teaching and coaching subordinates, motivating others, and intervening actively in his group's work.

By a formal organization (Cecil, 1970, p. 884 – 89) it means such a human hierarchy established for achieving defined objectives. The hierarchy is made up of divisions, departments, sections, positions, jobs, and tasks so that all members would behave impersonally towards clients and other members. Employees are ranked based on either merit or seniority so that the higher a member's position in the hierarchy, the greater his/her presumed expertise and social status. Within such bureaucratic structure heads are appointed and endowed with authority for administrative purposes. Beyond these appointed heads, an informal leader generally emerges within the underlying informal organizational structure that is made up of the personal objectives and goals of individual employees. All the unspoken needs, such as personal security, maintenance, protection, and survival, of the employees are met within the informal organization and its leaders (Knowles and Saxberg, 1971, p. 884 - 89).

Each informal leader without any formal authority provides supports for a group of employees, and is recognized by his/her caring for others, clear communication, and a commitment (Hoyle, 1995). At the same time, although appointed managers have the authority to command and enforce obedience, they still need to possess adequate personal attributes to match their authority. When sufficient personal competence is absent, a manager will have to confront emergent unofficial leader, who challenges the manager and reduces his/her role to that of a figurehead. So, leadership can be defined as one's ability to get others to willingly follow. Every organization needs leaders at every level to achieve functionality and efficiency.

Systemically, the concept of leadership, be it official or informal, can be modelled and analyzed as follows. Based on the definitions of Chemers (2001) and Kouzes and Posner (2007), leadership is one's capability to adjust his/her underlying yoyo field structure in such a way that many other neighboring yoyo fields would spin in similar fashions without much difficult readjustment. Specifically, if one person can utilize social influence to obtain aids and supports of others in accomplishing a common task (Chemers, 2001), it implies that there has appeared a big whirlpool spinning around a defined axis – the common task. Although this pool might initially be conceptual and physically weak, it covers a large territory, within which many smaller yoyo fields - individual people, relevant resources – are located. Now, the so-called leader, formal or not, is the person who is able to realign sufficient number of individual eddy fields in such a way that the conceptual large yoyo field becomes a visible and functional reality, Figure 6, where the central pool is able to align the neighboring fields so that jointly a much greater pool of eddy fields is formed.

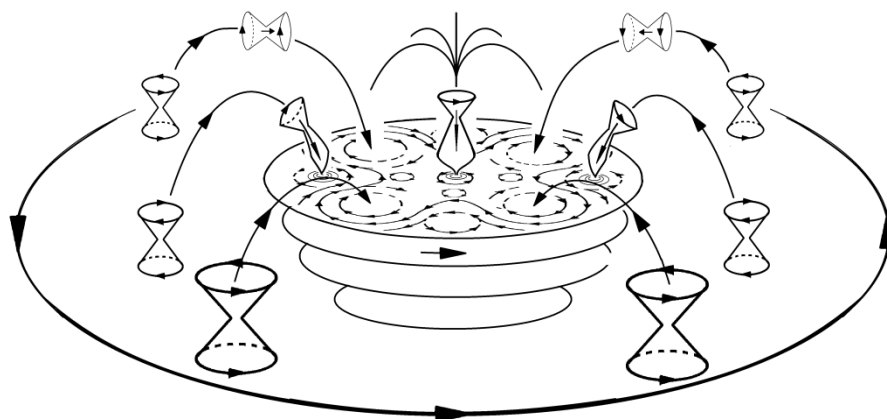


Figure 6. The yoyo field of a leader

This systemic model of leadership unifies all the relevant studies into one organic whole. In particular, to be a leader, the person indeed needs to possess some key elements, such as talents, skills, and physical characteristics, as claimed in the trait theory (House, 1996), and drive, leadership motivation, honesty, integrity, self-confidence, cognitive ability, and knowledge of the business, as argued by Kirkpatrick and Locke (1991). It is the patterns of field movement

that are the fundamental reason why a person would become a leader: his overreaching field influence on others makes him seen as having a high need for power, a low need for affiliation, and a strong self-control. This systemic modelling also explain why, as argued by (Spencer, 1841), it is the times that produce the leaders and not the other way around and that different situations call for different leadership characteristics. For all relevant details, see (Lin and Forrest, 2011).

### **Leadership Commitment - the Essence for Success**

Through clearly stating and strictly following the mission, the leadership is able to bring out and amplify the harmonic aspects of individual employees' philosophical assumptions and value systems. Beyond that, the leadership commitment is the essential key. In fact, leadership represents the center of the organizational system, a slight change or vibration of which creates shock waves throughout the entire system. That is, a firm with a true leadership presenting is a centralized system (Hall and Fagen, 1956). In other words, when the leadership embraces, endorses, and actively seeks after the goal of materializing the mission, then a focused effort throughout the organization will appear.

As discussed in the previous subsection, leadership commitment represents a process of social influence where the leader(s) can solicit the support of others to accomplish a common task. And, when the organization wants to materialize its ambition, its selected leaders will most likely possess the corresponding key traits and demonstrate a pattern of motives, as discussed earlier, such as a burning desire, energy, tenacity, and initiative to achieve, an ability to rally supporters, strong self-confidence backed by emotional stability, a necessary vision for the future, and sufficient knowledge of the business.

Systemically, leadership commitment is important because it stands for the organization's capability to adjust its underlying field structure so that all or most of the individual employees' fields would spin in necessary fashions, Figure 6. The coordinated movements of the individual yoyo fields naturally give rise to the appearance of a much greater field that spins around the common task – the big ambition (Lin and Forrest, 2011).

In short, no matter what venture the firm is engaged in and no matter which particular strategy the firm adopts, everything needs to be clearly linked to the mission and the effort of materializing the ambition with visible leadership commitment. Through conducting business with such persistent consistency, the firm clearly establishes an aiming point for all employees to work towards and a comforting point for customers of the firm to look up to.

### **Leadership and the Innovativeness of the Firm**

As discussed earlier, the mission and ambition of the firm have to be embraced, endorsed, and sought after by the leadership. One definite indication of such leadership commitment is the presence of a 'project leader' in the company, as empirically confirmed by Chandy and Tellis (1998) and Souitaris (2002). This person enthusiastically supports and is committed to innovation projects. At the same time, when the firm is committed to its long-term, unwavering ambition, its selected leadership will most likely possess the corresponding key characteristics and abilities to achieve and to motivate with an adequate vision for the future and knowledge of the business, as indicated by levels of education, qualifications and cumulative experience. That explains theoretically why the Chief Executive Officers' (CEO) characteristics have a significant positive influence on the innovativeness of the firm (Jung, Chow & Wu, 2003; Papadakis and Bourantas, 1998). In other words, when the CEO is entrepreneurial, a transformational leader, and has a strong desire to achieve, he/she will most likely set high goals, seek to do his/her work better, and be willing to embark upon innovation projects because only such projects can provide the company opportunities to achieve the established challenging goals.

As for the importance of the CEO's tenure on the firm's innovativeness, CEO's stability reflects how committed the firm is to its established mission and ambition. It is because only an endogenous stability, including those of mission, long-term ambition, and personnel, can help the firm to withstand chaotic impacts of the external world. In other words, only when the firm is sufficiently stable endogenously, it will not internalize chaos from its environment and alter its predetermined path of development (Forrest and Nightingale, 2017). That is, CEO's tenure in the firm is positively correlated with innovation.

In summary, all such variables that are related to the stability and presence of the leadership as ‘presence of a project leader’, ‘CEO’s characteristics’, ‘CEO change’, and ‘CEO’s qualification and experience’ are secondary when compared to having a long-term, unwavering ambition.

### EFFECTS OF FIRMS’ GENERAL CHARACTERISTICS ON INNOVATION

In this subsection, we analyze such variables that describe the general characteristics of a firm as ‘size of the firm’, ‘age of the firm’, ‘ownership structure’, and ‘past performance’.

To understand the size of the firm, let us see how the number of employees of the firm is generally determined based on (Lin, 2009). Assume that a manufacturer sells a specific product for  $\$p_s$  per unit. The total cost for the product from production to eventual sale is  $\$p_p$  per unit. If the number of units produced and sold at the price  $\$p_s$  is  $n = n(p_s)$ , then the profit of this manufacturer from this product is

$$P = \text{profit} = n(p_s)(p_s - p_p) \quad (1)$$

Maximizing this profit subject to the budget constraint  $n(p_s)p_p = I$ , where  $I > 0$  is the total available funds for the manufacturer to invest in this line of product, leads to the following solution

$$n(p_s) = \frac{n(p_{s0})p_{s0}}{p_s}, \quad (2)$$

where  $n(p_{s0})$  is the initial market demand when the product is sold at  $\$p_{s0}$  per unit. So, the profit of the manufacturer is

$$P = \frac{n(p_{s0})p_{s0}}{p_s} (p_s - p_p) = n(p_{s0})p_{s0} \left(1 - \frac{p_p}{p_s}\right). \quad (3)$$

Similar to what is seen above, each employee the manufacturer hires generates as much profit as  $(p_s^W - p_p^W)$ , where the average revenue the employee is expected to make is  $\$p_s^W$  while her total expected cost of employment is  $\$p_p^W$ . So, the total profit of the manufacturer is

$$P_{total} = P^p + P^W = n_p(p_s^p)(p_s^p - p_p^p) + n_W(p_s^W)(p_s^W - p_p^W), \quad (4)$$

where  $P^p$  stands for the profit from the product directly,  $P^W$  the profit from employees,  $n_p(p_s^p)$  the number of units of the product produced and sold at the unit price  $p_s^p$  with  $p_p^p$  being the unit cost, and  $n_W(p_s^W)$  the number of employees hired at the expected average revenue  $\$p_s^W$  per employee.

This profit is subject to the following budget constraint, where  $I > 0$  is a constant representing the total amount of funds available to the company,

$$n_p(p_s^p)p_p^p + n_W(p_s^W)p_p^W = I. \quad (5)$$

Solving the maximization problem of equation (4) subject to equation (5) leads to the following:

$$n_p(p_s^p) = \frac{n_p(p_{s0}^p)p_{s0}^p}{p_s^p}, \quad (6)$$

$$n_W(p_s^W) = \frac{n_W(p_{s0}^W)p_{s0}^W}{p_s^W}, \quad (7)$$

and

$$P_{total} = n_p(p_{s0}^p)p_{s0}^p\left(1 - \frac{p_p^p}{p_s^p}\right) + n_w(p_{s0}^w)p_{s0}^w\left(1 - \frac{p_p^w}{p_s^w}\right), \quad (8)$$

where all the symbols with a subscript 0 stand for the corresponding initial values.

This analytical analysis of the relationship between the manufacturer's total profit and number of employees hired implies the following:

1. Entrepreneurs and start-ups represent the foremost source of new ideas and technologies, as claimed by Schumpeter (1934), because equation (8) says the importance of being the initiator of a new product. That also explains why first movers tend to have their particular advantages (Lieberman and Montgomery, 1988).
2. The second term in equation (8) indicates that additional profits will be generated by increasing the number of employees if the ratio  $p_p^w/p_s^w$  stays constant or decreases. Considering the market competition described in Theorem 1, the market cost  $p_p^w$  per employee goes higher over time. So, to keep the ratio  $p_p^w/p_s^w$  constant or decrease, the expected average revenue  $\$p_s^w$  per employee has to at least keep up with the increase in  $p_p^w$ , which can be practically influenced by many factors (Bertschek and Entorf, 1996; MacPherson, 1994). This fact implies that in general innovation activity increases more than proportionally with firm size, as maintained by Schumpeter (1942). In other words, the effects of size on innovation as claimed by Schumpeter in 1934 and 1942 respectively are not contradictory as many scholars had thought (Majumdar, 1995; Damanpour, 1992; Stock et al., 2002; Tsai, 2001).
3. Market competition is an essential force behind the size of the company and directly stimulates innovation activity of manufacturing firms. It is because the modeling of the previous discussion suggests that generating extra profits is behind the need of hiring additional employees.

As for the effects of firm's age, ownership structure, and past performance on innovation, the systemic yoyo model suggests that these variables are only indicative of some aspects of the company. The company's current state of innovation is really determined by the present vigor of spin of the underlying yoyo field. That explains why the results of relevant empirical studies are mixed, leaning neither positive nor negative. For example, Sørensen and Stuart (2000) demonstrate that through age a firm accumulates the experience and knowledge on innovation. That is, there is a positive relationship between a firm's age and its innovativeness. And in the contrary, Freel (2003) shows how age represents a barrier to innovation because established procedures and routines resist the integration of external advances. From the systemic yoyo modeling such contradictory findings in fact reflect natural existences in nature, because each firm is a form of life so that age should not have such bearing on the innovativeness of the firm.

Similarly, studies on the effect of ownership structure on innovation are also mixed. For example, while Love and Ashcroft (1999) and Michie and Sheehan (2003) confirm the positive correlation between foreign ownership and the innovativeness of the firm, Love and Roper (1999; 2001) and Martinez-Ros (1999) find that this relationship is rather negative.

As for the relationship between the past performance and the innovativeness of the firm, our systemic logic suggests that these two variables should be positively correlated if the past can be extrapolated linearly into the future, assuming that the good past performance was more or less innovation dependent. The past dependence on innovation generally reinforces the belief that the firm's established competitive position, market share, and great profits are results of its innovativeness (Tsai, 2001; Zahra, 1993).

In short, 'firm size' and good 'past performance' are indicators of innovativeness of the firm, while 'age of the firm' and 'ownership structure' are not. However, both 'firm size' and good 'past performance' are only secondary when compared to the mission and global strategies of the firm, because these two variables are merely reflections of how well the firm discovers market cues and how carefully the firm takes the consequent actions.

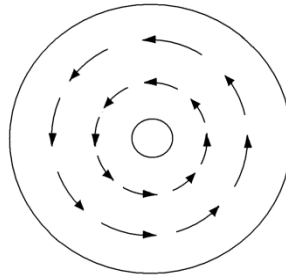
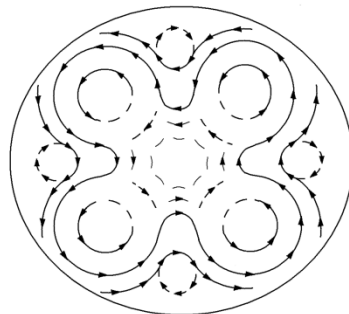


Figure 7. The uniform eddy field of a young firm

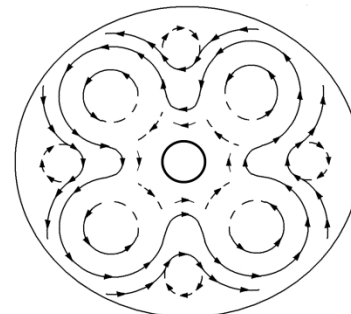
### EFFECTS OF FIRMS' STRUCTURE ON INNOVATION

Continuing the discussion in the previous section, such variables, which are related to the firm's structure, as 'formal structure', 'flexible structure', 'centralization of decision making', 'empowerment of employees', and 'interaction between firm's units', are all secondary and practical implementations of long-term, unwavering ambition.

In particular, the effects of 'formal structure' and 'centralization of decision making' on innovativeness of the firm should not be definitively positive or negative depending on the magnitude of the firm. If the firm is young and relatively small without any bureaucratic hierarchy, then its systemic yoyo structure can be adequately modelled by the eddy field in Figure 7, where information, energy, knowledge, and all other components of the organization, are 'spinning' in a uniform motion. In this case, both formalism and centralization jointly allow the young firm to concentrate its efforts and limited resources on what is important for the survival and growth of the firm by clarifying roles of individuals and by reducing ambiguity, which helps to improve effectiveness, morale, and innovativeness. For related discussions, see (Koberg, Uhlenbruck & Sarason, 1996; Walsh and Dewar, 1987).



(a) The eddy field with decentralization



(b) The eddy field with centralization

Figure 8. The yoyo field of a well-established organization

If the firm is a well-established organization, then its systemic yoyo structure can be adequately modelled by the eddy field in Figures 8(a) or 8(b), where each eddy leaf stands for a division within the firm. When decision making is decentralized, as shown in Figure 8(a) where the decentralization is depicted by the absence of a central circle, then each division is able to function as a relatively independent small, young firm so that it can easily concentrate its efforts and limited resources on what is important for the survival and growth of the division. So, the inevitably emerging competition and coordination between the divisions will actually help stimulate and promote the innovativeness of the overall firm to a high level. On the other hand, if decision making is centralized, as shown in Figure 8(b) where the centralization is depicted by the central circle, then other than responding to the changing environment, the outer edge of the dishpan in Figure 8(b), each division, an eddy leaf in Figure 8(b), has to follow the mandates of the central decision-making body. In other words, the wide spectrum of activities the firm is involved in more or less compete for the limited resources, the attention of the leadership, and the support of the administration so that the efforts and commitments of each division cannot be totally focused on what it thinks is important. Additionally, the relatively long chain of command makes the firm react only slowly to market changes. That is how formalism and centralized decision making weakens the innovativeness of the firm.

The same systemic modelling and analysis explain why such variables as 'flexible structure', 'empowerment of employees', and 'interaction between firm's units' are of significant positive effect on innovation. In particular, if a

young firm without any bureaucratic hierarchy can be innovative through formalizing its rules and procedures and through centralizing decision-making, a well-established company has to ensure, if it wants to stay in the same play field with all young firms, that its structure is flexible, that decision making is decentralized, and that interdivisional functional communication and coordination are stimulated.

## MANAGERIAL RECOMMENDATIONS

The developed theory in the previous sections naturally provides the following general managerial recommendations for a manufacturing firm to increase its innovativeness and create its success with innovation.

The manager and the entire leadership, including official and informal leaders, need to develop a clearly stated mission for their company and commit to a long-term, unwavering ambition. The mission and ambition represent the most principal guiding forces for the desired innovativeness to appear. They powerfully unify the otherwise inconsistent or even conflicting philosophical and value systems of individual employees. They bring out and amplify the harmonic aspects of these individuals' philosophical assumptions and values. Beyond developing the mission and ambition, the leadership needs to demonstrate its steadfast commitment to materializing the established mission and ambition and invest in cultivating an appropriate organizational culture that is conducive to change and supports innovative activities.

As the ones who push for the realization of the mission and the accomplishment of the long-term ambition, managers of all levels need to be of particular characteristics, such as emotional stability, cognitive abilities to vision the future, knowledge of the business, and burning desires, energies, tenacities, and initiatives to achieve, to lead, and to rally supports. Such quality managers need to be maintained for as long as their goodness and fitness last.

Beyond developing particular strategies to carry out the operational routines (to be addressed in another paper), the next step in encouraging innovation needs to make the administrative structure of the firm flexible; the decision-making process needs to be either centralized or decentralized in such a way that it can efficiently facilitate concentration of efforts and limited resources on what is important for the survival and growth of each division by clarifying roles of individuals and by reducing ambiguity. If the firm is well established and of a large scale, then it is recommended to make its decision-making process decentralized to promote the innovativeness of each business division. All employees need to be empowered and encouraged to interact between various divisions.

In pushing for realizing the long-term ambition, at the operational level, such secondary variables as 'firm size' and good 'performance' need to be maintained. In particular, the firm needs to recruit and maintain qualified and experienced personnel backed with advanced technologies. Continuous improvement and retraining programs need to be planned and run regularly for all employees. An adequate mechanism for personnel decisions needs to be introduced so that when needed, additional manpower can be readily hired or released depending on the changing flow of market demands. The mechanism needs to include specific ways for managers to alter the sizes of their divisions through internal movements of people or through mergers and acquisitions, through disinvestment, downsizing, reengineering, and/or outsourcing. Since good performance is generally good for investors and a good indicator of quality of the firm, it needs to be maintained if all possible.

Considering the fact that our theory is derived holistically through rigorous reasoning instead of data analysis, data mining and anecdotes, it is expected to work reliably in practice. This fact actually represents a major contribution of this work to the empirical literature, where only suggestions are provided without assurance of any degree of success. Generally, conjectures developed empirically suffer from weaknesses that prevent practitioners from making meaningful generalizations. For a more detailed discussion, see (Forrest, et al., to appear; Lin and Ouyang, 2010).

## CONCLUSION

Due to its practical importance, the innovativeness of a manufacturing firm has been investigated by many scholars from various angles (Marzi, et al., 2017). However, the more this topic is studied the more complex the phenomenon seems to become. To further the understanding of this phenomenon and help simplify the complexity, this paper focuses on the study of the impacts of manufacturing firms' culture, structure and leadership on their innovativeness. Owing to the power of the holistic thinking of systems science, we are able to card through the sixteen variables (identified in the literature), representing different aspects of manufacturing firms' culture, structure and leadership,



and identify which ones are essential for encouraging and promoting innovation in a manufacturing firm, which ones are primary forces underneath the innovativeness of the firm, and which ones are secondary that simply appear when the primary forces are created.

Practically, beyond the creation of many useful insights, the employed thinking logic and method of systems science enable us to theoretically validate many of the empirically discovered conclusions of the literature and explain why some of these earlier conclusions have been mixed with some studies showing positive effect, some negative, while others insignificant (Becheikh, Landry & Amara, 2006). That is why based on the theoretical results established in this paper we are able to provide managerial recommendations instead of merely suggestions as what has been done in the literature. In short, because of the particular holistic method of reasoning applied in this paper, the established theoretical results are expected to help make each real-life attempt of increasing the innovativeness of a manufacturing firm practically possible.

To locate potential questions for future research, one only needs to realize the main limits this work is subject to. First, all reasoning and results developed in this paper are based on our specific definition of innovation in the manufacturing sector; and second, throughout the entire paper there is an implicit assumption: each firm in the manufacturing sector wants to fill a particular market niche by generating a positive cash flow, either from the profits of the marketplace, or investments, or both. So, it is still unknown about how a firm's culture, structure and leadership would affect the innovativeness of the firm, if the firm exists for some purpose other than attempting to satisfy a market niche. And, the question of how a firm's culture, structure and leadership could affect the firm's efforts on making incremental improvements of the existing products and processes is still open. To this end, it is well known that a good number of major disruptive breakthroughs in the past appeared only as consequences of incremental progresses made over time (Kuhn, 1962; Rostow, 1960).

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## **STUDENT RIGHTS IN HIGHER EDUCATION**

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### **ABSTRACT**

When a student is accepted and enrolled at one of the many colleges or universities in the United States, their primary focus is on the pursuit of a degree in higher education. Upon admission, the next several years will be spent enrolled as a student engaged in that pursuit. Little concern, if any, is given as to how that student might face severe sanctions by their institution as a consequence of their deeds, whether on or off the college or university campus. For the most part, students do not realize that upon admission to an institution of higher education, certain commonly assumed civil liberties and rights may no longer exist in the relationship with their institution. Basic rights such as free speech, expression, association, substantive and procedural due process, and others, may be limited as a result of the institutional rules and regulations.

In recent years, several cases involving universities taking disciplinary action against students have brought attention to this issue. In light of these cases, and others, a debate has emerged as to the rights of students in relationship to the institutions of higher education in which those students are enrolled.

This paper will review the current law in the United States with respect to the issue of student rights in higher education. It will conclude with some recommended changes that universities could easily implement

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### **INTRODUCTION**

Amid the modern university culture of championing diversity, civility, and sensitivity to the rights of minorities on college campuses, it is surprising that today's universities do not always support traditional human rights as guaranteed under the Bill of Rights of the United States Constitution—especially the First, Fifth, Sixth, and Fourteenth amendments. In growing numbers, college campuses are restricting free speech if it is “hurtful”, often at the expense of intellectual inquiry. Of particular focus in this paper are the assaults on the Fifth, Sixth, and Fourteenth Amendments, as it relates to disciplinary proceedings for student conduct violations, both on and off campus. While the rules and procedures for taking disciplinary action may be clearly communicated, common civil liberties outside the university context do no function with the same power and authority within the university. These common civil liberties as established in the Bill of Rights include the right of representation by another during a disciplinary hearing, the right to avoid self-incrimination, the right to face and question the accusers, the presumption of innocence until proven guilty, and the right of an unbiased hearing.

This paper is a case study that examines the rights of the student in a student conduct hearing. It more broadly examines student rights in public institutions. The scope of the paper is limited to the laws applicable to public institutions. Private colleges and universities are not bound by the dictates of our Bill of Rights since their actions are not state actions. Through this paper, we hope to educate public universities about their obligations under the constitution to our students. After all, they are paying our bills and they deserve to be treated with respect and afforded the rights of humanity that are guaranteed to them in our constitution.

### **BACKGROUND ON THE CASE**

It was a typical early fall evening in Middle America in the backyard of an off-campus home rented by some university students. With permission of the owner of the property, these students had a bonfire and decided to burn some trash. Unfortunately, the bon-fire got larger than desired, and the heat caused some minor damage to the vinyl siding on the neighboring property—also a student rental. Ironically, it was the trash from that neighboring property that caused the excess heat. The student who was at the bonfire contacted the owner of the adjacent property and arranged and made satisfactory restitution. One of the tenants of that adjacent property contacted the local police the next day. At a later time, a public police officer investigated the event and interviewed only people who, although not present, had

heard of the event from others. The local police officer filed a criminal complaint against the student. However, at the preliminary hearing, the court properly dismissed the complaint as unfounded and no further action was taken.

Upon learning of the criminal complaint, the University Student Conduct officer filed a disciplinary complaint against the student and brought the student before the student conduct board the following semester—almost four months later. By this time, the student was in the last semester of his senior year. At the hearing, the student was allowed to have an “advisor” at the hearing but the advisor was not allowed to speak during the proceedings. During the hearing, the student was questioned and the police officer who conducted the investigation subsequent to the event “testified” as to what others had reported to the officer. It is important to note that one of the most damaging reports given the officer was from someone who was not present but told the officer what he had heard from someone else. During the hearing, a letter from the adjacent property owner stating that he was pleased with the restitution made by the student and had no complaint about what had transpired. Direct testimony was also given that the student did not start the fire nor had the student been present when the trash from the neighboring property was added to the fire. Upon presentation of the evidence, the student was dismissed from the hearing while the Conduct Board and the Student Conduct officer deliberated as to the guilt of the student and as to the penalty to be assessed if found guilty. The student was called back into the hearing and was told of his immediate expulsion from the university.

Following the ruling of the Conduct Board, the student reached out to faculty members for assistance in pursuing an appeal. He provided those faculty members a recorded transcript of the hearing. These faculty members attempted to communicate with the appeal officer assigned to the case; however, in a complete misreading and misapplication of the law of confidentiality and privilege the university refused to discuss the matter. The privilege and the confidentiality belongs to the student, not the university. It is the student’s right to waive confidentiality. Confidentiality is a shield to protect the student, the university subverted confidentiality by using it as a sword to punish the student.

### EXAMINATION OF APPLICABLE LAW

Over the years, law has developed which lays out bright lines as to what must be afforded to students before the state expels them from a state educational institution. The language of these bright lines are used by university administrations. The problem is that administrations do not use personnel who understand the definitions of the bright lines. Moreover, the personnel empowered to follow the law do not understand how to implement the law when conducting a disciplinary hearing. In a university setting, we do not allow Ph.Ds. in sociology to teach microbiology for the obvious reason that it is out of their field and they would have no understanding of the terms used in such class. As academicians we do this to ensure that our students are truly learning micro-biology. However, we allow Ph.Ds. in Sociology or Biology or History to apply terms and principles they don’t understand and, therefore, our students are not truly receiving due process. It is obvious that we care about academic integrity in the class room halls, but not so much about integrity when seeking justice. As educators, we need held to a stronger standard.

The sentinel case in this area is *Goss V Lopez*<sup>6</sup> a 1975 case challenging the constitutionality of an Ohio statute that allowed public school administrators to suspend students for up to ten days without a prior hearing. The Court ruled that any school suspension from a public institution required that the due process clause of the Fourteenth Amendment be adhered to. Clearly, the Ohio statute was unconstitutional in that it deprived the students of “...life, liberty, or property without due process of law”.<sup>7</sup> The Court found the students to have a property interest in Ohio’s decision to provide free public education and a liberty interest in their reputations. At a minimum due process requires prior notice of the charges against the students and an opportunity to be heard and to confront one’s accusers.

There is a bright line that has logically been drawn between disciplinary punishments and academic failure. In *University of Michigan v Ewing*<sup>8</sup>, the United States Supreme Court was faced with an issue where a student was dismissed for academic reasons. He was enrolled in a six-year program that provided a B.S and an M.D. at completion. At the end of his first four years, he failed an examination that would have allowed him to complete his final two

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<sup>6</sup> *Gross v Lopez*, 419 US 565 (1975)

<sup>7</sup> U.S. Constitution, Fourteenth Amendment

<sup>8</sup> *University of Michigan v Ewing*, 474 US 214 (1985)

years. Other students had been given the opportunity to retake the exam, however, Scott Ewing was not. The University of Michigan argued that the student had a number of incomplete classes, poor grades generally, and on a number of semesters was reduced to less than full time study. The student was allowed to appeal his dismissal and his academic dismissal was upheld. Although the court reasoned that Ewing had a due process right to his education, they would not second guess an academic decision. “When judges are asked to review the substance of a genuinely academic decision... they should show great respect for the faculty's professional judgment. Plainly, they may not override it unless it is such a substantial departure from accepted academic norms as to demonstrate that the person or committee responsible did not actually exercise professional judgment.”<sup>9</sup>

The Third Circuit Court of Appeals in *Hankins v Temple University* summed up precisely the state of the law regarding academic discipline by stating that “an informal faculty evaluation is all that is required.”<sup>10</sup> This demarcation line between academic and conduct discipline was a crucial issue discussed in *Valentine v Lock Haven University of Pennsylvania*.<sup>11</sup> The court had to determine if a dismissal for plagiarism was academic or conduct. “The Defendants’ argument relies on the assumption that Valentine's dismissal for plagiarism was “academic” in nature; Valentine disputes this assumption, arguing that her dismissal was “disciplinary,” and with good reason because the distinction has implications for the process due before a student can be expelled. Disciplinary dismissals must be preceded by, at least, notice to the student of the charges against her, an explanation of evidence underlying the charges, and an opportunity for the student to present her side of the story.”<sup>12</sup>

These rights are non-existent if the institution is private. Without state action, there are no due process requirements.<sup>13</sup> With public institutions, a limited form of due process is required. This limited amount of due process results in flawed outcomes. Moreover, the perception of bias is propagated. At the end of the day, the goal of all educational institutions should be fair and just in disciplinary determinations. Currently, the systems of determination being used are a hindrance to accuracy. The courts have allowed this lack of accuracy to prevail because of the perceived cost of conducting legitimate hearings and because the loss of liberty and property, school expulsion, is less than the loss of liberty and property in typical criminal hearings.<sup>14</sup> However, any definition of “fundamental fairness” which is the linchpin of any due process analysis requires some fundamentals regardless of balancing of constitutional rights with cost due to the perceived lesser penalties involved in public education disciplinary procedures.

The first is a fair and impartial tribunal. Under any logical analysis, the tribunal should be independent from the prosecution. In our case study, the prosecutor brought the charges, presented the evidence, ruled on the admissibility of his own evidence and then deliberated with the hearing board while the defendant was relegated to another room. Following the determination of guilt the University’s prosecutor (titled Coordinator of Judicial Affairs) then met with the jury to determine a sentence. It is often said as joke that someone wants “to be judge, jury, and executioner”. That joke is a reality in many of the nation’s public universities.

The lack of legal expertise at the conduct board hearings, and more importantly the denial of a right to effective assistance of counsel, end up being a double-edged sword that cuts both ways against the student. *Ruane v Shippensburg University*<sup>15</sup> found that charged students have no right to legal representation. However, the same courts use the back side of the sword against students by denying them their day in court because of their failure to make timely objections at a disciplinary board hearing. As an example, in *Jackson v Indiana University of Pennsylvania*,<sup>16</sup> the student attempted to argue in Commonwealth Court that the procedures violated due process because the tribunal and prosecutorial duties were comingled. The argument was blocked by the court because the student “failed to preserve the second issue for appeal, whether prosecutorial and adjudicatory functions were commingled, because she failed to raise the matters before the governmental agency.” It is highly doubtful that any undergraduate or member

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<sup>9</sup> Ewing at 225

<sup>10</sup> *Hankins v Temple*, 829 F.2d 437, 445 (3<sup>rd</sup> Cir. 1987)

<sup>11</sup> *Valentine v Lock Haven University*, 2014 WL 3508257 (M.D. PA 2014) Slip Opinion

<sup>12</sup> *Valentine*

<sup>13</sup> *Althiabat v Howard University*, 76 F. Supp. 3d (D.C. 2014)

<sup>14</sup> *Mathews v. Eldridge*, 424 U.S. 319 (1976)

<sup>15</sup> *Ruane v Shippensburg University of Pennsylvania*, 871 A.2d 859 (Com. Ct. 2005)

<sup>16</sup> *Jackson v Indiana University of Pennsylvania*, 695 A.2d 980 (Com. Ct. 1997)

of a disciplinary board understands the concept of preserving an issue for appeal. However, it is beyond any doubt that the impermissible comingling of duties creates the impossibility of an accurate fact-finding tribunal.

One of the most troubling areas in any due process analysis of higher education is the use of evidence in reaching a decision. University administrators are almost proud of the fact that the rules of evidence are not followed. This is troubling because the rules of evidence have been developed over hundreds of years with one purpose in mind the finding of truth. The abandonment of such tried and true methods in and of itself makes the accuracy of university tribunals unnecessarily error prone. Many states have taken the step of outlining hearing requirements for state institutions of higher education. Pennsylvania forbids the use of hearsay evidence<sup>17</sup> but that law was of no effect in our case study since the concept of hearsay was not something understood by the prosecutor, or the person who reviewed the case on appeal.

In *Coulter v East Strousburg University*,<sup>18</sup> the federal district court issued an injunction blocking the suspension of a student because the procedures at East Strousburg University did not allow for active cross-examination of witnesses against the student/defendant. East Strousburg is exactly on point as the university involved in our case study also violates the student's constitutional right to confront witnesses against him. In the case study, all of the evidence presented by the university was wholly unreliable because no one who witnessed any of the events was on hand to testify. The entire presentation by the university prosecuting the student was from a police officer testifying what someone had told him that somebody else had said. The right to confrontation of witnesses was denied to the student in the case study. According to East Strousburg University, this problem could have been completely resolved and truth could have been ascertained if the student "... could have had counsel or some other representative, Chief Olson could have been cross-examined to disclose his lack of personal knowledge of the situation."<sup>19</sup> Since this right to confrontation was denied the injunction against the discipline of the student was issued.

Our system of government, including the freedom of the press and free speech, start from the premise that free and open debate will allow us to reach truth through the market place of ideas. Our court system is premised on the ideal of giving a fair and impartial hearing where allegations are tested by vigorous debate before a fair and open tribunal. The allegations presented against a student should be able to stand the test of accuracy. Without allowing a representative of the student, or the student himself, to cross examine the real witnesses against him there is no way to establish truth or accuracy. Lay people, which includes those on university discipline tribunals, may have a strong misconception of cross-examination and its role in determining truth. Perhaps, through fictional television and movies lay people believe that cross examination is a shouting match, or an effort to belittle a witness, or an effort to cause them to misstate something. Nothing could be further from the truth.

Proper and effective cross-examination delves into five specific areas. Very few witnesses take the stand in a court room with the intention of deceiving. However, it is very likely that their testimony is not completely accurate. To test this accuracy and insure the discovery of truth every witness must be challenged in regard to the following issues:

1. Problems with perception: This delves into mistakes in perception that the witness may have had. Was the witness wearing her glasses? Was it dark out? How far away was the witness? Was the witness sober? Was the witnesses view obstructed? All areas that affected the witness's ability to perceive an event must be delved into. This can only be done through effective cross examination. Effective cross-examination can only be completed by someone educated in trial practice.
2. Defects with memory: Time passes and details tend to be forgotten. Interviews and retelling of events tend to adjust a person's remembrance to what the listener wants to hear. Psychologists have long told us that honest eyewitness testimony is suspect.<sup>20</sup> Often good cross-examination questions will jog a person's memory.

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<sup>17</sup> 22 PA Code § 505.6

<sup>18</sup> *Coulter v East Strousburg University*, 2010 WL 1816632 (M.D.PA 2010)

<sup>19</sup> *Strousburg* at 1816632

<sup>20</sup> Sporer, et. al, *Psychological Issues in Eyewitness Identification*, Psychology Press, 2014

“The courts’ reliance on witnesses is built into the common-law judicial system, **a reliance that is placed in check by the opposing counsel’s right to cross-examination**—an important component of the adversarial legal process—and the law’s trust of the jury’s common sense. The fixation on witnesses reflects the weight given to personal testimony. As shown by recent studies, this weight must be balanced by an awareness that it is not necessary for a witness to lie or be coaxed by prosecutorial error to inaccurately state the facts—the mere fault of being human results in distorted memory and inaccurate testimony.”<sup>21</sup> Without effective cross-examination there is no way that the university tribunals are conducting effective truth determining procedures.

3. Defects in Veracity: There are also times when people simply do not tell the truth. It may be that they are hiding their own complicity or protecting another. The list of possible motivations to not tell the entire truth are as long and wide as the human condition.
4. Defects in Transmission: Slang terms, misstatements, failures to be clear and concise are all problems that every nervous witness confronts and yet only effective cross-examination can correct.

Of course, if the university tribunal allows hearsay evidence to be introduced any right to cross-examination is by definition absent since the person who is truly testifying is not present. In this case study, no one who witnessed the events was present to testify. Pennsylvania, like many other states, has created a short series of regulations dealing with a few of the issues present in public university discipline procedures. Pennsylvania specifically states that “Hearsay evidence may not be used to establish a fact necessary to establish guilt or innocence in a case.”<sup>22</sup> However, this regulation provides no protection for the student if those conducting the hearing are unaware of what hearsay is. In the case study, a police officer testified as to what others had told him and as to what others had told others. No one who witnessed the events in question were present. Therefore, the board was prevented from doing their job. They had no idea if the statements were credible because they could not judge any of the issues that may have made their statements believable. If Bob tells Linda something and Linda tells a police officer and the police officer testifies to Bob’s statements in court, all of the problems with accuracy are multiplied again and again. The tribunal in the case study had to blindly believe that Bob, Linda and the police officer had no defects in perception, memory, veracity, or transmission. What if Bob and/or Linda had simply made it up? There is no way for the tribunal to perform their function of seeking the truth.

Hearsay is, “statement (either a verbal assertion or nonverbal assertive conduct), other than one made by the declarant while testifying at the trial or hearing, offered in evidence to prove the truth of the matter asserted.”<sup>23</sup> If the police officer testifies that Linda told Bob the car was dark blue, the information is coming from the perceptions of Bob. The accuracy of Bob’s statements can only be accurately assessed if Bob is there to answer the questions. When he is not, it is inadmissible hearsay.

In the case study, the only evidence presented was hearsay. Therefore, the procedure violated both the Fourteenth Amendment’s Due Process clause and the Confrontation Clause found in the Sixth Amendment. The Sixth Amendment gives everyone in a hearing the right “...to be confronted with the witnesses against him....” Clearly, when those testifying against the student are not present at the hearing there is no right to be confronted with those witnesses.

The law does not require strict enforcement of due process principles at an academic disciplinary hearing. However, it does require a balancing test between the need for accuracy and the burden on the educational institution. In *Matthews v Eldridge*,<sup>24</sup> the United States Supreme Court laid out the balancing test that courts need to apply in determining how much process is due.

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<sup>21</sup> Fisher and Traversky, The Problem with Eyewitness Testimony, *Stanford Journal of Legal Studies*, Vol 1:1, December 1999, page 29. (emphasis added)

<sup>22</sup> 22 PA. Code § 505.6 (2015)

<sup>23</sup> Black’s Law Dictionary

<sup>24</sup> *Matthews v Eldridge*, 424 US 319 (1976)

First, the private interest that will be affected by the official action; second, the risk of an erroneous deprivation of such interest through the procedures used, and the probable value, if any, of additional or substitute procedural safeguards; and finally, the government's interest, including the function involved and the fiscal and administrative burdens that the additional or substitute procedural requirement would entail.<sup>25</sup>

The first issue is a determination of how damaging to the student's property interests an adverse decision would be. Will the student be expelled, will the student's reputation be harmed, and will there be a substantial financial burden? An answer of yes to these questions necessitates a greater degree of safeguards to insure accuracy. The second question asks if additional procedural safeguards would in fact insure accuracy while the third ask how much improving the accuracy of the tribunals would cost.

In this case, at the public university the student was initially permanently expelled. Following an appeal process the punishment was reduced to an expulsion of one year. A one-year loss in education is a significant loss of a property interest. Further, the stigmatism of such a decision may well follow the student through a significant portion of his working life. As to the second issue, accuracy of the tribunal could have easily been assured by simply not allowing hearsay evidence to be used as the basis for the adverse decision.

Another difficulty with the administration of justice in student conduct hearings is that the standard of proof is set at the lowest level of a burden of proof. The policy at the state institution of higher education in question establishes a standard of the preponderance of the evidence when identifying truth. This standard is identified as a fact being more probable than not. This is the standard in civil court in litigation between two parties. The presumption behind this standard is that neither party's interest supersedes the other. For example, if "A" sues "B" for breach of contract, the standard is appropriately a preponderance of the evidence. If, however, the government is attempting to deprive an individual of liberty or property, the burden of proof requires a higher standard—either “clear and convincing evidence” or the highest burden of proof, “beyond a reasonable doubt.”

A standard of proof of the preponderance of evidence might be appropriate for a private university where the relationship between the student and the university more closely resembles a bilateral contract. As a private university, students can be required to give up many of the freedoms allowed by students at public institutions. An extreme example would be Bob Jones University where students are prohibited from listening to any radio station other than the university station. Religious colleges can allow professors to engage in public prayer in the classroom. Public colleges and universities must adhere to the doctrine of the separation of church and state. As a public institution, the requirement should be higher. The United States Supreme Court case *In Re Winship*,<sup>26</sup> identified three compelling public interests in using the reasonable doubt standard of proof—the defendant's liberty, to protect the innocent from the stigma of conviction, and to give confidence that the procedure protects the presumption of innocence.

We currently have a situation where if one is charged with a minor traffic offense which risks one hundred dollars in fines, the state must prove its case beyond a reasonable doubt. However, if a public university wishes to deprive a student of thousands of dollars in tuition, fees and room and board by expelling that student from the university only a preponderance of the evidence is required. This problem becomes even more critical as public universities have now taken it upon themselves to discipline students for conduct that occurs off campus whether school is in session or not. We have created a situation where egregious deprivations of basic legal rights are forced on citizens, in the guise of student discipline, for actions totally in the realm of the public police and legal authorities best equipped to handle them. The case study is an example of a public university bringing its deprivations of basic civil rights out into community law enforcement.

The problem lies largely in whom public institutions employ to handle their disciplinary hearings. Clearly, those involved in the decision making at the public university had no idea of what hearsay was. Those conducting the hearings should have at least a one-day presentation on basic tried and true methods of testing the reliability of

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<sup>25</sup> Nash v Auburn University, 812 F.2d 655, 660 (11<sup>th</sup> Cir. 1987)

<sup>26</sup> In Re Winship, 397 US 358, 364 (1970)

evidence. An understanding of the hearsay rule is simply mandatory if we, as educators, are going to provide any degree of due process in our discipline determinations.

As of the writing of this paper there are proposals for regulatory changes to the methodology used by educational institutions in disciplining sexual misconduct under Title IX of the Education Amendments of 1972.<sup>27</sup> The two most relevant proposals to the subject matter of this paper commands the university to seek accuracy in their adjudication processes by forbidding the investigator from also acting as judge and jury and instituting the fundamental right of cross-examination.<sup>28</sup> As Title IX coordinators and adjudicators tend to have degrees in student services or education, they have no background in fundamental legal principles or understanding of the laws they are attempting to enforce. These problems in the Title IX area were brought out in two recent federal cases. The first involved a student in a three plus four pre-med program at Penn State University.<sup>29</sup> The student was accused of sexual assault, which he denied, but was expelled from the university for two years. The student brought a suit in federal court and sought a preliminary injunction blocking the enforcement of the punishment. The preliminary objection was granted since Penn State University did not follow its published conduct board procedures, failed to allow effective cross-examination, and blocked the introduction of relevant evidence.

However, Penn State University compounded their errors by violating the court order. They elected to conduct a new hearing charging the student with the same acts as under the first hearing. Penn State's Vice President for Student Affairs, Danny Shaha, went so far as to email the accused laying out the decision to violate the federal court order. A contempt petition was filed against Danny Shaha and the Interim Director of Student Conduct.<sup>30</sup> Penn State never conducted the second hearing following the contempt petition. The accused is continuing his studies at Penn State. On March 19, 2019 the case was settled with Penn State paying an undisclosed amount.<sup>31</sup>

In *Doe v Baum*<sup>32</sup> the issue was much simpler. The University of Michigan conducted a sexual assault discipline hearing and found against the accused. The accused filed a federal court action alleging a violation of due process since the accused was not allowed to cross examine the accuser. The Sixth Circuit Court of Appeals held that "if a public university has to choose between competing narratives to resolve a case, the university must give the accused student or his agent an opportunity to cross-examine the accuser and adverse witnesses in the presence of a neutral fact-finder."<sup>33</sup>

To avoid costly civil rights suits and more importantly to be fair and accurate in our determinations public educational institutions must at a minimum:

1. Provide advance notice of the charges against a student. The charges need to be stated in sufficient specificity to allow for the preparation of a defense. Today in to many universities, including the one which produced the case study, the same person who writes the charges and the person who determines if they are of sufficient specificity is one and the same.
2. Provide adequate time between the charge and the hearing to allow the student to prepare a defense.
3. Have a mandatory process similar to a subpoena available to the charged student. Those facing discipline need to have the ability to call witnesses in their favor without fear of retribution. Some universities, including the one that produced the case study, go so far as to forbid student/defendants from speaking to potential witnesses.

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<sup>27</sup> 20 U.S.C. § 1661-1668 (1972)

<sup>28</sup> Proposed Rules Department of Education 34 CFR Part 106

<sup>29</sup> *Doe V Penn State University*, 276 F.Supp. 3d 300 (MD of PA 2017)

<sup>30</sup> MEMORANDUM OF LAW IN SUPPORT OF PLAINTIFF'S MOTION FOR CIVIL CONTEMPT AS AGAINST THE PENNSYLVANIA STATE UNIVERSITY, DANNY SHAHA AND KAREN FELDBAUM, No:4:17-CV-01315

<sup>31</sup> <https://www.pennlive.com/news/2019/03/penn-state-settles-lawsuit-over-handling-of-claims-of-student-sexual-misconduct.html>

<sup>32</sup> *Doe v Baum*, 903 F.3d 575 (6<sup>th</sup> Cir. 2018)

<sup>33</sup> 903 F.3d 575, 578

4. Allow the charged student the opportunity to face his accusers.
5. Allow the charged student to have an active advisor, which may be an attorney to represent him. This active advisor must have the right to speak and to cross-examine witnesses so that the accuracy of the witness's statements can be deduced by the finder of fact. Without this basic right, there is no opportunity for accuracy.
6. Ensure that the prosecution and the tribunal fact finder are separated. Allowing the person serving as prosecutor to be part of the panel determining liability is on its face silly.
7. Allow cross examination to test the list of hearsay dangers.
8. Allow for a meaningful appeal process.
9. Change the burden of proof from a "preponderance of the evidence" to at least "clear and convincing evidence" or even the highest burden of proof, "beyond a reasonable doubt." Through all of the attempts to define the three burdens of proof known to our legal system the best simply says that with a preponderance of the evidence we are "sure"; with clear and convincing we are "very sure", with beyond a reasonable doubt we are "extremely sure". Our students at least deserve that we are "very sure" before we strip them of education, take their property, and destroy their careers.
10. With whatever procedures are put in place, they have to be enforced by someone knowledgeable in the administration of justice. Ideally the person in charge of these hearings should have some minimum legal education. At least someone with a degree in paralegal studies should be the head of the judicial branch of a public university. With serious charges, our students deserve a competent, qualified, member of the bar who can conduct a fair and impartial hearing. It is difficult for expert judges to reach decisions in complicated cases, let alone a layperson university administrator.

We typically do not ask sociologists to be experts in chemistry or accountants to be experts in physics. Yet when it comes to legal decisions universities typically entrust their appeal process to those with no education at determining whether a fair hearing was conducted. Since law is a part of everything in our society, every university has those holding Doctors of Jurisprudence as part of their faculty. It is an anathema that universities do not take advantage of this expertise by having those who process the credentials and the expertise in these matters to review the decisions. This would become a self-improving process as the attorney could be able to point out practices that do not comport with due process or other areas of the law.

Higher education should not be entirely focused upon imparting technical knowledge to be used only in the student's career path. Learning the skill sets necessary to be an engineer, an architect, a social worker, a teacher, or a business person is important, but not everything a student needs to know to become "educated." If learning skill sets were all a student needed, perhaps trade schools would be more appropriate. An important element to being an educated person is acquiring moral and ethical perspectives to assist the person in life as well as in their career.

The institutions of higher education boast that they are teaching moral and ethical principles. Most every accreditation body for institutions of higher education has a moral and ethical component to their quality assessment. As such, institutions of higher education have a responsibility to model moral and ethical behavior. Current procedures for handling student misconduct fail in modeling the moral and ethical principles taught in the Bill of Rights and demanded by basic human dignity and the pursuit of justice.



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# THE FUTURE OF VALUE: FROM BITCOIN TO CENTRAL BANK DIGITAL CURRENCIES

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## ABSTRACT

Bitcoin (BTC), due to its decentralized design, works without any need for a centralized authority and is also censorship resistant. It has caused much speculation over the course of current socioeconomic models in terms of banking, money, privacy, and government. We examine the history of money and how cryptocurrencies may disrupt the current global economy by challenging the U.S. dollar standard. Furthermore, we examine structures and operations of emerging Central Bank Digital Currencies (CBDC) and their mechanics. We differentiate CBDCs from current commercial digital fiats issued by banks and analyze their role as potential tools for monetary policy and examine CBDCs currently in development in Russia, Venezuela, and China. We also look to how CBDCs would affect tax policy, security, monetary controls and speculate about their impact in domestic markets. We argue that Bitcoin will emerge as ‘good money’, gold for the digital age, representing a new currency standard for international commerce.

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## INTRODUCTION

Classically money has been defined to possess the following three main qualities; <sup>34</sup>*Medium of Exchange, Store of Value, Unit of Account*. Kocherlakota predicted that a government’s monopoly on seigniorage (profit from money production) can be jeopardized with cheap and accessible informational storage, with technological advancement as he argued that ‘Money is Memory.’<sup>35</sup>

Historically, commodities were the earlier form of money represented by gold that acted as ‘good money’: medium of exchange, store of value, and unit of account as well as scarce, fungible, divisible, durable, portable, religiously significant, and no one person controlled its supply. Paper Money was introduced by Merchants attempting to secure their gold, trusted goldsmiths to safeguard funds in vaults, which were recorded with a depository paper receipt used to reclaim the funds. Goldsmiths started to loan out against the dormant gold at interest and making a profit with the dormant assets, thus becoming the earliest form of banks.<sup>36</sup> Goldsmiths and lenders realized that most deposits weren’t being redeemed, as the popular paper-receipts were commonly used as tender in place of gold, and issued more paper than gold available.<sup>37</sup> This was the start of fractional-reserve-banking, which allowed for unprecedented economic growth as a country’s reserves and money supply is artificially expanded for unseen economic development.<sup>38</sup>

### The USD as Global Reserve Currency

After WWII, to restart the global peace and trade initiative and to provide relief and financial stability to Europe and the rest of world a series of meetings between 44 nations, called the Bretton-Woods Agreement took place for establishing a conducive environment for international trade. Here, the US pressed its position as the World Power by having all attending countries establish a fixed peg to the world’s ‘gold-convertible currency’ - the USD at \$35 per ounce.

In early 70’s, despite the ‘Nixon Shock’, abolishment of the Bretton-Woods System and gold standard, the USD still held its position as the global reserve currency. The US was still the world’s strongest and developed economy, and USD was redeemable for US goods and services within its economy despite leaving the gold standard. In a system called Petrodollar Recycling, Saudi Arabia and OPEC countries seeking price stability and to protect their USD assets, tied oil prices to the USD. This helped establish the USD as the world’s dominant currency post Bretton-Woods, as

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<sup>34</sup>Hileman, Garrick. (2014). From bitcoin to the brixton pound: history and prospects for alternative currencies. Paper presented at the International Conference on Financial Cryptography and Data Security, Berlin, Heidelberg. Retrieved from [www.hillsdale.edu/wp-content/uploads/2016/02/FMF-2014-A-History-of-Alternative-Currencies.pdf](http://www.hillsdale.edu/wp-content/uploads/2016/02/FMF-2014-A-History-of-Alternative-Currencies.pdf) 2014

<sup>35</sup>Kocherlakota, Narayana R. (1998). Money is memory. *Journal of Economic Theory*, 81.2, 232-251. <https://doi.org/10.1006/jeth.1997.2357>

<sup>36</sup>United States. Congress. House. Banking and Currency Committee. (1964). *Money facts; 169 questions and answers on money – a supplement to A Primer on Money, with index, Subcommittee on Domestic Finance ... 1964* (PDF). Washington D.C.

<sup>37</sup>Menger, C., & Frank H.. Knight. (1950). *Principles of Economics. 1st, General Part*. Free Press.

<sup>38</sup>Inspection of Gold at Fort Knox.” *United States Mint*, 20 Sept. 1974, [www.usmint.gov/learn/history/historical-documents/inspection-of-gold-at-fort-knox](http://www.usmint.gov/learn/history/historical-documents/inspection-of-gold-at-fort-knox).

all trade to oil was traded with USD, essentially backing the USD in oil, the industrialized world's essential commodity<sup>39</sup>. Additionally, there was no alternative for the world economy to question the newfound direction of global finance, as every country's fate was tied in with the US Dollar. The USD, still remains the Global Reserve Currency that international organizations and governments trust as a safe store of value, as of April 2016 the Bank for International Settlements calculated that 88% of global trade uses the USD.<sup>40</sup>

Nobel-Prize Winning Economist, Paul Krugman, argues that 'fiat money is backed by men with guns' that force you to accept it.<sup>41</sup> Over history the strongest World Power set traditionally the global 'reserve' or 'trade' currency, due to the unquestioned challenge of the issuing tender's military and government strength. Regardless of how wealth is represented with currency, governments can still control the physical goods in the economy. Historically at times, governments just seized the raw resources themselves and took state control over various industries as needed for the regime's sustainability. The US, the world's superpower, spends over 600 Billion annually on Military, which by comparison is equal to the next seven largest countries combined military spending.<sup>42</sup>

## CRYPTOCURRENCIES - POTENTIAL DISRUPTION

### Bitcoin & Blockchain

Bitcoin, pioneered by the mysterious Satoshi Nakamoto in 2009<sup>43</sup>, was the first cryptocurrency. Bitcoin achieved a distributed consensus via a blockchain, an immutable and shared ledger. Bitcoin, is decentralized, censorship-resistant, borderless, and not contingent on any government backing, hence deriving its value only on its network of those that believe and value it for payment. Many have made the obvious comparison of Bitcoin to Gold, often referring to Bitcoin as 'Digital Gold' and 'good money' thus, sharing all the benefits of a gold based monetary system. While no one knows for certain which cryptocurrency/ies will endure the test of time and reach universal acceptance, this paper will focus on Bitcoin, and treat Bitcoin and cryptocurrency interchangeably in regard to economic impact. Bitcoin has consistently had the largest coin market capitalization with its present capitalization at \$100 Billion, maintaining ~50% dominance over the entire crypto industry<sup>44</sup>.

### Challenge to USD Global Standard

Some speculate that cryptocurrencies can and may disrupt the current global economy by challenging the global US Dollar standard. The emergence of Bitcoin and other cryptocurrencies question the existing financial model on a large scale by threatening to circumvent banks, clearinghouses, and government-imposed regulation and authority. Since the continuity and existence of Bitcoin and other decentralized coins have minimal direct recourse on the U.S. Dollar and government backing, cryptocurrencies may have the potential to reset the dynamics of foreign relations, diplomacy, international trade, and the effect of economic sanctions in what is referred to the 'de-dollarization' of the global financial system. Additionally, Bitcoin creates a new asset class that unlike gold, can't be seized or controlled, as governments around the world (including the US), throughout history have done. Moreover, for the first time this century, people around the world have access to an alternative to our current Keynesian economic system, with Bitcoins first 'genesis block' (the first recorded bitcoin block) encoding "*The Times 03/Jan/2009 Chancellor on brink of second bailout for banks*", criticizing the instability of modern banking.

### Blockchain Security

Bitcoin is evidently very secure as there has not yet been a breach in its core protocol. It uses blockchain as a way of organizing transactions into blocks that are encoded into unique hashed identified codes that are virtually impossible to replicate. Since each added block has the hash of its predecessor, there is never a break in this cryptographic chain

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<sup>39</sup>Tun, Z. T. (2018, October 16). How Petrodollars Affect The U.S. Dollar. Retrieved from <https://www.investopedia.com/articles/forex/072915/how-petrodollars-affect-us-dollar.asp>

<sup>40</sup>Global FX trading averages \$5.1 trillion a day in April 2016; spot trading falls while FX swaps rise. (2016, September 01). Retrieved from <https://www.bis.org/press/p160901a.htm>

<sup>41</sup>Krugman, Paul. (2018, August 7). Opinion | Transaction Costs and Tethers: Why I'm a Crypto Skeptic. The New York Times. Retrieved from [www.nytimes.com/2018/07/31/opinion/transaction-costs-and-tethers-why-im-a-crypto-skeptic.html](http://www.nytimes.com/2018/07/31/opinion/transaction-costs-and-tethers-why-im-a-crypto-skeptic.html)

<sup>42</sup>Peter G. Peterson Foundation (2018, May 07). U.S. Defense Spending Compared to Other Countries. Retrieved from [https://www.pgpf.org/chart-archive/0053\\_defense-comparison](https://www.pgpf.org/chart-archive/0053_defense-comparison)

<sup>43</sup>Nakamoto, Satoshi. (2009). Bitcoin: A peer-to-peer electronic cash system. Retrieved from <https://bitcoin.org/bitcoin.pdf>

<sup>44</sup><https://coinmarketcap.com/charts/#dominance-percentage> Accessed (2018, August 20)

of transactions. Despite this theoretically sound security protocol, there exists the possibility of a '51% Attack', in which an adversary can command a majority of the network hashing power and probabilistically generate new blocks at a higher rate than the global network, potentially challenging the decentralization and integrity of the network. However, this conceptual possibility has not materialized to this date and seems not be a serious challenge. If it ever happens the Bitcoin community and network would likely identify the attack and 'fork' to protect against it. A 'fork' is essentially a protocol change where the community universally (or partially) adopts a new standard or the rules, usually as an update or to reverse specific bugs or issues.

### Current Technological Setbacks

A large critique of Bitcoin is that its network is slower and more costly than conventional commercial digital alternatives. Currently Bitcoin processes ~7 transactions a second compared to Visa Network's of 50,000 transactions per second at its peak. Although Bitcoin doesn't allow for the ledger to have a double spend, there is a potential for an orphaned block which is source of inefficiency in the system. Bitcoin fees have skyrocketed with its oversaturated network, making small day to day purchases or 'microtransactions' cost more in transactions than for the good they are buying peaking in January 2018 at an absurd \$37, though it has since stabilized now at about \$0.10<sup>45</sup>. Current technological solutions are being worked on with the introduction of 2<sup>nd</sup> layer solutions, namely 'The Lightning Network'<sup>46</sup> which essentially enables parties to have a circulating network of safe and valid Bitcoin transactions much like a valid endorsed check, that only hit the main blockchain when written and 'cashed'. This enables parties to make account changes by ripping up the old 'check' balances and writing new ones, rather than going to the bank to cash and settle every minor transaction. This solution would make Bitcoin transaction secure within seconds and less costly for 'micro-transactions' and has the support of the Bitcoin Community.

Critics argue over the enormous cost of electricity to sustain the Bitcoin network regarding its environmental externality, with estimates of roughly the electrical use of Ireland due to the fierce competition to mine caused by ASICs.<sup>47</sup> This is misleading on several accounts. Firstly, when the network hashing power increases, the Bitcoin protocol adjusts its difficulty to equalize the pace of new block creation to 10 minutes, whether by making the puzzle harder or easier to match the network block propagation rate. Furthermore, this doesn't consider the type of energy used. Many bitcoin mining operations are pushing for cheaper and renewable energy sources in developed regions. Lastly, for a fair comparison we need to compare the cost of maintaining the current financial system of: banks, money security, ATMs, infrastructure, employees, printing presses, bank ledgers, money transit; all which are much costlier in aggregate to estimates of 3x with only the consideration of the hardware.<sup>48</sup> Furthermore, Bitcoin Protocol Improvements such as Segwit and Lightning Network will significantly make bitcoin more efficient and less energy intensive.

Many have also criticized the Bitcoin mining network as being overly centralized. Because mining has become so competitive, it now requires top-grade equipment and access to cheap and abundant energy, making it more of a professional industry in addition to the high concentration of global hashing power dedicated to mining pools<sup>49</sup>.

### Volatility

Economists are quick to dismiss Bitcoin as a failed money due to its volatile 'store of value'. However, this condition could exist because Bitcoin has yet to reach critical mass and/or achieved trading pair valuation outside the USD and other major currencies. With more institutions, endowments, and pensions buying cryptocurrencies, this will drastically decrease the volatility by mitigating large volume price action and provide better BTC price stabilization. In addition, once goods & services, and commodity-based resources start creating BTC trade pairs outside of the USD,

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<sup>45</sup> <https://bitcoinfees.info/>

<sup>46</sup> Poon, Joseph & Thaddeus Dryja. (2016, January 14). The Bitcoin Lightning Network: Scaleable Off-Chain Instant Payments. Retrieved from <https://lightning.network/lightning-network-paper.pdf>

<sup>47</sup> de Vries, Alex. "Bitcoin's Growing Energy Problem." *Joule* 2.5 (2018): 801-805. <https://doi.org/10.1016/j.joule.2018.04.016>

<sup>48</sup> Domingo, C. (2017, November 30). The Bitcoin vs Visa Electricity Consumption Fallacy. Retrieved from <https://hackernoon.com/the-bitcoin-vs-visa-electricity-consumption-fallacy-8cf194987a50>

<sup>49</sup> <https://www.blockchain.com/en/pools>

Bitcoin will stabilize, and it will be a constant and stable monetary weight outside of speculation with lesser impact on its value relative to the USD.<sup>50</sup>

### **Deflationary Currency**

Bitcoin would create a deflationary currency, meaning the currency is of a finite supply. Its growth will be slower relative to the goods and services it can purchase; Consequently, Bitcoin would appreciate and grow in value by holding it. Deflationary currencies encourage hoarding, pulling funds out of investments and shrinking the money supply in an economy. However, Austrian Economists argue that a stable deflationary currency would provide better price stabilization, as demonstrated during the gold backed dollar years in the US. While this is traditionally problematic as the unit of accounts for currencies such as the USD is finite until the penny, Bitcoin is theoretically infinitely divisible, allowing for Bitcoin to continually be broken down into smaller amounts and causing BTC's price against goods inflate in the opposite direction, meaning less is now worth more. Additionally, if deflation is predictably stable, prices of goods and services would decrease relative to Bitcoin, encouraging people to spend coins as everything gets cheaper. Prices would adjust like they do now with inflation, though in the opposite direction. The psychology of having less gross sum at equal value is a behavioral trap referred to as nominal rigidity or 'sticky wages', where people used to their income at a numerically high value have issues accepting less despite equal purchasing power<sup>51</sup>. Unlike gold however, Bitcoin would be a true finite supply, reaching a specific cap of 21 million Bitcoins to be completely mined around year 2140, tapping out its supply growth.

### **Bitcoin Adoption**

A Bitcoin state standard, directly or indirectly (fiat backed by Bitcoin) would be a modern return to a 'gold standard', restricting how much currency a government can allow in circulation. Historically, governments have gone off the gold standard since it was finite and scarce which drastically limits a government's power to manipulate the money supply for economic growth.<sup>52</sup> While Bitcoin may not be a viable alternative to state issued fiat for personal use in strong economies, it does possess the qualities that make it extremely attractive for an international currency, free from state influences for international trade. In addition, it also satisfies what John Maynard Keynes theorized as the Bancor, or the International 'gold backed' unit of account as a supranational currency for international use, with the IMF (International Monetary Fund)<sup>53</sup> recently publishing in support of an international Bancor like currency in 2010 to resolve the Triffin Dilemma<sup>54</sup>. Bitcoin, unlike Bancor, wouldn't require an International Clearing House or a Global Reserve Bank because of its superior technical efficiency to any gold based or fiat based international global currency. If Bitcoin was to transcend into this status as the Global Reserve Currency, governments would start mining and maintaining the Bitcoin Ledger to ensure and protect the international Bitcoin standard from rouge malicious state/nation actor attacks (as we mentioned above, 51% attack).

## **THE CASHLESS ECONOMY**

### **Introduction of a Centralized Digital Currency**

A Centralized Bank Digital Currency (CBDC) poses an interesting question: What if a government issued its own digital fiat cryptocurrency coin? Venezuela has been the first country to issue its Petro token, based on the NEM blockchain; while countries such as Estonia, Russia, Sweden, Japan, and countless other nations' central banks are

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<sup>50</sup>Hampl, Mojmír. (2017, July 20). Mojmír Hampl: Central Banks, Digital Currencies and Monetary Policy in Times of Elastic Money. Retrieved from [www.bis.org/review/r170720b.htm](http://www.bis.org/review/r170720b.htm)

<sup>51</sup> Keynes, J. M. (2018). *The general theory of employment, interest, and money*. Springer.

<sup>52</sup>Weber, Warren E. (2016). A Bitcoin standard: Lessons from the gold standard. Bank of Canada Staff Working Paper. No 2016-14. Retrieved from <https://www.bankofcanada.ca/wp-content/uploads/2016/03/swp2016-14.pdf>

<sup>53</sup>International Monetary Fund, Strategy, Policy and Review Department. (2010 April 20). *Reserve Accumulation and International Monetary Stability*. Approved by Reza Moghadam. Retrieved from <https://www.imf.org/external/np/pp/eng/2010/041310.pdf>

<sup>54</sup>International Monetary Fund. System in Crisis (1959-1971) Part 4 of Money Matters, an IMF Exhibit -- The Importance of Global Cooperation. Retrieved from [www.imf.org/external/np/exr/center/mm/eng/mm\\_sc\\_03.htm](http://www.imf.org/external/np/exr/center/mm/eng/mm_sc_03.htm)

researching CBDCs and their theoretical impact in an economy. It is important to distinguish that the CBDC would lack the decentralization that gives current cryptocurrencies viability as a value beyond government control and manipulation. There would be minimal similarities between public cryptocurrencies and a nationally issued CBDC, since a nationally issued CBDC would need to be extremely customized and tailored to fit a government's agenda, controls, and needs.

### **The Current Digital Cash Economy - Digital Messaging**

Currently the public does have access to digital funds, though these digital funds aren't issued by the central bank, rather by commercial banks throughout the country that facilitate digital money transfers in an interconnected banking system. This system revolves around a 'digital messaging' system that alerts banks to update their accounts to reflect on transfers, payments, and balances between parties. While the current digital monetary system works rather well, many have argued over several key issues that a crypto CBDC based solution would improve for the monetary system of an economy.<sup>55</sup> The delayed payment clearing time in our current financial banking system (3-5 business days), frequent credit card/bank fraud and financial disenfranchisement for the 'unbanked' are all notable disadvantages. In terms of financial instruments currently issued by Central Banks, namely physical cash, it is very costly to produce and in cashless economies like Sweden and Denmark, CBDCs help keep government relevant and protect seigniorage revenue. Additionally, it's important to have a money alternative to protect against the risks of the banking sector.<sup>56</sup>

In many developed countries, cash represents a tiny amount of the money supply also referred to as M1 and M2 (M1 is the actual bills and M2 is M1 + the amount of funds or money supply in checking and saving accounts). Sweden has a record low of 2% of transactions being done in cash as it races towards a cashless economy<sup>57</sup>. Businesses such as By Chloe, and many other restaurants no longer accept cash, though ironically, it's completely legal for them to refuse US 'legal tender' as per US Federal Law<sup>58</sup>. The ability to buy goods and services almost anywhere with your credit/ debit card, and now smartphone is an illustration of such forces at play. Through monetary policy, a country's central bank can influence the banking system's Fund Interest Rate, a rate of which banks pay to borrow cash from each other and are used to vicariously expand and contract the money supply in circulation and effect inflation, credit, and loans in an economy. Furthermore, the government imposes serious limitations and laws on the banks to regulate and safeguard its economy. From KYC (Know Your Customer), to cash transfer limitations, to individual balance history for taxes and freezing accounts, the government uses banks to oversee and regulate the economy and its denizens in a way that is functional, and the controls are relatively understood.

### **Current Issues with Modern Banking and Financial System**

While a government issued cryptocurrency would eliminate the need for consumers to have bank accounts to transact online and safely store value; CBDC's wouldn't resolve the intended purpose of banks, to reallocate resources via loans and credit for economic stimulus<sup>59</sup>. Moreover, current Keynesian economics conditions are more of a credit and spending-based economy, banks would still serve as a body to evaluate and manage risks in loan investments to avoid moral hazards of macro epidemic of 'bad loans'. Though many critics argue that it is the banks themselves that cause the financial panics and issues with systemic risks, the need to allocate dormant funds is what grows the economy. While some do argue for a Public Banking Sector, it is likely decades away with its own challenges, and beyond the scope of this paper.

As economies become increasingly cashless, the government's ability to profit via printing funds of seigniorage can diminish. Seigniorage is a powerful tool that enables a government to create money without raising and collecting

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<sup>55</sup> Ludwin, Adam. (2016, June 6). Why Central Banks Will Issue Digital Currency. Retrieved from <https://blog.chain.com/why-central-banks-will-issue-digital-currency-5fd9c1d3d8a2>

<sup>56</sup> Bjerg, O., & Nielsen, R. H. (2018, February). Who should make kroner? - Copenhagen Business School. Retrieved from [http://openarchive.cbs.dk/bitstream/handle/10398/9592/Who should make kroner-CBS Working Paper 2018.pdf?sequence=1](http://openarchive.cbs.dk/bitstream/handle/10398/9592/Who%20should%20make%20kroner-CBS%20Working%20Paper%202018.pdf?sequence=1)

<sup>57</sup> Alderman, L. (2015, December 27). In Sweden, a Cash-Free Future Nears. Retrieved from <http://www.nytimes.com/2015/12/27/business/international/in-sweden-a-cash-free-future-nears.html>

<sup>58</sup> FAQs: Currency and Coin. (2011, June 17). Retrieved from [https://www.federalreserve.gov/faqs/currency\\_12772.htm](https://www.federalreserve.gov/faqs/currency_12772.htm)

<sup>59</sup>Weidman, Jens. (2018, February 26). Jens Weidmann: Opening Remarks - 'Fourth Cash Symposium of the Deutsche Bundesbank. The Bank for International Settlements. Retrieved from [www.bis.org/review/r180226a.htm](http://www.bis.org/review/r180226a.htm)



taxes. A CBDC would protect this income for governments with the growing trend towards digital cash,<sup>60</sup> though there are still many who rely on cash for a safe monetary value outside of the banking system. A CBDC would enable cash to transcend into the digital realm, enabling people to transact without a bank account and protect the people who need a non-bank monetary alternative like a public utility. This would provide a safe monetary umbrella that can help ‘bank the unbanked’ and combat the likes of credit card fraud that is estimated to cost \$190 Billion annually<sup>61</sup>. Furthermore, in our growing cashless digital economy, commercial digital fiat questions the safety of the financial sector as all funds would have risk from the banking market sector.

### Central Bank Tender and CBDCs

Currently, Central Banks have two forms of tender: legal notes also known as cash, and a digital settlement used for banks and large financial institutions. Some see a CBDC as a development of digital settlement used by financial institutions and banks to operate inside of the traditional banking system using Distributed Ledger Technology. Due to blockchains technological efficiency in place of clearing houses, the Bank of England anticipated that “*CBDC issuance of 30% of GDP, against government bonds, could permanently raise GDP by as much as 3%*” due to the “reductions in real interest rates, distortionary taxes, and monetary transaction costs” and “stabilize the Business cycle”<sup>62</sup>. One can ask why stop at bank-to-bank interactions, countries, and intuitions, and instead just issue a CBDC directly to the public for peer to peer use and settlement redeemable for physical cash tender at a fixed rate of 1:1. It's important to note that a CBDC wouldn't be aimed at replacing cash, rather to supplement it. The Fed or any nation's central bank can transcend its role from a ‘bank of banks’ to a ‘bank of the people’ by allowing private individuals to hold its digital tender, though it doesn't have to deploy a system based in cryptocurrency, blockchain, or distributed ledger technology.<sup>63</sup> Currently around the globe countless central banks and governments are experimenting with the new technology and it shows promise to make current processes and clearing houses more efficient, but nothing conclusive has been determined significantly better than existing infrastructures.<sup>64</sup> CBDCs are likely to continue to develop with more testing and research, in addition to financial standardization across the globe as banks develop and link their research and innovations together.

### Banks and Commercial Digital Fiat

While the role of the bank may have originally been to safeguard and protect funds and safeguard physical value; banks are now mostly credit agencies that are in the businesses of assessing risk and issuing credit. Banks are essential to the current economic system by re-allocating unused capital back into the economy via investments, loans, credit for businesses, and homes to enhance and develop overall economic growth. A Central Bank Digital Currency (CBDC) can be problematic since it would compete with the commercial bank digital fiat. Depending on the various inflationary and deflationary interest policies a central bank deploys, commercial banks would have to offer a higher saving interest rate compared to CBDCs to compete for consumer funds.

A CBDC can give a Central Bank more tools and impact to secure the economic growth and purchasing power of its national currency especially during booms and busts. Depending on how the CBDC protocol is set up, a CBDC can be interest (or negative interest)<sup>65</sup> bearing and have a modified ‘Proof of Stake’ approach where users can mine new

<sup>60</sup> Hampl, Mojmir. (2018, March 8). Mojmir Hampl: A Digital Currency Useful for Central Banks? Retrieved from [www.bis.org/review/r180308a.htm](http://www.bis.org/review/r180308a.htm)

<sup>61</sup> Shaughnessy, H. (2012, April 15). Solving the \$190 billion Annual Fraud Problem: More on Jumio. Retrieved from <https://www.forbes.com/sites/haydnshaughnessy/2011/03/24/solving-the-190-billion-annual-fraud-scam-more-on-jumio/#2d43ddb390e0>

<sup>62</sup> Barrdear, J. & M. Kumhof. (2016). The Macroeconomics of Central Bank Issued Digital Currencies. Bank of England.Staff Working Paper No. 605. Retrieved from <https://www.bankofengland.co.uk/working-paper/2016/the-macroeconomics-of-central-bank-issued-digital-currencies>

<sup>63</sup> Bech, Morten, & Rodney Garratt. (2017, September). Central Bank Cryptocurrencies. BIS Quarterly Review. Retrieved from [www.bis.org/publ/qtrpdf/r\\_qt1709f.htm](http://www.bis.org/publ/qtrpdf/r_qt1709f.htm)

<sup>64</sup>Engert, Walter & Ben Fung. (2017). Central bank digital currency: Motivations and implications. Bank of Canada. Retrieved from <https://www.bankofcanada.ca/wp-content/uploads/2017/11/sdp2017-16.pdf>

<sup>65</sup> Bordo, M., & Levin, A. (2017, May). Central Bank Digital Currency and the Future of Monetary. Retrieved from [https://www.hoover.org/sites/default/files/bordo-levin\\_bullets\\_for\\_hoover\\_may2017.pdf](https://www.hoover.org/sites/default/files/bordo-levin_bullets_for_hoover_may2017.pdf)



coins relative to the amount ‘put up’ or deposited<sup>66</sup>. Since a CBDC isn’t decentralized, this feature can be implemented to be like a basic saving account, giving interest for people who decide to ‘lock in’ money at set rates for set times. This would directly incentivize the consumer to ‘lock money’ in an economy, should the economy be predicted to be overheating, to gradually and more effectively contract the money supply. Also, a staking approach enables wealth creation to be given to its holders or citizens directly, giving seigniorage directly back to the customers to better infuse the money into the economy. While this may sound irrational, the FED’s Required Reserve Balances and Excess Balances rate is used to do just that for the banks. Essentially paying banks to just sit on funds to prevent inflation from the quantitative easing of monetary supply expansion, which many question ethically.<sup>67</sup> A CBDC would extend the impact of monetary policy and provide for tools to regulate the currency directly.

A CBDC can also help Central Banks overcome the lower bound negative interest issue. After the last financial recession of 2008, Banks have approached zero Fed Loan Interest Rates, and central banks have entered a new age in banking with negative interest rates, where people pay to hold funds, incentivizing banks to issue loans and credit, and thus kickstart the staggering economy. When Interest Rates approach zero, monetary policy is potentially nullified with limited potential policy impact to the money supply, due to cash holders who are not directly affected by the interest rates. A successful CBDC would overcome this issue as the interest rate would universally affect the economy and all ‘cash’ holders, enabling all CBDC holders to fall prey to the Fed’s newfound Monetary Policies and negative interest rates since all CBDC holders will be affected.<sup>68</sup>

A critical concern of CBDC’s is that they lack borders to operate and open the currency beyond its national borders enabling a global run on national currency. This can be a serious problem to ensure economic sanctions along with current KYC laws, to ensure that US businesses and commerce do not fund terrorist or totalitarian regimes. Likely any implementation of a CBDC would not be anonymous for several reasons; it would help ensure better collection of taxes and payment, and it would help restrict the flow of money to illegal businesses and actions, and lastly and less nobly would generate a treasure trove of data that would be easily accessible and tempting for governments and corporations.

## Security Risks

A government issued Centralized Bank Digital Currency also poses many risks of foreign government and malicious attacks. If a successful adversary can gain access and overrun a self-contained system, they can block transactions, mine or mint coin, and possibly crash or devalue the network. Therefore, a government issued cryptocurrency is likely to operate in a closed system, only allowing highly authorized and nationally approved institutions to be ‘master nodes’- network validators. In addition to the centralization and ‘closed’ system deployed, a CBDC will employ specific protocol limitations on itself to restrict a system breach. That said, CBDC’s that enlist on established Public blockchains networks are limited to the security proof/work of that network. If governments either buys up a major stake of the coin or rents enough Hash power, the monetary network can be used as a new form of National Warfare or Crypto-War, attacking the consensus validity of the State Issued CBDC coin/token. Methods not even theorized can be used in attack as the race for a viable quantum computer are likely to impose challenges and threaten encrypted networks; at the same time, there are quantum proof algorithms that can implemented in response. Like any warfare, the attack and defense would grow to outpace the other, and the security of any nation's currency is of top-level national security concerns. It is worth noting that current international banking standard (SWIFT) is extremely safe, with its biggest security risk being the login credentials for the Central Banks themselves as demonstrated by the \$81million dollar Bangladesh Central Bank heist conducted by alleged North Korea state hackers the Lazarus Group.<sup>69</sup> Any developed system would follow the current banking security protocols and the redundancy checks framework of

<sup>66</sup> Meaning, J., Dyson, B., Barker, J., & Clayton, E. (2018, May). Bank of England Staff Working Paper No. 724. Retrieved from <https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2018/broadening-narrow-money-monetary-policy-with-a-central-bank-digital-currency.pdf>

<sup>67</sup> Econ, Dr. (2013, March). Why Did the Federal Reserve Start Paying Interest on Reserve Balances Held on Deposit at the Fed? Does the Fed Pay Interest on Required Reserves, Excess Reserves, or Both? What Interest Rate Does the Fed Pay? Retrieved from [www.frbsf.org/education/publications/doctor-econ/2013/march/federal-reserve-interest-balances-reserves](http://www.frbsf.org/education/publications/doctor-econ/2013/march/federal-reserve-interest-balances-reserves)

<sup>68</sup> Gupta, Sahil, et al. (2017, May). Fedcoin: A Blockchain-Backed Central Bank Cryptocurrency. Retrieved from [https://law.yale.edu/system/files/area/center/global/document/411\\_final\\_paper\\_-\\_fedcoin.pdf](https://law.yale.edu/system/files/area/center/global/document/411_final_paper_-_fedcoin.pdf)

<sup>69</sup> Hammer, Joshua. (2018, May 3). The Billion-Dollar Bank Job. The New York Times. Retrieved from [www.nytimes.com/interactive/2018/05/03/magazine/money-issue-bangladesh-billion-dollar-bank-heist.html](http://www.nytimes.com/interactive/2018/05/03/magazine/money-issue-bangladesh-billion-dollar-bank-heist.html)

FINRA (Financial Industry Regulatory Authority) and SWIFT (Society for Worldwide Interbank Financial Telecommunication).

## Russia/ China

While the academic material in regard to foreign government blockchain, crypto, and CBDC developments are limited at this time the news-articles are reporting on current developments. Authoritarian governments can use this to mark, freeze, or seize political opposition funds limit what people can buy and with whom they can transact. Such power should be cautioned, as warned by George Orwell in his novel *“Nineteen Eighty-Four’s”* ‘Big Brother’ omnipresent government surveillance. Countries like Russia and China are most interested in Blockchain Technology each for their own reasons, but they share a desire for it to ensure and maintain political control.

China has been pursuing its economic goals primarily through monetary policy, in addition to their suspected currency devaluation as it attempts to pursue economic growth through number manipulation. *“For instance, if Bitcoin or a stablecoin became a medium for exchange, especially for international trade, it would limit the efficacy of China’s exchange rate policies that have historically supporting its export industry.”*<sup>70</sup>

Russian had declared its path towards a state issued ‘CryptoRuble’.<sup>71</sup> While not too much information is published about it, it will not be mined, and be redeemable 1:1 pegged to the physical Russian Ruble. Additionally, Russia would levy a 13% Tax against any CryptoRuble income that couldn’t be verified.<sup>72</sup> President Putin’s economic advisor Sergei Glazev was quoted saying: *“This instrument suits us very well for sensitive activity on behalf of the state. We can settle accounts with our counterparties all over the world with no regard for sanctions.”*<sup>73</sup> In another report, Deputy Governor of Russia’s Central Bank, Olga Skorobogatova was quoted *“We will definitely get to a virtual national currency, we’ve already started working on it.”*<sup>74</sup>

## Venezuela

The Petro, the state-run cryptocurrency for Venezuela is on the Public NEM network, which uses the proof-of-importance method (modified proof of stake) to verify the authentication of the transitions. The Petro is the first state issued and asset backed crypto token, backed by the raw oil reserves of Venezuela; though many skeptics look at the Petro as a loophole to get around the US imposed economic sanctions and illicitly raise funds for what critics call a largely corrupt regime that has pushed Venezuela to hyper-inflation and horrible economic conditions. The Petro whitepaper openly acknowledges that the USD and several other basket currencies have acted as the global reserve currencies making global market access and trade dependent on them. *“Due to the imposition of the US dollar as the international backing currency...which has been particularly harmful to emerging economies... decisions made in the major centers of power to stabilize economies has been recognized”*<sup>75</sup> President Trump reaffirmed the US sanction on the Petro Token, forbidding any US Citizen or trading partner in investing in the token sale<sup>76</sup>, Additionally, matters aren’t so clear with Russian investors and government helping and aiding the Petro’s development, and the Venezuela National Assembly legislature calling the initiative illegal as oil assets can’t be sold or put up as debt without the approval of the legislature making the Petro not a democratically verified coin. A clear issue for any asset backed currency is how to verify the reserves. It isn’t clear how Venezuela will be able to prove that its Petro fairly represents

<sup>70</sup> Ehrlich, Steven. (2018, September 17). Making sense of China’s grand blockchain strategy. Forbes. Retrieved from [www.forbes.com/sites/stevenerlich/2018/09/17/making-sense-of-chinas-grand-blockchain-strategy/#4af7bf723678](http://www.forbes.com/sites/stevenerlich/2018/09/17/making-sense-of-chinas-grand-blockchain-strategy/#4af7bf723678)

<sup>71</sup> Buck, Jon. (2017, October 15). Breaking: Russia Issuing ‘CryptoRuble’. Retrieved from [www.cointelegraph.com/news/breaking-russia-issuing-cryptoruble](http://www.cointelegraph.com/news/breaking-russia-issuing-cryptoruble)

<sup>72</sup> The CryptoRuble - A 13% Tax On The Crypto Economy? (2017, December 5). Retrieved from <http://cryptogurus.com/bitcoin/cryptoruble>

<sup>73</sup> Arnold, Martin. (2018, January 2). Putin Considers ‘Cryptoruble’ as Moscow Seeks to Evade Sanctions. Financial Times. Retrieved from [www.ft.com/content/54d026d8-e4cc-11e7-97e2-916d4fbac0da?segmentId=9b41d47b-8acb-fadb-7c70-37ee589b60ab](http://www.ft.com/content/54d026d8-e4cc-11e7-97e2-916d4fbac0da?segmentId=9b41d47b-8acb-fadb-7c70-37ee589b60ab)

<sup>74</sup> Capozzalo, Olivia. (2018, October 9). Putin Adviser Says ‘CryptoRuble’ Will Circumvent Sanctions, Government Remains Divided. Retrieved from [www.cointelegraph.com/news/putin-adviser-says-cryptoruble-will-circumvent-sanctions-government-remains-divided](http://www.cointelegraph.com/news/putin-adviser-says-cryptoruble-will-circumvent-sanctions-government-remains-divided)

<sup>75</sup> Bolivarian Republic of Venezuela. (2018, January 30). Petro Whitepaper. Retrieved from [www.elpetro.gob.ve/pdf/en/Whitepaper\\_Petro\\_en.pdf](http://www.elpetro.gob.ve/pdf/en/Whitepaper_Petro_en.pdf)

<sup>76</sup> Trump, Donald. (2018, March 19). Executive Order on Taking Additional Steps to Address the Situation in Venezuela. The White House. United States Government Executive Order. No. 13808. Retrieved from [www.whitehouse.gov/presidential-actions/executive-order-taking-additional-steps-address-situation-venezuela/](http://www.whitehouse.gov/presidential-actions/executive-order-taking-additional-steps-address-situation-venezuela/)

the assets it claims as reserves. As for the Petro's ability to evade US sanctions to conduct global trade, it's too early to have any significant data<sup>77</sup>.

## **Taxes**

A national based CBDC would be able to develop creative ways to tax a domestic economy. While traditional tax returns are done annually, all transactions through a CBDC would be recorded and permanent. However, record aggregation has been proven to be extremely complicated to analyze for cryptocurrencies and likely CBDCs due to need to analyze what transaction a transfer is; getting even more complicated as people trade into other currencies and cryptocurrencies. The easiest way to implement a transaction-based tax- is have a flat tax, which is widely unpopular as most countries impose higher taxes on wealthier inhabitants. Depending on how the CBDC and tax system is set-up, tax could be a form of transaction-fee. This would eliminate any need for most tax reporting, as all transactions would embody the levied tax in a payment fee at the given tax level and could be used to balance the tax on its higher income residents with different fees at different transaction volumes. Furthermore, depending on the wallets verification (knowing who the wallets belong too) and identity of the wallet, there can be tiers set up having different tax status identities (nonprofits). Additionally, governments could tax un-accounted for income at a set rate similar to the proposition of the Russian Ruble (at 13%). It's important to recognize that this system wouldn't resolve a tax solution for states and municipalities. This can be tricky due to identifying the location of transactions of purchase, but likely would result to the tax liability of the selling parties registered address of business in conjunction with the Federal Filing/ Receipt of annual taxes.

## **CONCLUSION**

While the current digital fiat system works rather soundly domestically, governments at this time are cautious about issuing a CBDC but will likely start doing so as the economy becomes increasingly cashless. While Central Banks are rightfully hesitant to issue CBDCs to be fashionable, cryptocurrencies' and Bitcoin's success can force governments around the world to respond with their own alternative. Authoritarian governments will likely lead the way, in order to have untold and far reaching influence on the control, privacy, spending, and regulation of its citizens, providing a cash-like substitute for the digital age. The implementation of a CBDC needs to be extremely tailored and highly custom, with a tested and durable function for broad use. CBDC's need to ensure financial safety, and central bank maneuverability for changes in its protocol development which will be done via a closed operation system and not decentralized. If done correctly, CBDC's can provides a more direct method for economic stability than the current vicarious and indirect banking system and could be further developed for future economic and social policies.

While Bitcoin and other Cryptocurrencies do have their current shortfalls in terms of national domestic adoption; citizens, businesses, and international governments now have access to a financial instrument and financial 'hedge' to the USD. While Bitcoin is unlikely to be used as national tender inside national domestic government-controlled markets at this time, it's likely to grow as a monetary weight with the potential to displace gold in international trade and settlement creating a monetary hedge and value outside of USD speculation with better liquidity, storage, and security than gold ever had. Should Bitcoin unseat gold, nations will likely start protecting the network integrity of the Bitcoin and Cryptocurrency ledgers from foreign state level manipulation and maintain and protect its citizens balances. Bitcoin takes the very idea of money and pushes it to the extreme, accepting money and value, are fundamentally just the ideas we believe.

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<sup>77</sup>Chohan, Usman. (2018). Cryptocurrencies as Asset-Backed Instruments: The Venezuelan Petro. Retrieved from [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3119606](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3119606)

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# PATENTS, TECHNOLOGY, DOWNSIZING AND CHANGES IN IDIOSYNCRATIC RISK

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## ABSTRACT

We examine patent filings, technological intensity and changes in idiosyncratic risk around downsizing announcements using the Fama-French-Carhart 4 factor model for both the short term and the longer horizon. The average market reaction to downsizing announcements is negative. However, a significant portion of our sample experiences a positive market response. We consider analyst following and institutional ownership to further elucidate this result. Our findings suggest that the short-term market response to downsizing decisions for firms that do not file patents is negative and that the filing of patents reduces the impact of the negative market reaction. Similarly, technological intensity in the face of downsizing is important, exacerbating the negative market response for firms that fail to simultaneously announce a technological innovation. In the long-term, we find a greater than 1% level of significance associated with change in idiosyncratic risk, technological intensity, patents filed, analyst recommendations and institutional ownership, suggestive that all of these factors contribute to explaining the overall market impact to human capital downsizing events.

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## INTRODUCTION

Empirical research concerning market responses to human capital reductions documents an association with financial distress, firm size, economic cycles, offshoring, asset changes, financial changes, business focus changes and technology. Palmon, Sun and Tang (1997), Elayan, Swales, Maris and Scott (1998), Hillier, Marshall, McColgan and Werema (2007) and Marshall, McColgan and McLeish (2012) and Cowan, Denning, Anderson and Yang (2018) demonstrate a clear division between positive and negative market responses for initial announcements of corporate downsizing events. The results of Cowan et al. (2018) further hint that there is some implication for the market response to human capital reductions depending on the technology intensity of the firm. We add to the literature by examining the association between human capital restructuring and technology by focusing on patents, firm self-reporting of technological change and the firm's technology intensity as determined by its NAICs code. We conjecture that corporate downsizing and technology intensity may be positively related and therefore may affect the market response to human capital restructuring.

We employ the Fama-French, Carhart four-factor model to document the market reaction to human capital restructuring announcements. To examine the information effect of this announcement we include analyst recommendations and institutional ownership as potentially important attributes of its strength. Seemingly, the more analyst recommendations and the larger the institutional ownership the more intense should be the market response. Within this context, our first innovation is the categorization of firms according to patents filed, technological intensity and self-reported announcements of technological change.

Our second innovation is the consideration of mediator and moderator variables in the examination of human capital restructuring. Baron and Kenney (1986) document this technique, which to the best of our knowledge, has not been used in an empirical examination of the market response to layoffs and job-cuts. Rather than select financial distress or business cycles (commonly associated with downsizings) as mediator or moderator variable we choose the change in firm specific idiosyncratic risk.

Our final innovation is the empirical examination of the longer run implications of human capital reductions. Denning and Shastri (2011) provides some evidence regarding the impact of human capital reductions and long run accounting outcomes. Dichev and Piotroski (2001) provides a method for examining the longer horizon implication of a news event. Bagnoli, Levine and Watts (2005a, b) examines three alternative classes of corporate information events: standard quarterly announcements, standalone guidance events and strategic events. For the strategic events, the lag is more prolonged and the market requires repetition to interpret the information. It seems reasonable that institutional owners and analysts may require more than a few minutes to understand the profit and stock price implications of patents, technological changes or changes in technology intensity. We consider these as strategic events and examine their long run implications.



We examine 1759 announcements of human capital reductions from 385 firms and associated patent filings, technological change and technological intensity, which result in a positive or negative market response. Sixty-eight percent of the layoff announcements occur during a period when patents are filed and 23% of the layoff announcements are from firms that are classified as technologically intensive. The number of patent filings per firm within six months of a human capital restructuring announcement, as well as the number of employees impacted, tend to follow the economic cycle. Approximately 59% of the market responses due to the announcements of human capital downsizing events are negative and 41% are positive. Thus, the short run, overall market response is on average negative. Alternatively, in the long run, the response to human capital restructuring announcements is evenly split (50%/50%) between positive and negative market responses. There is some slight evidence that the long run average market response is positive. The market response to a human capital event varies depending on whether the firm is technologically intense and whether a patent is filed.

When we include the moderator variable, the change in idiosyncratic risk, and consider, analyst recommendations and institutional ownership, the change in idiosyncratic risk has a dampening effect on abnormal returns for both the negative and positive subsamples. The change in idiosyncratic risk modifies the impact of technology for both subsamples. We reason that the market fears that laying off human capital minimizes potential positive exploitation of the impacts of the patents and technology. In the long-run, technological intensity, idiosyncratic risk, patents filed, analyst recommendations and institutional ownership are all significant at less than 1%, suggestive that these factors contribute to the market response to human capital restructuring announcements.

This paper provides insight for both managers and investors. The results of this manuscript suggest that managers should increase the level and frequency of communications regarding the value of patents and new technologies and their potential market gains more effectively. These communications help minimize the time it takes for the information to create an impact on market valuations. For investors, the results presented in this paper suggest evaluating the long run implications of the quality, quantity and frequency of filed patents on market valuations. Section 2 presents the hypotheses development; section 3 presents our data and methodology; section 4 presents the results; and section 5 discusses our conclusions.

## HYPOTHESES DEVELOPMENT

We examine the market reaction to announcements of human capital downsizing events (layoffs, job cuts and early retirements) associated with patents filed and issued, technological intensity, as well as announcements of technological change. In this paper, we differentiate between firms that issue patents, and firms that do not, as well as firms that make announcements of technological changes and those that do not. We also differentiate between firms that are technologically intense and ones that are not. Announcements of technological change may take the form of product or process innovation. We expect a technological change to affect manufacturing or service provision by improving or replacing the existing production process, reducing costs or improving the product or service. Changes in operating processes potentially lead to reductions in a firm's workforce. Ex ante, we expect the market to recognize the effect of these changes and reward the firm with a higher stock price.

Anderson, Cowan and Denning (2015) and Cowan et al. (2018) provide evidence that technology intensity has some impact on market performance. The results in these two manuscripts demonstrate that the market amplifies both the negative and positive responses to human capital reductions for technologically intensive firms. Specifically, technology intensity causes the negative market reaction to be more negative and the positive, more positive. However, neither Anderson et al. (2015) nor Cowan et al. (2018) provides evidence that self-reported announcements of technological change have an impact on market performance. Maresch, Fink and Harms (2016) indicates that patents have a positive but lagged effect on firm performance (revenues and profits), and to be effective, patents must deliver innovations quickly. They also find that there is a time lag for the market to recognize the value of the anticipated market potential. Therefore, we consider hypotheses H1A to H1D and H2 (stated in the alternative form).

H1A: Technological innovation, as reported by human capital reducing firms, occurs for all firms in our sample in the same relative frequency for patents filed, technology intensity and self-reported announcements of technology change.

H1B: The number of negative market responses to human capital reducing announcements is approximately the same as the number of positive market responses to human capital reducing announcements.

H1C: There is no abnormal market response to human capital reduction announcements in conjunction with patents filed, technological intensity or self-reported announcements of technological change.

H1D: The strength of the negative market response to human capital downsizing announcements is equivalent to the strength of the positive market response to announcements of downsizing.

H2: The market does not respond differentially to announcements of human capital reductions made in the face of technological innovation, i.e., patents filed, technological intensity or self-reported announcements of technological change.

To consider the market response to human capital downsizing events associated with patents filed, technological intensity and self-reported announcements of technology change, we include idiosyncratic risk in our analysis. The empirical literature in finance provides multiple examples of the consideration of idiosyncratic risk in investment decisions by institutional investors and analysts. Durnev, Morck and Yeung (2004) defines idiosyncratic volatility as a measure of how quickly security pricing incorporates information. Using idiosyncratic volatility, Fang and Peress (2008) finds that mass media publications influence security prices in a general sense, but do not shape opinion or bring about a consensus across analysts. They find a positive relationship between analyst forecast dispersion and media coverage. George and Hwang (2013) finds that when analyst coverage and institutional ownership is low, the relationship between volatility and returns is stronger. Several researchers find a positive and increasing relationship between institutional ownership and idiosyncratic risk, i.e., more institutional ownership correlates to increasing idiosyncratic risk (Sias 1996; Campbell et al. 2001; Xu and Malkiel 2003). In contrast, others find that when institutional ownership has increased idiosyncratic volatility decreases (Zhang 2010; Brandt et al. 2010). Chichernea, Petkevich and Zykaj (2015) argues that institutional ownership and idiosyncratic volatility are related, but depend on the holding period horizon.

Our perspective is different from the above. Like the aforementioned literature, we use institutional ownership and analyst recommendations as proxies for information flow. Institutional investors and analysts may be interested in the impacts on market returns associated with the combination of idiosyncratic risk, patents filed, technology intensity and technological change. Further, senior management may focus on the firm's specific idiosyncratic risk when initiating a human capital downsizing event. We therefore use the change in idiosyncratic risk to modify the relationship between market returns generated by the human capital downsizing event and the various other variables, including technology intensity, number of patents filed, announcements of technological change, analyst recommendations, and number of institutional investors. Therefore, we consider hypotheses H3A and H3B (stated in the alternative form).

H3A: As a mediator variable, the change in idiosyncratic risk does not affect the market's reaction to human capital restructurings.<sup>78</sup>

H3B: As a moderator variable, the change in idiosyncratic risk does not affect the market's reaction to human capital restructurings.

Theoretically, the market fully captures the information content of an announcement of a corporate event in a few minutes. However, the firm's decision to file a patent or initiate a new technology involves increased uncertainty, the information content of which may not be resolved immediately. Analysts who focus on the firm or the industry will take some time to understand the new patent application or technology and its implications for firm value and stock valuation. Considering R&D investment, a form of technology innovation, Lev and Sougiannis (1996) estimates that the average duration of R&D investment ranges from 5 to 10 years. Total future earnings range between \$1.66 and \$2.63 for each \$1 of current R&D spending. This finding suggests there may be considerable security valuation consequences and time delays associated with patent filings and technology innovations.

Liu (2006) demonstrates the uncertainty and the positive relationship between long run cross-sectional abnormal returns and technology depth. Some innovations are very valuable and others less so. Liu examines one to six-month abnormal returns and the depth of analyst following. Despite eliminating news announcements about negative innovative outcomes, he finds a long run negative drift in abnormal returns despite the positive announcement period abnormal return. This positive abnormal return, followed by the negative one in the long-run is robust to both various benchmarks and various procedures for calculating abnormal returns. Considering R&D reductions, or a decrease in dollars spent on innovation, Chan, Lin and Wang (2015) find a positive abnormal return in the short-run but a long-

<sup>78</sup>We measure the change in idiosyncratic volatility around the event  $(-102, -2) \sim (+2, +102)$ .

run negative abnormal return associated with a decrease in innovative technology. Kannan (2016) notes that layoff decisions have long run implications for share price performance and for corporate strategic decisions. Kannan (2016) further finds that nearly 32% of these firms do not actually experience a decline in their work force. The short run abnormal returns appear quite similar for those firms reducing their work force (68%) and those that effectively do not (32%). However, the long-run abnormal returns are different. Long-run abnormal returns are on average higher for firms that do downsize their work force.

The above-mentioned empirical evidence suggests that there are long runs implications for market returns resulting from technological changes, innovations and downsizings. Further, the directional impacts of the long run return are uncertain. Therefore, we consider hypotheses H4 and H5A and B (stated in the alternative form).

H4: There is no long-run market reaction to an announcement of a human capital reduction and the associated technology change.

H5A: As a mediator, the change in idiosyncratic risk does not affect the market's long-run reaction to human capital restructurings.

H5B: As a moderator variable, the change in idiosyncratic risk does not affect the market's long-run reaction to human capital restructurings.

## DATA AND METHODOLOGY

### Data

Data on patent filings are available from 1980 to 2010 and are not available publicly after 2010 (Kogan, Papanikolaou, Seru and Stoffman, 2018). We obtain the sample of human capital-restructuring events from ProQuest National Newspapers Expanded, which contains 27 national newspapers and 13 databases. Searching ProQuest U.S. National Newspapers Expanded over the period identifies over 100,000 news articles concerning work force reductions which are cataloged as early retirements, job cuts, layoffs and corporate downsizing events. The sample includes firms of varying asset and market sizes and all NAIC industrial classifications. Survivorship bias occurs if we collect the sample in a forward manner; therefore, we collect the sample backward in time to 1981. To make the size of the sample manageable we consider only firms in the Large Capitalization (S&P500) Index, Mid-Capitalization (S&P 400) Index and Small Capitalization (S&P 600) Index. This approach captures both the 2010 S&P Index firms and those deleted from any of the indexes during the previous time-periods. The resulting sample includes 2762 firms with 385 making 1759 announcements of layoffs, job cuts and early retirements. We include a human capital event only if it was the first announcement of a specific downsizing. We exclude any additional follow-on announcement occurring within the six-month window.

Bloomberg provides analyst recommendations and data, such as the number of analysts covering a given stock, the stock rating and the date. Bloomberg identifies the number of analysts covering a given stock, the stock ratings, and the date. We include only observations for which there are two or more analyst recommendations. SEC Edgar filings provide institutional ownership data. Finally, we map the analyst and the institutional ownership data into our human capital reduction sample by ticker symbol and date. Two hundred and fifty-five out of 385 firms in our sample have matched records.

Figure 1 provides a visual depiction of the number of human capital reduction announcements and the magnitude of the labor force affected each year. The number of employees affected peaks during downturns in the economy. The peaks for the announcements of the human capital downsizing events coincide with the recessions in 1991, 1998, 2001 and 2008, with the actual number of employees affected peaking a year earlier in 1990, 1997, 2000, and 2007. Managing the flow of information about layoffs and other human capital events is increasingly important with the ever-growing number and varieties of ways in which information reaches the market place and impacts the market results.

Figure 2 segments the sample of 1759 human capital announcements into a matrix containing technology intensive, patent change and self-reported technological changes. In the horizontal dimension, Figure 2 uses the Paytas and Berglund (2004) NAICs classification scheme to categorize the sample into technologically intensive and non-intensive events. In the vertical dimension, we classify number of human capital announcements by patent changes (or announcements of technological changes) and no patent changes (or no announcements of technological changes).

For firms that are technologically intensive and file patents, there are 401 announcements of human capital downsizing events. For firms that are not-technologically intensive and file patents, there are 791 human capital reorganization events. For the total of both technologically intensive and not-technologically intensive firms that file patents, there are 1192 announcements. For firms that are technologically intensive and do not file patents, there are 32 announcements of human capital reducing events. For firms that are not-technologically intensive and do not file patents, there are 535 announcement of human capital downsizing events. Firms that did not file patents generated 567 human capital reorganization announcements.

Figure 3a displays the total patents filed and issued from 1980 to 2010 in the United States (Kogan, et al., 2018). The total number of patents issued increased from 22,820 in 1981 to 74,615 in 2010.

Figure 3B displays the patents filed and issued for our sample firms. The sample number of patents issued increased from 2,770 in 1981 to 23,810 in 2010. In 1981, our sample contains 12.1% of the total number of patents issued and increases to 31.9% of patents issued in 2010. The peaks for total filed and issued are different, with those filed peaking in 2000 at 82,996 and those issued in 2006 at 78,298. The peaks for the sample filed and issued are different, with those filed peaking in 2002 at 28,210 and those issued in 2006 at 25,379. Figures 3b, 3c and 3d display the increasing importance of patents as proxies for technological innovation in our sample of firms making announcements of human capital restructurings.

Figure 3c combine our firm sample and the U.S. patents sample by mapping 228 out of 385 sample firms to patents. Figure 3c indicates the number of patents filed and issued per firm. It shows that the amplitude of patents filed and issued increased during the period 1980 to 2010 as technological change accelerated. Figure 3d isolates the patents issued and filed within six months before the human capital layoff event and is relevant for our short-term analysis. Figure 3e isolates the patents issued and filed within six months after the human capital layoff event. This may be an indicator of the long-term relationship between patents and announcements of human capital downsizing events.

### Fama-French-Carhart Four-Factor Model

We develop cumulative abnormal returns (CARs) from the Fama-French (1992, 1993, 1996) and the Carhart (1997) value weighted models.<sup>79</sup>

$$R_{it} - R_{ft} = \alpha_{it} + \beta_{i,MKT}(R_{mt} - R_{ft}) + \beta_{i,SMB}SMB_{it} + \beta_{i,HML}HML_{it} + \beta_{i,MOM}MOM_{it} + \varepsilon_{it} \quad (1)$$

$$AR_{it} = (R_{it} - R_{ft}) - \hat{\beta}_{i,MKT}(R_{mt} - R_{ft}) - \hat{\beta}_{i,SMB}SMB_{it} - \hat{\beta}_{i,HML}HML_{it} - \hat{\beta}_{i,MOM}MOM_{it} \quad (2)$$

Where

$AR_{it}$  = the abnormal returns on the  $i$ th stock in time  $t$

$CAR_{it}$  = the cumulative abnormal returns on the  $i$ th stock in time  $t$

$R_{mt}$  = the market return in time period  $t$

$R_{ft}$  = the risk free rate in time period  $t$

$SMB_t$  = thereturns on a small – sized portfolio minus a large – sized portfolio

$HML_t$  = the difference in the returns on a high and low book-to-market portfolio

$MOM_t$  = the montly difference in the returns between winners and losers.

<sup>79</sup> We are grateful to Kenneth French for making the data on the four factors available for download from his website at [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

$$CAR_{it} = \prod_{\tau} (1 + AR_{\tau}) - 1$$

where

$\tau = (-1, +1)$  and  $(0, +1)$  for the short term; and  $\tau = (+2, +128)$  for the long term.  $R_{mt}$ ,  $R_{ft}$ ,  $SMB_t$ ,  $HML_t$  and  $MOM_t$  are obtained from Kenneth French's website. Their definitions can be found at [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data\\_Library/f-f\\_factors.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/f-f_factors.html) [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data\\_Library/det\\_mom\\_factor\\_daily.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/det_mom_factor_daily.html).

$\hat{\beta}_{i,MKT}$ ,  $\hat{\beta}_{i,SMB}$ ,  $\hat{\beta}_{i,HML}$ , and  $\hat{\beta}_{i,MOM}$  are the factor loadings of stock  $i$  estimated using (1).  
 $\varepsilon_{it}$  = error term,  $E(\varepsilon_{it}) = 0$ ,  $Var(\varepsilon_{it}) = \sigma^2$ .

For each event date, we compute a stock's coefficient estimates using the data in the estimation window of 100 days starting on day  $t=-150$  and ending on day  $t = -51$ . We perform a time-series regression for each stock on each event date  $t$ . In our short run analysis, we use the event intervals  $t = (-1, +1)$  and  $t = (0, +1)$  to consider the announcement effect of the corporate restructuring. To develop our long run analysis, we use a six-month interval forward of the announcement date,  $(t = +2, +128)$ , corresponding to the number of trading days in the six months.

### Mediator and Moderator Models

Baron and Kenny (1986) provide a three-step econometric approach to understand the relationship between independent variables and a dependent variable in a time series or cross-sectional regression. Our dependent variable is the cumulative abnormal returns from equation 2 above. Our independent variables include patents filed, technology intensity, self-reported announcements of technological change, analyst recommendations and institutional ownership. We select the change in idiosyncratic risk around an event date as our mediator or moderator variable. Figure 4 depicts an illustrative relationship among three variables: cumulative abnormal returns, patents filed and the change in idiosyncratic risk.

For example, the moderator variable, change in idiosyncratic risk, influences the independent variable, patents filed, to transform how the independent variable (patents filed) explains the dependent variable, CARs. Just as the Fama-French Carhart four-factor model explains a return, we modify the residuals by extracting the change in idiosyncratic risk from them. If the change in idiosyncratic risk is statistically significant when we regress it against CARs, i.e., if it stands alone and acts directly on the dependent variable, then we use it as a mediator variable. As a moderator variable, the change in idiosyncratic risk works in conjunction with other independent variables on the dependent variable, i.e., the Fama-French Carhart four-factor residuals. Intuitively, firms filing patents while simultaneously reducing human capital may experience changes in firm specific risk.

We modify Baron and Kenny's (1986) three-step approach for use in our stepwise regression process. In step one, we regress CARs using ordinary least squares against each independent variable to determine that the relationship is statistically significant. Baron and Kenny's approach requires statistical significance in this step. As an illustration, we use total CARs as well as positive and negative CARs as dependent variables and regress them against patents filed or issued that is:

$$C_{it} = \alpha_{it} + \beta_i v_{it} + \varepsilon_{it} \quad (3)$$

where

$v_{it}$  = patents filed for firm  $i$  (we then replicate this step for each of the independent variables).

In step 2, we develop the mediator/moderator variable using a variation of the methodologies of Aharony, Jones and Swary (1980), Unal (1989), Waheed and Mathur (1995) who examine risk changes. We partition the variance of returns ( $VAR(R_{it})$ ) on each firm  $i$ 's stock into systematic risk ( $SYS_i$ ) and idiosyncratic risk ( $Var(\varepsilon_i)$ ) and use the four-factor event study methodology to develop the slopes and residuals. We compute the pre- and post-variances for each event using the residuals and calculate the change in idiosyncratic risk for each event on a pre-announcement,  $t = (-102 \text{ to } -2)$ , to post-announcement,  $t = (+2 \text{ to } +102)$  basis. We measure changes in the variance as

$$\Delta Var(R_i) = \frac{Var(R_{i,post}) - Var(R_{i,pre})}{Var(R_{i,pre})} \quad (4)$$

We calculate systematic risk based on the four-factor model of Fama-French (1993) and Carhart (1997), using Bali, Brown and Caglayan (2012), where

$$R_{it} = \alpha_{it} + \beta_{i,MKT}(R_{mt}) + \beta_{i,SMB}SMB_{it} + \beta_{i,HML}HML_{it} + \beta_{i,MOM}MOM_{it} + \varepsilon_{it} \quad (5)$$

where  $R_{it}$  is the excess return on stock  $i$  and  $MKT_t$  is the excess market return. The total risk is the variance of  $R_{it}$ :  $\sigma_i^2 = VAR(R_i)$ . The idiosyncratic risk is the variance of  $\varepsilon_{it}$ :  $\sigma_{\varepsilon i}^2 = VAR(\varepsilon_i)$ . The systematic risk of stock  $i$  is defined as the difference between total and unsystematic variance:  $SYS_{it} = VAR(R_i) - VAR(\varepsilon_i)$ . We then measure changes

in systematic risk as  $\Delta SYS_i = \frac{SYS_{i,post} - SYS_{i,pre}}{SYS_{i,pre}}$ . We measure changes in idiosyncratic risk as

$$\Delta \text{ idiosyncratic risk} = \Delta Var(\varepsilon_i) = \frac{VAR(\varepsilon_{i,post}) - VAR(\varepsilon_{i,pre})}{VAR(\varepsilon_{i,pre})} \quad (6)$$

We then regress the mediator/moderator variable against the independent variables using ordinary least squares regression to determine whether it is statistically significant, that is

$$ME_{it} = \gamma_i + \sum_{i=1}^n \beta_i v_{it} + \varepsilon_{it} \quad (7)$$

where

$$ME_i = \Delta \text{ idiosyncratic risk} = \frac{VAR(\varepsilon_{i,+2,+102}) - VAR(\varepsilon_{i,-102,-2})}{VAR(\varepsilon_{i,-102,-2})} \quad (8)$$

In the final step, we include the mediator/moderator variable in the stepwise regression. The moderator model is the more general model with both the standalone moderator variable and the interaction terms between the moderator variable and the independent variables.

#### Short Term Stepwise Regression using the Baron and Kenny Mediator/Moderator Approach

We use Baron and Kenny's (1986) three-step process to develop the mediator/moderator variable (change in idiosyncratic risk) and then we estimate the parameters and statistics using stepwise regression analysis at both a 5% and 10% cutoff level of significance. The regression introduces the independent variables one at a time. If the variable is significant at the 5% stay level, we retain the variable. If it is not significant, then the procedure removes the variable and selects the next variable. Each variable enters at the either the 5% or 10% cutoff level and is retained at the stay level of 5% depending on which stay level we establish in SAS. This process continues through all variables. Equation nine provides the short-run model.

$$C_{it} = \alpha_{it} + \beta_1 x_{1it} + \beta_2 x_{2ikt} + \beta_3 x_{3it} + \beta_4 x_{4it} + \beta_5 x_{5it} + \beta_6 x_{1it} x_{2ikt} + \beta_7 x_{2ikt} x_{5it} + \beta_8 x_{3it} x_{5it} \\ + \beta_9 x_{4it} x_{5it} + \beta_{10} x_{1it} x_{2ikt} x_{5it} + \varepsilon_{it} \quad (9)$$

where

$C_{it}$  = CAR for firm  $i$  for time  $t$ , where  $t = (-1, +1)$ ,  $t = (0, +1)$

$$x_{1it} = \begin{cases} 1 = \text{technologically intensive in time } t \text{ for firm } i \text{ classified by Paytas \& Berglund (2004)} \\ \text{six digit NAIC} \\ 0 = \text{not technologically intensive} \end{cases}$$

$x_{2ik(t-6,t)} = \text{patents, } k = 3, 4$

$$k = \begin{cases} 3 = \text{the natural log of the number of patents filed within the six months} \\ \text{before the event window } (t - 6) \\ 4 = \text{the natural log of the number of patents issued within the six months} \\ \text{before the event window } (t - 6) \end{cases}$$

$x_{1it} x_{2ik(t-6,t)}$  = cross impact of the technology intensive and patents issued or filed for firm  $i$  in time  $t$

$x_{3it}$  = the percent of sell or buy recommendations issued by analysts following firm  $i$  in month  $t$

$x_{4it}$  = the percent of shares of firm  $i$  owned by institutional investors at the quarter end  
 $x_{5it}$  = the mediator variable, i.e., change in idiosyncratic risk  
 $x_{2ik(t-6,t)}x_{5it}$  = cross product of patents issued or filed and moderator variable  $(t - 6)$   
 $x_{3it}x_{5it}$  = cross product of sell or buy recommendations and the moderator variable  
 $x_{4it}x_{5it}$  = cross product of shares owned by institutional Investors and moderator variable  
 $x_{1it}x_{2ik(t-6,t)}x_{5it}$  = cross impact of technology intensive, patents issued or filed  
 $(t - 6)$ , and change in idiosyncratic risk for firm  $i$  in time  $t$   
 $\alpha, \beta, \varepsilon$  = intercept, slopes and error term respectively

We conduct the analysis on the full sample, and negative and positive market response subsamples. Table 5 presents the short-term results.

### Long-term Stepwise Regression model using Baron and Kenny Mediator/Moderator Approach

The market may require time to internalize the implications of changes in technology or patents on firm performance and market returns. Following Dichev and Piotroski (2001), we examine the long run market reactions to human capital reorganizations in conjunction with changes in technological intensity, patents filed and announcements of technological change. We use a similar research design as in the short-term model (see section 3.3). That is, we regress the long-term CARs on the same regressors for full, negative and positive market responses, respectively. We use an uncontaminated six-month interval forward of the announcement date of the layoff to develop the long run CARs ( $t = +2, +128$ ).

$$\begin{aligned}
 LTC_{it} = & \alpha_{it} + \beta_1 x_{1it} + \beta_2 x_{2ikt} + \beta_3 x_{3it} + \beta_4 x_{4it} + \beta_5 x_{5it} + \beta_6 x_{1it} x_{2ikt} + \beta_7 x_{2ikt} x_{5it} + \beta_8 x_{3it} x_{5it} \\
 & + \beta_9 x_{4it} x_{5it} + \beta_{10} x_{1it} x_{2ikt} x_{5it} + \varepsilon_{it}
 \end{aligned} \quad (10)$$

where

$LTC_{it}$  = the 6 – month CAR for firm  $i$  for time,  $t = (+2, +128)$   
 $x_{jkit}$  =  $j$ th variable for the  $k$ th patent type for firm  $i$  in time period  $t$   
 (see section 3.3 for detailed definition of the variables)  
 $\alpha, \beta, \varepsilon$  = intercept, slopes and error term respectively

Table 6 presents the long-term results.

## RESULTS

### Short-Term Results: Frequency, Number and Abnormal Responses to Human Capital Reduction Events and Simultaneous Announcements of Technological Change or Intensity or Patents Issued

Table 1, Panel A shows the actual distribution of announcements of human capital reorganizations by technological intensity and announcements of patent issued. Table 1, Panel B shows the actual distribution of announcements of human capital reorganizations by technological intensity and self-reported announcements of technological change. The Chi-Square statistic is significant at less than 0.0001 probability for patents issued ( $X^2 = 162.3017$ ), but is not significant for self-reported announcements of technological change. Therefore, patents are an important distinguishing characteristic for firms laying off employees, but self-reported announcements of technological change are not. We reject hypothesis 1A for patent filed, but not for announcements of technological change.

In addition, the ratio of negative to positive CARs in Table 2, column 5 for the total sample and the subsample splits of technological intensity and patents issued are statistically significant at the 1% level. Additionally, the ratio of negative to positive CARs in Table 3, column 5 for the total subsample and the subsample splits of technological intensity and announcements of technological change are significant. The combination of these results causes us to reject the null hypothesis (H1B) that the number of negative events is approximately the same as the number of positive events. There are statistically more negative than positive announcements of human capital reorganization events.

**Figure 5 depicts the distribution of the four-factor cumulative abnormal returns. Approximately, 59% of the announcements exhibit negative CARs and 41% positive CARs.**

The short-run hypothesis H1C considers the abnormal market response to human capital reduction announcements in conjunction with patents filed, technological intensity or self-reported announcements of technological change. Table 2 examines cumulative abnormal returns for announcements of human capital reductions using the classification scheme based on patents filed and technological intensity described in Table 1, Panel A. Table 3 examines cumulative abnormal returns using technology intensity and self-reported announcements of technological change, as in Table 1, Panel B. Table 2 and Table 3 (column 4) demonstrate that hypothesis H1C is rejected. We find a statistically significant negative abnormal response to patents issued, technological intensity and human capital reductions, as well as to self-reported announcements of technological changes, technological intensity and human capital layoffs.

For hypothesis H1D, we consider the strength of the negative market response to human capital downsizing announcements and whether it is equivalent to the strength of the positive market response to announcements of downsizing. The strength of the negative market response for firms that announce a human capital downsizing is greater for firms with negative cumulative abnormal returns than for firms with positive returns. The ratio of positive to negative announcements of human capital layoffs is statistically significantly different from one (Tables 2 and 3, column 5). In addition, the overall market response to human capital reductions as depicted in Tables 2 and 3, column 4 for the total sample is statistically negative. We therefore conclude that the intensity of the negative market response to the layoffs announcements is statistically significantly stronger than the intensity of positive market response to the layoff announcements. We therefore reject hypothesis H1D.

### **Differences in Market Responses to Human Capital Reductions, Technological Intensity, Patents Filed, and Announcements of Technological Change**

For hypothesis H2, we consider whether the market responds differentially to announcements of human capital reductions made in conjunction with technological innovation, i.e., patents filed, technological intensity or self-reported announcements of technological change. Table 4A displays a mean difference test of the market responses for the total sample of announcements. Using the Fama-French-Carhart Four-Factor model, which adjusts the abnormal returns for firm size, market to book effects and momentum, the results indicate that patents filed, technological change and intensity matter. The results in Table 4, Panel A indicate that patent filings, in conjunction with human capital reducing efforts, by both technologically ( $t = 3.86$ ) and non-technologically intensive ( $t = 2.77$ ) firms positively affect the returns of those firms. Firms that do not file patents within a six-month window of a human capital restructuring action and are technologically intensive experience a larger, statistically negative return than those firms that are not technologically intensive ( $t = -3.32$ ).

Table 4, Panel B indicates that firms that are not-technologically intensive and do not announce technological changes within six months of a human resource reduction see a significantly negative impact on their returns ( $t = -2.12$ ), whereas those that are technologically intensive do not ( $t = 0.68$ ). For firms that are not announcing a technological change, but are technologically intensive, the market reacts more negatively than for not-technologically intensive firms ( $t = -2.48$ ). For hypothesis H2, there are differences in market responses to human capital reduction announcements based on patents filed, the technology intensity of the firm and announcements of technological change. We therefore reject hypothesis H2.

The average market response to a human capital reduction announcement is consistently negative. When a firm lays off employees and files a patent, the market responds less negatively than if it does not file a patent. The market responds similarly whether for a patent filing ( $t = -1.54$ ) or there is a self-reported announcement of a technological change ( $t = 1.28$ ).

### **Stepwise Regressions Using Mediator and Moderator Variables**

We examine the market response to human capital reductions using stepwise regressions based on the Baron and Kenney (1986) mediator and moderator model approach. We examine hypotheses H3A and H3B, that as a mediator or moderator variable, the change in idiosyncratic risk does not affect the market's reaction to human capital restructurings. We do not reject hypothesis H3A, that as a mediator variable, the change in idiosyncratic risk does not affect the market's reaction to human capital restructurings. We conclude this since our Table 5 results do not include idiosyncratic risk as a standalone variable, i.e., it was not statistically significant. However, as a moderator variable, we do reject H3B, i.e., that the change in idiosyncratic risk does not modify the relationship between one or more of



the independent variables and the dependent variable. We analyze the data in three segments: the total CARs sample, the negative CARs subsample and the positive CARs subsample. Our process systematically introduces the right-hand side variables at the 5% cutoff level and then on a subsequent iteration at the 10% cutoff level for examination of statistical significance. We show the results of both cutoff levels in Table 5, Panels A and B. Note that we only show variables that have a 5% stay level of significance.

For the total sample, the only variable that is significant is analyst recommendations; seemingly, the negative and positive subsample results offset each other. Analyst recommendations acts as a proxy for information availability and is significant at better than the 1% level. The negative coefficient ( $F = 5.37$ ) associated with analyst recommendations intensifies the average negative market response due to the information value provided by their insights. The overall regression F-statistic is significant at better than the 5% level. Table 2 and Table 3 indicate that there is a statistical difference in the market responses of firms with positive and negative results; consequently, we examine these subsamples separately in Table 5, Panels A and B.

Panel A examines the results using the subsample of firms with negative responses to announcements of human capital reductions, and Panel B, those with positive market responses. We include the change in idiosyncratic risk as our moderator variable in both panels as a cross product with other right-hand side variables. Note that the change in idiosyncratic risk as a standalone mediator variable is not statistically significant at either the 5% or the 10% cutoff level and is excluded from the reported regression results.

Examining Table 5, Panel A for the stepwise regression using the negative subsample, the first column labeled “Variable p-value  $\leq 0.05$  cutoff with a 5% stay” indicates the cutoff and stay criteria. The only explanatory variable (other than the intercept) that is statistically significant is institutional ownership ( $F = 7.15$ ) which is significant at the greater than 1% level. The regression analysis is complete since there are no other variables that meet the 5% cutoff significance level.

Moving to the right of the Table 5, Panel A to the five columns with the label “Variable p-value  $< 0.10$  cutoff level with a 5% stay level”, we indicate the stepwise procedure results. The first variable added in the sub-column labeled “(1) First statistically significant variable” is again institutional ownership ( $F = 7.15$ ). However, in the next column labeled “(2) Second statistically significant variable”, the cross-product variable, institutional ownership \* change in idiosyncratic risk ( $F = 3.61$ ) is added. In the third column, patents filed \* change in idiosyncratic risk ( $F = 7.35$ ) is added; in the fourth column, tech intensive \* patents filed \* change in idiosyncratic risk ( $F = 3.81$ ) is added; and in the fifth column, analyst sell recommendations ( $F = 3.53$ ) is added as a standalone variable. Announcements of technology change as a standalone variable or with the mediator variable, change in idiosyncratic risk as a standalone variable are not statistically significant at the 10% level or better and do not enter the regression. The overall regression F-statistic is 5.51 with a significance of greater than 1% suggests that our proxies for information, that is institutional ownership and analyst sell recommendations, as well as patents filed and technological intensity, as moderated by the change in idiosyncratic risk, are instrumental in explaining the negative market response when firms announce human capital reductions.

Examining Table 5, Panel B for the results of the stepwise regression using the positive subsample, the first column labeled “Variable p-value  $\leq 0.05$  with a 5% stay” indicates the cutoff and stay criteria. Note that the first statistically significant variable meeting the 5% cutoff criteria is the negative coefficient of analyst buy recommendations\*change in idiosyncratic risk cross product ( $F = 11.36$ ); the second statistically significant variable is the negative coefficient of institutional ownership ( $F = 7.74$ ); and the third is the positive coefficient of analyst buy recommendations ( $F = 4.19$ ). All three variables are significant at the 5% level. The final regression using the positive subsample is significant at greater than one percent level with an  $F = 7.95$  and an  $R^2 = 0.0867$ . The coefficient on analyst buy recommendations is significant and positive and reinforces the positive return. Using the moderator variable, change in idiosyncratic risk, along with analyst buy recommendations, the coefficient becomes negative and significant. Therefore, we infer from this stepwise regression of positive announcement period returns corresponding to human capital downsizing events that the market response is associated with an increase in idiosyncratic risk. The higher the change in idiosyncratic risk the larger the dampening effect on the positive market response. In the first round, there are no additional variables added with the 5% enter and 5% stay criteria.

In the portion of the table labelled “Variable p-value  $\leq 0.10$  cutoff level with a 5% stay,” we add a final column with two additional variables. Starting with the first column under this heading we find that the coefficient of the cross

product of analyst buy recommendations\*change in idiosyncratic risk is negative and significant ( $F = 11.36$ ); and in the second column, the negative coefficient of institutional ownership is significant ( $F = 7.74$ ). In the third column, the coefficient of analyst buy recommendations is positive and significant ( $F = 4.19$ ). In the fourth column the coefficient of the cross product of technological intensity\*change in idiosyncratic risk is positive and significant ( $F = 12.22$ ); and in the fourth column, the negative coefficient of the cross product of technological intensity\*patents filed\*change in idiosyncratic risk is significant ( $F = 14.2$ ). The final regression, using the positive subsample, is significant at greater than one percent level with an  $F = 7.84$  and an  $R^2 = 0.1360$ . If firms are technologically intensive and risk increases, there is an amplification of the positive market response, i.e., since the coefficient of the cross product of technological intensity and change in idiosyncratic risk is positive that suggests that when the change in idiosyncratic risk increases then cumulative abnormal returns increase. For technologically intensive firms that layoff human capital and have positive abnormal returns and issue patents, there is a dampening effect on the positive market response ( $\beta_{10} = -1.32$  and  $F = 14.2$ ). This is consistent with the negative coefficient associated with institutional ownership. A priori, we would expect that the impacts of institutional ownership and patents filed would have a positive impact on the positive market response. We, however, find that for the positive announcement period market returns, the coefficients on institutional ownership and on the cross product of technological intensity\*patents filed\*change in idiosyncratic risk are significant and negative.

Due to the dampening effect of institutional ownership, the negative and positive market responses to labor reduction are canceled out in our total sample test. From another point of view, institutional investors tend to look for equity investment opportunities in long term, rather than in short term. They are motivated to get closely involved in the firm's strategic management such as influencing a firm's innovation, in order to benefit from their equity investments in the long-run. However, concerns have been raised that the stock market puts pressure on managerial incentives to generate short-term gains at the expense of long-term innovative value creation. As a result, neither the institutional ownership nor the innovation's impact on firm's long-run performance is clear a priori. This leads us to investigate the long-run CARs after the layoff announcements. We conjecture that institutional owners take a longer time to understand the implications of newly filed patents. (See section 4.4 below).

When we split the sample into negative (Table 5, Panel A) and positive (Table 5, Panel B) market responses to human capital downsizing events, analyst recommendations matter in that it reinforces both the negative and positive market responses, i.e., makes the negative response more negative and the positive response more positive. Institutional ownership dampens the abnormal market responses for both the negative and positive subsamples, i.e., makes the negative less negative and the positive less positive. These results reinforce our use of analyst recommendations and institutional ownership as proxies for information flow.

The change in idiosyncratic risk as a moderator variable increases the explanatory power associated with the variables for both subsamples. For technologically intensive firms laying off human capital, the combination of issuing patents and change in idiosyncratic risk has a dampening effect on the abnormal returns for both subsamples, i.e., makes the positive subsample less positive and the negative subsample less negative. Further, the change in idiosyncratic risk modifies the impact of technology for both subsamples. For the negative subsample, the change in idiosyncratic risk modifies the coefficient of patents filed, and for the positive subsample, it modifies the coefficient of technological intensity. Next, the change in idiosyncratic risk modifies the coefficient of institutional ownership for the negative subsample and modifies the coefficient for analyst buy recommendations for the positive subsample. We interpret these results as being substantively similar, since we use analyst recommendations and institutional ownership as proxies for information and we use technological intensity and patents as proxies for strength of technological innovation.

For firms that are technologically intensive and layoff human capital, and file patents as moderated by the change in idiosyncratic risk, both the negative (Table 5, Panel A) and positive (Table 5, Panel B) market responses are dampened. We reason that the market fears that laying off human capital may minimize potential positive exploitation of the patents. In Table 5, Panel B, the coefficient of the product of technological intensity and change in idiosyncratic risk is positive and the coefficient of technological intensity, patents filed and change in idiosyncratic risk is negative. This implies that filing a new patent has a negative impact on the market response to the announcement of a downsizing of human capital and hence dampens positive market returns. In Table 5, Panel A, the coefficient of patents filed and change in idiosyncratic risk is negative, which implies that either one or the other factor has a negative impact on the negative market response to the announcement of the downsizing. The coefficient of technological intensity, patents filed and change in idiosyncratic risk is positive, which implies that technological intensity is negative, so that the

combination of the three dampens the negative market response to the announcement of the human capital layoffs. Examining all of the evidence in Table 5, Panels A and B, we reject hypothesis H3 that as a moderator variable, the change in idiosyncratic risk does not affect the market's reaction to human capital restructurings. However, we do reject the hypothesis that it does not act as a standalone mediator.

### **Stepwise Regressions Using Mediator and Moderator Variables: Long Run CARs**

The announcement of a layoff for any firm may create uncertainty in the market place. Resolution of this uncertainty may take longer than usual when analysts and institutional investors examine new product and process technologies or the implications of new patents. Due to the potentially longer time horizon required to understand the impacts of these new technologies and patents, we examine the market response to human capital downsizing events using the same mediator/moderator, stepwise regression approach with long-run cumulative abnormal returns as the dependent variable. Reviewing Tables 2 and 3 (with the exception of technologically intensive and announcements of self-reported technological change in Table 3) we do not reject hypothesis H4 that there is no long-run market reaction to an announcement of a human capital reduction and the associated technology change. Along with failing to reject this hypothesis, we note that unlike the short-run, there is no reason to split the sample into negative and positive subsamples because the results of Table 2 and 3, column 5 do not suggest that this is necessary. We draw this conclusion, since the ratio of positive to negative is essentially one and statistically insignificant for the long run interval  $t = (+2, +128)$ .

Additionally, we examine hypotheses H5A and H5B, that as a mediator or moderator variable, the change in idiosyncratic risk does not affect the market's reaction to human capital restructurings. As the results in Table 6 illustrate, we do not reject the hypothesis H5A, that as a mediator variable, the change in idiosyncratic risk does not affect the market's reaction to human capital restructurings. However, as a moderator variable, we do reject H5B, i.e., that the change in idiosyncratic risk does not modify the relationship between one or more of the independent variables and the dependent variable.

Following Liu (2006), Chan, Lin, and Wang (2015) and Kannan (2016) and using the Dichev and Piotroski (2001) methodological approach, we examine the long-run market reaction to announcements of human capital downsizing events and technological innovations. Table 6 contains the results of this examination using our stepwise regression and the total sample. We report the results for the regression with a 5% cutoff level and a 5% stay level. Examining columns ten and eleven for the same 587 observations in Table 5, the  $F = 8.64$  and is significant at the less than 1% level. The coefficients of technology intensive\*change in idiosyncratic risk ( $F = 17.97$ ), Technology intensive\*patents filed\* change in idiosyncratic risk ( $F = 10.56$ ), analyst recommendations ( $F = 14.05$ ), analyst recommendations\* change in idiosyncratic risk ( $F = 11.45$ ), and institutional ownership\* change in idiosyncratic risk ( $F = 13.49$ ) are significant at the less than 1% level of significance. Since the change in idiosyncratic risk as a moderator is significant in each of the variables, we reject hypothesis 5 that the change in idiosyncratic risk does not matter. It appears that technological intensity and patents filing impact the long run market response to human capital restructuring. Consistent with the literature, the coefficients of analyst recommendations and institutional ownership are also significant explanatory variables. We interpret the results that technological intensity as modified by the change in idiosyncratic risk dominates the results; however, these results are dampened by the negative information concerning the implications of patents filed and the information flow from analysts and institutional investors. In addition, we find that the coefficients of the standalone variables, institutional ownership and change in idiosyncratic risk, are not statistically significant.

## **DISCUSSION**

For our sample of 1759 announcements of human capital reductions from 385 firms, the average short-run market response is statistically negative. However, the average market response is not indicative of the specific response to an announcement for an individual firm. Approximately, 59% of the market responses are negative and 41% are positive. Technology intensity and patent filings have implications for the market response, whereas self-announcement of technological process or product innovations do not. The market response to downsizing decisions for firms that do not file patents is negative. Filing of patents reduces the impact of the negative market reaction. For firms that do not announce a technological innovation but are technologically intensive, the market reacts more negatively than for non-technologically intensive firms.

Splitting the sample into positive and negative announcement and including the moderator variable, change in idiosyncratic risk, we infer that the market response to human capital downsizing is associated with an increase in idiosyncratic risk. Specifically, the higher the idiosyncratic risk the larger the dampening effect on the positive market response.

Additionally, analyst recommendations and institutional ownership seem to be reasonable proxies for information flows. Analyst recommendations reinforces both the positive and negative market responses. Institutional ownership dampens the abnormal market response for both negative and positive subsamples. Therefore, we infer that analyst recommendations and institutional ownership are not redundant proxies for information flow.

For technologically intense firms laying off human capital, the combination of filing patents and change in idiosyncratic risk has a dampening effect on abnormal returns for both subsamples. However, changes in idiosyncratic risk impact the positive and negative subsamples differently. While it modifies the impact of technology for both subsamples, for the negative subsample it modifies the coefficient of patents filed and for the positive subsample it modifies the coefficient of technological intensity. Idiosyncratic risk modifies the coefficient of institutional ownership for the negative subsample and modifies the coefficient of analyst recommendations for the positive subsample. Overall, we interpret these results as not being substantively different since we use analyst recommendations and institutional ownership as proxies for information flow. Additionally, we use technological intensity and patents filing as proxies for technological innovation.

Looking to the long-run impact of human capital downsizing events, our regression results have a statistically insignificant intercept. Additionally we find a greater than 1% level of significance associated with change in idiosyncratic risk, technological intensity, patents filed, analyst recommendations and institutional ownership, suggestive that all of these factors contribute to explaining the overall market impact to human capital downsizing events.

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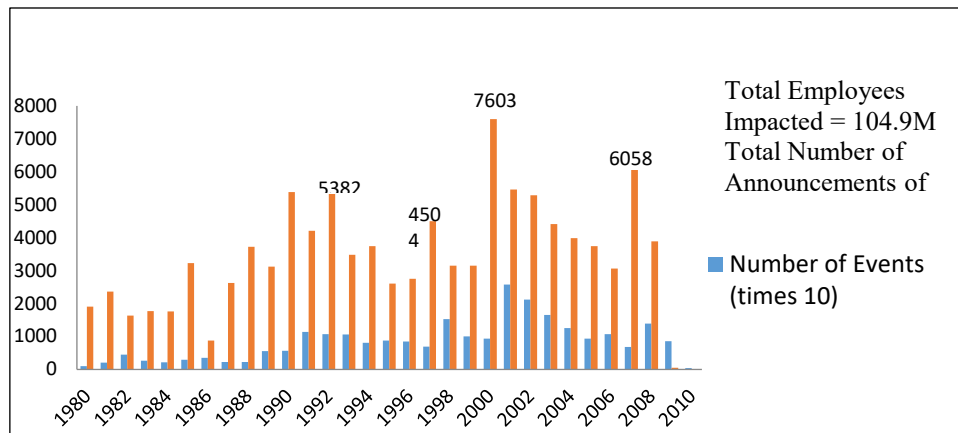
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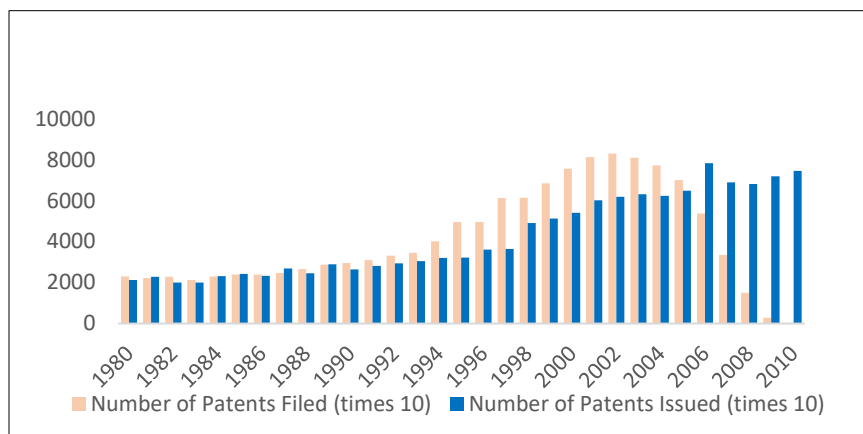
**Figure 1** Sample number of employees impacted and number of announcements of events by year



**Figure 2** Number of announcements of human capital events for the sample period

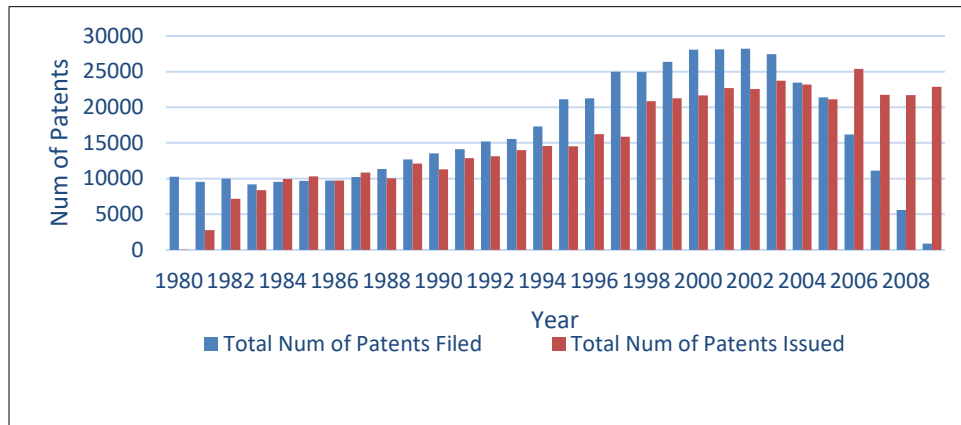
	Patent filed / Announcement of Technology Change	No Patent filed /No Announcement of Technology Change
Announcements for Technology Intensive Firms	401 / 41	32 /392
Announcements for Not Technology Intensive Firms	791/97	535/1229
Total Announcements for all Firms	1192/138	567/1621
* Event subsample = 385 firms and 1759 Announcements, i.e., 1192 plus 567 or 138 plus 1621 announcements. Total sample firms = 2762		

**Figure 3a** Total number of patents filed and issued by year: 1980 to 2010

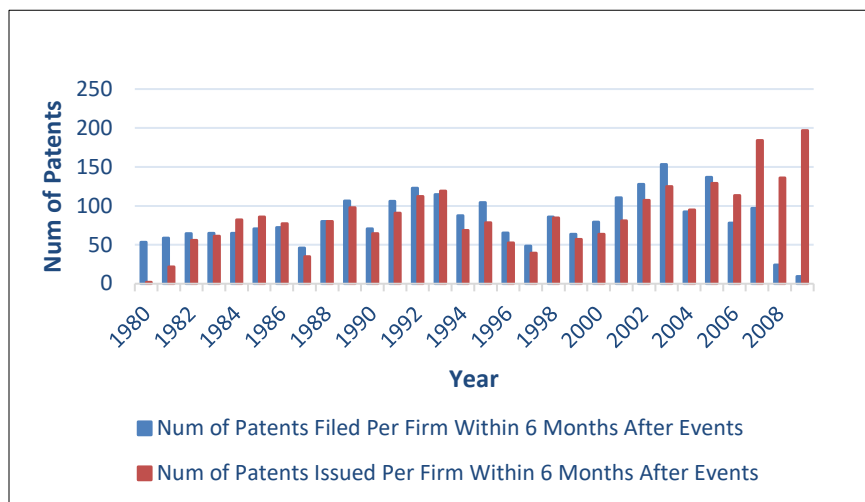




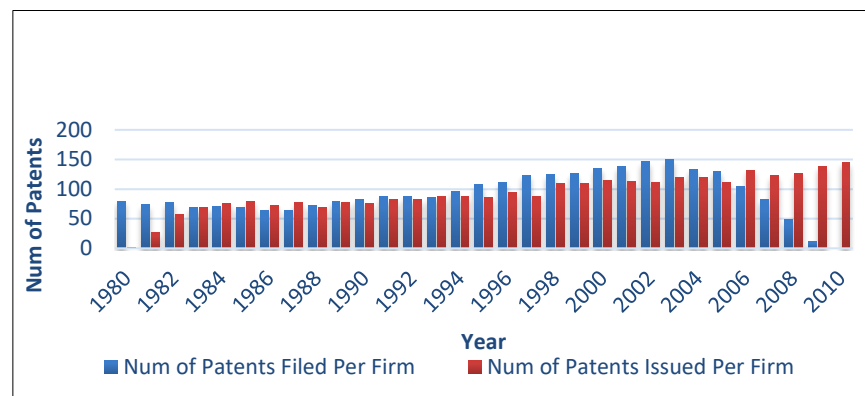
**Figure 3b** Number of patents filed and issued by year: 1980 to 2010 for our sample



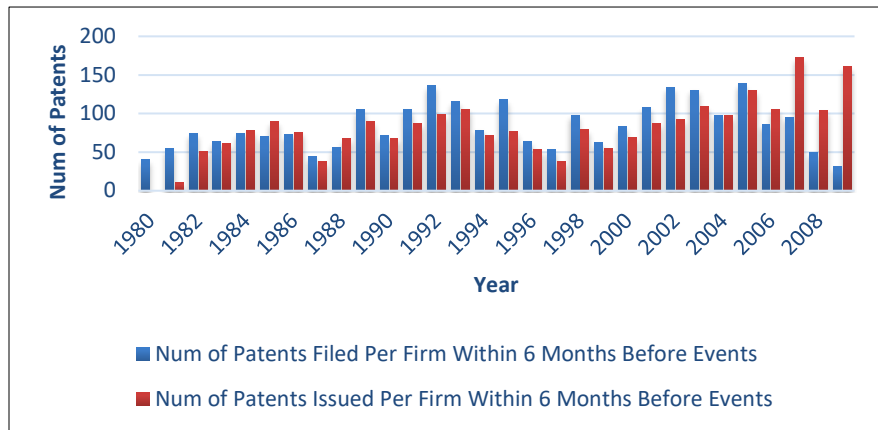
**Figure 3c** Average number of patents filed and issued per firm for our sample



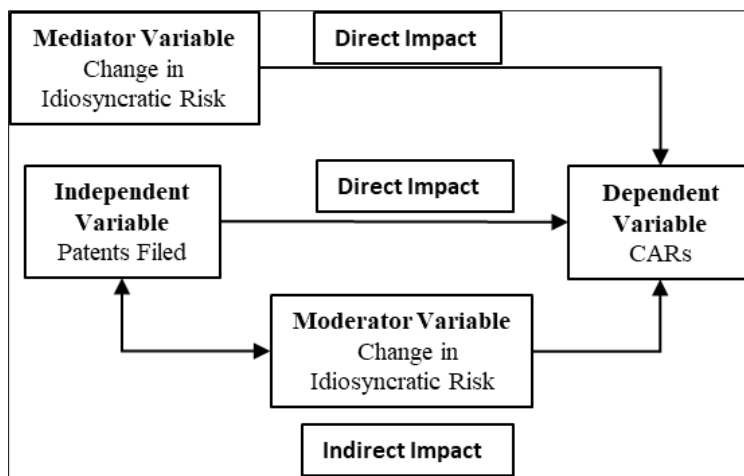
**Figure 3d** Number of patents filed and issued within 6 months before events for our sample



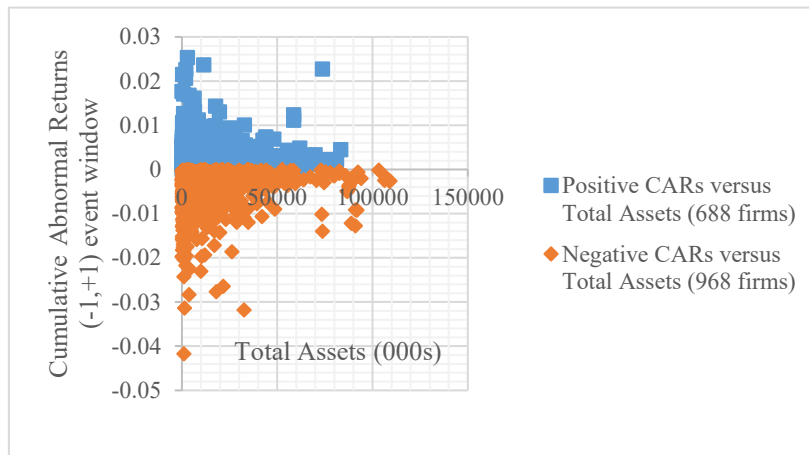
**Figure 3e** Number of patents filed and issued within 6 months after events for our sample



**Figure 4:** Mediator—Moderator Model Illustration



**Figure 5:** Cumulative Abnormal Returns



**Table 1, Panel A**

*1759 Human Capital Reduction Announcements Classified by Technological Intensity and Announcements of Patents Issued*

		1	2	3	4	5	6
		Technology Intensity by NAICS					
			<i>Not Tech Intensive</i>	<i>Tech Intensive</i>	Total	Row Percentage	
Patents Filed	<i>No Patent Filed</i>		535	32	567	32.23%	
	Table Frequency		30.42%	1.82%			
	Row Percentage		94.36%	5.64%			
	Column Percentage		40.35%	7.39%			
	<i>Patent Filed</i>		791	401	1192	67.77%	
	Table Frequency		44.97%	22.80%			
	Row Percentage		66.36%	33.64%			
	Column Percentage		59.65%	92.61%			
<i>Total</i>			1326	433	1759	100%	
<i>Column Percentage</i>			75.38%	24.62%	100.0%		

The Chi Square statistic with one degree of freedom is 162.3017 and is significant at the less than 0.0001 level of probability for the sample of 1759 announcements of human capital layoffs.

**Table 1, Panel B**

*1759 Human Capital Reduction Announcements Classified by Technological Intensity and Firm Announcements of Technological Change*

		Technology Intensity by NAICS			
		<i>Not Tech Intensive</i>	<i>Tech Intensive</i>	Total	Row Percentage
Announcements of Technological Change	<b><i>No Tech Change Announcements</i></b>	<b>1229</b>	<b>392</b>	<b>1621</b>	<b>92.15%</b>
	Table Frequency	69.87%	22.29%		
	Row Percentage	75.82%	24.18%		
	Column Percentage	92.68%	90.53%		
	<b><i>Tech Announcements</i></b>	<b>97</b>	<b>41</b>	<b>138</b>	<b>7.85%</b>
	Table Frequency	5.51%	2.33%		
	Row Percentage	70.29%	29.71%		
	Column Percentage	7.32%	9.47%		
	<b><i>Total</i></b>	<b>1326</b>	<b>433</b>	<b>1759</b>	<b>100%</b>
	<b><i>Column Percentage</i></b>	<b>75.38%</b>	<b>24.62%</b>	<b>100.0%</b>	

The Chi Square statistic with one degree of freedom is 2.0939 and is not statistically significant for the sample of 1759 announcements of human capital layoffs.

**Panel A** shows the actual distribution of firms by technological intensity and announcements of patents issued. Panel B shows the actual distribution of firms by technological intensity and firm announcements of technological change. We use Paytas and Berglund (2004) to classify firms as technologically intensive (1) and not technology intensive (0). We use Kogan, Papanikolaou, Seru and Stoffman (2018) to map patents to firms. If a firm has filed at least one patent within the six months before a human capital event, it is classified as (1), and (0), otherwise. The number of announcements of human capital events are shown as bold whole numbers. The percentages are listed below.

**Table 2**

*Four-Factor Model -- Cumulative Abnormal Return Evidence for Human Capital Events for **Patent Filed** and Technological Intensity*

1	2	3	4	5
Event Window	CAR Fama-French- Carhart Four-Factor model	# Positive to # Negative	Z-stat for abnormal return	Z-stat to test ratio of positive to negative abnormal returns
Panel A: Total Sample (1759)				
(0,+1)	-0.09%	680:976	-9.35***	-7.27***
(-1,+1)	-0.13%	688:968	-9.30***	-6.88***
(+2,+128)	0.75%	867:879	1.70*	-0.29
Panel B: <b>Patent Filed</b> , Not Technology Intensive (791)				
(0,+1)	-0.05%	308:430	-4.38***	-4.49***
(-1,+1)	-0.08%	306:432	-4.41***	-4.64***
(+2,+128)	1.11%	402:386	1.78*	0.57
Panel C: <b>Not Patent Filed</b> , Not Technology Intensive (535)				
(0,+1)	-0.11%	215:299	-6.21***	-3.71***
(-1,+1)	-0.17%	219:295	-6.16***	-3.71***
(+2,+128)	-0.41%	248:280	-0.53	-1.39
Panel D: <b>Not Patent Filed</b> , Technology Intensive (32)				
(0,+1)	-0.37%	9:22	-4.68***	-2.33***
(-1,+1)	-0.54%	9:22	-4.68***	-2.33***
(+2,+128)	-0.97%	15:16	-0.24	-0.18
Panel E: <b>Patent Filed</b> , Technology Intensive (401)				
(0,+1)	-0.09%	148:225	-4.54***	-3.99***
(-1,+1)	-0.13%	154:219	-4.46***	-3.37***
(+2,+128)	1.71%	202:197	1.65	0.25

In **Table 2**, we examine whether there is an abnormal market response associated with the announcement of work force reductions. This examination includes only firms classified by patent filed and technological intensity. The estimation window for calculation of abnormal returns includes only firms with a minimum of 100 daily observations. The estimation window of 100 days starts on day  $t = -150$  days and ends on day  $t = -51$ . Data for inclusion in this table came from firms with work force reductions that are a minimum of six months apart and the news reporting did not indicate that this reduction was the next step in an on-going lay-off plan. Column 1 indicates the event window, column 2 the cumulative abnormal return, column 3 the number of firms with positive and negative returns, column 4 the Z-statistic associated with the significance of the abnormal return and column 5 the Z-statistic examining the difference between the number of events with positive and negative returns. Results are presented using a value weighted market portfolio proxy with event windows of  $t = (0 \text{ to } +1)$  and  $t = (-1 \text{ to } +1)$  and for long run CARs  $t = (+2, +128)$ . (We also used an equally weighted market portfolio and obtained similar results). The CARs are developed based on the methodology in Fama and French (1992,1993) and Carhart (1997). Three asterisks indicate that the result is statistically significant at the 1% level; two asterisks, 5% level; and one asterisk, the 10% level.

**Table 3**

*Four-Factor Model -- Cumulative Abnormal Return Evidence for Human Capital Events for Announcements of Technological Change and Technological Intensity*

1	2	3	4	5
Event Window	CAR	# Positive to # Negative	Z-stat for abnormal return	Z-stat to test ratio of positive to negative abnormal returns
Panel A: Fama-French-Carhart Four-Factor model - Total Sample (1759)				
(0,+1)	-0.09%	680:976	-9.35***	-7.27***
(-1,+1)	-0.13%	688:968	-9.30***	-6.88***
(+2,+128)	0.75%	867:879	1.70*	-0.29
Panel B: Fama-French-Carhart Four-Factor model - <b>Technological Change</b> , Not Technology Intensive (97)				
(0,+1)	-0.14%	32:60	-4.34***	-2.92***
(-1,+1)	-0.22%	30:62	-4.41***	-3.34***
(+2,+128)	0.95%	45:51	0.56	-0.61
Panel C: Fama-French-Carhart Four-Factor model - <b>Not Technological Change</b> , Not Technology Intensive (1229)				
(0,+1)	-0.07%	491:669	-6.67***	-5.23***
(-1,+1)	-0.11%	495:665	-6.64***	-4.99***
(+2,+128)	0.46%	605:615	0.92	-0.29
Panel D: Fama-French-Carhart Four-Factor model - <b>Not Technological Change</b> , Technology Intensive (392)				
(0,+1)	-0.11%	142:222	-5.52***	-4.19***
(-1,+1)	-0.17%	149:215	-5.44***	-3.46***
(+2,+128)	0.86%	193:196	0.80	-0.15
Panel E: Fama-French-Carhart Four-Factor model - <b>Technological Change</b> , Technology Intensive (41)				
(0,+1)	-0.07%	15:25	-1.37	-1.58*
(-1,+1)	-0.10%	14:26	-1.38	-1.90**
(+2,+128)	3.82%	24:17	2.63**	1.09

In **Table 3**, we examine whether there is an abnormal market response associated with the announcement of work force reductions. This examination includes only firms classified by self-reported technological change and technological intensity. The estimation window for calculation of abnormal returns includes only firms with a minimum of 100 daily observations. Estimation window of 100 days starts on day  $t = -150$  days and runs to day  $t = -51$ . Data for inclusion in this table came from firms with work force reductions that are a minimum of six months apart and the news reporting did not indicate that this reduction was the next step in an on-going lay-off plan. Column 1 indicates the event window, column 2 the cumulative abnormal return, column 3 the number of firms with positive and negative returns, column 4 the Z-statistic associated with the significance of the abnormal return and column 5 the Z-statistic examining the difference between the number of events with positive and negative returns. Results are presented using a value weighted market portfolio proxy with event windows of  $t = (0 \text{ to } +1)$  and  $t = (-1 \text{ to } +1)$  and for long run CARs  $t = (+2, +128)$ . We also used an equally weighted market portfolio and obtained similar results. The CARs are developed based on the methodology in Fama and French (1992, 1993) and Carhart (1997). Three asterisks indicate that the result is statistically significant at the 1% level; two asterisks, 5% level; and one asterisk, the 10% level.

**Table 4, Panel A***Mean Difference Test of Market Response (CARs) for Technology Intensity and Patent Filing CARs*

1	2	3	4	5
	Patents filed	No Patents filed	Difference	t-statistic
Technology Intensive	-0.001262	-0.005375	0.0041130***	3.86***
Non-Technology Intensive	-0.0007584	-0.001696	0.0009376***	2.77***
Difference	-0.0005036	-0.003679***		
t-statistic	-1.54	-3.32***		

**Table 4, Panel B***Technology Intensity and Firm Announcement of Technological Change CARs*

	Technology Change	No Technology Change	Difference	t-statistic
Technology Intensive	-0.001036	-0.001748	0.000712	0.68
Non-Technology Intensive	-0.002237	-0.001145	-0.001092**	-2.12**
Difference	0.0012010	-0.000603**		
t-statistic	1.28	-2.48**		

In **Table 4**, we use a mean difference test to examine whether there are significant differences in cumulative abnormal market responses associated with the announcement of work force reductions for technology intensive and non-technology intensive firm. Panel A presents the average market results for technology intensity and patent filings; Panel B, for technology intensity and firm announcements of technology changes. The estimation window for calculation of abnormal returns includes only firms with a minimum of 100 daily observations. The estimation window of 100 days starts on day  $t = -150$  days and ends on day  $t = -51$ . Data for inclusion in this table came from firms with work force reductions that are a minimum of six months apart and the news reporting did not indicate that this reduction was the next step in an on-going lay-off plan. Results are presented using a value weighted market portfolio proxy with event windows of  $t = (-1 \text{ to } +1)$ . We developed the CARs based on the methodology in Fama and French (1992, 1993) and Carhart (1997). Three asterisks indicate that the result is statistically significant at the 1% level; two asterisks, 5% level; and one asterisk, the 10% level.

**Table 5, Panel A**

*Stepwise Regression Negative Subsample Short Run Results*

1	2		3		4		5		6		7	
	Variable p-value ≤ 0.05 cutoff level with a 5% stay level		Variable p-value ≤ 0.10 cutoff level with a 5% stay level									
	(1) First statistically significant variable		(1) First statistically significant variable		(2) Second Variable added		(3) Third Variable added		(4) Fourth Variable added		(5) Fifth Variable added	
Patents Filed * Change in Idiosyncratic Risk (Moderator)							-.2870***		-0.6415***		-0.7065***	
							(7.35)	0.0070	(9.34)	0.0024	(11.11)	0.0010
Tech Intensive * Patents Filed * Change in Idiosyncratic Risk (Moderator)									0.3772**		0.5125**	
									(3.81)	0.0517	(6.22)	0.0131
Analyst sell Recommendations											-0.00004*	
											(3.53)	0.0613
Institutional Ownership	0.0061***		0.0061***		0.0068***		0.0058**		0.0055**		0.0052**	
	(7.15)	0.0079	(7.15)	0.0079	(8.76)	0.0033	(6.28)	0.0127	(5.61)	0.0184	(5.01)	0.0259
Institutional Ownership * Change in Idiosyncratic Risk (Moderator)					1.0421**		2.805***		3.0975***		3.0815***	
					(3.61)	0.0584	(10.96)	0.0010	(13.07)	0.0003	(13.03)	0.0004
Intercept	-0.0095***		-0.0095***		-0.0100***		-0.0093***		-0.00914***		-0.0086***	
	(45.62)	<0.0001	(45.62)	<0.0001	(49.05)	<0.0001	(42.09)	<0.0001	(40.69)	<0.0001	(34.82)	<0.0001
Number of Observations	351		351		351		351		351		351	
F-statistic	7.15		7.15		5.41		6.13		5.59		5.21	
Probability > F	0.0079		0.0079		0.0049		0.0005		0.0002		0.0001	
R <sup>2</sup>	0.0213		0.0213		0.0319		0.0532		0.0642		0.0742	

In **Table 5, Panel A**, we examine the abnormal negative market response associated with the announcement of work force reductions. Patents filed, analyst sell recommendations, institutional ownership, and technology intensity coefficients that may be modified by change in idiosyncratic risk. The estimation window when calculating of abnormal returns includes only firms with a minimum of 100 daily observations. The estimation window of 100 days starts on day  $t = -150$  days and runs to day  $t = -51$  with the events measured in the event window  $t = (-1, +1)$ . Data for inclusion in this table came from firms with work force reductions that are a minimum of six months apart and the news reporting did not indicate that this reduction was the next step in an ongoing lay-off plan. We develop the mean CARs based on the methodology in Fama and French (1992, 1993) and Carhart (1997). Patents filed were obtained from Kogan, Papanikolaou, Seru and Stoffman (2016), analyst sell recommendations and institutional coverage from Bloomberg for 1996-2010 using the ANR and FLDS functions, and the methodology of Denning, K. C., Hulburt, H. and Ferris, S. P. (2006) to develop the change in idiosyncratic risk variable. We use Baron and Kenny's (1986) three-step process to develop the mediator variable (change in idiosyncratic risk) and we estimate the parameters and statistics using stepwise regression analysis at both a 5% and 10% cutoff level of significance. Yearly fixed effects pickup year over year effects that other right-hand side variables do not. We used the yearly fixed effect function provided by SAS and STATA to do the regression. All F-statistics are reported after yearly fixed effects are controlled. The numbers below the values of the parameters are F-statistics and the number to the right is the probability. Note that the coefficient, F-statistic and probability for each coefficient are shown in bold print the first time they are reported. Right-hand variables that did not meet the 10% cutoff and 5% stay levels include standalone change in idiosyncratic risk, standalone technological intensity, technological intensity\*change in idiosyncratic risk, standalone patents filed, technological intensity\*patents filed, as well as analyst sell recommendations\*change in idiosyncratic risk. Three asterisks indicate that the result is statistically significant at the 1% level; two asterisks, 5% level; and one asterisk, the 10% level.



**Table 5, Panel B**

*Stepwise Regression Positive Subsample Short Run Results*

	1	2	3	4	5	6	7	8
	Variable p-value ≤ 0.05 cutoff level with a 5% stay level						Variable p-value ≤ 0.10 cutoff level with a 5% stay level	
	(1) First statistically significant variable	(2) Second Variable added	(3) Third Variable added	(1) First statistically significant variable	(2) Second Variable added	(3) Third Variable added	(4) Fourth Variable added	
<b>Tech Intensive* Change in IR (Moderator)</b>								<b>2.9843***</b>
								<b>(12.22)</b> <b>0.0006</b>
<b>Tech Intensive* Patents Filed * Change in IR (Moderator)</b>								<b>-1.3022***</b>
								<b>(14.2)</b> <b>0.0002</b>
<b>Analyst Buy Recommendations</b>				<b>0.00002**</b>			<b>0.00002**</b>	0.00002**
				<b>(4.19)</b> <b>0.0417</b>			<b>(4.19)</b> 0.0417	(5.40) 0.0209
<b>Analyst Buy Recommendations* Change in IR (Moderator)</b>	<b>-0.0211***</b>	-0.0205***	-0.0197***	<b>-0.0211***</b>	-0.0205***	-0.0197***	-0.0165***	
	<b>(11.36)</b> <b>0.0009</b>	(10.95) 0.0011	(10.28) 0.0015	<b>(11.36)</b> <b>0.0009</b>	(10.95) 0.0011	(10.28) 0.0015	(6.87) 0.0093	
<b>Institutional Ownership</b>		<b>-0.0060***</b>	-0.0060***		<b>-0.0060***</b>	-0.0060***	-0.0055***	
		<b>(7.74)</b> <b>0.0058</b>	(7.71) 0.0059		<b>(7.74)</b> <b>0.0058</b>	(7.71) 0.0059	(6.98) 0.0088	
<b>Intercept</b>	0.0050***	0.0087***	0.0075***	0.0050***	0.0087***	0.0075***	0.0070***	
	(283.20) <0.0001	(40.87) <0.0001	(25.34) <0.0001	(283.20) <0.0001	(40.87) <0.0001	(25.34) <0.0001	(23.21) <0.0001	
<b>Number of Obs</b>	236	236	236	236	236	236	236	
<b>F-statistic</b>	11.36	9.70	7.95	11.36	9.70	7.95	7.84	
<b>Probability &gt; F</b>	0.0009	<0.0001	<0.0001	0.0009	<0.0001	<0.0001	<0.0001	
<b>R<sup>2</sup></b>	0.0430	0.0715	0.0867	0.0430	0.0715	0.0867	0.1360	

In **Table 5, Panel B**, we examine whether there is a positive abnormal market response associated with the announcement of work force reductions. Patents filed, analyst buy recommendations, institutional ownership, and technological intensity coefficients that may be modified by change in idiosyncratic risk. The estimation window for calculation of abnormal returns includes only firms with a minimum of 100 daily observations. The estimation window of 100 days starts on day  $t = -150$  days and runs to day  $t = -51$  with the events measured in the event window  $t = (-1, +1)$ . Data for inclusion in this table came from firms with work force reductions that are a minimum of six months apart and the news reporting did not indicate that this reduction was the next step in an on-going lay-off plan. We develop the mean CARs based on the methodology in Fama and French (1992, 1993) and Carhart (1997). Patents filed were obtained from Kogan, Papanikolaou, Seru and Stoffman (2018), analyst buy recommendations and institutional coverage from Bloomberg for 1996-2010 using the ANR and FLDS functions, and the methodology of Denning, K. C., Hulburt, H. and Ferris, S. P. (2006) to develop the change in idiosyncratic risk variable. We use Baron and Kenny's (1986) three-step process to develop the mediator variable (change in idiosyncratic risk) and we estimate the parameters and statistics using stepwise regression analysis at both a 5% and 10% cutoff level of significance. Yearly fixed effects pickup year over year effects that other right-hand side variables do not. We used the yearly fixed effect function provided by SAS and STATA to do the regression. All F-statistics are reported after yearly fixed effects are controlled. The numbers below the values of the parameters are F-statistics and the number to the right is the probability. Note that the coefficient, F-statistic and probability for each coefficient are shown in bold print the first time they are reported. Right-hand variables that did not meet the 10% cutoff and 5% stay levels include standalone change in idiosyncratic risk, standalone technological intensity, standalone patents filed, patents filed\* change in idiosyncratic risk, technological intensity\*patents filed, as well as institutional ownership\* change in idiosyncratic risk. Three asterisks indicate that the result is statistically significant at the 1% level; two asterisks, 5% level; and one asterisk, the 10% level.

**Table 6***Total Sample, Stepwise regression with Change in Idiosyncratic Risk & Patents Filed Long-Run Results*

1	2		3		4		5		6	
	Variable p-value <= 0.05 cutoff level with a 5% stay level									
	(1) First statistically significant variable		(2) Second Variable added		(3) Third Variable added		(4) Fourth Variable added		(5) Fifth Variable added	
Tech Intensive* Change in Idiosyncratic Risk					0.02999**		0.07092***		0.23167***	
					(4.13)	0.0426	(9.17)	0.0026	(17.97)	<0.0001
Tech Intensive*Patents Filed*Change in Idiosyncratic Risk									-0.04349***	
									(10.56)	0.0012
Analyst recommendations	-0.00308***		-0.00315***		-0.00363***		-0.00316***		-0.00322***	
	(14.15)	0.0002	(15.01)	0.0001	(18.46)	<0.0001	(13.29)	0.0003	(14.05)	0.0002
Analyst recommendations*Change in Idiosyncratic Risk							-0.000621**		-0.00101***	
							(5.04)	0.0251	(11.45)	0.0008
Institutional Ownership*Change in Idiosyncratic Risk			-0.05415***		-0.07457***		-0.08286***		-0.07860***	
			(8.26)	0.0042	(12.25)	0.0005	(14.79)	0.0001	(13.49)	0.0003
Intercept	0.02209**		0.02703**		0.02914***		0.02484**		0.02567**	
	(4.07)	0.0441	(6.02)	0.0144	(6.98)	0.0085	(4.95)	0.0264	(5.38)	0.0207
Number of Observations	587		587		587		587		587	
F-statistic	14.15		11.30		8.95		8.02		8.64	
Probability > F	0.0002		<0.0001		<0.0001		<0.0001		<0.0001	
R <sup>2</sup>	0.0247		0.0390		0.0461		0.0547		0.0723	

In **Table 6**, we examine whether there is a long run abnormal market response, using the total sample, associated with the announcement of work force reductions, patents filed, analyst recommendations, institutional ownership and change in idiosyncratic risk used as a moderator variable. The estimation window for calculation of abnormal returns includes only firms with a minimum of 100 daily observations. Estimation window of 106 days starts on day  $t = +2$  days and runs to day  $t = +128$ . Data for inclusion in this table came from firms with work force reductions that are a minimum of six months apart and the news reporting did not indicate that this reduction was the next step in an on-going lay-off plan. We develop the mean CARs based on the methodology in Fama and French (1992, 1993) and Carhart (1997). Patents filed were obtained from Kogan, Papanikolaou, Seru and Stoffman (2018), analyst recommendations and institutional coverage from Bloomberg for 1996-2010 using the ANR and FLDS functions, and the methodology of Denning, K. C., Hulburt, H. and Ferris, S. P. (2006) to develop the change in idiosyncratic risk variable. We use Baron and Kenny's (1986) three-step process to develop the mediator variable (change in idiosyncratic risk) and we estimate the parameters and statistics using stepwise regression analysis at both a 5% and 10% level of significance. Yearly fixed effects pickup year over year effects that other right-hand side variables do not. We used the yearly fixed effect function provided by SAS and STATA to do the regression. All F-statistics are reported after yearly fixed effects are controlled. The numbers below the values of the parameters are F-statistics and the number to the right is the probability. Right-hand variables that did not meet the 10% cutoff and 5% stay levels include standalone change in idiosyncratic risk, standalone technological intensity, standalone patents filed, patents filed\*change in idiosyncratic risk, technological intensity\*patents filed, and standalone institutional ownership. Three asterisks indicate that the result is statistically significant at the 1% level; two asterisks, 5% level; and one asterisk, the 10% level.



## **JBET Research Notes**

## **PROVIDING MORE THAN KNOWLEDGE: PROJECT-BASED LEARNING THAT DEVELOPS PROFESSIONAL SKILLS & SATISFIES LEARNING OUTCOMES**

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### **ABSTRACT**

Over a 30-year period, students in the Introduction to Marketing course were assigned a project to “invent” a new product and develop a complete strategic marketing plan within an assigned group, which they delivered in a written report and an oral presentation. Students brainstormed to generate creative, innovative, futuristic products that they could effectively market. In addition to learning core concepts in marketing, students were able to apply this knowledge to a real-world situation and develop valuable professional business skills such as communication, critical thinking, creative thinking, team-building, leadership, and project management. For an instructor, the goals of this assignment were to challenge students to utilize their resourcefulness, demonstrate their capabilities, and enhance their skills; thus acquiring more than classroom marketing knowledge and which satisfy employers’ future needs. For universities and business schools, this project worked toward fulfilling the AACSB requirements of Assurance of Learning and Outcomes Assessment.

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### **INTRODUCTION**

Academics recognize project-based learning is essential to enhance overall learning. Providing real world business experience through projects offers students the best opportunities to prepare them for the professional world.

As noted, over a 30-year period, students in the Introduction to Marketing class engaged in a project-based learning assignment requiring them, in a group, to invent a new product or service and to develop a complete strategic marketing plan. The plan included the marketing mix, the target market, and the concept of synergy to explain how the marketing mix elements fit together. They were expected to create a product, promote it, plan for its distribution, price it, and determine its target market. (See Table 1 for the project requirements.) This project enables students to apply their marketing knowledge and expertise to a managerial situation. Projects were evaluated on the creativity of new product ideas, thoroughness of the marketing mix strategy, and use of multi-media.

Each group was responsible for a written report and an oral presentation using presentation software. Every student was required to participate in the presentation. The presentations were videoed and students watched the video with their group members and the professor, in order to improve their communication skills. After viewing the video, each student was required to do a self-critique of his or her own communication performance. Groups were encouraged to design a multi-media package of advertising: print, broadcast, and social media. The expectation was not that students are experts in videography, production, web design, and social media, but that they should be able to determine the objectives of a media plan and how to meet these goals to reach the target market. After the presentation, questions were solicited from the class. This helped the students who watched the presentations develop listening skills as well as their communication skills. The professor also questioned the group regarding the group’s marketing strategies and their rationale for these strategies.

### **HOW STUDENTS LEARN**

The popularity of experiential curriculum courses has risen as universities attempt to fulfill the requirements of accrediting institutions, accomplish student goals, and meet employers’ expectations. The objective of universities is to develop a curriculum that is based on desired student outcomes. Stinson and Milner (1996) suggest approaching this with the question “What is it that we want our students to know and know how to do, as they leave our program?” Organizations such as the Association to Advance Collegiate Schools of Business (AACSB) International has as its primary goal the assurance that business schools impart students with knowledge and skills necessary for their future jobs, as well as to train them as professionals (Rob & Etnyre, 2009). According to Raehsler (2018), while it is important for all members of a college to take part in the process of assessment and improvement, much of the burden related to the AACSB accreditation process falls on the college administration. Yet, in a survey of university deans, they believed faculty in economics played a major role in AACSB accreditation/reaccreditation (Raehsler, 2018). So it would seem it is critical for faculty as well as administrators to pursue the goals of the AACSB.

Students seek to obtain necessary business skills such as leadership and communication while pursuing their personal and professional needs (Stutts & West, 2005). There is significant data to support the notion that project-based learning plays a significant role in students' learning of these skills and needs. According to Krajcik and Blumenfeld (2006), project-based learning roots go back to John Dewey (1959), who argued that students will develop a personal investment in the material if they engage in real, meaningful tasks. Other research has shown that students create a deeper understanding of material with hands-on interactions. In a study by Horan, Lavaroni and Beldon (1996), students of all levels showed an increase in the ability to critically think and socially participate after doing project-based assignments.

Marketing classes that emphasize experiential learning through project-based assignments helped students acquire leadership and communication skills while meeting both needs of future students' employers and academic accreditation institutions (Stutts & West, 2005). Moreover, employers see great value in applied learning through projects, believing that it would improve learning and better prepare students for career success (Hart Research Associates, 2015). An ability to "think critically, write, and work effectively in teams" is required by employers (Gruba & Al-Mahmood, 2004). Other research suggests that the learning outcomes that employers value the most are written and oral communication skills, teamwork skills, ethical decision-making, and the ability to apply knowledge in real-world settings (Hart Research Associates, 2015).

From an instructor's perspective, the most effective projects are those with a well-planned question or problem presented to students that engage them and require that they generate artifacts and organic problem-resolutions. The ability of students to work independently of instructors, with limited supervision, creates an efficient working environment (Blumenfeld et al., 1991).

### **Problem-based learning**

Experience-based learning highly contributes to student learning, and includes student-centered learning, classrooms as organizations, and problem-based learning (Conklin, 2013). The research suggests that experience-based learning develops skills in communication, leadership, teamwork, decision-making, and planning. In addition, problem-based learning develops entrepreneurship skills, as students face situations that require them to take responsibility for their own learning (Bell, 2008). A study by Zenger and Folkman (2014) that reviewed a database of over 332,000 managers, found that solving problems and issues, communicating, teamwork, and building relationships were voted as critical for managers by more than 30% of those interviewed.

In order to enhance students' learning through problem solving, professors should present students with problems that are holistic, not divided by narrow disciplinary boundaries, problems that mirror professional practice, problems that are unstructured, and problems that are contemporary. It is crucial that in this type of learning students are coached by their professors and encouraged to start taking responsibility for their learning (Rob & Etnyre, 2009). Professors should offer support to students, listen to them, create time for independent work, offer hints, and be responsive to questions and comments (Conklin, 2013).

This project is holistic because it encompasses many business disciplines and it is reality based because it mirrors real marketing situations. It is unstructured because students create their own process. It is contemporary in that students are inventing the future.

Problem-based learning is student-centered rather than teacher-centered. Factors that contribute most effectively to this type of learning are: 1) students are orientated to new instructional strategy; 2) students select and solve problems; and 3) students form teams (Peterson, 2004). Time in the classroom is allocated for work on the projects rather than traditional lecture-based instructions. More professors are adopting project-based learning to connect students with actual business and community organizations to help solve real problems (Smith & Gibson, 2016). In one survey, students reported that they are motivated by solving real-world problems, as they prefer "doing" rather than "listening". "Authentic learning typically focuses on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice" (Lombardi, 2007). This project fits the criteria for student-centered learning: 1.) students teach themselves the new instructional process; 2.) students determine the problem/opportunity; and 3.) they work in teams.

The problem-based learning for this project is the creation of an innovative product along with the development of a detailed strategic marketing plan. The invention and marketing of a new product is a reality-based scenario. It is reasonable to recognize that students can be inventors of future products. Research has shown that many times the sources of new product ideas are consumers. According to Schweitzer, Gassmann, and Rau (2014), customers are being involved more than ever by companies' new product development teams. Product users frequently provide solution information in the form of new product ideas. Companies understand that insightful inputs from consumers can add value to their products and services. So the idea that students can be inventors is in keeping with this perspective.

### **Communication skills**

The ability to speak in front of groups is a valued skill for business professionals. Having the ability to speak effectively and with confidence can enhance career opportunities. Practice is the key to improving speaking competence, and class projects can provide that opportunity for students to polish their communication proficiencies. Projects assigned in classroom settings create an environment that is very conducive to enhancing public speaking skills (Shyam & Joy, 2016).

Communication skills are aligned at the same level of importance with technical skills according to Nickles et al. (2010). Mastering communication skills enables students to communicate their specialized knowledge to others in the organization where they are employed (Baugh, Davis, & Turcheck, 2008). In one study, college professors and employers were asked to rank sixteen personal and technical skills based on importance. Both groups ranked interpersonal skills and ethical values as the most important (Tanyel, Mitchell, & McAlum, 1999). In addition, for schools that are accredited under the Association to Advance Collegiate School of Business (AACSB), communication skills were the most assessed competency in the modified assessment methods and programs (Wheeling, Miller, & Slocombre, 2014).

For the new product development project, each student is expected to present. Students are encouraged to practice the presentation with the entire group to support and assist their team members. Furthermore, students' opportunity to improve their public speaking is enhanced when given the ability to critique recordings of themselves for future improvement (Beebe & Beebe, 1997). This technique was used in this project giving students a better grasp of their strengths and shortcomings in this area. Having students view their own presentation within the comfort of their group helps them improve their speaking skills. Students' comments as they viewed the video suggest that it was effective in improving their communication skills. Students remarked that they appeared more confident and effective in the video than they originally thought they were. The self-critique, that the students did of their speaking skills, also showed that they believed this was a valuable learning experience that improved their speaking ability.

Similar to the concept of public speaking, writing skills are necessary for professional development. Muir (1996) states that critical-thinking approaches to teaching using projects, improve business communication most particularly writing. For this project, in order to develop a strategic marketing plan, effective writing is a necessity. Placing emphasis on writing puts "an important part of creativity where it belongs - in the hands of the working, thinking writer" (Flower & Hayes, 1981).

Writing a business plan can be done individually or in a group. When completed in a group, such as in this new product development project, it is referred to as collaborative writing, and is used frequently in businesses for on-the-job purposes (Morgan, Allen, Moore, Atkinson, & Snow 1987). Galegher and Kraut (1994) define collaborative writing as "writing involving multiple people, thus increasing the complexity of the writing process." There is an increasing need to teach these skills in higher education, which was what this project design allowed. Google Docs and other group sharing technologies allow students to write together remotely and in the true fashion of business professionals due to the ever-growing importance of group writing.

In addition, while participating in this project, students also make use of Microsoft Word and PowerPoint (or other similar presentation programs such as Prezi) to design an interesting presentation. By utilizing these programs, skills are gained in those areas are transferable to a business career.

## **Critical thinking and creative thinking**

According to Bloom's taxonomy (1956) and Paul and Elder's (2010) critical thinking framework, there is a link between the service-learning project and the development of students' critical thinking skills. When examining many successful business leaders in the last half century, it was noted that they all used critical thinking. Kepner and Tregoe (2013) found that 99% of the top managers surveyed indicated that "critical-thinking skills should be a core competency for their companies."

Creative thinking is described as "subjective, diffusive, and right-brain focused thinking". Creative thinking is "forming a new twist on an old idea or an improvement to a process that has previously worked satisfactorily" (Derr-Castiglione, 2006).

This new product development project encourages students to think critically by evaluating the product they have developed and determining marketing strategies. Students have to exercise their creative thinking skills to be ingenious, original, and imaginative as product developers.

## **Teamwork/teambuilding skills**

In a search of job requirements for business jobs in all different disciplines, the ability to work in teams is critical for survival in the business world. In a world that becomes more connected every day by technology, this is a trend that is becoming more important. Stott and Walker (1999) state "there is widespread agreement that teams form an increasingly important part of life in schools." This arises from the recognition that it is a valuable skill outside of academic settings. Yet it is still not being utilized enough in educational settings and that an increased focus on teamwork skills is necessary to prepare graduates for the ever-developing business world (Somech & Drach-Zahavy, 2007).

A significant focus of any group-related project is teamwork skills. Effective teamwork is essential to the completion of this new product development project since groups submit a group-written paper and create a group-produced presentation. Even if the personal bonds between members are not be strong, it is crucial that these differences be overlooked to complete a successful project.

Research suggests that students participating in groups develop effective communication and interpersonal skills. College professors are aware that creating teamwork projects enhances skills in diverse team environments. Building teams that consist of people with different personalities increases effectiveness and students become accustomed to diversity and strengthen interpersonal skills (Nickles, Parris, Gossett, & Alexander, 2010). Cognitive and practical skills are developed among members of the group with different backgrounds and personalities. Even though members work independently, they work together toward the common goal (Byrd & Luthy, 2010). Deep, meaningful relationships among group members have occurred in some scenarios, therefore, leading to collaboration in personal and professional areas outside of the classroom.

Helping behavior among team members is seen as an important group norm (Dumering and Robinson, 2007). This team project has the potential of encouraging students to develop norms that encourage helping behavior, and further cooperation (Byrd & Luthy, 2010). Leadership that emphasizes both business skills and the ability to influence others has been known as "organizational citizenship behaviors" and represents genuine commitment to people in the organization. It includes "expressions of personal interest in the works of others, genuine interest in the training and development of employees, and a concern for the spirit of cooperation as well as the need for cooperation for business reasons alone" (Organ, 1990).

Although few studies have addressed the networking benefits of marketing group projects, it is clear that they exist. Social aspects are inevitable due to the close work required between group members in creating such an in-depth project. These connections have the potential to link students outside of the classroom and provide them with opportunities in social settings and the workplace. Students also enjoyed problem-based learning because it gave them opportunities to interact with their friends and make new friends through cooperative projects (Lightner, Bober, & Willi, 2007). Further research is needed in this area.



One of the biggest disadvantages of group work is the disproportionate contribution of group members. One way to deal with the inequity of the situation is to obligate students to provide peer evaluations of each of their teammates. Students had the opportunity to “grade” each of the other team members. Students who scored high among their peers earned extra points and were rewarded for being a good team player. Students who were deemed by their peers as not contributing to the group lost points. This was one way to improve the fairness factor for the students and to encourage involvement in the group.

### **Leadership skills**

Leadership is defined as “a social influence process whereby intentional influence is exerted by one person [or group] over other people [or groups] to structure the activities and relationships in a group or organization” (Yukl, Gordon, & Taber, 2002). A leader is important to a group so that it may maintain psychological safety, organization, and effective solution development (Day, 2001).

In a group project such as this, there are no assigned leaders. Rather, leaders emerge and guide the group in the decision-making that is necessary for completion of the project. Students are provided the opportunity to exercise leadership skills by being put in unfamiliar groups with no job assignments. Individual work may not provide this invaluable opportunity. Therefore, it encourages students to use leadership skills in order to guide others with citizenship behavior (Byrd & Luthy, 2010).

### **Project management**

Project management evolved as a discipline due to its importance in the development of all spheres of organizations. The importance of project management in education was realized during the 1990s and qualifications in this field have become necessary for those involved in specific activities (Melnic, 2013). Project teams represent a significant advantage for students as they become more aware of task simulation. Companies prefer to hire people with project management experience, who have worked in teams and who possess norms associated with effective teams (Groysberg & Abrahams, 2006). Project-based learning provides deeper understanding of subject matter, helps in developing communication skills, fosters teamwork, and develops leadership skills (Rob & Etnyre, 2009).

The structure of this new product development assignment is project-based and gives students the opportunity to experience and learn how to function in a project-management environment and allows them to experiment and even make mistakes within the safety net of the classroom.

## **THE AACSB AND THE ASSURANCE OF LEARNING**

The Association to Advance Collegiate Schools of Business (AACSB) International is the accredited organization for college business worldwide (Lafleur, Babin, & Lopez, 2009). The primary goal of the AACSB is to ensure that business schools provide students with knowledge and skills necessary for their future jobs, as well as to prepare them to grow personally and professionally through their professional career (Rob & Etnyre, 2009). The mission of the AACSB is to foster engagement, accelerate innovation, and amplify the impact of business education. In order to achieve that, each program must identify mission-based goals, operationalize the goals, and demonstrate the attainment of the goals (Lafleur, Babin, & Lopez, 2009). For schools that are accredited under the AACSB, assessment of academic programs is increasingly important. As schools have to comply with changing accreditation requirements, they have to constantly improve and revise outcomes assessments (Wheeling, Miller, & Slocombre, 2014).

According to the AACSB, the outcomes assessment process should include:

- Definition of student learning goals and objectives
- Alignment of curricula with the adopted goals
- Identification of instruments and measures to assess learning
- Collection, analyzing, and dissemination of assessment information
- Use assessment information for continuous improvement including documentation that the assessment process is being carried out in a systematic, ongoing basis (AACSB Assessment Resource Center, 2007)

The questions to be addressed by business schools are: What will our students learn in our program? How will they learn it? How will we know they have learned it or not? What will we do if they have not learned it?

In 2013, the AACSB adopted accreditation standards that require business schools to adopt new ways of assessing student learning. This new standard placed even more importance on documenting achievement of student learning and linking assessment data to curriculum management (Pringle & Michel, 2007). Some of the assessment methods include: “continuing use of indirect measures, the amount of time that assessment takes, the extent of faculty resistance, and the results that assessment yield” (Pringle & Michel, 2007). Kelley, Tong, & Choi (2010) list written and oral assignments as direct measures, and surveys of graduating students as indirect measures. By 2006, over half of business school participants reported greater use of written, oral, and course embedded assignments graded with rubrics (Wheeling, Miller & Slocombe, 2014).

Table 2 shows the objectives, learning goals, and suggested methods of assessment for a typical Introduction to Marketing class. The new product development project meets the criteria for achieving each of the five objectives.

## CONCLUSION

After analysis of the student projects from a three-decade period of data collection, many discoveries were made regarding the learning process. Such a project helps students establish a firmer grasp on marketing concepts and improves critical thinking skills. Requiring students to design new products that have a viable marketing strategy gives real-world experience that is valued by the students and their future employers.

Skills manifested by such a hands-on project include communication, critical thinking, creative thinking, teamwork, and leadership, as suggested by the post-project self-critiques. By examining the general course objectives and the specific learning goals of a class, an instructor can determine the best means of measuring whether the goals have been achieved. A project such as this is all encompassing of a semester’s material, and can fulfill many, if not all, of the course goals.

This project has a built-in Learning Outcomes Assessment determination. One can clearly measure and document if the objective and specific goals were met. A project of this design is highly recommended to faculty of higher marketing education. It benefits students, the faculty, the university, and corporate America by cultivating necessary skills essential for a business professional. It is suggested that faculty who adapt this learning method follow the guidelines recommended in this research and potentially add new ideas and requirements to personalize the experience.

Future research is needed to measure the learning outcomes of students and to determine the effectiveness of such a project. One recommendation is that faculty conduct pre-testing and post-testing to assess student learning.

**Table 1**

**Project Requirement for Introduction to Marketing – New Product Development Project**

Each group is to select a new product that has been conceived by the group. Each group is responsible for presenting one new product idea to the class. BE CREATIVE! YOU WILL BE GRADED ON YOUR INGENUITY! The presentation should be formal and thorough, as if it were being presented to a group of senior product managers. The presentation should last no more than 20 minutes. Be interesting -- use visuals!!! You are required to use PowerPoint for your presentation. It is also strongly recommended that you produce television commercials, radio commercials, magazine/newspaper ads, and/or prototypes of the packaging. The class will be allowed to ask questions of your group with regard to your product and its marketing strategies. Dr. G. will be asking questions, too☺ Also, a written paper, one per group, should be submitted the day of the oral presentation. This paper should be at least fifteen pages and should be structured along the lines of an executive report. Thus, it should be typed, double spaced, concise, and thorough, covering all the key issues which are enumerated below.

1. What is the product's (or service's) core benefit?
2. How is this core benefit manifested in the tangible product? What functions does it perform?
3. What are the intangible factors?
4. What is the name of the product? What name strategy was used - family name extension, separate family name for different product lines, or individual brand name? Why?
5. Describe the logo and/or trademark.
6. Describe the design of the product.
7. How will the product be packaged? (May not be applicable for some products or services.)
8. How will this product help the organization compete? In other words, how does this product fit into the organization as far as the organization's resources and expertise, the organization's mission, and the environmental opportunities?
9. Describe the product's promotion mix. Elaborate on the advertising (media type, media vehicle, and the theme of the ad), the sales promotion, publicity, and personal selling.
10. Highlight your pricing structure. Is this a price skimming or price penetration strategy? What pricing method did you use (cost, demand, competition, customer-oriented)? Why?
11. Discuss the distribution channels. Is this intensive, selective, or exclusive? Will you use wholesalers and/or retailers? Describe the places your product will be sold.
12. Evaluate this product as to whether you feel this product will be successful or not successful. Include information on the target market and why this strategy will reach this group.
13. Elaborate on the concept of SYNERGY – HOW DO ALL THE PIECES OF THE 4P's PUZZLE FIT TOGETHER IN RELATION TO YOUR PRODUCT CONCEPT.

**Table 2**

**Learning Outcomes Assessment for an Introduction to Marketing Class**

<b><u>OBJECTIVES</u></b>	<b><u>STUDENT LEARNING GOALS</u></b>	<b><u>SUGGESTED MEASUREMENT TECHNIQUES</u></b>
<p>1. To guide the student in the building of a knowledge base of marketing principles and concepts. Thus, the student will be able to think and communicate as a marketing professional.</p>	<p>Know the definition and scope of marketing. Students will recognize basic marketing concepts and tools including the marketing mix elements. Understand the concept of target markets. Discuss the five types of market segmentation and the advantages and disadvantages of each.</p> <p>Understand consumer behavior: why and how consumers make purchases. Students will have the ability to analyze a particular purchase behavior through the five steps of the consumer decision purchase. Students will be able to contrast consumer buying behavior with business-to-business buying behavior.</p> <p>Know the various elements involved in the product mix. Realize the importance of services in today's society and the strategies involved in the marketing of services. Describe the steps of the new product development process. Understand product life cycles and how to revitalize declining products. Discuss the promotion elements of advertising, sales promotion, personal selling, and publicity and the use of each for effective communication. Students will be able to design a promotional mix strategy. Understand distribution strategies. Understand pricing strategies.</p>	<p>Examinations New product development project  Comprehensive common final</p>
<p>2. To demonstrate to the student how to apply marketing principles to the solution of business problems in various marketing contexts. The student should develop an expertise in market analysis which will be useful over a range of professional situations.</p>	<p>Explain strategic marketing and its importance and contribution to an organization's business goals. Students will know the basic components of a strategic marketing plan. Understand how external and internal environments affect business.</p> <p>Describe the steps of the new product development process.</p>	<p>Examinations – Essay questions New product development project Case studies Comprehensive common final</p>

3. To generate an excitement and enthusiasm about the marketing field which will help the student survive and excel in the corporate world and in the consumer marketplace.	Describe the steps of the new product development process. Develop as a professional speaker. Develop leadership skills to assist in a marketing internship or career position.	New product development project Case studies Student engagement: AMA events & AMA Speakers Series
4. To help the student develop effective communication skills – verbal, written, and digital.	Explain strategic marketing and its importance and contribution to an organization's business goals. Students will know the basic components of a strategic marketing plan. Understand how external and internal environments affect business.  Describe the steps of the new product development process. Develop as a professional speaker.	New product development project Case studies Student engagement: AMA events & AMA Speakers Series
5. To provide the opportunity for students to cultivate leadership expertise and team work competence.	Explain strategic marketing and its importance and contribution to an organization's business goals. Students will know the basic components of a strategic marketing plan. Understand how external and internal environments affect business. Describe the steps of the new product development process. Develop leadership skills to assist in a marketing internship or career position.	New product development project Case studies Student engagement: AMA events & AMA Speakers Series

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## **BIG IS NOT BAD**

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### **ABSTRACT**

Our study is motivated by the continuing criticism of large banks and their role in the 2008 financial crisis. The need for the government to provide bailouts under the “Too Big to Fail” umbrella led to a negative perception associated with the term ‘big.’ This study provides an alternate perspective by examining the relation between stock market returns and asset size of bank holding companies around the crisis caused by the September 11, 2001 terrorist attacks on the World Trade Center in New York. We find evidence that larger banks experienced lower negative returns following the attack. This suggests that maybe “big is not bad.” The larger asset size appears to have acted as a cushion in the aftermath of the unexpected sudden shock.

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### **INTRODUCTION**

During the 2007-2009 period, the world faced a severe financial crisis such as had not been seen in decades. The crisis, popularly known as the ‘2008 financial crisis,’ spread from the USA to several countries around the globe including the European Union. Millions of people lost their jobs and homes, as unemployment rates dramatically soared. The banking sector was often viewed as the main culprit behind the crisis, especially the larger banks. In the US and elsewhere, it was urged that large banks had to be protected from bankruptcy by their respective governments because they were “Too Big to Fail.”<sup>80</sup> It was argued that if the large banks were to fail, the impact on the global economy would be widespread and so devastating that inaction would push the affected countries into a further economic downward spiral. To avoid this, governments around the world poured billions of dollars as bailout money into the largest banks.

In the US too, several measures were taken by the George W. Bush administration, most significant being TARP, which was enacted in October 2008 with bipartisan legislative support. A massive ‘stimulus’ program followed under the Obama administration. Larger banks were the biggest beneficiary of these stimulus programs, while few banks were allowed to fail (Duchin & Sosyura, 2014; O'hara & Shaw, 1990).

Thus, in the aftermath of the 2008 financial crisis, large banks had an extra layer of protection in the form of government aid. If this ‘extra layer of protection’ is recognized and anticipated or expected to continue by investors, the stock market reaction to any crisis should be different for larger banks as compared to smaller banks. In other words, asset-size of banks could be a determining factor for the stock market reaction during a crisis. This kind of thinking is supported by the Gandhi & Lustig (2015) study which finds that, during NBER recessions, largest banks outperform smaller banks. They conclude that shareholders perceive this implicit financial disaster subsidy for the largest commercial banks. In line with Gandhi & Lustig (2015), extant literature also documents that, during uncertain times, investors look for investments that are less risky— a phenomenon called as “flight to safety” (Baele, Bekaert & Inghelbrecht, 2013; Caballero & Kurlat, 2008). One implication of these studies is that stock market performance of larger banks, which are more likely to receive the government support, should be better than their smaller counterparts during a crisis.

However, continued government support through bailouts in the future is not guaranteed. In fact, the government bailouts during the 2008 financial crisis and afterward provoked a strong outcry from the public and politicians. There were protest marches, sit-ins, and ‘camp’-ins across cities. The larger banks were perceived as the ‘big bad wolves’ who preyed upon the ‘small man in the main street.’ Outcries against “Too Big to Fail” were sometimes extended to the lament that bankers were “Too Big to Jail.” The Dodd-Frank regulations were introduced to rein in big banks and reduce the chances of such a devastating financial crisis in the future. However, the Obama administration did not force the larger banks to shrink or break-up. In fact, regulators asserted that big banks would be allowed to fail. The debate has continued over the years with some proponents suggesting means to end the “Too Big to Fail” banks. There

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<sup>80</sup> It is important to note that “too big to fail” is not a recent idea, O'hara & Shaw (1990) attests to the fact that the Comptroller of the Currency announced 11 largest banks to be “too big to fail” back in September, 1984.

was also a change in the label from “Too Big to Fail” to “Systematically Important” banks and the Federal Reserve adopting a new Bailout Prevention Rule. And now, there are expectations that these policies implemented after the crisis should be reviewed and relaxed.

Our study contributes to the debate of whether “Too Big to Fail” is bad, or whether big banks should be broken, by providing an alternate perspective. In this study, we examine the relation between the size of assets of banks and stock price performance in response to an exogenous shock leading to a financial crisis. Using an event study, we calculate abnormal returns for 469 US bank holding companies for three trading days after the terrorist attacks on September 11, 2001. The tragic event led to a severe fall in stock prices, the banking sector was one of the worst. It was unexpected and a highly consequential event. We compare abnormal returns for portfolios of bank holding companies sorted on their asset size. We find a lower negative abnormal return for larger banks as compared to smaller banks.

Our evidence suggests that shareholders perceive the benefit of holding large bank stocks, especially during uncertain times. Big asset size indeed seems to keep banks from becoming the victims during “flight to safety” event. Thus, though the phrase “Too Big to Fail” draws public contempt, our findings show that “Big is NOT Bad” necessarily.

The rest of the paper is organized as follows: in section 2 we present a literature review; in section 3 we present our hypotheses; in section 4 we describe data and methodology; in section 5 we discuss our findings, and in section 6 we provide conclusions.

## LITERATURE REVIEW

Gandhi & Lustig (2015) and Kelly, Lustig, & Nieuwerburgh (2016) document that the implicit financial disaster subsidy provided by the government to the large banks was priced by the market during the 2008 financial crisis. Gandhi & Lustig (2015) find that during NBER recessions stocks of largest banks outperform stocks of smaller banks. Gandhi & Lustig (2015) document that this return differential between large and small banks is not captured by common risk factors, like small minus big. Both studies conclude that shareholders perceive an implicit financial disaster subsidy for the largest commercial banks.

Consistent with these studies, stock market reactions during crises are frequently tied to flight to safety. Flight to safety is when investors sell their riskier assets in favor of less risky assets during uncertain market conditions (Caballero & Kurlat, 2008). Flight to safety implies that investors are attracted to the safest assets during uncertain times (Baele, Bekaert & Inghelbrecht, 2013; Caballero & Kurlat, 2008). Caballero & Krishnamurthy (2008) also posit that, during an unexpected financial crisis, investors look for investments that are less risky. Caballero & Kurlat (2008) further predict that the presence of the government bailout guarantee in the banking sector increases the desirability of the securities in the financial sector. Furthermore, the presence of government bailout guarantee may also prevent liquidity spirals (see Brunnermeier and Pedersen, 2009) when investors feel safe about their investments.

Rosch & Kaserer (2013) show that flight to safety phenomenon becomes stronger during market downturns or major crises. Similarly, Baele, Bekaert & Inghelbrecht (2013) examine flight to safety in stocks, bonds, and commodity market and find that stocks of firms with larger market capitalization outperform the smaller counterparts during the “flight to safety” event. They interpret this size effect as “a flight to quality into larger, well-known companies.”

The implication of “flight to quality” and “flight to safety” is that investors dump small firm stocks in favor of less risky, larger firm stocks during market crises, such as the 9/11 attacks. The presence of government bailout guarantee makes larger banks more desirable and hence less risky. Indeed, Gandhi and Lustig (2015) find that government bailout guarantee of larger banks is incorporated in the stock prices of larger banks.

## HYPOTHESES

In this study, we test the relationship between asset size of bank holding companies and stock returns following an unexpected financial crisis. During the time of a financial crisis investor demand for safety increases, this puts upward pressure on the prices of safer firms. Investors withdrawing from smaller firms to invest in larger firms causes a larger spread in the security prices during a crisis. Accordingly, we test the following hypothesis.

H<sub>0</sub>: The negative stock market reaction to the 9/11 terrorist attacks is less pronounced for larger bank holding companies.

## DATA AND METHODOLOGY

### Data

We collect our sample of bank holding companies from Compustat database and stock market data from Center for Research in Securities Prices (CRSP) database. From the CRSP-Compustat universe of bank holding companies, we exclude firms with the book value of assets of less than \$20 million obtaining 469 sample firms. In Table 1 we report summary statistics. The mean (median) asset size is \$18,093.22 (\$829.51) million. The mean (median) market-to-book ratio is 1.62 (1.02) times. The mean (median) Risk-adjusted Capital Ratio - Tier 1 is 11.58 (9.30). The mean (median) Risk-adjusted Capital Ratio - Total is 13.30 (11.10). The mean (median) cumulative abnormal return (CAR) for the three-day event window is -6.25% (-29.69%). This indicates a strong negative market reaction to the event.

### Methodology

Since our study focuses on a common event for all firms, the standard market model is not appropriate for the computation of abnormal returns. The errors from the market model are correlated when the event date is common, which violates the assumption of the market model that errors are independent. In order to address this issue, we use Schipper & Thompson (1983) approach and use a multivariate regression model to compute the abnormal returns around our event of interest.

Similar to the multivariate regression method used by Johnson, Kasznik, & Nelson (2000) and Howe and Jain (2004), we use portfolio returns to compute abnormal returns. The regression equation is:

$$R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_{pk} D_{kt} + \varepsilon_{pt} \quad (1)$$

where  $R_{pt}$  is the daily return from January 2, 2001 to Dec 31, 2001 on a portfolio of US banks.  $R_{mt}$  is the return on the CRSP value-weighted index, and  $D_{kt}$  is equal to 1/3 for each of the three event days and zero otherwise. Thus,  $\gamma_p$  represents the CAR over the three event days.

In Table 2 we report results for equally weighted portfolios. In Table 3 we report results for portfolios created using weights calculated in two steps. In step one, we run Equation (1) for each firm and obtain residuals. In step two, we form the portfolio using the inverse of the variance of the residuals thus obtained as weights. This approach controls for cross-sectional heteroscedasticity that arises due to common event date (Thompson, 1985). We refer to the portfolio thus formed as “variance-weighted” portfolios. We use Newey-West (1987) heteroscedasticity and autocorrelation consistent estimators to compute standard errors.

For robustness test, we compute cumulative abnormal returns (CARs) for each firm and perform a multivariate analysis. We use the following regression equation to compute CARs for each firm:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_{ik} D_{kt} + \varepsilon_{it} \quad (2)$$

where  $R_{pt}$  is the daily return from January 2, 2001 to Dec 31, 2001 on an individual US bank.  $R_{mt}$  is the CRSP value-weighted index, and  $D_{kt}$  is equal to 1/3 for each of the three event days and zero otherwise. Thus,  $\gamma_i$  is the cumulative abnormal return (CAR) over the three event days for an individual firm.

In Table 4 we report the results of the multivariate analysis. Model 1 uses individual CARs (%) as the dependent variable and the log of total assets as the explanatory variable. Model 2 includes log to total assets as the explanatory variable and market/book ratio as a control variable. Finally, model 3 includes the log of total assets as the explanatory variable and three control variables: market/book ratio, Risk-adjusted capital ratio - Tier 1 and Risk-adjusted capital ratio - Total.

## DISCUSSION OF RESULTS

We present our results in four tables. Table 1 provides descriptive statistics of variables used in the analysis. Table 2 and Table 3 present the relationship between asset size and stock returns during the crisis using portfolio returns, and Table 4 reports the results from multivariate analysis of the relationship between asset size and stock returns during the crisis using individual returns.

In Table 2 we report the results of the test of our hypothesis using an equally weighted portfolio, and in Table 3 we report results using a variance-weighted portfolio. We report the number of days used in the estimation, the coefficient on the market index, and the coefficient on the dummy variable indicating event days. The coefficient on the event dummy variable captures the cumulative abnormal stock market returns for the three-day event window after the 9/11 attacks. The reports for equally weighted portfolios (Table 2) show that the coefficient on event dummy is -0.01 for the full sample, -0.02 for the bottom half of banks sorted on asset size, and 0.01 for banks in the top half. The coefficient for the smaller banks is statistically significant at the one percent level, but the coefficient for the full sample and larger banks are not statistically significant at the ten percent level.

The reports for variance-weighted portfolios (Table 3) show that the coefficient on event dummy is -0.00 for the full sample, -0.02 for smaller banks, and -0.01 for larger banks. The coefficient for smaller banks is statistically significant at the one percent level, the coefficient for the larger banks is statistically significant at the ten percent level, while the coefficient for the full sample is not statistically significant at the ten percent level. Overall, these results indicate that the stock market reaction was more negative for smaller banks, thus supporting our hypothesis.

Table 4 reports the results of a multivariate analysis to test our first hypothesis. We use individual firm CAR (%) as the dependent variable and the log of total assets as the explanatory variable. We include three firm-level variables: market/book ratio, risk-adjusted capital ratio - tier 1, and risk-adjusted capital ratio - total. Model 1 uses only the log of total assets, and the coefficient is 0.50, statistically significant at the one percent level. Model 2 includes the market/book ratio as a control variable, and the coefficient for the log of total assets is 0.36, statistically significant at the five percent level. Model 3 includes market/book ratio, risk-adjusted capital ratio - tier 1, and risk-adjusted capital ratio - total as control variables, and the coefficient for the log of total assets is 0.47, statistically significant at the one percent level. These results indicate a strong mitigating effect of asset size on abnormal returns after the 9/11 attacks. Again, these results are supportive of our hypothesis.

We argue that the larger decline in the stock prices of smaller banks vis-à-vis the larger banks is due to an increase in the stock market uncertainty in the aftermath of the 9/11 attacks, which caused the risk-averse investors to sell-off riskier stocks in favor of the safer ones. This argument is supported by Vayanos (2004), who posits that, in volatile times, investors become more risk-averse. Our finding is also consistent with Baele, Bekaert & Inghelbrecht (2013) and Caballero & Kurlat (2008) in that we document, similar to these authors' predictions that larger banks, which are more likely to be backed by government bailout guarantees, were indeed more desirable to investors.

## CONCLUSION

Is the phrase “Too Big to Fail” an empty slogan? Our findings provide support to the presence of a ‘size effect’ as related to the banking industry. The 9/11 attacks led to a severe negative stock market reaction. The banking sector was one of the worst performing sectors in the stock market. It is in this setting of an exogenous, yet significant, event that we test our hypothesis that size of bank assets has implications for the bank's stock market reaction during a crisis. We find that the abnormal stock market returns were less negative for larger banks as compared to smaller banks. Our documentation of larger decline in bank stock prices following the 9/11 attacks provides evidence of “flight to safety” (selling off riskier assets in favor of safer ones) in the banking sectors. Our findings suggest that government bailout guarantee makes larger banks safer than smaller banks during volatile times. Our findings suggest that this perceived government protection may subdue an otherwise stronger stock market sell-off.

Our study also contributes to the debate of whether big banks should be broken up. The argument for breaking up is that the implied government protection to large banks increases the ‘moral hazard’ problem by encouraging the large banks to take on more risk (providing sub-prime mortgage loans, for example) than they would otherwise take (Gandhi & Lustig, 2015). However, our results show that larger banks may be helping soothe investor sentiment and thus keeping the financial sector, and the stock market at large, from going out of control in times of a sudden shock. We conclude, “Big is NOT Bad” necessarily.

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**TABLE 1: Descriptive Statistics**

Variable	N	Mean	25 <sup>th</sup> percentile	Median	75 <sup>th</sup> percentile
Asset Size (\$ million)	469	18,093.22	394.91	829.51	2,741.38
Market/Book ratio	469	1.62	1.02	1.35	1.89
Tier1	469	11.58	9.30	10.82	12.92
TierT	469	13.30	11.10	12.35	14.29
3-day CAR (%)	469	-6.25	-29.69	-10.91	2.34

This table reports summary statistics for variables used in our regression model. 469 bank holding companies are included in the sample. Market/Book ratio is market value of equity (compustat # 199 \* compustat # 25) divided by the book value of equity (compustat # 60). Tier1 is the Risk-adjusted Capital Ratio – Tier 1 (compustat # 337) and TierT is the Risk-Adjusted Capital Ratio – Total (compustat # 348). The 3-day CAR is the Cumulative Abnormal Return over three days following the 9/11 attacks of 2001. We compute CAR using the following regression equation:

$$R_{it} = \alpha_p + \beta_p R_{mt} + \gamma_{pk} D_{kt} + \varepsilon_{pt} \quad (2)$$

where  $R_{it}$  is the daily return from January 2, 2001 to Dec 31, 2001 for an individual bank.  $R_{mt}$  is the return on CRSP value-weighted index, and  $D_{kt}$  is equal to 1/3 for each of the three event days and zero otherwise. Thus,  $\gamma_p$  represents the CAR over the three event days.

**TABLE 2: Bank Size and Abnormal Returns: Equally Weighted Portfolios**

Variable	Full Sample	3-day CAR (%) Bottom 50% Asset size	3-day CAR (%) Top 50% Asset size
No. of days	248	248	248
CRSP Value-Weighted Index	0.32*** (0.000)	0.09*** (0.000)	0.54*** (0.000)
Event	-0.01 (0.314)	-0.02*** (0.001)	0.01 (0.288)
F-statistic	110.44*** (0.000)	22.32*** (0.000)	159.28*** (0.000)

This table reports the Cumulative Abnormal Return (CAR) over three days following the 9/11 attacks of 2001. The CARs are computed using the following regression:

$$R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_{pk} D_{kt} + \varepsilon_{pt} \quad (1)$$

where  $R_{pt}$  is the daily return from January 2, 2001 to Dec 31, 2001 for a portfolio of US bank holding companies. The first column presents the analysis of a portfolio of 469 sample firms, the second column portfolio has sample firms in the lower half of sample based on total assets in the year 2000, and the third column portfolio has sample firms in the top half of sample based on total assets in the year 2000.  $R_{mt}$  is the return on CRSP value-weighted index, and  $D_{kt}$  is equal to 1/3 for each of the three event days and zero otherwise. Thus,  $\gamma_p$  represents the CAR over the three event days. Portfolios are created using equal weights. P-values reported in the parenthesis are based on Newey-West (1987) heteroscedasticity and autocorrelation consistent standard errors. \*, \*\* and \*\*\* denote statistical significance at 10%, 5% and 1%.



**TABLE 3: Bank Size and Abnormal Returns: Variance Weighted Portfolios**

Variable	Full Sample	3-day CAR (%) Bottom 50% Asset size	3-day CAR (%) Top 50% Asset size
No. of days	248	248	248
CRSP Value-Weighted Index	0.33*** (0.000)	0.07*** (0.000)	0.52*** (0.000)
Event	-0.00 (0.867)	-0.02*** (0.000)	-0.01* (0.081)
F-statistic	150.12*** (0.000)	33.53*** (0.000)	170.02*** (0.000)

This table reports the Cumulative Abnormal Return (CAR) over three days following the 9/11 attacks of 2001. The abnormal returns are calculated using the following regression:

$$R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_{pk} D_{kt} + \varepsilon_{pt} \quad (1)$$

where  $R_{pt}$  is the daily return from January 2, 2001 to Dec 31, 2001 for a portfolio of US bank holding companies. The first column presents the analysis of a portfolio of 469 sample firms, the second column portfolio has sample firms in the lower half of sample based on total assets in the year 2000, and the third column portfolio has sample firms in the top half of sample based on total assets in the year 2000.  $R_{mt}$  is the return on CRSP value-weighted index, and  $D_{kt}$  is equal to 1/3 for each of the three event days and zero otherwise. Thus,  $\gamma_p$  represents the CAR over the three event days. Portfolios are created with weights calculated in two steps. In step one, we run Equation (1) for each firm and obtain residuals. In step two, we form the portfolio using the inverse of the variance of the residuals thus obtained as weights. P-values reported in the parenthesis are based on Newey-West (1987) heteroscedasticity and autocorrelation consistent standard errors. \*, \*\* and \*\*\* denote statistical significance at 10%, 5% and 1%.

**TABLE 4: Multivariate Analysis**

Variable	Dependent variable = Three-day CAR (%)		
	Model 1	Model 2	Model 3
N	469	469	469
Log of total assets	0.50*** (0.001)	0.36** (0.030)	0.47*** (0.010)
Market/Book ratio		0.45 (0.127)	0.38 (0.193)
Tier1			0.46** (0.027)
TierT			-0.54** (0.013)
Intercept	-4.25*** (0.000)	-3.99*** (0.000)	-2.77** (0.043)
R-squared	0.04	0.04	0.06
F-statistics	11.65*** (0.000)	6.72*** (0.001)	5.01*** (0.000)

This table reports the results of multivariate analysis using the Cumulative Abnormal Return over three days following the 9/11 attacks of 2001 as the dependent variable. The explanatory variable of interest is cash/total assets ratio. In model 1 we only have one explanatory variable, in model 2 we add the log of total assets and market/book ratio, as well and in model 3 we also include debt/total assets ratio. We use the following regression equation to compute 3-day CARs for each firm:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_{ik} D_{kt} + \varepsilon_{it} \quad (2)$$

where  $R_{it}$  is the daily return from January 2, 2001 to Dec 31, 2001 on an individual US bank.  $R_{mt}$  is the return on CRSP value-weighted index, and  $D_{kt}$  is equal to 1/3 for each of the three event days and zero otherwise. Thus,  $\gamma_i$  represents the CAR over the three event days for an individual firm. Tier1 is the Risk-adjusted Capital Ratio – Tier 1 (compustat # 337) and TierT is the Risk-Adjusted Capital Ratio – Total (compustat # 348). P-values reported in the parenthesis are based on robust standard errors. \*, \*\* and \*\*\* denote statistical significance at 10%, 5% and 1%.

## **JOB SATISFACTION IN PUBLIC ACCOUNTING: THE IMPACT OF WORK STATUS, GENDER, AND LINE OF SERVICE**

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### **ABSTRACT**

The extant literature is replete with studies of job satisfaction within the realm of public accounting firms, or as more commonly known as, professional services firms. This study is unique in that it considers not only recent hires, but also interns who have just completed their internship experience, and those who have completed an internship and are finishing their final year of school and have intentions of accepting a full-time position with their employing firm. This study reports the results of a survey of 100 accountants from various public accounting firms, including the Big Four firms. Globally, respondents were asked to indicate how satisfied they felt with numerous areas of their occupation. These areas include pay, promotion, work itself, supervision, coworkers, variety, identity, significance, autonomy, and feedback. Most notably, interns indicate higher satisfaction than full-time employees in seven of the ten facets studied in the survey. Females showed higher levels of job satisfaction than males, while those working in the tax practice indicated higher job satisfaction than those in Audit and Advisory. The results should be considered by students, recruiters, supervisors, and others who hold an interest in public accounting. The findings can guide both prospective and current accounting students as they consider accounting as the starting point for their career paths. Also, recruiters can use the findings of the study to strategize and fine tune their recruiting and retention efforts.

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### **INTRODUCTION**

Accounting continues to be a very popular major for college students. It has long been described as the “language of business.” As such, accounting can open many doors in the business world. Many successful leaders began their careers as accountants. public accounting firms, or as the major players prefer to refer to themselves as, “Professional Services Firms,” are eager to hire talented students. Many employers have a strong internship program that identifies potential full-time employees in their sophomore or junior years of college. Those who enter the field of public accounting can climb the ranks of a firm all the way to partner, or use their experience as a stepping stone to other opportunities outside of public accounting. Virtually all major firms have established internship programs. In fact, it is estimated that 80 to 90% of new hires at these firms have had an internship with their hiring firm. In most cases, internships lead to full-time employment for the students upon graduation. The internship experience includes working in a team, whether it be in the audit, tax, or consulting practice of the firm. Here, the student receives realistic and genuine work experience. For many, the internship proves to be an eye-opening experience. For some, it solidifies their desire to begin their careers in public accounting. For a few others, it convinces them that public accounting may not be their preferred career path.

Thus, it is reasonable to assume that the degree of job satisfaction will vary across the interns and potential full-time new hires. By comparing the perspectives of college students interning at public accounting firms and actual public accountants, we can see where the differences may lie and how feelings change as one's career progresses. We can also see where differences in perception and feelings about one's job lie in relation to gender and area of practice. High job satisfaction levels have been linked to better job performance which in turn increases the success of the organization (Colquitt, et. al., 2010).

### **LITERATURE REVIEW**

In any profession, including accounting, job satisfaction is very important to employers. Firms are concerned with the productivity and turnover of subordinates. Numerous studies have linked job satisfaction with performance and turnover (Carcello et al. 1991; Dean et al. 1988; Bullen and Flamholtz 1985). Granados (2016) suggests that accountants who feel they are contributing to the “betterment of society” are likely to be very satisfied with their work experience. Whether these people are helping to better society, businesses, individuals, or their own company, they are likely to feel higher levels of job satisfaction than those who do not feel they are helping others. The study concluded that relationships, with both clients and coworkers are associated with job satisfaction.

Individuals predominantly view their work in one of three ways: as simply a job, as a career, or as a calling (Wrzeskiewski et al. 1997). An individual's view regarding his or her work has implications for the individual's work involvement, organizational commitment, and job satisfaction (Ghazzawi, 2008; Wasti 2002; Yamamura et al. 2004).

Support for the complementary nature of intrinsic and extrinsic motivation was found (Stringer et al 2011). Intrinsic motivation was positively associated with pay and job satisfaction, whereas extrinsic motivation was negatively associated with job satisfaction, and not associated with pay satisfaction. Half (2013) discusses benefits of a career in public accounting. He found that exposure to many different tasks was related to job satisfaction. Additionally, he discussed the "swift" opportunities for advancement/promotion and the potential to climb the ranks as a motivating factor for employees. Granados (2016, b) concluded that employees need hope, particularly in having the opportunity for advancement; if they feel they can advance, they will be more satisfied. Also, accountants, value task variety and a sense of autonomy with the ability to do their job as they wish.

Moyes et al. (2008) studied various components of job satisfaction in accounting. They found that those in public accounting are generally satisfied with their colleagues, compensation packages and acknowledgment of a job well done from their supervisor. In the same study, females reported being less satisfied with opportunities for promotion. Absenteeism, tardiness, turnover, and negative attitudes towards work have been associated with job dissatisfaction (Randolph 2005; Rue and Byars 2005). A study of workers in Spain, Mexico, and the United States reported that respondents were mostly satisfied with their jobs (Greenberg and Baron 2008; Page and Wiseman 1993).

Across genders, females were found to be less satisfied with their jobs and reported higher turnover intentions than males (Reed et al. 1994). In their study, Aranya et al. (1986) reported lower job satisfaction for women accounting professionals. Females rated overtime burden, time for personal life, and time for parenting less satisfactory than males (AICPA 1990). On the other hand, female government auditors were more satisfied with their jobs in three areas: colleagues, promotions and pay, but reported lower levels of happiness with supervision (Brown and Corless 1990). Ward et al. (1986) found that women employed by CPA firms are generally satisfied, but are least satisfied with promotion opportunities and pay.

In summary, prior research on gender differences of accountants provided some conflicting results. The majority of studies indicate that men and women in accounting are similarly committed to their careers, but overall, women have indicated lower levels of job satisfaction often due to a perceived lack of advancement opportunities. The prior research concludes that females are often less committed to their employers and more likely to leave their jobs for more attractive opportunities elsewhere.

## **THEORY/MODEL DEVELOPMENT AND HYPOTHESES**

Job satisfaction can be defined as "a pleasurable emotional state resulting from the appraisal of one's job or job experiences" (Locke 1976). Individuals that are satisfied with their job will have positive feelings about their job while individuals that are dissatisfied with their job will have negative feelings about their job. Two popular theories that are helpful in analyzing job satisfaction are the Value-Percept Theory and the Job Characteristics Theory.

The Value-Percept Theory contends that individuals will feel satisfaction in their job when they perceive that their job supplies what they value. The theory is based on five facets: Pay satisfaction, promotion satisfaction, supervision satisfaction, coworker satisfaction, and satisfaction with the work itself.

Pay satisfaction occurs when one feels they are being fairly compensated for their services. Promotion satisfaction considers the opportunities for promotion within the organization and the likelihood of a promotion. Supervision satisfaction describes how employees feel about their supervisors and the quality and frequency of performance feedback. Coworker satisfaction is an indication of how individuals feel about their colleagues. Lastly, satisfaction with the work itself outlines how individuals feel about the actual work they perform on the job (Colquitt et al.).

The Value-Percept Theory ranks the importance of the five specific facets of job satisfaction. Satisfaction with the work itself is shown to have the highest correlation with overall job satisfaction, meaning that an individual is more likely to be satisfied with their job when they enjoy the work that they are asked to perform. Supervision and coworker satisfaction both have moderate correlations with overall job satisfaction, meaning that they are important but not the most important facets of satisfaction. Promotion satisfaction has the fourth highest correlation with overall job satisfaction while pay satisfaction has the weakest correlation with overall job satisfaction, confirming the idea that

work isn't all about the money. Overall, this theory hypothesizes that satisfaction with the work itself is the most important facet of the theory while pay satisfaction is the least significant facet of job satisfaction.

The Job Characteristics Theory complements the Value-Percept Theory by focusing primarily on satisfaction with the work itself. It focuses on five work-related components. The Job Characteristics Theory predicts attitudes and behavior based on three critical psychological states that make the work itself satisfying: meaningfulness of work, responsibility for outcomes and knowledge of the results. Hackman and Oldham (1980) suggest that if certain characteristics are present in a job, individuals will be internally motivated to perform well because their needs will be met. They consider the 'motivating potential' of jobs. The Job Characteristics Theory defines five core job characteristics that aid in measuring the motivating potential of a job and the achievement of the three critical psychological states: skill variety, task identity, task significance, task autonomy and task feedback. Skill variety is the degree to which a job can allow an individual to utilize their various skills to perform the work. Task identity refers to the extent to which the job requires the completion of an entire and discrete piece of work. Task significance is the degree to which a job affects other people's lives. Task autonomy is the extent to which the job allows individual discretion throughout the work process. Task feedback is the degree to which an individual is aware of how effectively he/she is performing on the job itself. (Colquitt et al.).

The Job Characteristics Theory studies satisfaction with the work itself in greater depth. The three critical psychological states that make work satisfying are closely related to the five facets of job satisfaction defined in the model. Theoretically, an individual that is satisfied with their work variety, identity, and significance will feel that their work is meaningful, meaning that they feel their work "counts" and is important. The theory also hypothesizes that an individual that feels satisfied with autonomy on the job will feel a sense of responsibility for outcomes, resulting in a feeling of being an integral person in the quality of the work. Lastly, an individual that is satisfied with their feedback will feel a sense of knowledge of results, which describes the extent to which individuals feel they know how they are doing. This theory hypothesizes that individuals that feel they have achieved these three psychological states will feel satisfied with the work that they perform on the job.

While both theories are certainly useful tools in analyzing job satisfaction, there are limitations to both theories. For the Value-Percept Theory, sometimes it uses a scale to weigh the facets of satisfaction based on importance, and this can be difficult because it may turn out unreliable results as some individuals may value certain facets differently than the theory does. Additionally, it does not account for external factors that may affect one's job satisfaction, such as one's social, economic, and organizational conditions both in the past and present. For the Job Characteristics Theory, all employees may not feel the same about equally weighted facets of satisfaction. For example, two people may have the same exact job with the same exact tasks and still have different levels of job satisfaction (Judge & Klinger 2008).

## RESEARCH METHODOLOGY

Data were collected in this study through Google Forms. A 20-question instrument along with a request for certain demographic information was sent to the participants. The instrument was pretested by students and faculty colleagues for clarity and readability. Several slight changes were made for the final version. Some questions from the survey were adapted from Paul Spector's survey on job satisfaction, while the researchers created the rest of the questions. A variety of styles of questions were used, utilizing positive and negative wording, while spreading out the facets that were questioned. The survey included instructions to guide the respondents in completing the instrument. After completion of a few demographic pieces of information, respondents were asked to rank their feelings toward the 20 questions, with 1 representing strongly disagree, 2 representing disagree, 3 representing neutral, 4 representing agree, and 5 representing strongly agree.

Recruiters at various public accounting firms distributed the survey to the full-time employees who participate in the study. Participation was strictly voluntary and anonymous. The goal was to have as many accountants in their first five years of service respond to the survey, to have a narrowed demographic to compare to the interns. This narrowed demographic was preferred to a wide range of experience levels, as satisfaction levels would likely vary greatly between partners and associates. The researchers also presented the survey to numerous classes on campus and asked the students who had interned in public accounting to complete the survey. The in-class respondents were juniors and seniors who had either interned in the current or previous year. Like the full-time employees, no one was pressured to participate, merely encouraged by faculty. All data were collected anonymously. Additional demographic information gathered included: work status, company, graduation year, gender, and area of practice.

## Demographic Profile of Participants

Table 1

Demographic Profile

Gender

	Total
Female	60
Male	40
Total	100

Work Status

Work Status	Female	Male	Total
Full-Time	34	19	53
Intern	26	21	47
Total	60	40	100

College Graduation Year

Year	Female	Male	Total
2012	1	2	3
2013	11	2	13
2014	7	3	10
2015	8	4	12
2016	7	8	15
2017	10	14	24
2018	16	7	23
Total	60	40	100

Practice

Practice	Female	Male	Total
Advisory	1	2	3
Audit	39	27	66
Tax	16	7	23
Other	4	4	8
Total	60	40	100

A total of 110 responses were received. Of these, 10 were eliminated because they were either incompletely filled out or had over five years of work experience, thus reducing the sample to 100. Sixty per-cent of the respondents were female, while 40% were male. Fifty-three respondents were full-time employees, while 47 were interns. Of the 47 interns, 23 interned in 2016 and 24 interned in 2017. Sixty-six per-cent of the respondents registered with the audit practice of their firm, with 23% in tax, 3% in advisory, and 8% noting “other” as their practice. See Table 1 for a complete profile of demographics.

## DISCUSSION OF RESULTS

It is difficult to arbitrarily define a number or range of numbers to be considered satisfied or dissatisfied. Thus, the researchers found it useful to compare average levels of satisfaction in the different facets of job satisfaction and note the trends between the two. When scoring satisfaction levels, questions that contained negative wording, like “I am not satisfied with the benefits/salary I receive,” responses were reverse-coded. In other words, if a respondent answered 1 to that question or one of similar style, indicating that they strongly disagreed with that statement, they would be answering a five in terms of satisfaction. This technique was utilized with negatively-worded questions to keep the results consistent and to keep a consistent scale for measuring satisfaction across all questions.

Per the Value-Percept Theory, the interns showed higher levels of job satisfaction than full-time employees and did so in every facet of the theory. The average satisfaction level of interns was 4.18 vs. 3.75 for the full-time employees. Females showed higher levels of satisfaction than males, as females scored a 4.06 and the males scored a 3.86. Tax

was the area of practice shown to have the highest level of job satisfaction per the Value-Percept Theory with a score of 4.12. This finding suggests that these three groups perceive that their job provides more of the things that they value, when compared to others in their respective demographic groups. A complete profile of results per the Value-Percept Theory can be seen in Table 2.

To gauge pay satisfaction, respondents were asked if they felt satisfied with the pay they received and if they felt they were paid a fair amount for the work they complete. In response to these two questions, eight respondents indicated strong dissatisfaction, while 33 respondents indicated strong satisfaction. The interns scored 4.08 and the full-time employees scored 2.80. This shows that there is a large discrepancy of pay satisfaction between interns and full-time employees. This may be the case because interns are paid on an hourly basis and are thus further compensated when working overtime. Also, to a college student, the salary is probably a large step up to what they are used to, so they are more likely to be more satisfied with the pay because they've never earned that much money before. When further broken down, the data also reveals that females were more satisfied than males in terms of pay. As salaries do not differ by gender, the only logical explanation for this difference is based on the groups' perspective. Also, Tax was the area of practice most satisfied with the pay received. This may be the case because salaries in the Tax department are generally a bit higher and people that work in tax may receive more compensation based on their specialty as well. Overall, pay satisfaction had the lowest ranking among the five facets of the Value-Percept Theory, with a score of 3.54. However, because this facet is least correlated with job satisfaction, this does not provide a significant indication of satisfaction with one's job.

Respondents were asked if they felt there was an adequate chance for promotion and if good workers are properly rewarded with promotions. Of the 200 responses related to promotion satisfaction (100 for one question and 100 for the second question), 73 responses indicated strong satisfaction, while only two responses indicated strong dissatisfaction. The interns averaged 4.41, while the full-time employees scored 4.11. The reason interns may be more satisfied with promotion/potential promotion is because the interns that do a good job probably feel they are being "promoted" by being assigned more work and responsibilities. Full-time employees may feel that promotion is often based on time with the firm, so more patience may be necessary until promotion. However, public accounting is known for providing workers with the ability to ascend the ranks in a firm rather quickly, and promotion is often one of the strong selling points. The data was further broken down to show that females have higher satisfaction with promotion, while the category "Other" had the highest satisfaction in terms of practice, with Tax in a close second. Promotion satisfaction is the 4<sup>th</sup> most significant facet related to job satisfaction, but ranks 2<sup>nd</sup> in score among the five facets studied in the survey with a score of 4.25.

Respondents were asked if they liked their supervisor and felt he/she was competent to measure supervision satisfaction. In response to the two questions related to supervision, zero respondents were strongly dissatisfied, while 87 of the 200 responses indicated strong satisfaction. The interns had an average level of satisfaction of 4.48, while the full-time employees had an average level of 4.27. Interns are probably more willing to listen and feel that a supervisor is necessary in their work, as full-time employees may come to feel that they do not need as much supervision. However, both scores indicate that both groups are very satisfied with supervision. Females have a higher average score in terms of supervision, while Tax is the highest scoring area of practice in terms of supervision. Supervision satisfaction has a moderate correlation with overall job satisfaction and had the highest overall score of all facets in the Value-Percept Theory portion of the survey.

In response to questions asking if they liked the people they worked with and were satisfied with their coworkers, three respondents were strongly dissatisfied, while 65 respondents were strongly satisfied. Interns scored 4.18, while the full-time employees averaged 4.06. Both scores are very similar, but interns may enjoy working with students from their own school, as well as nearby colleges and feel connections that way. Females scored slightly higher than males in terms of coworker satisfaction, while Advisory had the highest score in terms of practice. However, given the fact that only three people identified with the Advisory practice, this is not a statistically significant response. Coworker satisfaction has a moderate correlation with overall job satisfaction and ranked 3<sup>rd</sup> overall in scores gathered from the survey.

Lastly for the Value-Percept Theory, respondents were asked how they felt about the tasks they performed at work and if they deem them interesting/fun. Most respondents reported feelings of "neutral" or "satisfied" with the work that they perform on the job. The interns scored higher than the full-time employees on satisfaction with the work itself with a score of 3.74 as opposed to a score of 3.51 for full-time employees. Females registered higher satisfaction

than males in this category, while “Other” was higher in terms of practice, but Tax was merely .05 behind. Overall, six respondents indicated strong dissatisfaction, while 24 respondents reported strong satisfaction. This area is covered in more depth by the Job Characteristics Theory, but is one of the most significant factors in job satisfaction overall. Satisfaction with the work itself has the strongest correlation with overall job satisfaction, and scores 4<sup>th</sup> out of the five facets examined in the Value-Percept Theory.

Per the Job Characteristics Theory, all demographic groups scored lower satisfaction levels than they did in the Value-Percept Theory. The interns and full-time employees showed comparable levels of job satisfaction as the interns scored 3.66 and the full-time employees scored 3.65. Females scored higher than males in the Job Characteristics Theory with a score of 3.74, compared to 3.52 for the males. Those in the Tax practice scored higher than those in Audit or Advisory, with a score of 3.82. As this theory is a more detailed test of how satisfied individuals are with the work itself, the results show that there are varying levels of satisfaction with the actual work accountants perform on the job among various demographics. A complete profile of results for the Job Characteristics Theory can be found in Table 3.

To gauge satisfaction with task variety, respondents were asked if they felt their job requires many skill sets to be successful and if they do different activities day in and day out. One response indicated strong dissatisfaction, while 60 responses indicated strong satisfaction. The full-time employees scored higher than the interns at 4.13, compared to 4.06. This may be because full-time employees have a better understanding of their job and can thus provide more skills to the firm, resulting in more of a variety of tasks. Females show a much higher satisfaction level than males in terms of satisfaction with variety, which is purely based on perception, as gender does not determine work assigned in this field. “Other” registered the highest satisfaction level, which could encompass a wide variety of practices, while Tax was .07 behind. Variety had the highest overall score among the five facets of the Job Characteristics Theory with a score of 4.10.

Respondents were asked if they had knowledge of an identifiable outcome from the work they do and if they know the results of their work to test identity. Of the 200 responses in this facet of satisfaction, two indicated strong dissatisfaction and 11 indicated strong satisfaction. The full-time employees scored 3.68, while the interns scored 3.38. It makes sense that full-time employees would have more knowledge of the results of the work they are asked to perform because they can often see and understand their work to the end. In an internship, an intern may work on a task for 2-3 months and not understand the result it has on the company. Females indicated much stronger satisfaction than males in this category, while Advisory had a higher average score than Audit and tax. Identity had the 3<sup>rd</sup> highest total average among the five facets of the Job Characteristics Theory with a score of 3.54.

Respondents were asked if they felt their job had meaning and a substantial impact on the lives of others to analyze significance. Both questions testing satisfaction with significance resulted in 11 responses of strong dissatisfaction, and 17 responses indicating strong satisfaction; most responses indicated neither satisfaction nor dissatisfaction with significance, as most the respondents felt “neutral.” Interns feel that their work is more significant than full-time employees scoring at 3.48, compared to 3.04 for full-time employees. Interns may feel that their work is more significant because it is probably some of the most important work they have performed on a job in their lives. Additionally, they may feel it is significant because if they mess up, their supervisors will feel the effects of it. Females feel that their work is more significant than males, while Tax and “Other” are the two areas of practice with the highest satisfaction levels in terms of significance. In comparison to the other facets studied in the Job Characteristics Theory, significance had the lowest overall average score of 3.25.

Autonomy was measured by asking respondents whether they felt their efforts were blocked by red tape and if their job allowed them to be independent in their work. Five responses suggested strong dissatisfaction and 15 responses suggested strong satisfaction with autonomy; however, most the responses indicated satisfaction with autonomy. For the fourth component of the Job Characteristics Theory, autonomy, the full-time employees scored 3.39, while the interns scored 3.22. It is understandable that interns felt less autonomy in their job because they probably have a supervisor watching and reviewing their work at most times, while full-time employees have more responsibility and experience to be able to work on their own. Females and males both had comparable levels of satisfaction with autonomy, scoring 3.30 and 3.32, respectively. Tax was the area of practice with higher levels of satisfaction than Audit and Advisory in terms of satisfaction with autonomy. Autonomy had the 4<sup>th</sup> highest scoring among the five facets, with a score of 3.31.



Respondents were asked if they felt they were properly recognized when doing a good job and if they received an adequate number of performance evaluations to analyze feedback satisfaction. Zero responses indicated strong dissatisfaction, while 49 indicated strong satisfaction, with most responses revealing that Accountants feel satisfied with the amount of feedback they receive. The interns scored higher at 4.14, compared to 4.00 for the full-time employees. This makes sense as interns likely receive feedback for most the tasks that they perform, while full-time employees may be expected to be more independent with less feedback. Females felt more satisfied with the amount of feedback they receive, while Advisory was the most satisfied area of practice. Given the fact that only three responses were collected from Advisory, no statistical tests were appropriate. In comparison to the other facets studied in the Job Characteristics Theory, feedback ranked 2<sup>nd</sup> with a score of 4.07.

It is important to examine the satisfaction of the three critical psychological states achieved because of a combination of these five facets: meaningfulness of work, responsibility for outcomes, and knowledge of results. Since satisfaction with variety, identity, and significance connects to an important psychological state of job satisfaction, meaningfulness of work, it is important to examine the combination of these three facets in comparison to the other states. Satisfaction with autonomy achieves the state of responsibility for outcomes, while satisfaction with feedback achieves the state of knowledge of results. Knowledge of results had the highest score with a score of 4.07, while meaningfulness of work had the second highest score of 3.63, while accountants indicated that they were least satisfied with their responsibility for outcomes, with a score of 3.31.

### **SUMMARY**

Overall, public accounting seems to be a satisfying profession. A complete profile of overall average satisfaction levels can be seen in data Table 4. Respondents are most satisfied with their supervisors and the variety of work that they are asked to perform. They indicate that they are least satisfied with the pay that their employers provide and the significance of their work. Differences in job satisfaction across work status, gender, and area of practice have been identified. While accounting seems to be a satisfying profession, there are opportunities to build on to continue to keep employees happy and areas that could deserve more attention to increase the happiness and the performance of public accountants across all levels, practice areas and both genders.

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<b>Table 2</b>											
<b>Average Satisfaction Levels Per Value-Percept Theory</b>											
	Interns	Full-Time	Significance	Male	Female	Significance	Audit	Tax	Advisory	Other	Total Averages
Pay	4.08	2.80	<.0001	3.35	3.67	.1442	3.47	3.76	3.67	3.44	3.54
Promotion	4.41	4.11	.0336	4.17	4.30	.3703	4.25	4.26	3.84	4.32	4.25
Supervision	4.48	4.27	.1022	4.27	4.44	.1825	4.35	4.48	4	4.32	4.37
Coworker	4.18	4.06	.4540	4.08	4.14	.7164	4.05	4.26	4.33	4.13	4.12
Work Itself	3.74	3.51	.2008	3.45	3.73	.1257	3.58	3.83	3.33	3.88	3.62
Total Averages	4.18	3.75	.0090	3.86	4.06	.2332	3.94	4.12	3.83	4.02	3.94

Scale: 1=Strongly Dissatisfied  
5=Strongly Satisfied

<b>Table 3</b>											
<b>Average Satisfaction Levels Per Job Characteristics Theory</b>											
	Interns	Full-time	Significance	Male	Female	Significance	Audit	Tax	Advisory	Other	Total Averages
Variety	4.06	4.13	.6579	3.84	4.27	.0068	4	4.31	3.83	4.38	4.10
Identity	3.38	3.68	.0736	3.38	3.65	.1149	3.43	3.63	3.84	4.07	3.54
Significance	3.48	3.04	.0275	3.13	3.30	.4060	3.17	3.42	3.17	3.44	3.25
Autonomy	3.22	3.39	.3823	3.32	3.30	.9198	3.20	3.48	3.17	3.76	3.31
Feedback	4.14	4.00	.3086	3.91	4.18	.0527	3.98	4.26	4.33	4.13	4.07
Total Averages	3.66	3.65	.9532	3.52	3.74	.2054	3.56	3.82	3.67	3.96	3.65

Scale: 1=Strongly Dissatisfied  
5= Strongly Satisfied

<b>Table 4</b>											
<b>Overall Average Job Satisfaction Levels</b>											
	Interns	Full-time	Significance	Male	Female	Significance	Audit	Tax	Advisory	Other	
Overall Average	3.87	3.7	.3062	3.69	3.9	.2186	3.75	3.92	3.75	3.99	

Scale: 1= Strongly Dissatisfied  
5= Strongly Satisfied

## IMPACT OF A BUSINESS PLAN PROJECT AMONG UNIVERSITY BUSINESS MAJORS

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### ABSTRACT

High impact practices are important co-curricular educational experiences in college education, as they promote learning, development, and persistence among students. The objective of this study is to expand the research on high impact practices and explore their connections with the development of the business plan (BP) by college students. Using the National Survey of Student Engagement (NSSE) questionnaire, this study explores whether the participation of students in the development of a business plan has a positive impact on the level of commitment, engagement, and motivation of Lock Haven University Business majors. A control group and an experimental group have been asked to complete the survey. Results suggest that there is some relationship between the students who had been asked to develop a business plan and their High-Value Educational Experience (HVEE) either at the college or in the community.

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### INTRODUCTION

One of the aims of undergraduate education is to help students develop a set of transversal and professional competences, which are expected to help them reach the highest performance in their future work. In this sense, we are interested in identifying those activities or projects that may have a high impact on their development. This topic of study has been related to the concept called engagement, which is defined as ‘the quality of effort students themselves devote to educationally purposeful activities that contribute directly to desired outcomes’ and is related to ‘the effort institutions devote to using effective educational practices’ (Kuh et al, 2008). These two critical features of collegiate quality may be summarized as those situations in which the student is motivated and undertakes to offer the best of himself, reaching the limit of his abilities.

When intrinsically motivated, people are absorbed in the activity they are performing and are not easily distracted. They take the initiative, and this often persists for a long time (Deci & Ryan, 2002). Steele & Fullagar (2009) indicate this often takes the form of "a total state of absorption." Individuals indicate that they are immersed in the activity being carried out and that, for them, the experiences produce such a degree of enjoyment that they are intrinsically motivated by the task itself, rather than by any external reward. Some authors link student involvement in university activities with their higher performance and persistence, critical thinking, methodological competences, and intra- and inter-personal skills. A number of researchers of university student development indicate that the best predictor of their learning and personal development is the time and energy they pour into educational activities (Astin, 1993; Chickering & Reisser, 1993; Pike, Kuh, & Gonyea, 2003; Pascarella & Terenzini, 1991, 2005; Kuh et al., 2005).

Kuh (2008) shows that the main factors of commitment are high academic challenge, enriching extracurricular experiences, high interaction between students and teachers, active and collaborative learning, and campus provisions to motivate and support them. Along with this idea, Chickering & Gamson (1987) proposed seven principles linked to good practices in university education. These High-Value Educational Experiences (HVEE) determining academic performance include: contact with the teaching staff; cooperation between students; active learning; immediate feedback; high expectations; and respect for various forms of learning. Among factors favoring academic performance, student sense of belonging to a group, clear expectations of what must be done, and reasonably high challenge seem to have the greatest impact.

The NSSE - National Survey of Student Engagement - follows the Kuh et al. (2008) definition of engagement as a base for their engagement research. Annually, this institution publishes The College Student Report, which collects information on hundreds of training organizations and universities about the participation of students in programs and activities that institutions provide for their learning and personal development. Therefore, the results provide a set of good practices that universities can adopt to contribute positively to the development and commitment of their students. A high impact activity involves the student having to deal with an open and poorly structured question or complex problem, that involves asking students, at least (1) to analyze in depth an idea, a question, a problem; (2) to analyze critically knowledge or data of various subjects, sources or perspectives; (3) to develop a new track point,

hypothesis, interpretation, project; and (4) to critically argue (self-evaluating) its foundations, strengths and weaknesses, scope, and indicators.

In the same line, some items of the NSSE<sup>81</sup> indicate how often the students have done the following aspects with a certain frequency: (1) to apply facts, theories or methods to practical problems or new situations; (2) to analyze in depth an idea, experience or line of reasoning by examining its parts; (3) to evaluate a point of view, decision or source of information; (4) to develop a new idea or interpretation from different information; (5) to combine content from different subjects to solve problems; (6) to analyze the strengths and weaknesses of their own points of view on a topic or question; and (7) to learn something that has changed their way of understanding a question or a concept. If we analyze these aspects, we can identify that students who carry out a business plan (BP) must face them and therefore we could consider that their realization could become an educational experience of high commitment and value. Thus, the realization of a BP represents a complex challenge that generates a high level of involvement since the perception of relevance and autonomy raises a sense the BP is their “baby.” At the same time, to know something in depth generates a benefit as it responds to a personal intellectual challenge and that can also mean belonging to a learning community.

Likewise, in a business plan, students must carry out inquiry processes as they will have to reflect on their projects resulting in a knowledge increase of business. According to Brew (2003), involving students in inquiry processes - in research - is a way to improve their learning and to motivate them. After all, what drives the majority of academics is to engage in the excitement of research. Teaching is a way to improve the motivation of students. Finally, a highly challenging academic activity obtains, in terms of learning, (1) a more sophisticated understanding of the contents (Blackmore and Cousin, 2003; Smeby, 2002); (2) greater cognitive flexibility and critical thinking; and (3) metacognition, perception of self-efficacy and intellectual empowerment.

Kuh, et al. (2008) surveyed 6,193 freshmen students in the United States looking for the relationship between academic engagement, success, and trend towards premature abandonment. Its results showed that students’ commitment or engagement was positively related to their results and grades. It also pinpointed that their engagement had a direct relationship with their persistence. That is, a higher engagement correlated negatively with their probability of abandonment and positively with their course success. A different research study with 259 students in Europe (Svanum & Bigatti, 2009) tried to find the relationship between engagement, academic success and the average length of university studies completion. Although the magnitudes of the observed relationships were modest, they followed the expected direction. Thus, the students with the highest level of engagement not only obtained better results, but they were 1.5 times more likely to graduate and required an average of one semester less than those with lower levels of engagement.

To conclude this introduction, the findings underline the predictive nature of engagement in relation to academic success. That is why, in this present research, we were interested in determining whether the realization of a business plan (BP) could be considered a High-Value Educational Experience (HVEE) contributing to students’ engagement, and thus, to their success as students.

## **BUSINESS PLAN AND ENGAGEMENT**

The business plan (BP) is a written document, prepared by an entrepreneur, that describes all the relevant, external and internal elements involved in starting a new company (Hisrich, 2013). It integrates the functional plans of the different departments involved such as marketing, finance, manufacturing, and human resources. The business plan development requires a high level of planification (Gibson, 2005; Boyd et al, 1998; Matthews, 1995) that integrates marketing, production plan and human resources in a coherent way (Krueger and Carsrud, 2000). It also crystallizes dreams and expectations and contributes to the motivation of students to establish businesses.

## **METHODOLOGY TO TEACH THE BUSINESS PLAN**

According to R. Lang and David (2006) it is important methodologically to use a variety of strategies and instructional methods (Kusumaningrum et al., 2016) to teach subjects in class. The development of business plans (BP) contributes to the development of an inherently experiential methodology that promotes entrepreneurial learning among those

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<sup>81</sup> <http://nsse.indiana.edu>

who decide to participate (Hegarty, 2006; Roldan et al., 2005; Russell et al., 2008; Sekula et al., 2009). Some authors (Honig et al., 2005) argue that investigating a first entrepreneurial project of business creation is of great importance for nascent entrepreneurs. The transformation of experience as part of a gradual and recursive process of learning by doing allows especially those “who start with inadequate knowledge or experience” develop new competences (Aldrich and Yang, 2014). Participating in a Business Plan Competition (BPC) generates a high level of entrepreneurial motivation, stimulating the creation of new companies and supporting nascent entrepreneurial behavior (Kwong et al., 2012; Randall and Brawley, 2009; Roldan et al., 2005; Russell et al., 2008; Thomas et al., 2014). Roldan et al. (2005, p. 339) affirmed that “as a learning vehicle for entrepreneurship, Business Plan Competitions are difficult to overcome.” (Kusumaningrum et al., 2016). However, some authors also mention that, from the business learning point of view, the BPCs at the university level bring limited results (Schwartz et al., 2013).

### **EDUCATIONAL COMPETENCES DEVELOPED WITH THE BUSINESS PLAN**

The development of a business plan contributes to the development of entrepreneurship (Gartner & Vesper, 1994; Gorman, & King, 1997; Hills, 1988; Kuratko, 2005) since it generates the combination of knowledge, skills and attitudes necessary to start and manage the new company efficiently (Aouni & Surlemont, 2009; Politis, 2005). Entrepreneurial learning has also been considered a social and collective process of co-participation (Taylor & Thorpe, 2004), through which the context, networks and external interactions of the entrepreneur support the development of new ways of thinking, skills and attitudes (Cope, 2005; Davidsson & Honig, 2003; Gibb, 1997; Pittaway & Cope, 2007; Pittaway & Thorpe, 2012; Rae, 2006). Therefore, business planning, teamwork, leadership, communication, financial research, pitching, networking, marketing, presentation, sales, project management, self-awareness, self-confidence and the propensity to risk are cited as examples of competencies developed through the practical emphasis of the experience of participation in competition (Hegarty, 2006; Jones & Jones, 2011; McGowan & Cooper, 2008; Randall & Brawley, 2009; Roldan et al., 2005; Russell et al., 2008; Sekula et al., 2009). As a consequence, trying to predict students’ engagement using a written BP as a predictive variable needs to take into account the interaction with environment in addition to the hard work emphasized by Kuh, et al. (2008). The NSSE survey incorporates this missing interaction with environment factor.

### **THE BUSINESS PLAN AND HIGH EDUCATIONAL VALUE**

The realization of an activity of HVEE, like a BP, could help students with what Egan (2010) denotes as the danger of superficial knowledge: “Not knowing anything with a significant depth also implies, that the one who has never suffered it, is developing a clear ability to understand.” The problem here is not that a well-equipped person with a broad range of superficial knowledge cannot lead a perfectly happy life, but rather that a specifically human pleasure is denied. This pleasure comes from particular wisdom accessible only to those who recognize the nature of their own knowledge. Once someone knows a little in depth, the developed understanding extends over other endeavors in business without any in-depth knowledge: understanding does not extend to just about anything else. At the same time, according to Brew (2017), a business plan also allows future professionals to be prepared. For students, who are future professionals, it develops the ability to investigate problems, makes them take judgments on solid evidence, allows them to make decisions based on rational arguments, and helps them understand what they are doing and why. Research and inquiry are not just for those who pursue an academic career, but it is central to professional life in the 21st century.

### **ADVANTAGES OF DEVELOPING A BUSINESS PLAN**

The nascent entrepreneur, potentially lacking experience and practical understanding of what the entrepreneurial effort could imply in a practical and procedural sense (Karatas-Ozkan and Chell, 2010), can be a “practically blank list” (Aldrich and Yang, 2014). The progression of nascent entrepreneurs and their businesses depends on entrepreneurial learning (Honig et al., 2005; Sullivan, 2000) that can be acquired through the development of a BP. In addition, and according to Rangkuti (2003), the development of a BP contributes to keeping the future entrepreneurship on the right track (Kusumaningrum et al., 2016). By extension, nascent entrepreneurship and its associated activity and effort are based on nascent entrepreneurs developing their ventures from conception to gestation. This progress is gradual and iterative, with business learning crucial for the emergence of a successful company and the operationalization of it (Aldrich and Yang, 2014; Davidsson and Honig, 2003; Deakins and Freel, 2003; Dimov, 2010; Fayolle and Gailly, 2008; Karatas-Ozkan and Chell, 2010). Likewise, entrepreneurial learning serves as a vital response mechanism for the rapid change that characterizes the development of new companies (Fayolle and Gailly, 2008). Entrepreneurial

education can "fill the gap" for those who lack experience (Blundel and Lockett, 2011). Consequently, it has been suggested that the nascent entrepreneur participates in entrepreneurial education as a key activity (Davidson and Honig, 2003; Rae, 2004). Therefore, the development of the business plan is a significant activity as a form of business education and positions itself as a key methodology for the development of entrepreneurship (Kusumaningrum et al., 2016).

## METHODS

The study herein is a quantitative survey using the same structure as the National Survey of Student Engagement (NSSE) project, which has managed to design a generalized assessment tool called the College Student Report to compare higher education institutions, detect differences and find good practices. NSSE does not evaluate the student's learning directly, but the results of the survey point to areas where universities are working well and those that could be improved. We reasoned that using a trusted and accepted methodology would enhance the integrity of the research. The main difference is the purpose of the application of the methodology. In our case, the survey is applied to check if the students who have used the business plan in the subjects studied in their business curriculum increase the level of engagement in comparison with students who have not done so. By using the NSSE survey, we assume that the High-Value Educational Experiences (HVEE) the survey is looking for, is directly linked to student engagement.

To be able to do this assessment, we proposed to pass and complete the scientifically validated NSSE questionnaire<sup>82</sup> to experimental and control groups from different universities in order to assess the level of engagement along with the advantages and disadvantages of developing a business plan in similar academic trainings. The methodology used is structured in an experimental study carried out from a pilot test in two universities passing a validated questionnaire to experimental and control groups, as has been done in other previous research or empirical studies to test if the adoption of innovative teaching methods improves the academic performance of students (Garcia & Montagud, 2011). The experimental group from the different universities were represented by students who have studied subjects that include in their work plan the development of a business plan, while the control group will be represented by students who have not studied subjects that include in the work plan the development of a business plan. The questionnaire included 41 questions and was expected to be answered within 30 minutes. Questions focus on the 10 typologies mentioned by Gaspersz, (2005) and Borg and Gall (2003).

## RESEARCH CONTEXT AND PARTICIPANTS

The validated questionnaire was given to a control group and to an experimental group of Business faculties from Lock Haven University (LHU) from Dec. 11<sup>th</sup>, 2017 till Dec 15<sup>th</sup>, 2017. LHU students were all Junior and Senior year business majors from the Business and Computer Science Department. However, the Experimental group was composed of students enrolled in Entrepreneurship (MANG317) and International Business (MANG425) during the Fall 2017 semester, while the Control group included junior and senior business majors who had not yet attended the target courses. The student code in the questionnaire allowed us to distinguish between those belonging to the experimental group and those who belong to the control group.

## DATA COLLECTION

As per the time when to pass the questionnaire, the idea was that students complete the questionnaire at the end of their semester. It must be kept in mind that the research project needed approval from the Lock Haven University of Pennsylvania Institutional Review Board (LHUP-IRB) and that all researchers needed to supply their National Institutes of Health (NIH) Office of Extramural Research certificate of successful completion of the NIH Web-based training course, "Protecting Human Research Participants." On the other hand, at LHU students might have completed a BP in International Business (MANG425) or Entrepreneurship (MANG317). Some students may have done both. Also, as Freshmen or Sophomores, all students have taken Introduction to Marketing (MRKT200), a course that includes a final work that is close to being considered a BP. To do the study, students are divided into two groups: group A (control group) and group B (experimental group). The process of assigning each student to the group has been differentiating those who have done a BP and those who have not done it through the different subjects studied in their specific degree track, suitable for this type of exploratory analysis. Each group is then given the same

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<sup>82</sup> [http://nsse.indiana.edu/html/survey\\_instruments.cfm](http://nsse.indiana.edu/html/survey_instruments.cfm)



questionnaire in English through a link to Google Forms. The process to choose the subjects has been discretionary depending on whether they completed classes that included a BP.

## DATA ANALYSIS

Statistical methodology was used to get (1) tables of frequency and of percentages of the qualitative variables obtained and (2) the significant differences in the responses of the two groups (control and experimental) through contingency tables and the Chi-square test. This methodology follows previous research methodologies (Garcia & Montagud, 2011). In particular, the statistical process enables (1) a table of frequency and percentages, for the qualitative variables origin and sex to evaluate the number of students who have taken part; and (2) a check if there are significant differences in the responses of the two groups. To verify if there are significant differences in the responses of the two subgroups, contingency tables and the Chi-square test (p-square) are used to evaluate the relationship between the group variable and the question, with a confidence of 95% (or level of significance p-square of the 0.05). The contrast test hypothesis of the Chi-square checks if:

- $H_0$ : There are no significant differences in the answers that have been made depending on the group to which the students belong (control or experimental).
- $H_1$ : There are significant differences in the answers that have been made depending on the group to which the students belong (control or experimental).

If the p-value exceeds 0.05, the  $H_0$  is accepted with 95% confidence. If the p-value is less than 0.05, the  $H_0$  is rejected, so alternative  $H_1$  is accepted.

## FINDINGS

Findings are shown in tables, splitting between those of the control group from the experimental group (Table 1). Pearson chi-square is calculated using the SPSS software package (Table 2).

**Table 1. Example of a question results (question 6 a)**

		6 b. Student prepared two or more drafts of a paper or assignment before turning it in				Total
		1.0	2.0	3.0	4.0	
Control group	Count	17			13	30
	% of the group	56,7%	0,0%	0,0%	43,3%	100,0%
Experimental group	Count	17			13	30
	% of the group	56,7%	0,0%	0,0%	43,3%	100,0%
Total	Count	17			13	30
	% of the group	56,7%	0,0%	0,0%	43,3%	100,0%

**Table 2. Question 6a Pearson Chi-square test results**

	Value	gl	Asymptotic meaning
Pearson Chi-square	10.083	3	0.018
Reason of verisimilitude	13.554	3	0.004

Frequency tables indicate that all students who have taken part in the study number 58, of which 28 students correspond to the experimental group and 30 to the control group, that is, 48% of students have done a BP and 52% have not completed a BP in their coursework.

## TABLES OF FREQUENCY

Using the above-mentioned methodology, the significant differences between the control group and the experimental group are as follows:

### Group of questions 6:

Drafts are prepared before delivering a job:  $p\text{-value} = 0.018$ . For the control group, 30% of the cases do not prepare drafts before delivering a work while for the experimental group in 32% of the cases drafts are prepared very frequently and, most interestingly, none of the students responded that they ever prepared drafts. That is, experimental group students always prepared drafts.

Work is done with other students:  $p\text{-value} = 0.009$ . 40% of the control group students very frequently work with other students while this is 79% for the experimental group. It is interesting to note that neither the control group students nor the experimental ones mentioned that they ever worked with other students.

A topic is analyzed identifying its strengths and weaknesses:  $p\text{-value} = 0.032$ . In the control group, in 90% of the cases, students often or very often examined the strengths and weaknesses of the topics while this was done frequently or very frequently only in 57% of the cases within the experimental group. In fact, the control group students said that they have always done this analysis somehow (0% said that they never did the analysis). On the contrary, 10% of the experimental group students said they never performed this analysis.

### Group of questions 8:

The teachers clearly explain the objectives:  $p\text{-value} = 0.027$ . For 87% of the control group students, professors clearly explain the objectives of the course. This compares to 54% for the experimental one.

Professors explain the topics in an organized way:  $p\text{-value} = 0.007$ . In both cases 43% of students say professor do so. However, 40% of the control group students mentioned that the organization was very good while only 7% of the experimental group said so.

### Group of questions 10:

The work required in the subjects is significantly different between the two groups. For the control group, in 73% of the cases, the delivered works did not require writing more than 11 pages while this was true for only 21% for the experimental group ( $p\text{-value} = 0.001$ ). 50% of the deliveries of the control group were up to 5 pages ( $p\text{-value} = 0.004$ ). Thus, the control group required shorter deliveries than the experimental group.

### Question 11 a:

Students often talk with people from different races or ethnic groups. Of the control group, 43% talked frequently and 43% very frequently with other races or ethnic groups. On the other hand, is the experimental group, 57% talked very often with other ethnic groups or races ( $p\text{-value} = 0.000$ ) and 0% often. there is a certain polarity of the results between those who talk very often 57% (0% just often) and those low frequently (39%).

### Group of questions 13:

Students have decided to participate in study abroad programs: ( $p\text{-value} = 0.001$ ). The control group students have not decided or not surely decided to participate in them in 80% of the cases while the experimental group students have not participated in them in 68% of the cases.

During the university courses, students are asked to carry out community-based projects, not just with their own faculty: ( $p\text{-value} = 0.029$ ). The control group students did not do so in 96% of the cases. On the contrary, the experimental group completed them in 25% of the cases.

### Group questions 16:

Students participate simultaneously in curricular activities: ( $p\text{-value} = 0.035$ ). The control group significantly participates in fewer activities such as sports or student associations than the experimental group. 32.5% of the experimental group participated in more than 16 activities in a typical 7-day week, while this is reduced to only 10 activities for the control group (39%).

Students take care of their personal relationships, socialization, with more relaxed, less competitive environments: ( $p\text{-value} = 0.049$ ). 14% of the experimental group students do socialize a lot (26-30 times a week) for 0% of the control group students. However, it seems there is a polarization of behavior within the experimental group (32% take care

of their relationships 1-5 times during a typical 7-day week) while 77% of the control group students do so between 6 to 20 times a week.

**Question 19:** Students class level. 71% of students in the experimental group are Seniors while only 27% of control group students are Seniors: (p-value = 0.000).

**Question 28:** 77% of students in the control group are men while in the experimental group 70% are women: (p-value = 0.001).

### FINDINGS BUSINESS PLAN AND HIGH EDUCATIONAL EXPERIENCE

Taking the survey as a whole, in 13 of the 41 questions there is some significant relationship, that is, in 32% (p-value is less than 0.05). In the others, there is no significant relationship. Another aspect that needs to be reviewed carefully is the sense of the relationship. A positive relationship will directly link writing of a BP and student's High-Value Educational Experience (HVEE), while a negative relationship would mean that writing a BP is not to be considered an HVEE. Starting with question 6m, it did not show positive relationship. It seems that the experimental group is less prone to analyze strengths and weaknesses than the control group. This is somehow unexpected as a BP requires this analysis. In the same line, the answers to question 11a are not positive. It seems the experimental group is not demanding as much to talk to other ethnic groups. Concerning the questions with significant differences that do not have a clear relationship with HVEE, questions 8, related to how clearly professors explain the course and how organized the course is, have been discarded as relating the BP and HVEE. In fact, they would link the professor and the HVEE. In the same line, questions 19 and 20 (Class level and students declared sex) are not to be related to HVEE. Overall, out of 13 questions with significant differences in results between the experimental group and the control one, 2 have a negative relationship and 4 are not relevant (Table 3).

**Table 3. Business Plan realisation vs HVEE**

	High-Value Educational Experience		
	More	Less	Not relevant
Question 6 b	X		
Question 6 h	X		
Question 6 m		X	
Question 8 a			X
Question 8 b			X
Questions 10	X		
Question 11 a		X	
Question 13 d	X		
Question 13 g	X		
Question 16 b	X		
Question 16 f	X		
Question 19			X
Question 28			X

If we have a look at the significantly different answers between the groups looking for questions directly linked to engagement, we can see that 8 out of 13 of the questions are linked to it. Those who are not either instrumental, such as questions about the class level or their declared sex, or purely course-related ones, such as the perception of how structured the classes are, how the professor explains, or the number of drafts they need to prepare before delivery (Table 4).

**Table 4. HVEE links to engagement**

	HVEE vs Engagement?	
	Yes	No
Question 6 b		X
Question 6 h	X	
Question 6 m	X	
Question 8 a		X
Question 8 b		X
Questions 10	X	
Question 11 a	X	
Question 13 d	X	
Question 13 g	X	
Question 16 b	X	
Question 16 f	X	
Question 19		X
Question 28		X

Among the unexpected, non-significant answers, we could put upfront:

- The BP does not seem to help students apply theories and methods to practical problems (group questions 7). The Pearson Chi-square is 0.057, so non-significative.
- A BP plan does not seem to increase the frequency of using numerical information to take decisions (Group questions 9). The Pearson chi-square is 0.051.
- Among the questions 11, though talking with other races or ethnicities has a significant meaning, talking to different religions, social classes, or with people having different points of view, have insignificant answers.
- For the group questions 12 about revising class documentation or student motivation, the answers are not significant.
- Within the group questions 13, which assess the interaction and leadership within the community, it is interesting to note the non-significative answers around the leadership or organizations or having internships.
- This is also found in the group questions 14, assessing student interaction with different people. There are no significant answers.
- Also, the group questions 15 that look for the interest from the institution that students help in different on-campus and off-campus activities, none of the questions showed significant differences between the two groups.
- A BP does not seem to increase the knowledge, skills, personal development, or likelihood of finding a job (group questions 17).
- The literature predicted a link between HVEE and academic success. Question 23 is trying to measure this aspect. However, the correlation between writing a BP and having higher grades is not significant.

## DISCUSSION

Looking at these findings, the first aspect to look at is the choice of the definition of engagement. It seems that adding the interaction with the environment is important as some of the significant answers are just related to this interaction: Questions like working with other students (question 6h), talking with people from other races or ethnicities (question 11a), participating in foreign studies (question 13d), participating in community-based projects (question 13g), or taking care of relationships (questions 16f) show that aspect. Comparing the findings to the literature, we can start with the seven principles that linked to good practices in university education proposed by Chickering & Gamson (1987). Results show that 32% of the LHU students having developed a BP in at least a course of the Faculty of Business, increase their motivation to offer the best of themselves by pushing their capabilities to the limit by favoring performance, persistence, critical thinking, methodological competences, and intra and interpersonal skills. Also, it seems that writing a BP means carrying out inquiry processes that can lead to conjectures or tests as described by Brew (2003).

Concerning the negative relationship between HVEE and whether the professor explains the topic clearly and having a well-structured course (questions 8), we shall remember that the NSSE indicates that HVEE means students have to deal with open and poorly structured questions or complex problems. It might be considered normal that students feel unease when confronted with problems without “the right answer” and related to specific market segments where the professor does not specialize. In that case, faculty is more looking for a logic in the reasoning than a specific figure. This might be different for students in courses where topics are clearly fixed, and results of students’ work fall into standardized answers. One aspect that could lead to question 11a not having a positive relationship between writing

a BP and HVEE is the fact that students are asked to constitute groups to write their BP. If these groups are not set at random, students might tend to set the group with friends, thus limiting their interaction with other ethnicities. However, there are a significant number of questions that have not validated the link between writing a BP and HVEE and HVEE with engagement. This goes against some authors' assumptions (Egan, 2010). If we accept the finding of Kuh (2008) that extracurricular activities are a predictor of engagement/commitment, the corresponding question to measure that is question group 16. While participating in curricular activities (question 16b) and taking care of personal relations (question 16f) are both significative, the others are not.

### **LIMITATIONS OF THIS RESEARCH**

It is important to note that this research has some limitations. The first one is that the experimental group is composed by a majority of senior students (71%) compared to the control group (only 27%). Therefore, since control group students are most probably younger, a doubt can be raised about them being as integrated or engaged in the community. Also, the control group students are mostly men (77%), while the experimental group is mostly composed by women (70%). Maybe this could have had some influence. However, the impact is not assessable with the available data. Considering that the applied methodology is just Pearson Chi-square, incorporating other types of analysis such as Structural Equation Modeling (SEM) could increase the power of this research. Last but not least, the number of respondents is relatively low. That means that enlarging the number the students, either in the same university or even better, incorporating other universities not only from Pennsylvania or the US, could provide a better understanding and validity to the findings.

### **CONCLUSION: IMPLICATIONS OF BUSINESS PLANS IN THE BUSINESS STUDENTS ENGAGEMENT**

This objective of this article has been to open the discussion linking the writing of a Business Plan (BP) within a university course with improved student engagement. For that the validated NSSE survey has been used. Lock Haven University Business Juniors and Seniors have been asked to take the survey. The survey tried to validate the link of High-value Educational Experiences (HVEE) and engagement, using a definition of engagement that includes the dimension of the interaction with the environment. Half of the students taking the survey have been asked to write a BP and constituted the experimental group. Our findings seem to confirm that the relationship does exist despite the fact that not all questions had a significative link. Also, among the questions with significative response, some relationships were positive (in the same sense) while others had contrary signs. One consequence of this research for the universities is that a BP can be considered a HVEE that helps students understand the complexity of taking a decision without having the whole set of necessary information. This activity seems to be accompanied with increasing interaction with the environment, as this relationship increases the perception of course value. However, students, when writing a BP, tend to be very conservative and limit their interaction with other kinds of people. However, this contradicts the above mentioned finding that a BP is linked to an increase of students' interaction with the environment. So further research needs to be implemented to understand how this interaction needs to be implemented to ensure its high value.

Another consequence is that professors requiring their students to write a BP seemed to be perceived negatively in regard to the course structure and them explaining the course clearly. This could be explained by the fact that the course output is not a standardized project. Instead, each project is different, might touch market segments outside of the professor specialization, and leaves students knowing more about the project and market segment than the professor. However, this explanation might also be influenced by having a weak professor teaching these courses. Thus, it would be wise to reproduce such study in other environment to check if the professor, as the one who sets the course structure and explains it, continues to have a negative impact on student engagement. These mixed findings open the door to new research, especially trying to understand the reasons for the unclear results. There might be some variables that could be explained by others. So, a Structural Equation Modeling (SEM) could help determine the independent and the dependent variables. Using this methodology, we could expect to examine the processes by which the university should structure the courses that include a BP.

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# **STUDENTS' GRADE EXPECTATIONS IN PRINCIPLES OF ECONOMICS COURSES: HOW DO THEY VARY THROUGHOUT THE SEMESTER AND WHAT'S THE IMPACT OF FEEDBACK?**

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## **ABSTRACT**

Students often have wildly unrealistic grade expectations. Using a sample of students taking classes from eight professors across five universities, we examine students' expectations for grades in principles of economics courses. By assessing expectations at the beginning, middle and end of the semester, we evaluate how grade expectations change throughout the semester. We find that the average GPA expected initially was a 3.6, but grade expectations decreased throughout the semester. We also find that male students overestimated their final grades more than female students.

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## **INTRODUCTION AND BACKGROUND**

Students often form unrealistic expectations concerning final course grades they receive in their college courses. Svanum and Bigatti (2006) found that 95.5 percent of students enrolled in their abnormal psychology classes expected to receive a B or better. The student's average anticipated course GPA was a 3.6 (on a 4.0 scale). Upon assignment of final course grades, 70 percent of students had overestimated the grade they would actually earn.

Unrealistic grade expectations may yield severe consequences. Most notably, grade expectations and course evaluations have been shown to be highly correlated (see Feldman 1976, Marsh 1980, Marsh 1987, Millea and Grimes 2002, Johnson 2003, Isely and Singh 2005, McPherson 2006, Heckert et al. 2006, and Nowell, 2007). Because the teaching effectiveness of many professors, particularly untenured ones, is partially measured by student evaluations, grade expectations can play a significant role in the promotion, retention, and tenure of faculty members.

In this study, we contribute to the literature by assessing students' grade expectations in principles of economics courses. More specifically, we survey students at the beginning of the semester, midway through the semester, and a week before the end of the semester to have them estimate their final course grade. Students taking principles-level economics courses from eight professors at five different universities were asked about their grade expectations at three different points of the semester.

With our data, we provide further insight into three primary research questions. First, how accurate are students' pre-course grade expectations compared to the final course grades received upon completion of the course? Second, do students adjust their expectations as they gain information throughout progression of the course? (Theory predicts students' grade expectations should become more accurate as they receive graded feedback throughout the course.) Finally, do other factors such as gender, institution, or number of hours per week the student expected to study at the beginning of the course influence the accuracy of students' grade expectations?

## **BACKGROUND LITERATURE ON GRADE EXPECTATIONS**

The focus of much of the expectations literature has been an attempt to connect students' grade expectations, actual grades, and the student's evaluations of their instructors (see Feldman 1976, Marsh 1980, Marsh 1987, Millea and Grimes 2002, Johnson 2003, Isely and Singh 2005, McPherson 2006, Heckert et al. 2006, and Nowell, 2007). The consensus is that expectations matter. Large, negative deviations from expected grades are strongly correlated with poor teaching evaluations. While unrealistic student expectations of grades can hurt faculty members in the form of bad teaching evaluations there are adverse effects for students to consider as well. Many principle students take a principles of microeconomics course as a requirement to graduate. Moreover, many business schools and degree

programs require a specific (non-failing) grade in order to pass the class and count towards graduation (for example, students may be required to earn a C- or better for the course to count towards their major). For students who choose to wait until the last semester before graduation to take such a course, forming unrealistic grade expectations could result in choices that prevent them from graduating on time.

Ewing (2012) measured the influence of students' relative expected grade on students' evaluations of teachers. Using information from the University of Washington's Office of Educational Assessment, Ewing found the coefficient associated with the relative expected grade variable was positive and significant. In other words, an increase in each student's expected relative grade lead to an increase in the professor's course evaluation score. Ewing also notes that, because professors likely know that expectations influence evaluations, professors have an incentive to grade less strictly, resulting in grade inflation as an effort to improve their evaluation scores.

Moving beyond the single-institution connection between grade expectations and evaluations, McCann et al. (2013) examined student grade expectations across types of institutions. The authors focused on three types of institutions: technical, community, and 4-year colleges/universities. They found that technical and community college students had higher expectations for final grades than students at 4-year universities. The authors also examined grade expectations within 4-year universities. They found students in lower level courses expected higher grades than those enrolled in upper level courses and females expected higher grades compared to their male counterparts.

Guillaume and Khachikian (2011) found that engineering students' expectations are overly optimistic, regardless of their GPA. The authors also found that the time and effort students exert is reliant on grades earned throughout the year. 'A' students exerted fairly consistent work throughout the semester; 'B' students ramped up effort toward the end of the semester; and 'C or worse' students contributed less effort after receiving poor grades on early assignments.

Matos-diaz (2012) used student course evaluation data from the University of Puerto Rico-Bayamon to analyze students' development of expected grades and the likelihood of students retaking a professor for future courses. The author reported three major findings. First, as hypothesized, a student's GPA is an important determinant in forming expected grades. Second, knowledge students acquire about the instructor's previous grading pattern does impact their expected grades. Finally, when students become more optimistic about their relative expected grade they are more likely to take that professor for future classes. Matos-diaz discussed higher enrollment in classes and improved evaluation scores as potential outcomes emerging from this last result.

Svanum and Aigner (2011) explore the standardized pathways and relationships between students' goals, cumulative GPA, grade expectations, course effort, course grades, and course satisfaction. They find that expectations are positively influenced by external and internal goal orientation and cumulative GPA. Grade expectations are then positively associated with course effort, course grades, and (indirectly via course grades) course satisfaction.

Snyder and Chair (1976) explore the rationale behind the grade-evaluation connection. Using a controlled experiment, the authors found that students who received higher grades gave themselves the most credit for their success, while students earning lower grades were more likely to blame the instructor.

## **SURVEY AND ECONOMETRIC MODEL**

This study includes grade expectations survey results from six hundred thirty-four students in principles of economics courses across five universities (Susquehanna University, Benedictine College, East Tennessee State University, University of Wisconsin La Crosse, and Colorado School of Mines).<sup>83</sup> Students took the survey at three points in time during the spring semester of 2014: the beginning of the course, the midpoint of the course, and just before the course concluded. The surveys were straightforward and concise, taking students only a couple of minutes to complete. The survey asked students "What grade do you expect you'll receive in this class?" Additional survey questions included asking students the number of hours they expected to spend studying for the course (in the beginning survey) along with whether the course was required for their major. Other variables included are the student's gender, the student's mid-term course grade and the student's final course grade. For grades, we used the GPA scale (A = 4.0, A- = 3.667,

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<sup>83</sup> This research was approved by the Susquehanna University Institutional Review Board (IRB). The survey used for the data collection is provided in the Appendix.

A/B = 3.5, B+ = 3.333, B = 3.0, etc.)<sup>84</sup> to quantitatively analyze the grade expectations relative to actual grades received in the class.

Consider an OLS regression examining students' grade expectations at the beginning of the semester, as shown in equation 1:

$$(1) \text{ expected grade}_i = \beta_0 + \beta_1 H_i + \beta_2 F_i + \sum_{j=1}^4 \theta_j U_{i,j} + \varepsilon_i.$$

$H_i$  indicates the hours the student planned on studying at the beginning of the course;  $F_i$  is equal to one if the student is a female;  $U_i^j$  are dummy variables for the four universities at which the experiments were conducted (with SU excluded as a reference university); and  $\beta$  and  $\theta$  are the parameters to be estimated.

We also used OLS regressions to explore which factors influence the gap between students expected grade at the end of the course and their final course grade, as shown by equation 2:

$$(2) \text{ Gap between grade and expected end grade}_i = \beta_0 + \beta_1 H_i + \beta_2 EX_i + \beta_3 MTG_i + \beta_4 F_i + \sum_{j=1}^4 \theta_j U_{i,j} + \varepsilon_i.$$

$H_i$  indicates the hours the student planned on studying at the beginning of the course;  $EX_i$  is the student's initial grade expectations at the beginning of the semester;  $MTG_i$  is the gap between the student's midterm grade and their expected grade at the middle of the course;  $F_i$  is equal to one if the student is a female;  $U_i^j$  are dummy variables for the four universities at which the experiments were conducted (with SU excluded as a reference university); and  $\beta$  and  $\theta$  are the parameters to be estimated.

We then estimated a model examining how students' grade expectations changed over the course. Our dependent variable for equation 3 is the difference between students' expected grades at the beginning of the course and students' expected grades at the end of the course.

$$(3) \text{ Change in grade expectations}_i = \beta_0 + \beta_1 H_i + \beta_2 EX_i + \beta_3 MTG_i + \beta_4 F_i + \sum_{j=1}^4 \theta_j U_{i,j} + \varepsilon_i.$$

All the right-hand side variables are as previously defined in Equation (2).

Previous research revealed (e.g. Svanum and Bigatti, 2006) that most students overestimate their expected grades. Consequently, we examine the factors that impacted the probability a student overestimated their grade. We estimated a probit model as shown in the following equation:

$$(3) \text{ Prob (Overestimated}_{i=1}) = f(\beta_0 + \beta_1 H_i + \beta_2 EX_i + \beta_3 MTG_i + \beta_4 F_i + \sum_{j=1}^4 \theta_j U_{i,j} + \varepsilon_i).$$

In (4), *overestimated* equals one if a student's expected grade at the beginning of the semester was higher than the final grade they received and a zero otherwise. All the right-hand side variables are as previously defined in Equation (2).

## RESULTS

Descriptive statistics are presented in Table 1. At the beginning of the semester, the mean grade expected by students was close to an A-. (GPA=3.59, where 3.67 is an A-.) The mean expectations did drop as the semester progressed, with students' mean expectations slightly above a B+ at midterms (3.37, where 3.33 is a B+) and 3.2 at the end of the semester. There is significant variation in expectations and changes in expectations across universities. For example, students' expectations at Susquehanna University and the University of Wisconsin La Crosse were persistently high throughout the semester. These results contrast dramatically with students at Benedictine University and East Tennessee State University, who had expectations that were dramatically lower by the end of the course.

<sup>84</sup> <sup>84</sup> Different universities in our data collection used different grading scales. Most used a system that contained A, A-, B+, B, B-, etc. One university used an A, A/B, B, B/C, etc. scale.

Table 2 presents the results of the OLS regression examining the students' expectations at the beginning of the semester. Neither gender nor hours studied has a statistically significant impact on initial grade expectations. There are differences across universities, however. Table 3 reports the results of the OLS regressions that examine the gap between the grade students expected to receive at the end of the course and their final course grade. Four items are of note. First, females had more realistic expectations than males. The gap between females' expected grades and final course grades was significantly smaller than that for men.

Second, there are dramatic differences across universities. Students at East Tennessee State University had a larger difference between expected and actual final grades than students at Susquehanna University, while students at the Colorado School of Mines and the University of Wisconsin La Crosse had a smaller difference between expected and actual final grades.

Third, we examine the impact of the gap between a student's actual midterm grade and the grade they expected to receive at midterms.<sup>85</sup> Theory is not clear whether a student who overestimates their grade at the middle of the course would be more likely to overestimate their grade at the end of the course. On one hand, students overestimating their grade at midterms might also be more likely to overestimate their grade at the end of the course. However, students who overestimate their midterm receive feedback that their expectations are too high. The coefficient of 0.28 signifies that if a student expects a grade at the middle of the course that is a full letter grade lower than their midterm grade (e.g., the student expected a B+ and received a C+), they will overestimate their final grade by about a third of a letter grade.

Finally, higher grade expectations at the beginning of the course reduced the gap between final expected grades and final grades received in the course, although this coefficient is only statistically significant in one of the two models. Given the overall high expectations of our sample, this provides some evidence that those with more unrealistic expectations aren't those who expect the highest grades (A or A-), but rather are those C or D students who initially expected to earn a B or B+. To further examine the overestimation of final grades based on initial expectations, we chart in Figure 1 the final grade earned for those who expected an A- or A for a final grade and we chart the final grade earned for those who expended a final grade below an A-. Over 50% of students who expected an A or an A- earned a B+ or better; 75% earned a B or better. For those who initially said they expected lower than an A-, only about 55% earned a B or better, with a much higher percentage earning a D or F.

Table 4 presents results from OLS regressions where the dependent variable is the change in students' grade expectations from the beginning of the semester to the end of the semester. We find that females adjust their grade expectation downward more than males throughout the semester and that those who expect higher grades initially adjust their expectations more throughout the semester. We also find that significant differences exist across universities. Furthermore, we find that the gap between what a student received for a midterm grade and their expected grade at the beginning of the semester had a positive and statistically significant effect on how much students' expectations adjusted throughout the semester. This indicates that students whose expectations were off in the middle of the semester adjusted their expectations more than students whose expectations were more accurate. Similar to the unconditional results, we find differences across universities. This should make sense, as these dummy variables contain information on the professors and the student body, and previous research has shown these can influence expectations (Chonko et al. 2002, Acchiardo and Mateer 2015).

Table 5 presents the results from the probit model. Students who initially had higher grade expectations were more likely to overestimate the final grade they received. We find no statistically significant difference in the probability a student overestimated their grade based on gender or the hours spent studying. Once again, however, there were differences in students across universities. The difference across universities is driven by the fact that while little difference was noticed in grade expectations at the beginning of the semester across universities, final grades varied considerably.

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<sup>85</sup> Students received official midterm grades from some of the universities. Students received the actual letter grade they were earning to that point in the course.

## CONCLUSION AND DISCUSSION

This study contributes to the literature in several important ways. First, consistent with results from previous research, this study provides evidence that students wildly overestimate their course grades (e.g., see Svanum and Bigatti 2006). However, this is the first study to our knowledge to examine how students' grade expectations change throughout a course and vary across multiple universities. We examine the changes in expectations by surveying students at the beginning, middle, and just before the end of the course. We found that grade expectations did adjust: as expected, grade expectations fell as the semester progressed and feedback in the form of midterm grades influenced expectations. The farther the student's midterm grade was from her initial expected grade, the more the student adjusted their expectations. That said, students with greater overestimates of their grade at the middle of the semester still had greater overestimates of their grade at the end of the course.

We found no evidence to suggest that the propensity to overestimate course grades differed by gender. Our results provide evidence that men and women were equally likely to expect a grade that was higher than the one they actually received. However, for those who did overestimate their grade, we found that male students overestimated their grades by more than female students.

Finally, by utilizing a research design that employs professors across multiple universities, we ensure that the results are not specific to the peculiarities of any one professor or the student body of a particular institution. Our multi-university approach was crucial because we found significantly different results across institutions. Using results from only one university or professor could result in vastly different findings that are not robust to a variety of educational environments. When possible, we advise other pedagogical researchers to follow the same format.

There is future research that could be done in this area. First, while our sample did contain several universities, it notably lacked top research universities or community colleges in the samples. It is possible those students' grade expectations would be different, and future research to assess such differences would be useful. We were also unable to collect GPA information on our students. It is possible that a student's GPA could be correlated with their expected grade or the inaccuracy of their grade expectations.

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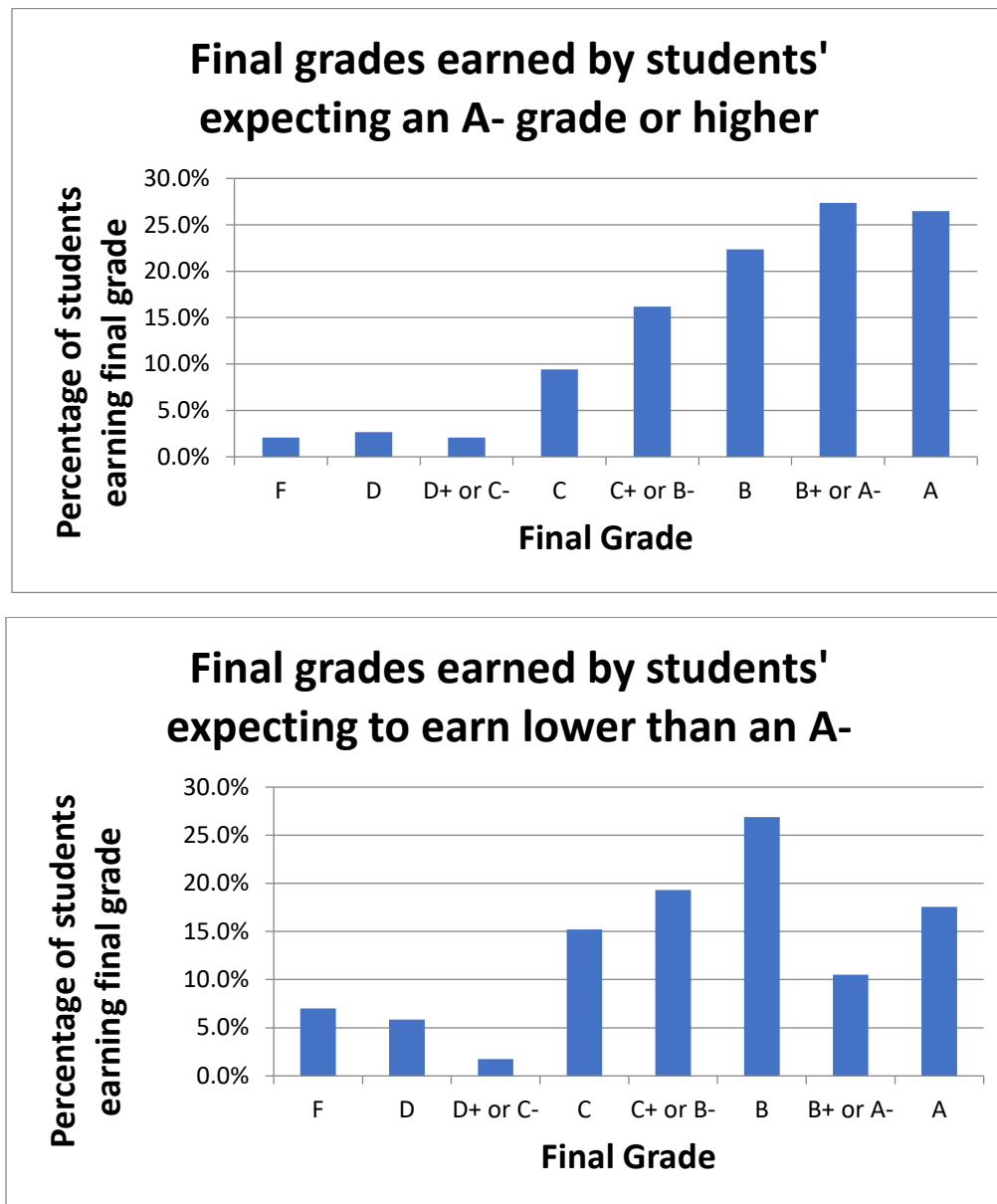
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**Figure 1:** Final grades earned by those who expected an A- or better at the beginning of the semester and those who expected lower than an A- at the beginning of the semester.



**Table 1:** Univariate Statistics

Variable	Overall N=634	Susq N=200	Bend N=37	ETSU N=81	UW-LC N=41	Colo Mines N=275
Expected Grade: Beginning of Course	3.59	3.40	3.47	3.69	3.54	3.73
Expected Grade: Middle of Course	3.37	3.53	3.33	3.30	3.45	3.26
Expected Grade: End of Course	3.20	3.33	2.11	2.90	3.49	3.17
Actual Course Midterm Grade	2.70	2.82	2.56	2.36	2.94	NA
Actual Course Final Grade	2.87	2.85	2.34	2.21	3.44	3.03
Percent of students that overestimated their final grade	0.69	0.62	0.84	0.79	0.41	0.73
Hours the student expected to study at beginning of course	4.74	5.34	5.19	4.27	5.70	4.24
Hours studying at end of course	4.21	4.93	3.19	4.27	3.73	3.89
Female	0.37	0.38	0.49	0.38	0.39	0.35

**Table 2:** OLS regression. Dependent variable: Students grade expectations at the beginning of the semester.

	<b>Model 1 (N=624)</b>
Intercept	3.44*** (0.07)
Female	-0.04 (0.04)
Hours student planned to study at the beginning of the semester	0.00 (0.01)
Dummy variable =1 if student from Benedictine	0.06 (0.10)
Dummy variable =1 if student from ETSU	0.28*** (0.07)
Dummy variable =1 if student from UWLC	-0.13 (0.09)
Dummy variable =1 if student from CSM	0.32*** (0.05)

\* Statistically significant at 0.1 level  
 \*\* Statistically significant at 0.05 level  
 \*\*\* Statistically significant at 0.01 level

**Table 3:** OLS regression. Dependent variable: Gap between student's expectations for grades at the end of the course and final course grade.

	<b>Model 1 (N=624)</b>	<b>Model 1a (N=624)</b>	<b>Model 2<sup>+</sup> (N=349)</b>	<b>Model 2a (N=349)</b>
Intercept	0.48*** (0.08)	0.72*** (0.18)	0.38*** (0.09)	1.20*** (0.21)
Female	-0.13** (0.05)	-0.14** (0.05)	-0.24** (0.07)	-0.26** (0.07)
Hours student planned to study at the beginning of the semester	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)
Expected grade at beginning of semester		-0.07 (0.05)		-0.24*** (0.06)
Gap between grade student expected at the beginning of the semester and midterm grade			0.28*** (0.03)	0.30*** (0.03)
Dummy variable =1 if student from Benedictine	0.01 (0.11)	0.02 (0.11)	0.07 (0.11)	-0.06 (0.11)
Dummy variable =1 if student from ETSU	0.22*** (0.08)	0.25*** (0.09)	0.01 (0.02)	0.07 (0.09)
Dummy variable =1 if student from UWLC	-0.42*** (0.11)	-0.42*** (0.11)	-0.43*** (0.04)	-0.40*** (0.11)
Dummy variable =1 if student from CSM	-0.33*** (0.06)	-0.31*** (0.06)		

- + Sample size differs because CSM did not give midterm grades  
 \* Statistically significant at 0.1 level  
 \*\* Statistically significant at 0.05 level  
 \*\*\* Statistically significant at 0.01 level

**Table 4:** OLS regression. Dependent variable: Difference between expected grade at beginning of course and expected grade at the end of the course.

	<b>Model 1 (N=624)</b>	<b>Model 2 (N=624)</b>	<b>Model 3 (N=349)</b>	<b>Model 4 (N=349)</b>
Intercept	0.08 (0.08)	-1.59*** (0.19)	-0.22*** (0.08)	-1.58*** (0.16)
Female	0.10* (0.06)	0.11** (0.05)	0.14** (0.06)	0.16*** (0.05)
Hours student planned to study at the beginning of the semester	-0.01 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Expected grade at beginning of semester		0.48*** (0.05)		0.37*** (0.02)
Gap between grade student expected to receive at the beginning of the semester and midterm grade			0.40*** (0.02)	0.37*** (0.02)
Dummy variable =1 if student from Benedictine	0.27** (0.12)	0.24** (0.12)	0.13 (0.10)	0.11 (0.09)
Dummy variable =1 if student from ETSU	0.70*** (0.09)	0.57*** (0.09)	0.41*** (0.07)	0.32*** (0.07)
Dummy variable =1 if student from UWLC	-0.03 (0.12)	-0.10 (0.11)	-0.04 (0.09)	-0.09 (0.08)
Dummy variable =1 if student from CSM	0.48*** (0.07)	0.33*** (0.06)		

\* Statistically significant at 0.1 level  
 \*\* Statistically significant at 0.05 level  
 \*\*\* Statistically significant at 0.01 level

**Table 5:** Probit model. Dependent variable: Probability a student overestimated the grade they would receive in the course.

	<b>Model 1 (N=624)</b>	<b>Model 2 (N=624)</b>
Intercept	0.32 (0.17)	-1.11 (0.38)
Female	-0.03 (0.11)	-0.02 (0.11)
Hours student planned to study at the beginning of the semester	-0.01 (0.02)	-0.01 (0.03)
Expected grade at beginning of semester		0.42*** (0.10)
Dummy variable =1 if student from Benedictine	0.72*** (0.26)	0.70*** (0.27)
Dummy variable =1 if student from ETSU	0.53*** (0.18)	0.43** (0.19)
Dummy variable =1 if student from UWLC	-0.48** (0.22)	-0.55** (0.22)
Dummy variable =1 if student from CSM	0.35*** (0.13)	0.22* (0.13)

\* Statistically significant at 0.1 level  
 \*\* Statistically significant at 0.05 level  
 \*\*\* Statistically significant at 0.01 level

## A READABILITY ANALYSIS OF UNDERGRADUATE TEXTBOOKS IN OPERATIONS MANAGEMENT

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### ABSTRACT

*Selection* of a textbook for use in introductory operations management courses can be challenging. Many criteria may be considered in such decisions, including a textbook's readability. Applying a widely-used readability index, this study analyzes the predicted readability of five popular operations management textbooks. ANOVA testing is performed to determine whether significant differences exist between the texts. The study finds no compelling evidence, regarding readability, to select any one textbook over any other within the study. The findings can be useful to adopters and editors of introductory operations management textbooks.

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### INTRODUCTION

The selection of a textbook for use in operations management courses is an important decision for faculty. Since introductory operations management is required in the typical business curriculum, all students in the major are affected by their decision. But the text selection process is complicated by the large number of text attributes for faculty to consider. Such attributes may include: a text's pedagogical approach; coverage of material; exhibits, charts, and vignettes; end-of-chapter material; student and instructor supplements; and authors' reputations, as well as instructors' past experiences with the text. Faculty may also wish to consider a text's *readability*.

Readability may be defined as the degree to which a class of people finds certain reading matter compelling and comprehensible (McLaughlin, 1969). "Readability" should not be confused with "legibility," which refers to the ease of being read. Readability, in this context, refers to the qualities of writing which are related to reader comprehension. A variety of techniques have been used to predict readability, including several readability indexes (or formulas) which have been used widely since the 1950s. Examples of readability indexes include SMOG (developed by McLaughlin), Flesch Reading Ease, Flesch-Kincaid Grade Level, Gunning-Fog, and Fry.

Information on readability can be helpful to faculty when making textbook adoption decisions. One of the criteria to which faculty attach the most significance in those decisions is textbook comprehensibility (Smith & Ridder, 1997), which can be predicted, at least in part, using a readability index. Evidence also suggests that the higher the readability (difficulty) level of textbooks in core business courses, the lower the students' grade averages in those courses (Spinks & Wells, 1993).

### LITERATURE REVIEW

A careful survey of literature identifies only one work related to the study of the readability of introductory operations management textbooks. In Render et al. (1976), the authors apply the Flesch Reading Ease Index to nine operations management and fifteen operations research textbooks. They showed that although the majority of the books were in the expected range of readability for college undergraduates, most tended toward the lower end of the readability scale—in the "more difficult" to read range (30-35).

Some of the studies of textbook readability for other disciplines include: Raabe, Stevens, and Stevens (1984) in taxation, Razek, and Cone (1981) in business communication, Shuptrine and Licktenstein (1985) in marketing, Villere and Stearns (1976) in organizational behavior, Plucinski, Olsavsky, and Hall (2009), Plucinski (2010), and Plucinski (2011) in accounting, Tinkler and Woods (2013), McConnell (1982), and Plucinski and Seyedian (2014) in economics, and Plucinski and Seyedian (2013) in finance.

## METHODS

Undergraduate students usually take the introductory course(s) in operations management during their junior year. Familiarity with the fundamentals of operations management is critical to a full grasp of the upper level courses in business curricula. A more readable textbook will certainly help students understand the principles of operations management and subsequent subject matter.

The previous study of the readability of introductory operations management textbooks use the Flesch Reading Ease methodology, which is a function of the number of words per sentence and the number of syllables per word. Our study uses Flesch-Kincaid index, which is based upon and related to the original Flesch index. Since it can be easily generated using word processing software, a large amount of text can thereby be readily analyzed with results that are objective and easily replicated.

### Flesch-Kincaid Grade Level

The Flesch-Kincaid Grade Level has its roots in the Flesch Reading Ease formula developed in 1948 by Rudolf Flesch. In 1975, J. Peter Kincaid tested over 500 enlisted United States (U.S.) Navy personnel on a reading-comprehension test and also on passages from Navy training manuals. This enabled him to derive a version of the Flesch Reading Ease formula which yielded reading grade-level scores. The resulting Flesch-Kincaid Grade Level has since been adopted by the U.S. military services as the basis for deciding whether technical manuals from suppliers meet their readability requirements (Pearson, 2002). The Flesch-Kincaid index is now one of the leading readability indexes. It is used extensively by the U.S. government and others, and it is included as a grammar-checking feature in the word processing software, Microsoft Word (MS-Word).

The Flesch-Kincaid Grade Level formula is based upon sentence length and word length. It rates text on a U.S. school grade level. For example, a score of 11.0 means that an eleventh grader can understand the document. The formula is:

$$(0.39 \times \text{ASL}) + (11.8 \times \text{ASW}) - 15.59$$

where: ASL = average sentence length (number of words divided by number of sentences)

ASW = average number of syllables per word (number of syllables divided by number of words) (Pearson, 2002)

This study uses MS-Word to calculate the Flesch-Kincaid Grade Level of select passages. The formula used by MS-Word is confirmed by agreeing the formula above to that specified in the MS-Word help file. The MS-Word calculation is then validated by manually applying the formula above to a 200-word passage and agreeing the result to that provided by the grammar-checking function in MS-Word.

### Selection and Adaptation of Text Passages

An examination of the offerings of the five largest publishers of operations management textbooks in the United States yields about twenty introductory operations management texts currently being published in English. That number does not include the many variations of the main texts by the same author(s). To make this study manageable, a subset is chosen for consideration. However, fairly selecting among the many alternatives is difficult. To make the results useful to the greatest number of instructors while limiting the number of texts, this study examines the most popular (best-selling) introductory operations management textbooks.

To determine the most popular textbooks, an examination of the website *Amazon.com*, took place, where myriad titles were presented. However, many of the listed books were from the popular press. These popular press books were not included for consideration. Out of the remaining books, those from major publishers were identified, and this list was further refined using the best-seller ranking feature provided by *Amazon.com*, resulting in five textbooks for the study. The five textbooks are listed in Table 1, along with each textbook's particulars.

A review of the list of each text's ancillary materials reveals comparable offerings among the texts. For students, the textbooks have tools similar to study guides; these tools may be found as part of the text itself or as online study aids. For instructors, each text has an instructor/solutions manual, a test bank, PowerPoint presentations, and other support

materials. All of the publishers distinguish their product in some way, usually with additional online material. However, it is expected that an instructor will subjectively evaluate the usefulness of any distinctive ancillaries. Therefore, an examination of ancillaries is beyond the scope of this study. This study is limited to the main textbook.

Six chapters are selected for analysis from throughout the texts. The chapters (topics) targeted are those covering *Project Management, Forecasting, Scheduling, Inventory, Quality Control, and Capacity Planning*. The selection of material for analysis is driven by the topics rather than by the chapter. Each of the six topics generally appears in a chapter of its own; when topical content is identified in other chapters, that content is added to the analysis, as is the case of Quality Control and Capacity Planning in Table 1. The selection of these topics provides passages for analysis from throughout the texts, covering those topics that appear to present the most challenging aspects of operations management, based on exam scores of operations management students of one of the authors of this study.

An electronic copy of each text book is obtained. The chapters and content areas under study are imported into MS-Word for analysis. Only the sentences in the body of the chapters are subjected to analysis. Appendices are excluded. Since the Flesch-Kincaid formula analyzes only sentences, all material in figures, exhibits, and headings are omitted from analysis. Since material in graphics and vignettes cannot be readily converted to plain text by word-processing software, it is also omitted. End-of-chapter material (e.g., vocabulary, review, problems) is omitted as well, since it is largely quantitative/ tabular in appearance and does not match the textual nature of the Flesch-Kincaid index.

When a colon appears at the end of a sentence, it is replaced with a period when the sentence is originally followed by a calculation, list, or figure. This action is necessary because, in the Flesch-Kincaid calculation, MS-Word does not recognize a colon as the end of a sentence. Since calculations, lists, and figures are removed from the text, a sentence with a colon preceding a figure, for example, would have been combined with the one following the figure, thereby inflating the length of the sentence. In that case, replacing the colon with a period “ends” the sentence before the figure. Colons appearing in sentences that eventually ended in a period are unchanged.

After converting, importing and pruning all files, the spelling and grammar function in MS-Word is applied to all files to correct occasional errors that arise. The Flesch-Kincaid Grade Level is then provided by MS-Word. The Analysis of Variance (ANOVA) is applied to the data using the statistical software package Minitab. The analysis seeks to determine if statistical differences exist among the textbooks themselves, with regard to the Flesch-Kincaid Grade Level.

## RESULTS

### Comparison of Textbooks by Chapter

Table 2 shows the Flesch-Kincaid Grade Levels for the six target chapters of each textbook. The mean of the six grade levels for each text (MGL) is also shown. Since the grade level indicates the U.S. school grade level required to understand a text passage, the lower the grade level the more readable the chapter.

An examination of Table 2 shows no clear trending in the *overall* readability levels of the texts with the lowest grade level for each chapter highlighted. For example, the Schroeder & Goldstein text is the most readable (has the lowest grade level) for three of the six content areas. It demonstrates a similar score to the Heizner et al. text with regard to Quality Control, both of which have the lowest grade level for that content. However, the Schroeder & Goldstein text has the highest grade level for Capacity content.

The Schroeder & Goldstein text appears similar to the Jacob & Chase text grade levels in three of the content areas. However, in the remaining three content areas, the grade levels appear to be higher in one text than in the other. And, they have equal Mean Grade Levels (7.5), representing the lowest among the texts considered. The Stevenson text and the Krajewski et al. text appear very similar with regard to individual chapters; however, the Krajewski et al. text demonstrates a grade level of 9 regarding Capacity content, while the Stevenson text demonstrates a grade level of 7.6 for that content. Thus, some differences do exist among individual chapters, when considering individual grade levels. However, many of the grade levels for each chapter are very close to each other.



## Overall Comparison of Textbooks

While some texts are more readable than others for select chapters, no one text is more readable (nor less readable) than the other texts for all six content areas. Statistical testing is required to determine if significant differences exist between the texts overall (i.e., mean grade levels).

Although the text of each content area is analyzed, those results really represent sample passages relative to the entire text. Therefore, ANOVA is performed on the sample means to identify the p-value of the differences among the means for the grade levels of each textbook. Table 3 provides the results of the ANOVA, as generated from Minitab.

## CONCLUSIONS AND LIMITATIONS

If an instructor places substantial emphasis on readability in selecting an introductory operations management textbook, he/she should rest assured that any of the five most popular ones is as good as any other one. Therefore, the instructor is best advised to consider other features of a textbook. There is more to comprehensibility of a subject than the readability of text matter. The diagrams, charts, demonstrations, calculations, figures, and problem/question sets included in textbooks are intended to aid in the student's comprehension of the subject matter. Additionally, the textbook ancillaries, such as, study guides, test banks, and online aids are important considerations.

One limitation in this study concerns readability formulas in general. They assume that the lower the readability level the better; but an unrealistically low readability level may lead to lower transferability of the content. In addition, readability formulas *predict* readability; they do not *measure* it. While there have been many critics that questioned the validity and value of readability formulas, there is ample research to suggest that formulas, despite their faults, can predict whether one piece of text will be easier to read than another (Pearson, 2002).

A second limitation involves the amount of data used for the analysis. Because the sample sizes were limited, normality could be an issue. Future studies might consider including at least 15 chapters as part of the comparison to confront this limitation.

Thirdly, the results of this study should not be the sole basis for judging the appropriateness of a particular introductory operations management textbook. Only the main body of each target chapter was analyzed in this study. The calculations, vignettes, charts, exhibits, graphics, figures, and end-of-chapter material are excluded from analysis. Ancillaries such as instructor and student supplements are also not considered. It is likely that an instructor will subjectively evaluate the effectiveness of this material separately from the main body of the textbook.

Finally, as Smith and DeRidder (1997) indicated, when making a textbook selection, faculty attach the most significance to comprehensibility to students, timeliness of text material, compatibility between text material and homework problems, and exposition quality of text, respectively. The first of those criteria, comprehensibility, is addressed (at least in part) by this study. Future studies might address comparisons of texts based upon the remaining criteria.

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**Table 1:** Operations Management Textbooks Tested

Authors	Heizner et al	Jacob & Chase	Schroeder & Goldstein	Stevenson	Krajewski et al
Title	Operations Management: Sustainability and Supply Chain Management	Operations and Supply Chain Management	Operations Management in the Supply Chain: Decisions and Cases	Operations Management	Operations Management: Processes and Supply Chains
Edition	12th	14th	7th	13th	11th
Year	2017	2014	2016	2018	2016
Publisher	Pearson	McGraw-Hill Irwin	McGraw-Hill Education	McGraw-Hill Education	Pearson
ISBN-978	0134130422	0078024023	0077835439	1259667473	0133872132
Chapter Numbers tested:					
Project Management	3	4	13	17	7
Forecasting	4	18	10	3	8
Scheduling	15	22	12	16	10
Inventory	12	20	14	13	9
Quality Control*	6	13	9	10	3
Capacity Planning**	7	5	11	5	4

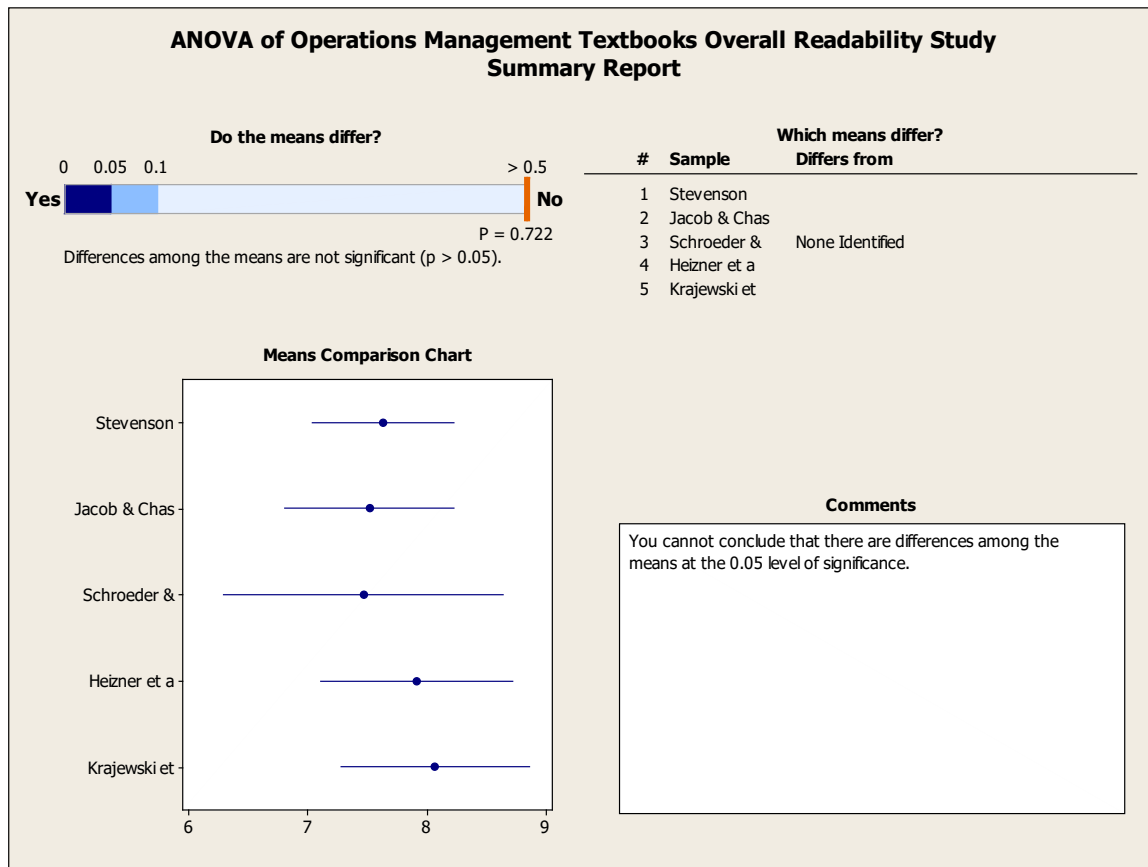
\*In some cases, the subject of Statistical Process Control was found as part of a different chapter; however, that content was evaluated as part of Quality Control.

\*\*In some cases, the subject of Waiting Line Theory was found as part of a different chapter; however, that content was evaluated as part of Capacity Planning.

**Table 2:** Computed Flesch-Kincaid Grade Levels of Textbook Chapters

	Heizner et al	Jacob & Chase	Schroeder & Goldstein	Stevenson	Krajewski et al
Project Management	9.1	6.6	6.2	8.1	8.1
Forecasting	7.7	8	6.9	8.1	8.8
Scheduling	7	6.9	6.6	6.7	7
Inventory	7.4	7.3	8.3	7.4	7.3
Quality Control	7.6	7.8	7.6	8.1	8.2
Capacity	8.7	8.5	9.2	7.4	9
MGL	7.9	7.5	7.5	7.6	8.1

**Table 3:** Test of Differences among the Mean Grade Levels of the Textbooks



The ANOVA provides a p-value of 0.722, at the .05 significance level, indicating no conclusion can be drawn that differences exist among the means with regard to grade level. It should be noted that the sample size is small, and such a small sample size may influence the validity of the results. No differences could further be identified when the significance level was 0.1. Therefore, in terms of readability, there appears to be no compelling evidence to prefer one textbook over another.

# STATE APPROPRIATIONS FOR HIGHER EDUCATION: DO POLITICS MATTER?

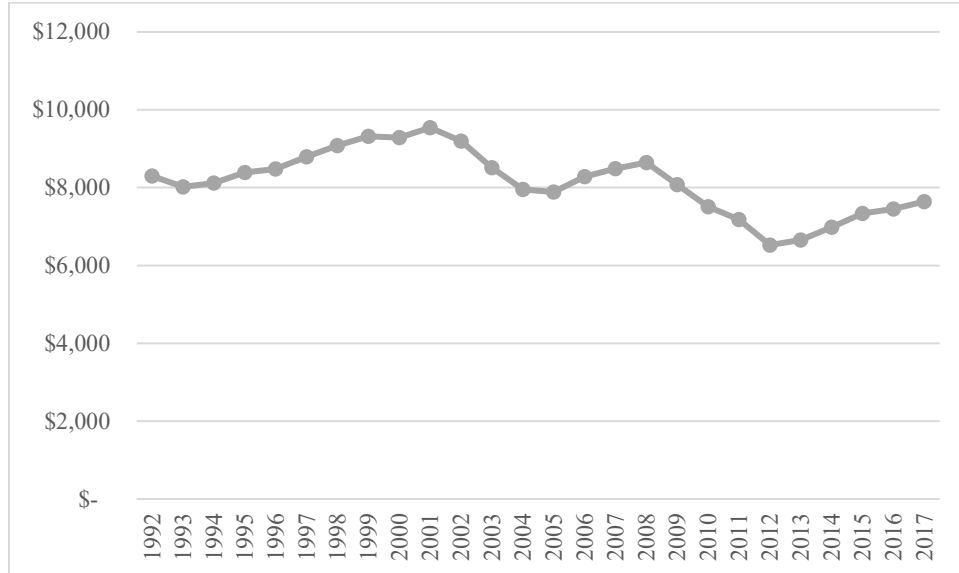
Casey R. Abington, Northwest Missouri State University

## ABSTRACT

Prior to the Great Recession, state appropriations for higher education were on a steady, upward trend. The recession ended this growth as states were forced to make large spending cuts. While some funding has been restored, appropriations are still below pre-recession levels. Clearly, economic conditions impact state appropriations for higher education, but what else causes funding to fluctuate? This paper explores the effect of state politics, specifically the political party of the governor and majority party of state legislatures. Using state-level panel data from 2000 to 2016, the fixed effects model shows mostly insignificant results as to the importance of politics. The model confirms the importance of state economic health for higher education appropriations. In addition to tax revenue, government spending, and unemployment, the results show that tuition, enrollment, and population are also significant determinants.

## INTRODUCTION

It has been more than a decade since the beginning of the Great Recession, yet universities across the United States are still feeling the effects. Prior to 2008, state funding for higher education had been steadily rising. This trend came to a dramatic halt with the worst economic downturn since the Great Depression. States struggled to balance budgets in the face of plummeting tax revenues. As a result, state support for public colleges and universities was slashed. Higher education funding is typically a discretionary budget item for states, so it is often one of the first cuts made during tough economic times. In theory, funding could then be restored or increased during good economic times. However, this has not fully come to fruition. Figure 1 below shows average higher education appropriations per full-time equivalent (FTE) enrollment from 1992 to 2017. The Great Recession led to the lowest funding levels in over twenty-five years. The graph also shows that, despite the end of the recession, funding remains well below pre-recession levels.



**Figure 1.** Higher education appropriations per full-time equivalent (FTE) enrollment. Graph created using data from: State Higher Education Executive Officers Association (SHEEO). (2018). State Higher Education Finance: FY 2017 Report. Retrieved from [http://www.sheeo.org/sites/default/files/SHEF\\_FY2017.pdf](http://www.sheeo.org/sites/default/files/SHEF_FY2017.pdf)

It is important to note that not all states have followed the trend shown in Figure 1. While it has been a tough decade for most public universities, the severity of cuts has differed across states. Since 2008, eight states experienced appropriation decreases of over 30%, 27 states had cuts between 30% to 10%, 9 states were between 10% to 0%, and only 5 states experienced increases in funding (Mitchell, Leachman, and Masterson, 2017). At the two extremes, state

funding in Arizona has been cut by more than 50% since the Great Recession, while funding in North Dakota has increased by nearly 40%.

Historically, public colleges and universities in the U.S. have relied heavily on state appropriations to fund operations. Prior to the Great Recession, state governments provided more than 60% of funds while students contributed approximately 35% through tuition. By the end of the recession, the proportion of funds from states dropped to about 50%, and the proportion from tuition revenue had jumped to 45% (Jones and Wellman, 2010). As a result, tuition at public 4-year colleges and universities has increased about 35% since 2008 (Mitchell, Leachman, and Masterson, 2017).

Even with additional revenue from tuition increases, universities have been forced to find other sources of revenues and cut costs to make ends meet. There is no doubt that eventually these changes will impact on the quality of education provided. Universities have sought to reduce costs in a variety of ways—all of which affect students directly or indirectly. Universities have laid off faculty and staff, eliminated programs, reduced course offerings, increased class sizes, cut services, imposed furloughs, and deferred maintenance, among others. Over the last decade, university administrators have been forced to shift their focus towards the budget and fundraising. Unfortunately, it doesn't appear the situation will get easier anytime soon. State appropriations for higher education across the U.S. increased by just 1.6% for the 2017-2018 academic year. This is the slowest growth in the last five years and almost 3% slower than in the previous year (Seltzer, 2018).

Clearly, economic conditions affect state appropriations for higher education, but it is certainly not the only factor. It is important to understand these other factors as well. This paper explores the determinants of state appropriations for higher education with a specific focus on the role of politics. Our elected officials directly impact higher education funding as they are responsible for setting state budgets. Along with control variables commonly found significant in previous research, this study analyzes the effect of the governor's political party and the majority party of state legislatures on state higher education appropriations. While there are many studies exploring higher education funding, the body of literature that focuses on the role of politics is relatively small, and the results are mixed.

## LITERATURE REVIEW

An early study by Peterson (1976) finds measures of legislative professionalism and political competitiveness to be important determinants of state higher education appropriations. Some of these results are verified by McLendon, Hearn, and Mokher (2009). They show appropriations are affected by partisanship, legislative professionalism, term limits, interest groups, and governor power. Tandberg (2010) also finds that politics and interest groups have a significant impact on state higher education funding in a study spanning over 19 years.

Furthermore, a study by Weerts and Ronca (2012) concludes that Republican-controlled state legislatures are associated with higher levels of higher education appropriations. McLendon, Tandberg, and Hillman (2014) find a similar result when exploring whether politics affects state funding for need-based financial aid. They find that a Republican governor and a higher proportion of Republicans in state legislatures are associated with higher levels of state spending. In contrast to these findings, a study by Okunade (2004) finds that a Democratic governor and a higher proportion of Democrats in state legislatures are associated with higher levels of higher education appropriations. Overall, the research does not point to a definitive conclusion, so more research in this area will be helpful.

## METHODOLOGY AND DATA

Following the work of McLendon, Hearn, and Mokher (2009), the methodology for this paper is a time-series analysis using fixed effects for both state and year. Employing a fixed effects model makes it possible to explore the impact of factors that vary over time and, therefore, to estimate variation within each state over time. Furthermore, the fixed effects method controls for omitted variables bias. The model is as follows

$$y_{it} = \beta x_{it} + \alpha_i + u_{it},$$

where:

$y_{it}$  = dependent variable (state appropriations for higher education) where  $i$ =state and  $t$ =time

$\alpha_i$  ( $i=1 \dots n$ )=unknown intercept for each entity (state)— $n$  specific intercepts

$x_{it}$  =one independent variable

$\beta$  is the coefficient on the independent variable  
 $u_{it}$  =error term

This study employs panel data for states covering the time period from 2000 to 2016. Forty-nine states are analyzed. Nebraska, is omitted because it is the only state with a unicameral and nonpartisan legislature<sup>86</sup>. All other states' legislatures are bicameral and partisan. In addition, several other observations are dropped from the data. The study focuses on the two main political parties—Democrat and Republican. Observations are omitted if the governor is from a different party<sup>87</sup>.

The model's dependent variable is state appropriations for higher education. It includes tax appropriations for higher education from the state as well as non-tax revenue, such as lottery revenue, devoted to higher education. The relief funds provided by the federal government as a result of the Great Recession is also included in fiscal years 2009 to 2011 (SHEEO, 2017).

Three variables are included in the model to capture the effect of state politics—the governor's political party (Democrat or Republican), the percent Democrat in the state Senate, and the percent Democrat in the state House of Representatives. These variables are analyzed to determine whether there is a significant relationship between a political party (Democrat or Republican) and higher education appropriations.

In addition to the political variables, the control set includes other measures found to be significant determinants of higher education appropriations in previous studies. See, for example, Toutkoushian and Hollis (1998), Kane, Orszag, and Apostolov (2005), and McLendon, Hearn, Mokher (2009). Two of these independent variables are specific to higher education—tuition and enrollment. Tuition is gross tuition and fees less financial aid and tuition waivers and discounts. Enrollment is the total number of students enrolled full time for an academic year. State unemployment rates are included in the model to reflect state economic health. Economic theory suggests that higher unemployment rates signal lower economic health. Therefore, it is expected that unemployment rates will have an inverse relationship with most types of government spending. State population is also included as a control variable. Finally, two independent variables reflect state fiscal policy—total tax revenue from all taxes imposed by state governments and total state government spending. See Table 3 for a listing of all variables along with descriptions and sources for each. See Table 1 below for summary statistics.

**Table 1**  
Summary Statistics

Variable	Mean	Std. Deviation	Minimum	Maximum
State Approp.	1,429,214,733.45	17,24,051,502.44	62,502,852.00 (VT 2000)	13,245,777,906.00 (CA 2016)
Govt. Expenditures	34,121,464.52	42,183,249.71	2,403,103.00 (SD 2000)	330,502,626.00 (CA 2015)
Tuition	887,436,618.27	893,280,792.30	43,525,758.23 (WY 2009)	5,005,837,486.00 (MI 2016)
Enrollment	206,289.09	243,189.38	15,571.00 (VT 2000)	1,624,753.00 (CA 2009)
Unemployment Rate	5.78	1.99	2.30 (VA (2000)	13.70 (MI 2009)
Population	6,056,084.87	6,684,959.46	494,300.00 (WY 2000)	39,296,476.00 (CA 2016)
% State Senate Democrat	0.49	0.18	0.09 (ID 2001)	0.96 (HI 2016)
% State House Democrat	0.58	2.52	0.13 (ID 2001)	0.92 (RI 2009)

<sup>86</sup> Information is from the Nebraska state website: <http://www.nebraska.gov/government/legislative/>.

<sup>87</sup> Specifically, the following observations are excluded because the governor was from the Independent party: Maine 2000 to 2002, Minnesota 2000 to 2002, Rhode Island 2011 to 2012, and Alaska 2015 to 2016.

Taxes	159762700.06	18421717.52	863723.00 (AK 2015)	155231252.00 (CA 2016)
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## RESULTS

The fixed effects regression results are shown in Table 2 below. The primary finding of this study is that the measures relating to state politics are mostly insignificant for determining higher education appropriations. Both the governor's political party and the percent of state House that is Democrat are insignificant, while the percent of state Senate that is Democrat is only marginally significant with a negative relationship. This result partially verifies the findings in previous studies showing that Republican-controlled state legislatures are associated with higher funding for higher education. See, for example, Weerts and Ronca (2012) and McLendon, Tandberg, & Hillman (2014). Republicans tend to support two-year, associates or community colleges over four-year colleges and universities (Weerts and Ronca, 2012). This could help explain the result seen here and in previous studies that found Republican-controlled state legislatures to be associated with larger levels of higher education appropriations.

Tuition and enrollment are both shown to have statistically significant, negative relationships with state appropriations. This could reflect that universities are relying more on tuition revenue and less on appropriations from the state. As expected, the results also show that state population, tax revenues, and government expenditures are significantly, positively associated with state funding for higher education. When the economy is doing well and tax revenues are higher, states are able to increase spending on higher education and other competing interests.

**Table 2**  
Regression Results

	Coefficient (std. error)	t-ratio	P>  t
State Appropriations (dependent variable)			
Tuition	-0.260*** (0.027)	-9.57	0.000
Enrollment	-1369.16*** (442.29)	-3.10	0.002
Unemployment Rate	-8092704* (4611276)	-1.75	0.080
Population	198.44*** (28.05)	708	0.000
Taxes	89100.84** (42076.51)	2.12	0.035
Expenditures	25.14*** (1.24)	20.29	0.000
Governor	2978021 (0.00)	0.18	0.858
% State Senate Democrat	-0.000* (0.00)	-1.91	0.056
% State House Democrat	-1392327 (2719299)	-0.26	0.795

\*p<0.10. \*\*p<.05. \*\*\*p<0.01.

## CONCLUSIONS AND FUTURE RESEARCH

Funding for public colleges and universities is a part of the political environment through the government budget process. We are in the midst of an unpredictable political climate and a challenging time for higher education. It is crucial to understand the impact of politics on our economy and on higher education. This paper explores the impact of political parties on state appropriations for higher education using state-level panel data from 2000 to 2016. The results show a mostly insignificant effect for these political variables. This is not necessarily a surprising result as the findings from previous studies have been mixed and inconclusive. This study, and most prior studies, include all public



colleges and universities—both two-year and four-year. It is possible that the political effects on appropriations are being muted by including all public higher education institutions.

The model indicates a significant, negative relationship between both tuition and enrollment and spending on higher education. It is possible that this reflects that universities are relying more on tuition revenue and less on state funding. The model also confirms the importance of state economic and fiscal health for higher education appropriations. Higher tax revenue and government spending are associated with higher education funding.

This study contributes to the literature by focusing on the effect of political parties using an updated dataset. The body of research that explores the role of politics in explaining state appropriations for higher education is small, so it is difficult to make any definitive conclusions on the topic. More research is needed.

In future research, it would be interesting to see if results are robust when including only four-year institutions or only two-year institutions. Two-year and four-year institutions are often viewed differently by politicians. In addition, perceptions of higher education in general have changed over time. A larger dataset covering a long period of time could help pick up the effect of these differing and changing views. It seems more important than ever that university leaders make clear the importance of higher education for developing a high-performing work force and contributing to regional economic development.

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**Table 3**  
Variable Descriptions and Sources

Variable	Description	Source
State Appropriations	State appropriations for higher education as a percent of total expenditures: tax and non-tax (e.g. lottery revenue) appropriations	SHEEO State Higher Education Finance Report; U.S. Census Bureau
Expenditures	Total expenditures: all money spent by state government during its fiscal year, with some exceptions (payment of debt, purchases of investment securities, loans granted, agency or private trust transactions, and correcting transactions)	U.S. Census Bureau
Taxes	Total tax revenue from taxes imposed and collected by state government	U.S. Census Bureau
Tuition	Net tuition: gross tuition and fees, less state and institutional financial aid, tuition waivers or discounts, and medical student tuition and fees	SHEEO State Higher Education Finance Report
Enrollment	FTE enrollment: “one student enrolled full time for one academic year, calculated from the aggregate number of enrolled credit hours”	SHEEO State Higher Education Finance Report
Population	Population: state population base + births – deaths + migrants	U.S. Census Bureau
Unemployment Rate	State unemployment rate	Iowa Community Indicators Program (ICIP)
Governor	Governor’s political party (Democrat or Republican)	Council of State Governments: Book of States
% State Senate Democrat	Percentage of Senate that is Democrat	Council of State Governments: Book of States
% State House Democrat	Percentage of House that is Democrat	Council of State Governments: Book of States

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