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Volume 17 has two issues, including one special issue on the impact of social media on businesses, and published nine articles. We received many high-quality papers, resulting in a 37.5 percent acceptance rate. The articles were written by authors whose primary affiliations include 33 institutions from 9 countries - **Australia, Bahrain, Brazil, Canada, Kuwait, Norway, Papua New Guinea, Taiwan** and the **United States**. For 25.0 percent of the editorial decisions, turnaround time was less than or 30 days, 37.5 percent of submissions took between 31 and 90 days, 37.5 percent took between 91 and 200 days.

The ISI Impact Factor Value of *The Journal of Business Inquiry* is 2.642 for the year 2016-17.

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IFRS Adoption in Korea: The Relation Between Earnings and Stock Prices and Returns

By KIMBERLY G. KEY AND JEONG YOUN KIM*

This study examines the value relevance of earnings surrounding Korea's adoption of International Financial Reporting Standards (IFRS), which was mandatory beginning in 2011. The study is motivated by mixed results in prior research of other countries' IFRS adoption and by limited research on Korea's adoption. We analyze annual stock prices and stock returns for 487 firms in the 10-year period, 2006 to 2015. Results indicate that the earnings-stock price relation increased in the IFRS periods compared to earlier periods, consistent with increased value relevance. The relation between earnings and stock returns decreases in IFRS periods.

Keywords: IFRS Adoption, Korea, Value Relevance of Earnings

JEL Classification: M41

I. Introduction

This study examines the effect of International Financial Reporting Standards (IFRS) on Korean capital markets. Korea's adoption of IFRS was precipitated by a serious financial crisis in 1997. Following the crisis, there was a significant overhaul of the financial environment in Korea, including mandatory changes to domestic accounting standards culminating in full IFRS adoption effective for years after 2010. In this study, we examine the value relevance of accounting information for stock prices and stock returns before and after IFRS adoption. The overarching motivation for this research is that capital market benefits are the most important reason for a government voluntarily to initiate IFRS (Hope *et al*., 2006).

Previous single-country research on IFRS adoption and value relevance of earnings has produced mixed results; therefore, information on the Korean setting provides additional evidence that can inform questions of why there are differences in results across adopting jurisdictions. We use both price and returns models, unlike some prior research that uses only one or the other.[1] Institutional settings and cultural variables are potentially important in IFRS adoption and implementation. For example, Korea had a fairly lengthy transition period from purely domestic standards to full IFRS adoption, which could attenuate the contrast of pre- and post-IFRS adoption periods. We also consider the potential effects of leadership and direction provided by the Korean

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[1] Barth *et al*. (2008) include both measures. Paananen and Lin (2009) examine stock prices, and Costa dos Santos and Cavalcante (2014) examine stock returns. We believe stock prices are theoretically more appropriate because value relevance should capture a relation between two measures whereas returns models are more commonly employed for studying pricing effects of events.

Accounting Standards Board as well as cultural variables defined by Hofstede *et al*. (2010), most of which suggest IFRS would be well-implemented. These types of factors can be used to compare and contrast prior single-country research results and to inform IFRS adoption decisions in jurisdictions where IFRS are currently being considered. Our study extends initial research on Korea's IFRS adoption by using different models and including data for longer time periods compared to Choi (2013) and Kim and Kim (2015).[2]

The study uses data for 487 firms in the 10-year period surrounding IFRS adoption, 2006 to 2015. We use regression analysis to examine the relation between earnings and stock prices and stock returns. Results show the earnings and stock price relation in IFRS periods is positive and statistically significant. Both an IFRS dummy and IFRS interacted with EPS are positive. There is a negative and statistically significant relation between the interaction term and stock returns in the IFRS period. The price results are consistent with the view that value relevance increases when IFRS is adopted.[3] Price is more commonly employed as the dependent variable in prior research and, we believe, is more appropriate from a research design perspective. Nonetheless, including returns is consistent with some prior research that uses only returns and provides additional information regarding value relevance.

Our price results are different from the limited research to date on Korea's IFRS adoption, which finds unchanged or weakened value relevance. Compare to our study, their test periods are more limited [only 2010 data in Choi (2013) and only three years in the IFRS time period for Kim and Kim (2015)], and importantly, we use a different value relevance model than Kim and Kim (2015). Our longer time period addresses an observation made by Kim and Kim (2015) that the effect of IFRS may require some passage of time before it is fully manifested, if indeed the IFRS accounting data are more value relevant. They use the term "full settlement," which we believe suggests that both financial statement preparers and capital market participants have an adjustment process to IFRS.

While it is not possible to explain fully the results obtained, we believe that Korea's IFRS adoption was a culminating event in a fairly lengthy change to the overall business and economic climate that started in the early 2000s. Institutional structures were put in place to support IFRS adoption, and Korea's "Big Bang" approach appears to be a fairly meaningful demarcation of accounting periods as well as an effort that garnered wide support.[4] Cultural aspects are likely to have bolstered successful implementation, which Henderson (2015) discusses. A complete picture of the post-IFRS accounting information and capital market relations in Korea may take even more than five years, especially to get at deeper questions that compare and contrast firms on more characteristics than book value and earnings. Overall, our results add to the literature on single-country IFRS adoption, and future research that explores possible explanations for inconsistent results in this literature is warranted. The paper proceeds by reviewing prior literature and the Korean setting and formally stating the research question. Then the methodology and sample are described, results explained, and conclusions made.

[2] Except for translated abstracts, those studies are published in Korean.

[3] Barth *et al*. (2008) find a positive relation for their stock price model and insignificant results for their returns model.

[4] The KASB (2012) report uses the term "Big Bang." We discuss the report in the next section of the paper.

II. Literature Review, Setting, and Research Question

Prior research assumes IFRS are of higher quality than domestic standards; thus, it is expected that the value-relevance of accounting information will increase. Nonetheless, IFRS adoption is subject to a wide range of business, economic, legal, and political influences, all of which potentially affect this relation. The literature review addresses both multiple- and single-country research settings and highlights trade-offs in these approaches. The section first reviews the prior research, then discusses the Korean setting of IFRS adoption and implementation, and, in conclusion, formally states the research question.

A. Prior Research

Barth *et al*. (2008), one of the most cited papers in this research stream, compare sample firms from 21 countries that apply international accounting standards (IAS) with a control group of firms applying domestic standards. They assume accounting amounts based on IAS are of higher quality than those based on domestic standards, which is the standard assumption in this area of research. They predict that firms with higher quality accounting will have a higher association between stock prices, earnings, and equity book value because higher quality earnings better reflect a firm's underlying economics. However, there are two reasons the prediction of higher quality accounting information may not be valid: IAS may be of lower quality than domestic standards, and other financial reporting system features can mitigate any improvement in accounting quality due to higher quality standards (Barth *et al*., 2008). These reasons likely help explain why prior single-country research has had mixed results. Also, in our discussion of the Korean setting below, there are setting features that we believe both increase and decrease the likelihood of finding an earnings-value relevance relation.

Barth *et al*. (2008) conclude that the value relevance of accounting information is greater for sample firms applying IAS than for matched firms applying domestic standards, but there is some inconsistency in the results. Stock price models show significant differences in explanatory power pre- and post-IAS, but the stock returns model does not. This result motivates our analysis of both stock price and stock return models. Further, although their research design carefully constructs a matched sample of adopting and control firms, a drawback of this sort of analysis is that adopting firms self-select as voluntary adopters. In addition, the sample must be constructed from data bases that have limited representation of a country's firms.[5] The mixed results and the research design limitations motivate separate-country analyses of IAS and IFRS settings in order to provide a more complete understanding of the effects of changing from domestic accounting standards to IFRS.

Several prior single-country studies investigate value relevance of accounting information after IFRS adoption. Some benefits of single-country analyses are that many possible explanatory variables are held constant and samples are representative of a country's full population of firms. In a single-country study, there is consistency in the IFRS adoption and implementation process (though there could be within-country firm differences if implementation dates differ for public and private firms, for example) and in institutional setting features such as economic, political, cultural, and the year of IFRS adoption. The mixed findings in this line of research are likely due in part to these setting differences. Second, method differences such as using annual or quarterly

[5] For example, the Germany component of the sample in Barth *et al*. (2008) has 65 IAS firms while Paananen and Lin (2009) have from 107 to 448 firms for their various sample periods.

data, stock prices or returns, and the pre- and post-IFRS years included in a sample are also potential explanations for prior mixed research results.

Single-country studies that find an increase in value relevance of accounting information include Horton and Serafeim (2009) for the United Kingdom, Vieru and Schadewitz (2012) for Finland, Chua *et al*. (2012) for Australia, Alali and Foote (2012) for Abu Dhabi, and Costa dos Santos and Cavalcante (2014) for Brazil. Some studies find no change in the value relevance of earnings [e.g., Callao *et al*. (2007) for Spain and Tsalavoutas *et al*. (2012) for Greece]. Similarly, Paananen and Lin (2009) find that earnings are less value relevant in IFRS periods than in earlier periods. They conclude that accounting quality has not improved but worsened over time, making it harder for investors to base their decisions on IFRS reporting. Oliveira *et al*. (2010) also find a decline in value relevance in the Portuguese setting. Finally, a study by Devalle *et al*. (2010) of five European countries finds the gamut of possible results: increasing, decreasing, or no value relevance.

Two studies examine the recent Korean IFRS adoption. Choi (2013) compares information for firms that prepared 2010 financial statements with both domestic standards and IFRS, which occurred because the first year of IFRS reporting, 2011, necessitated prior year financial statement disclosures also based on IFRS. Results using an Ohlson (1995)-based model show no difference in value relevance of net income and book value between the two sets of statements and no incremental value relevance of IFRS over domestic standards. Kim and Kim (2015), like Choi (2013), compare domestic- and IFRS-based value relevance for 2010 and also compare the pre- and post-IFRS adoption periods, 2008 to 2010 and 2011 to 2013, respectively. They use a model based on Ye and Finn (1999) that models stock price based on book value, return on equity, leverage, and asset turnover ratio, which is quite different from models in most prior IFRS adoption research. Their results for 2010 are consistent with Choi (2013); they conclude there is no difference in value relevance for domestic standards and IFRS. For their pre- and post-IFRS sample, they find weakened relations between return on equity and other measures and stock prices in the IFRS period compared to the domestic period.[6] They suggest that more time may be required for value relevance differences to appear, if in fact they exist, which we address in our study by using more years of data.

We believe inconsistent findings in prior research and limited direct evidence from Korea warrant further investigation of Korea's IFRS adoption. We carefully consider the setting to offer reasons to expect value relevance to increase as well as reasons that work against finding a relation between earnings and stock prices and stock returns. Further, our use of both stock measures provides a more complete picture of capital market effects than using only one of them.

B. The Korean Setting

In 2012 the Korean Accounting Standards Board (KASB) prepared a report on the country's IFRS adoption and implementation process. The report's executive summary explains that mandatory application of IFRS for all listed companies was intended to improve investors' perceptions of financial statement transparency and to demonstrate Korea's "strong will" to take part in the international movement towards a single set of high-quality global accounting standards. The term "unwavering will" is used elsewhere in the summary. The KASB report also states that Korea chose a "Big Bang" approach in adopting full IFRS rather than a phased-in or

[6] Return on equity includes earnings so is the closest theoretically to our study's use of earnings. The other measures that also have a weakened relationship post-IFRS are book value, leverage, and asset turnover.

convergence approach, and there was a multifaceted approach to aid the adoption process including committees of experts and education (KASB, 2012). The executive summary concludes that Korea expects to have improved perceptions of financial statement reliability and enhanced status in the international accounting community. These comments and setting features are consistent with expecting an increase in the post-IFRS earnings and stock price and return relations.

Nonetheless, there were challenges and difficulties in adopting the new standards because of the significant accounting paradigm shift; the report calls the adoption process a "bumpy ride." Further, although the "roadmap" towards adoption was announced in 2007, there were indications soon after the 1997 financial crisis that there would be changes in financial accounting standards, disclosures, and standards-setting organizations (Kim, 2000). Generally, there was to be less influence of political, economic, and social objectives, and the entire financial and legal systems were to become more market-oriented (Kim, 2000). The 2012 KASB report recognizes earlier changes to domestic standards such as requiring more professional judgment, more conformity to economic substance, and more footnote disclosures. Thus, there was reasonable expectation of increased accounting quality and a more transparent financial environment even before the roadmap was announced. With this transition view in mind, Kim and Key (2014) find that the ability of earnings to predict stock prices increased over the 30-year period from 1982 to 2011.[7] Thus, setting features and the results in Kim and Key (2014) suggest a gradual movement away from domestic and towards IFRS, which works against finding strict pre- and post-IFRS differences in the earnings and stock price and stock returns relations.

A final consideration is that culture can have a large effect on a country's accounting system (Henderson, 2015). She highlights Hofstede cultural variable measures that contributed to Korea's adoption of IFRS "without any major upheavals."[8] In particular, medium power distance suggests Korea's society is slightly hierarchical, and low individualism is consistent with a society where people agree to the power structure and believe that all people have their place in society. We believe these characteristics are likely to support effective IFRS implementation because of the implied respect for institutions. Further, Korea is one of the most pragmatic (focusing on long-term consequences) and restrained (emphasizing the importance of maintaining societal norms) countries according to the Hofstede Center (Henderson, 2015). Henderson (2015) concludes that pragmatic inclinations outweighed the desire to maintain societal norms (implying that the existing domestic standards were a societal norm).[9]A single-country study cannot exploit cultural as an explanatory variable, but we believe future work on IFRS adoption and capital market research questions could make use of the Hofstede variables.

[7] They employ the methodology of Kim and Kross (2005), using adjusted R^2 from annual regressions of earnings on price as the dependent variable and a time variable that reflects differences from earliest to latest years. The time variable is positive and statistically significant, consistent with increasing explanatory power of earnings for stock prices from the earlier to the later years.

[8] Geert Hofstede developed the now well-known theory of cultural dimensions in the 1960s and published several books and studies since that time including a revised and expanded third edition (Hofstede *et al*., 2010). There is a Hofstede Cultural Centre (https://geert-hofstede.com/the-hofstede-centre.html), and Korea's rankings on all six dimensions can be found at https://geert-hofstede.com/south-korea.html. Henderson (2015) is the first study we are aware of that ties cultural variables to IFRS adoption.

[9] In contrast to Henderson (2015), we believe the restraining characteristic would support the "buy in" of IFRS adoption as a new societal norm.

C. Research Question

Based on mixed results in prior research, theoretical issues of whether IFRS are of higher quality than domestic standards, Korea IFRS adoption setting aspects that start shortly after the 1997 financial crisis, and cultural aspects, a directional hypothesis for the relation between earnings and stock measures is not clear. Thus, we investigate the following research question:

What is the difference, if any, in the earnings and stock price and stock returns relations before and after IFRS adoption in Korea?

III. Methodology and Sample

The following regression models based on Costa dos Santos and Cavalcante (2014) are specified to test the value relevance of earnings for stock returns:

(1) $\text{PRICE/RETURN}_{i,t} = \alpha_0 + \alpha_1 \text{EPS}_{i,t} + \alpha_2 \text{BVPS}_{i,t} + \varepsilon_{i,t}$

(2) $\text{PRICE/RETURN}_{i,t} = \alpha_0 + \alpha_1 \text{EPS}_{i,t} + \alpha_2 \text{BVPS}_{i,t} + \delta_1 \text{IFRS}_{i,t} + \delta_2 \text{EPS}_{i,t} * \text{IFRS}_{i,t} + \varepsilon_{i,t}$

(3) $\text{PRICE/RETURN}_{i,t} = \alpha_0 + \alpha_1 \text{EPS}_{i,t} + \alpha_2 \text{BVPS}_{i,t} + \sum_{\tau=1}^{5} \beta\tau \, IFRS_{i,t}^{2010+\tau} + \sum_{\tau=1}^{5} [\gamma\tau \, YEAR_{i,t}^{2010+\tau} \text{x EPS}_{i,t}] + \varepsilon_{i,t}$

where:
$\text{PRICE}_{i,t}$ = firm i's stock price at the end of March of Year_{t+1},
$\text{RETURN}_{i,t}$ = firm i's 15 month return at the end of March of Year_{t+1},
$\text{EPS}_{i,t}$ = earnings per share of firm i during year t,
$\text{BVPS}_{i,t}$ = firm i's book value per share at the end of Year t.
IFRS = 0 if IFRS was not adopted and IFRS = 1 if adopted.
$YEAR_{i,t}^{2010+\tau}$ = 1 if in 2010 + τ, otherwise $YEAR_{i,t}^{2010+\tau}$ = 0.[10]
$YEAR_{i,t}^{2010+\tau}$ controls for events other than the IFRS adoption in each year after 2010.

We use this model because the study is the most recent IFRS adoption study that we reference; it also facilitates comparison with that study of Brazil's IFRS adoption, which occurred close to Korea's adoption.[11] The models used in prior research are very similar, although in some cases researchers make predictions for book value coefficients. We follow Costa dos Santos and Cavalcante (2014) and employ book value as a control variable. Model 1 is estimated primarily for informational purposes with the value relevance of earnings tested by the coefficent on α_1. The regression is estimated for the ten-year full sample period, 2006 to 2015, and also three sub-periods: pre-IFRS (2006 to 2008), the transition period where voluntary adoption was allowed (2009 and 2010), and post-IFRS when adoption was mandatory (2011 to 2015).[12] The research question addresses the effect of IFRS on value-relevance of earnings, which is tested in the

[10] The traditional specification of returns created multicollinearity issues, which is overcome by using the natural logarithm to compute stock returns. Costa dos Santos and Cavalcante (2014) state that they had the same issue and used the natural logarithm. Barth *et al*. (2008) also use the natural logarithm.

[11] Brazil announced in 2007 that IFRS would be mandatory in periods ending in 2010. Optional early adoption could be done in the 2007 to 2009 period. Korea's roadmap was announced in 2007 with mandatory adoption effective in 2011. The early optional period was 2009 and 2010. Like Korea, Brazil also adopted IFRS as an individual country (contrasted with the simultaneous country adoption in the European Union, for example).

[12] Costa dos Santos and Cavalcante (2014) also separate their analysis into the same three periods.

Model 2 coefficient on the IFRS-EPS interaction term, δ_2. We also test the IFRS-EPS relation with year-by-year interaction terms, represented by the Model 3 coefficients on γ_1 to γ_5, which represent years 2011 to 2015, respectively.

The sample is obtained from the KIS VALUE database for the ten-year period 2006 to 2015, five years before and after IFRS adoption.[13] Financial institutions and insurance companies are excluded as are firms with year-ends other than December 31 and without necessary data for all ten years of the sample period. The sample includes 487 firms with 4,870 firm-year observations. Twenty-six of the firms are early adopters, either 2009 or 2010, with the respective firm IFRS dummy variables in Model 2 coded =1. The early adopters are excluded in estimating Model 3 because the model includes the specific years, 2011 to 2015. To control for the effects of extreme observations, amounts are truncated at three standard deviations.[14]

IV. Results

Table 1 reports descriptive statistics for the full sample of 4,870 firm years. All amounts except returns are in Korean won.[15] The mean annual stock return is .0196. Table 2 reports correlations between stock price, stock returns, earnings per share, and book value. Not surprisingly, EPS and book value are positively correlated, and both are positively correlated with stock price, all with sizeable magnitudes. EPS is positively correlated with stock returns for the Spearman statistic (correlation coefficient = .11) but marginally negatively correlated for the Pearson statistic (*p*-value = .10). Book value is negatively correlated with returns. These correlations suggest the EPS and book value relations to stock prices and stock returns could also differ in multivariate tests, which helps motivate testing both stock measures.

Table 1: Descriptive Statistics

Variables	N =	Mean	Standard Deviation	Lower Quartile	Median	Upper Quartile
$EPS_{i,t}$	4,870	2,203	10,259	26	564	2,608
$BVPS_{i,t}$	4,870	40,790	84,217	4,264	13,161	40,627
$PRICE_{i,t}$	4,870	38,584	78,540	3,305	11,000	35,300
$RETURN_{i,t}$	4,870	0.0196	0.0847	-0.0222	0.0097	0.0486

EPS= earnings per share, BVPS= book value per share, PRICE= stock price at the end of March of $year_{t+1}$, RETURN = 15-month return at the end of March of $year_{t+1}$, i = firm, and t = year.

[13] KIS VALUE is the name of the financial database for public firms, similar to COMPUSTAT in the United States.
[14] If an observation for a variable is more than three standard deviations above or below the average for that variable, the value is set equal to the plus/minus three standard deviations amount.
[15] The average yearly exchange rate from 2006 to 2015 was approximately 1,100 won = $1 US.

Table 2: Correlation Coefficients

Variables	Price	Return	EPS	Book Value
Price	1	-0.04	0.56	0.78
Return	0.08	1	-0.02*	-0.10
EPS	0.67	0.11	1	0.63
Book Value	0.87	-0.07	0.64	1

Upper right = Pearson correlation coefficients
Lower left = Spearman correlation coefficients
All correlations are statistically significant at $p<.01$ except * is $p=.10$.

For all regression models, panel data models are used because the null hypotheses that there are no fixed effects and no random effects are rejected in all cases. The F-tests for fixed effects and Breusch and Pagan (1980) Lagrange multiplier test for random effects are tabulated on tables 3, 4, and 5 for the respective models. We use the Hausman (1978) specification test to determine whether to use fixed or random effects models. The null hypothesis that the preferred model is random rather than fixed effects is rejected in all cases except for the Table 3 stock returns model for the transition period, 2009-2010. Therefore, in all but that case, we estimate fixed effects models. Unit root tests are also calculated (not tabulated). The hypothesis that a unit root is present in a time series sample is rejected for the sample data.[16]

Table 3 reports the results for Model 1 with the two dependent variables, price and returns, for the full ten-year period and for three sub-periods, pre-IFRS (2006 to 2008), transition (2009 and 2010), and post-IFRS (2011-2015). These results do not address the research question but are specified in order to assess the general relations in the sample between earnings and book value and stock returns in a multivariate model. F-tests (not tabulated) for all models are statistically significant, and adjusted R^2 amounts range from .85 to .92 for price models and from .03 to .47 for returns models.

[16] The augmented Dickey-Fuller unit root test is used because it tests the null hypothesis that a unit root is present in a time series sample (Dickey and Fuller, 1979). Since the null hypothesis of the presence of unit root is rejected, the time series data are I(0).

Table 3: Regression Estimates of Model 1

Model 1: $PRICE_{i,t}$ /$RETURN_{i,t} = \alpha_0 + \alpha_1 EPS_{i,t} + \alpha_2 BVPS_{i,t} + \varepsilon_{i,t}$
Panel regression models. Coefficient estimates and (*t*-statistics) are reported.

Variables	Full Period		Pre-IFRS		Transition Period		Post-IFRS	
	2006-2015		2006-2008		2009-20010		2011-2015	
	Price Model (fixed effect)	Return Model (fixed effect)	Price Model (fixed effect)	Return Model (fixed effect)	Price Model (fixed effect)	Return Model (random effect)	Price Model (fixed effect)	Return Model (fixed effect)
Intercept	139,435 (13.98)***	3.28 (1.31)	39,629 (4.63)***	-6.71 (-1.43)	127,930 (8.01)***	3.94 (1.84)*	206,121 (17.39)***	1.52 (.50)
EPS	0.11 (1.65)*	0.00007 (4.48)***	.75 (6.18)***	0.000017 (.26)	.40 (2.12)**	0.000163 (4.64)***	-0.10 (-1.34)	0.00008 (3.93)**
BVPS	0.37 (22.24)***	-0.000003 (-0.80)	-.01 (-.40)	0.00004 (2.55)**	0.01 (.25)	-0.00003 (-5.76)***	0.19 (6.20)***	0.000004 (.45)
N	4,870	4,870	1,461	1,461	974	974	2,435	2,435
Adj. R^2	.85	.23	.92	.47	.90	.03	.92	.42
F test	14.96***	2.55***	9.69***	1.76***	7.83***	2.86***	18.61***	2.75***
LM test	5,665***	14,792***	410***	11,607***	192.98***	1,020***	2,362***	880***
Hausman test	211.2***	20.72***	513.18***	11.69***	268.25***	4.23	272.75***	16.87***

*, **, *** denote *p*-values < .05, .01, and .0001, respectively.
EPS = earnings per share, BVPS = book value per share, PRICE = stock price at the end of March of $year_{t+1}$, RETURN = 15-month return at the end of March of $year_{t+1}$, i = firm, and t = year.

The relation between EPS and stock price is positive and statistically significant except for the post-IFRS period. For stock returns, the relation is positive and statistically significant except for the pre-IFRS period. Thus, the full period results are driven by the two sub-periods with statistically significant positive relations. For BVPS, the coefficients are less consistent across time periods. In the price models, BVPS coefficients are positive and statistically significant in the full period and the sub-period, post-IFRS. In the returns models, the full period coefficient is not statistically significant, and in the three sub-periods there are mixed results: one period is not statistically insignificant, one is positive, and one is negative. Overall, these results generally show expected positive relations between earnings and stock returns and stock price, the main relation of interest in this study, but the lack of complete consistency suggests there could be some differences that manifest themselves in our tests that employ the IFRS and EPS interaction terms.

Table 4: Regression Estimates of Model 2

Model 2: $PRICE_{i,t}$ /$RETURN_{i,t} = \alpha_0 + \alpha_1 EPS_{i,t} + \alpha_2 BVPS_{i,t} + \delta_1 IFRS_{i,t} + \delta_2 EPS_{i,t} * IFRS_{i,t} + \varepsilon_{i,t}$
Panel Regression Models. Coefficient estimates and (*t*-statistics) are reported.

Variables	Price Model (fixed effect)	Return Model (fixed effect)
Intercept	106,247 (9.13)***	2.37 (.80)
EPS	-.45 (-4.79)***	0.00013 ((5.27)***
BVPS	0.33 (18.67)***	0.0000016 (.35)
IFRS	33,511 (5.49)***	0.839 (.54)
EPS*IFRS	0.88 (8.42)***	-0.00008 (-2.99)***
N	4,870	4,870
Adjusted R^2	.85	.24
F test	15.28***	2.52***
LM test	5,537***	13,499***
Hausman test	287.32***	31.25***

*, **, *** denote *p*-values < .05, .01, and .0001, respectively.
EPS = earnings per share, BVPS = book value per share, PRICE = stock price at the end of March of $year_{t+1}$, RETURN = 15-month return at the end of March of $year_{t+1}$, IFRS = 1 if year = 2011 to 2015 or if early adopter in 2010, i = firm, and t = year.

Table 4 reports results for Model 2, where an IFRS dummy variable and EPS*IFRS interaction term are added to the baseline model, and the full panel of data are tested in one regression. For the price model, IFRS is positive and statistically significant, indicating higher stock prices in IFRS periods. IFRS is not statistically significant in the returns model. Of course, the variable captures elements of that period other than IFRS adoption. The interaction term tests the research question: What is the difference, if any, in the earnings and stock price and stock returns relations before and after IFRS adoption in Korea? The coefficient on EPS*IFRS is positive and statistically significant for the price model, indicating that in IFRS adoption years, higher (lower) EPS is associated with higher (lower) stock prices. The opposite result obtains for the returns model: the EPS*IFRS coefficient is negative and statistically significant. The Costa dos Santos and Cavalcante (2014) results, where the dependent variable is returns, show statistically significant coefficients for the IFRS dummy (negative) and for the interaction term (positive), quite different from the Korea results. Our stock price results are different from Choi (2013) and Kim and Kim (2015), both of which report no difference in value relevance for domestic versus IFRS standards. Our model specifications are more consistent with prior research than Kim and

Kim (2015), but regardless, our study shows the importance of considering alternative models and having additional years of data.

Table 5 reports the results for Model 3, which follows Model 2 except that it specifies the IFRS dummy and IFRS*EPS interaction terms by separate IFRS years, 2011 to 2015, creating five dummies and five interaction variables. The results for the price model show that the IFRS dummy is positive and statistically significant in 2012 to 2015, consistent with the statistically positive coefficient on the [single] IFRS dummy in Table 4. For the returns model, the 2014 and 2015 IFRS dummies are positive and statistically significant (the Table 4 results show insignificant results for the dummy). The variables of interest for the research question, the five interaction terms, are different for the price and returns models in the same manner as Table 4. For the price model, four of the five years have positive and statistically significant coefficients on IFRS*EPS, all but 2013. For the returns model, coefficients in three of the five years are statistically negative, 2012, 2013, and 2014. [17] Again, the overall conclusion is that the price models are consistent with the view that value relevance of earnings increases when IFRS is adopted, but the returns models have the opposite conclusion. Our conclusions for stock prices differ from Kim and Kim (2015), although direct comparisons cannot be made because their model is different from ours. Their data included 2011 to 2013, and they found weakened relations between stock prices and several measures in the IFRS period compared to pre-IFRS, with return on equity the measure that includes earnings.

[17] Costa dos Santos and Cavalcante (2014) have yearly results that parallel their combined results for three of six interaction terms, the latter three years, and for five of six IFRS dummies.

Table 5: Regression Estimates of Model 3

Model 3: $PRICE_{i,t}$ /$RETURN_{i,t} = \alpha_0 + \alpha_1 EPS_{i,t} + \alpha_2 BVPS_{i,t} + \sum_{\tau=1}^{5} \beta\tau\ IFRS_{i,t}^{2010+\tau}$ $+ \sum_{\tau=1}^{5}[\gamma\tau\ YEAR_{i,t}^{2010+\tau} \text{x } EPS_{i,t}] + \varepsilon_{i,t}$

Panel regression models. Coefficient estimates and (*t*-statistics) are reported.

Variables	Price Model (Fixed Effect)	Return Model (Fixed Effect)
Intercept	121625.9 (13.49)***	-0.44742 (-0.17)
EPS	-0.15937 (-1.76)*	0.00015 (5.68)***
BVPS	0.37632 (20.18)***	0.000008 (1.54)
$IFRS_{i,t}^{2011}$	1532.791 (1.02)	-0.57242 (-1.3)
$IFRS_{i,t}^{2012}$	2811.082 (1.89)*	0.40003 (0.92)
$IFRS_{i,t}^{2013}$	7866.296 (5.33)***	0.53556 (1.24)
$IFRS_{i,t}^{2014}$	11130.69 (7.51)***	2.53890 (5.84)***
$IFRS_{i,t}^{2015}$	6999.457 (4.63)***	3.32864 (7.5)***
$IFRS_{i,t}^{2011}$ * EPS	0.69213 (4.82)***	-0.00005 (-1.08)
$IFRS_{i,t}^{2012}$ * EPS	0.69542 (4.7)***	-0.00015 (-3.43)***
$IFRS_{i,t}^{2013}$ * EPS	-0.09668 (-0.76)	-0.00013 (-3.54)***
$IFRS_{i,t}^{2014}$ * EPS	1.48852 (8.06)***	-0.00015 (-2.82)***
$IFRS_{i,t}^{2015}$ * EPS	3.86467 (17.39)***	-0.00005 (-0.7)
N	4,610	4,610
Adjusted R^2	0.8722	0.147
F test	13.42***	1.19***
LM test	4,935***	3.21*
Hausman	5,398.76***	41.84***

*, **, *** denote *p*-values < .05, .01, and .0001, respectively.

EPS = earnings per share, BVPS = book value per share, PRICE = stock price at the end of March of $year_{t+1}$, RETURN = 15-month return at the end of March of $year_{t+1}$, IFRS = 1 if year = 2011 to 2015 or if early adopter in 2010, i = firm, and t = year.

V. Conclusion

This study addresses the question: "What difference is there, if any, in the earnings and stock price and stock returns relations before and after IFRS adoption in Korea?" Results indicate that there is a positive and statistically significant relation between stock prices and IFRS and the interaction of EPS and IFRS. The stock return and IFRS*EPS interaction shows a statistically negative relation. We believe the stock price results are more appropriate for addressing the research question. However, we believe it is informative to present more than one measure, especially because some prior research uses stock returns. The results give some support to the view that compared to domestic-based earnings, IFRS earnings are more value relevant, and, implicitly, of higher quality than pre-IFRS domestic standards. The results for stock prices differ from preliminary research on Korea's IFRS adoption by Choi (2013) and Kim and Kim (2015). The stock returns results are consistent with Kim and Kim (2015) but differ from Choi (2013), who found no difference for 2010 domestic versus IFRS-based financial statements. The two prior Korean studies and our study add to results in the existing literature on single-country studies of IFRS adoption and value relevance of earnings.

We assert that several aspects of IFRS adoption settings affect the capital market effects of adoption. We recommend future research that incorporates more than one country's adoption with measurements such as length of time between expected and actual IFRS adoption, transition periods, and cultural variables. Such research would necessitate using world-wide databases or joint efforts between researchers because it is nearly impossible for a researcher to have access to numerous single-country data sets.

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Trust, Relationships, and Project Outcomes: The Impact of Trust on the Success of Construction Projects

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This article provides a rare look into the relationships between school-construction project owners, school district superintendents, and contractors. The authors surveyed these parties to new construction projects using English's (2006) framework. Our analysis provides a unique look at both sides of the construction project process and is based on years of negotiations. Operationalizing these constructs advances our understanding of how trust impacts these projects.

Keywords: Trust, Social Exchange Theory, Project Management

JEL Classification: L33, L74, M54

I. Introduction

Decision makers often initially have a clear idea about whether their firm should internalize a process or look to the market to provide the good or service.This clarity results from management researchers examining the make-or-buy decision starting as early as 1776 with Adam Smith until Oliver Williamson clarified the idea in 1975. An understanding of internal resources and capabilities available, the frequency of the process, and the search costs (both time and money) all lead to a lengthy discussion of contracting as the firm attempts to balance direct control with cost. Owners and managers can follow this clear guidance to determine the best course of action for their organizations.

Once the decision is made to externalize, however, the literature becomes a bit murkier. Williamson (1975) is silent on issues of trust and contract enforcement, yet trust is essential to optimize results for the creation of value networks. Given that managers and lawyers demonstrate a bounded rationality, contracts will be incomplete (March and Simon, 1958). All executives, including the CEO/Project owners under consideration in this study, demonstrate a bounded form of rationality and therefore cannot anticipate or monitor all aspects of a contract (Williamson, 1975).

When contracts are incomplete and both parties are expected to operate with their own self-interest at the fore, some authors have suggested that trust is a necessary component of complex projects (Axelrod, 1984; Putnam, 2000; Kramer and Tyler, 1996). Others disagree and argue that successful completion does not require trust (Korczynski, 1996).

This paper offers a number of contributions to the literature. Despite a diverse body of literature on social exchange theory, this study aims to better understand several interrelated aspects of trust and their impacts on working relationships in a rare project management context.

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Further, the study examines the relationships with project outcomes. This paper provides a rare empirical test of the theory by exploring these relationships through a unique study.

II. Literature Review

Social exchange theory handles trust in this way. Pesamaa and Hair (2007) cite Blau and Zaheer in asserting that trust is just one aspect of an individual's or firm's "long-term orientation" ("LTO"). These social arrangements then become much more than just a single transaction and can involve the forming of friendships and relationships beyond simple working interactions. In these types of arrangements, the individual or firm will be much less likely to consider taking advantage of their partner and this will probably have less to do with some of the individual factors, which build a trusting relationship.

In other words, there are probably some embedded characteristics in these types of relationships that confound many of these studies. Relationships of any length involve to varying degrees loyalty and commitment. Almost all involve some sort of trust, but parsing out where the trust relationship resides is difficult.

This concept of uncertainty runs throughout the literature on trust. Agents, in the classical theory, are self-serving and therefore will look for opportunities to shirk. They could potentially look to execute the contract in ways which were not originally conceived. However, more recent theories, e.g. Piercy and Lane (2007), recognize that all parties to the transaction will operate with a form of "enlightened self-interest" which allows parties to recognize social consequences. Parties will still act in a self-interested manner, often with guile. Monitoring is expensive and can have negative effects that serve to worsen performance to a level lower than what could have otherwise been expected (Husted and Folger, 2004). This other key concept of vulnerability also permeates the literature on trust.

The relationship of trust and control grows from the need to resolve uncertainty in relationships and to shore up vulnerabilities. Quite simply, there are limits to what can be contracted. Often the cost of contracting itself can be a barrier to contracting as when the over-formalization of a process actually slows the pace of the work to be completed. This takes the form of mutual experience and the interplay of nuances "signaled and received in a sensitive way" (Williamson, 1979). Given that contracting is an exercise in allocating risk and that a cost must be paid for assuming that risk, trust can be viewed not only as a lubricant to reduce friction, but may also reduce the overall cost of construction (Zaghloul and Hartman, 2003).

As Gulati and Nickerson summarize in their 2008 article, "Trust may substitute for formal governance if the cooperative behavior trust generates offers a less costly and more effective safeguard than complex contracts or vertical integration" (Bradach and Eccles, 1989; Dyer, 1997; Lincoln and Gerlach, 2004; Nootebloom *et al*., 1997; Zaheer and Venkatraman, 1995). Likewise, Gulati (1995) argues "trust can substitute for hierarchical contracts in many exchanges and serves as an alternative control mechanism."

Trust is clearly differentiated from contracting, but in defining trust it is important to understand that it is also different from confidence. Whereas both have a basis in past behavior, for expectations about present conduct, trust goes farther in considering future behaviors and as Das and Teng (1998) point out, trust also "refers to expectations about possible motives."

Robbins and Judge (2007) offer the following definition of trust: "A positive expectation that another will not – through words, actions or decisions – act opportunistically." This matches closely Das and Teng's (1998) definition: "The degree to which the trustor holds a positive attitude

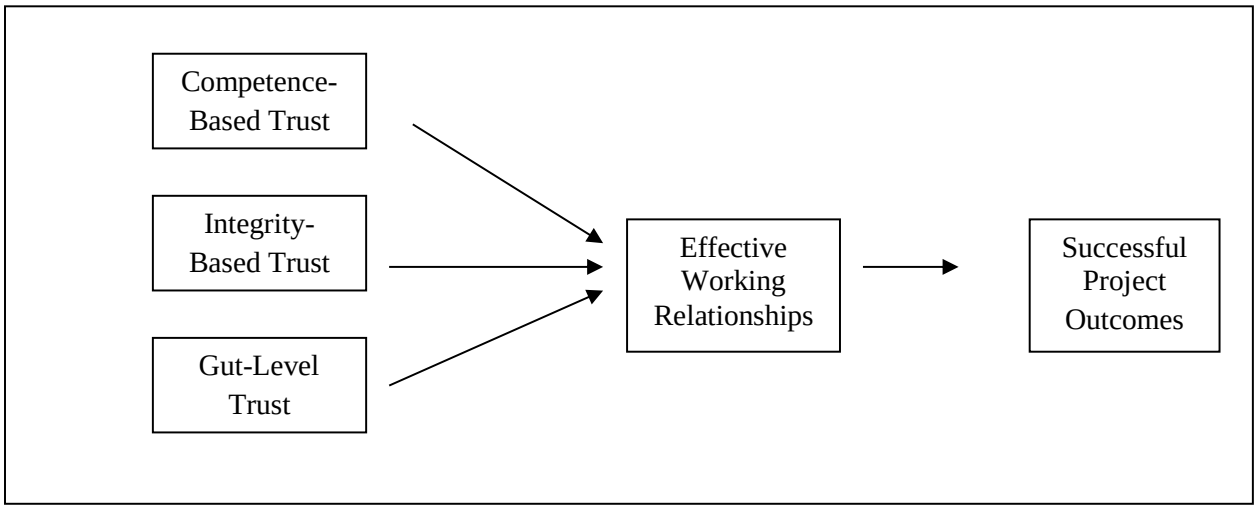
toward the trustee's goodwill and reliability in a risky exchange situation." Harvey MacKay, a best-selling author, captures the spirit of exposure to risk through a transactional relationship this way: "When a person with money meets a person with experience, the person with experience ends up with the money and the person with money ends up with the experience" (Mackay, 2013).

Das and Teng (1998) do point out benefits of trust that echo Zaghloul and Hartman (2003): lowering transaction costs, inducing desirable behavior, reducing the scope and extent of contracts, and dispute resolution. They also point out some of the costs of trust, chiefly risk. In extending trust, the actor or firm creates a vulnerability; if the person in whom they place that trust violates it, there is the risk of loss. Such trusting relationships also limit freedom of action for the parties. It is these constraints that cause such relationships, if they become long-standing, to be almost social contracts.

Language barriers and the distances of geography and background between parties often prevent the trust from developing. This failure can damage working relationships and lead to sub-optimal project outcomes (Pinto *et al*., 2009).

Trust has two important components to consider here. First, it is an interpersonal mechanism. "A firm does not trust, people trust" (Rodriguez *et al*., 2007). Even when trust is based upon the reliability of expectations that one firm places in the actions of another, those expectations are made by individuals. The other aspect is its future focus. This future orientation is based on a delicate interweaving of past encounters, connections, inferences, facts, and hunches. It governs present and future conduct.

Figure 1: The Model for Trust, Working Relationships, and Project Outcomes



Zaghloul and Hartman (2003), among others, divide the mechanism by which people trust into three component parts. *Integrity-Based Trust* is based on the perceived honesty of the individual. *Competence-Based Trust* is based on the perceived skill set (technical knowledge, interpersonal knowledge, and the perception as to whether the counterparties can accomplish what they say they will) of the individual. *Gut-Level Trust* is based on the perceptions towards individuals as to whether they inspire "gut-level" feelings of trust. These aspects of trust, whether positive or negative, define the relationships between parties. Figure 1 presents a graphic representation of the process, and the following two hypotheses are based on the process.

H1a: *For contractors, high levels of competence-based, integrity-based, and gut-level-based trust lead to better working relationships.*

H1b: *For owners, high levels of competence-based, integrity-based, and gut-level-based trust lead to better working relationships.*

"According to a substantial literature in economics and sociology, trust lowers transaction costs in all kinds of exchange relationships in which a risk of opportunism is present." (Bradach and Eccles, 1989, Nootebloom, 1997; Nootebloom *et al*., 1997; Gulati and Nickerson, 2008)

Difficult working relationships in any business-to-business setting devolve into ponderous legal exercises as both sides pore through the contract ensuring they do the minimum required and are not "taken advantage of" in the relationship. These conditions slow down work, lead to sub-optimal working conditions, and impair communication. In contrast, if working relationships improve and trust is formed, the result can be a more positive outcome over time. In fact, Ingram and Lifschitz (2006) found that relationships between long serving purchasing managers and buying agents were stronger due to the trust that built up through repeated contacts. "Trust is linked to the predictability of a partner firm's behavior toward a potentially vulnerable focal firm. If the partner firm fulfills positive expectations, the focal firm develops greater confidence in the partnership, and this confidence, in turn, mitigates future concerns about opportunism." (Gulati and Nickerson, 2008).

The projects under review in this study were all at least three million dollars (US) building projects and had generally high but varying degrees of complexity. The contractors here were workers with highly transferable skill sets. With different boundary conditions it would be possible to get a different result, but given these, we would expect the following.

Public school projects can be several months to as long as six years in duration. Some reconstruction contracts even turn into "perpetual" ones as it often takes fifteen years to cycle through renovation projects at a school district's buildings, just in time for the next round of renovations. As such it is very much in the best interest of the contractors to establish relationships with the "owners," who are district superintendents.

Likewise, benefits will accrue to superintendents who have developed a trusting relationship with good contractors. Larger school districts have larger buildings with higher prestige and higher salaries. Superintendents who have demonstrated an ability to get projects shepherded through the process "on time and on budget" have an advantage in seeking jobs when even moderately-sized districts can be expected to invest $60-$100 million (US) in school construction bonds every thirty years.

Gulati and Nickerson (2008) observe a number of easily noticed benefits to parties that develop mutual trust:

1) There are lower expected maladaptive and haggling costs because exchange partners are more likely to avoid disputes or resolve them quickly;
2) The scope of adjustments exchange partners are willing to embed in a contract or leave out of it may expand;
3) There is a less formal governance mode.

Given that the parties to the contract would be expected to be rational actors with awareness of the ability to "win" not just from a single contract but from multiple contracts, the following hypothesis is derived.

H2a: *For contractors, better working relationships lead to better project outcomes.*

H2b: *For owners, better working relationships lead to better project outcomes.*

III. Methodology

The original survey on which this study is based surveyed chief executive officers. The decision to treat the district superintendents as CEOs has its basis in the discussion from the Pennsylvania Department of Education in more than 7,500 links to the PA Department of Education website. Given that contractors were the other party in the survey, it is equally important that they held the view of the superintendent as CEO. Teaching.com and the more than 10 million links to "school superintendent as CEO" at Bing.com are evidence of the common acceptance in the educational community.

The original study (English, 2006) had several potential limitations which were identified by the authors as it relates to the theories offered by Zaghloul and Hartman (2003). For example, the integration of intuitive, or "gut feeling," trust is tested here as well as an attempt to link the owners and contractors based on specific projects. Thus the owners were surveyed and asked to identify a specific project and a specific contractor as a basis for their discussion. The contractor was then contacted and surveyed on these same points.

In addition to eliminating two questions that tested as having low reliability in the initial survey and allowing open-ended responses for the role, the survey was also reformatted to contain no indication of the sponsoring party, although it was accompanied by a cover letter.

The authors contacted district superintendents at random from a list of superintendents who had attended a Western Pennsylvanian Superintendents' Forum (to which every western Pennsylvania superintendent had been invited). The document contained contact information for each person, although two were incorrect.

The collection of the information from the individuals took several rounds of requests, with only one response to the initial request. A second email attempt with an attachment of the surveys elicited several more responses, with the final surveys being collected in a series of phone interviews. Each of the phone interviews was conducted by the authors and each question was read without comment. The authors provided no clarifications when the respondent was unclear of the intent of the question. Three of the superintendents chose to discontinue participation during the survey. One trusted survey had to be discarded when it was determined the "contractor" was actually a district employee (clerk of the works).

After four rounds of requests and cajoling, eleven respondents out of 50 potential respondents were tabulated. What was difficult to determine is how many superintendents should have been excluded as they did not have recent building projects, an issue that will be revisited in the discussion section. Using Dillman's (2000) recommendations and varying the methods of contact did yield a 22% response rate. We followed four of the five recommended techniques for ensuring high return rates, eschewing only the inclusion of a small financial reward. In addition, the study period has been a time of transition, and many of those approached have subsequently

retired, suggesting they had little motivation for gaining any better understanding of the complex processes under study here.

Each superintendent designated a primary contact person at the contractor, and an identical survey was then mailed to the person from the construction management or engineering firm. Unfortunately, the hope of creating a dyad between two people was only achieved in two cases. In the other cases, the survey returned by the contractor either named a primary contact other than the superintendent or failed to name a primary contact. As a result, that line of research was dropped from this study.

It should be noted that the use of survey research has come under fire. Golder (2000) points out that "it [survey research] can produce biased information when past events are recalled." Third party independent source materials can be used to detect and thwart biased historical recollections. In general, designed experiments are better than observational insights. Experiments provide better control over the amount and the quality of the data; however, in this case, it would not be possible to develop an experiment that would simulate the contact between superintendents and construction executives.

Factor analysis was used to determine what constructs would be used in the final model. Based on eigenvalues, a three-factor model was chosen with individual items loading on factors used as variables above. After the factor loads were calculated, a matrix determined the relevant score for each construct.

The variables of interest in this study were derived from Pinto *et al.* (2009). "Success" indicates the project was completed within the guidelines of the budget, timeline, and technical aspects of the project. "Relationships" measure the emotional investment in the on-going interactions between the parties. "Integrity" considers whether the rated individuals will keep their word. "Competence" considers whether the rated individuals could complete envisioned projects given their track record and performance. "Gut-level" considers the rated person's ability to complete envisioned projects based solely on inter-party interactions.

IV. Results

After considering the descriptive statistics and correlations for the superintendents and contractors separately, a series of regressions was run to determine the level of support for the hypothesis. In addition, a regression was run to check for multicollinearity. As none of the variance inflation factors was above 1.00, multicollinearity was judged not be an issue.

Table 1: Descriptive Statistics Among Constructs for Contractors, n=11

	Variable	Mean	Standard Dev	Min	Max
1	Success	6.318	0.529	5.73	7.00
2	Relationships	5.778	0.502	5.17	6.33
3	Integrity	5.429	0.900	4.21	6.50
4	Competence	5.550	0.818	4.50	6.50
5	Gut-Level	4.833	0.683	4.00	5.75

The contractors were very positive in their interpretation of success as seen by the narrow range of responses centered slightly above 6.3 (Table 1). This is by far the highest response amongst the key variables and, when taken in concert with the lower score for whether a relationship had been formed, may be suggestive of a contractor's view of the project as a "one-shot-deal," leading to transactional behavior. This could be due either to the infrequency of construction projects or the turnover amongst superintendents. Superintendents were viewed to have a high degree of integrity and competence, although competence slightly out-performed integrity and was more uniform. Gut-level or initial impressions were not as strong.

Table 2: Correlation Matrix Among Constructs for Contractors

	Variable	1	2	3	4	5
1	Success	1.000				
2	Relationships	-0.103	1.000			
3	Integrity	0.500	0.763	1.000		
4	Competence	0.094	0.752	0.885	1.000	
5	Gut-level	-0.327	0.429	-0.397	-0.281	1.000

A greater indication of transactional behavior can be found in the negative correlation between success and relationships. Integrity and competence were highly correlated and both were highly correlated with having a good relationship. Gut-level or initial impressions were only positively correlated to relationships.

Table 3: Regression Results for Hypothesis 1a

Hypothesis 1a: *For contractors, high levels of competence-based, integrity-based and gut-level-based trust lead to better working relationships*		
Variable	**Coefficient**	***p*-Value**
Intercept	1.430	0.686
Integrity	0.387	0.589
Competence	0.111	0.871
Gut-level	0.351	0.514
$R^2 = 0.796$ Adjusted $R^2 = 0.185$ 95% Confidence Interval = $1.07531 \leq \beta \leq 1.78469$		

Table 4: Regression Results for Hypothesis 2a

Hypothesis 2a: *For contractors, better working relationships lead to better project outcomes*		
Variable	**Coefficient**	***p*-Value**
Intercept	6.944	0.084
Relationships	-.108	0.847
$R^2 = 0.011$ Adjusted $R^2 = -0.237$ 95% Confidence Interval = $6.58032 \leq \beta \leq 7.29968$		

Table 3 shows the strong connection between trust and relationships, while Table 4 shows that for the contractors, the relationship and project success are not connected.

Table 5: Descriptive Statistics Among Constructs for Superintendents, n = 11

	Variable	Mean	Standard Dev	Min	Max
1	Success	5.675	1.238	3.45	6.82
2	Relationships	4.875	1.889	1.50	7.00
3	Integrity	4.946	1.241	3.29	6.57
4	Competence	4.750	1.837	1.00	6.75
5	Gut-level	5.031	0.761	4.00	6.50

The superintendents' views of the contractors were more muted with the exception of gut-level trust. The superintendents had a slightly higher impression of the contractor's abilities than the other way around, and some contractors generated a very high level of gut-level trust. The much higher standard deviations relative to those of the contractors suggest much less uniformity amongst opinions. Indeed, the range of competence spanned nearly the entire scale.

Table 6: Correlation Matrix Among Constructs for Superintendents

	Variable	1	2	3	4	5
1	Success	1.000				
2	Relationships	0.949	1.000			
3	Integrity	0.866	0.907	1.000		
4	Competence	0.838	0.934	0.916	1.000	
5	Gut-level	0.701	0.605	0.377	0.364	1.000

For the superintendents, there is a very high correlation between the variables of interest, with the exception of those involving gut-level trust, which were not highly correlated with either integrity or competence. It is suggestive that contractors were not able to maintain their initial impressions as the project continued.

Table 7: Regression Results for 1b

Hypothesis 1b: *For owners, high levels of competence-based, integrity-based, and gut-level-based trust lead to better working relationships*		
Variable	**Coefficient**	***p*-Value**
Intercept	-3.572	0.060
Integrity	0.368	0.380
Competence	0.622	0.068
Gut-level	0.729	0.050*
$R^2 = 0.962$ Adjusted $R^2 = 0.933$ 95% Confidence Interval = $-4.86547 \leq \beta \leq -2.17453$		

Table 8: Regression Results for 2b

Hypothesis 2b: *For owners, better working relationships lead to better project outcomes*		
Variable	**Coefficient**	***p*-Value**
Intercept	1.217	0.133
Relationships	.832	0.001*
$R^2 = 0.901$ Adjusted $R^2 = 0.882$ 95% Confidence Interval = $0.37322 \leq \beta \leq 2.06078$		

The results from these two tables confirm that gut-level trust in particular leads to better working relationships (Table 7), and those better working relationships lead to better outcomes (Table 8).

V. Discussion

With such small sample sizes and some missing information, it is difficult to gain great insights from this data. The contractors' sample was just too small and ended up coming from only four firms. The evaluations were very high for all but one of the districts, as would be expected if the contractors were relying on the districts for a continued flow of resources.

It was encouraging that, even for contractors, the correlation between the aspects of trust and relationships were so strong, although a bit weaker for gut-level.

The sample size is problematic in a number of ways. The small sample size provided a result with low power to answer this question. Studies which have low power, like this one, make it harder to detect small effects. Thus, the non-significant findings may be a direct result of the small sample size and leave the questions posed unanswered. A larger sample would have allowed for more reliability in this data. Although there are some significant findings, the "n" was so small it is difficult to infer much. Likewise, a larger sample would increase the ability to bring in more advanced statistical tools. Given the small sample size, the SPSS software was easily able to handle the computations.

What was encouraging was that for the superintendents, the hypotheses were directionally correct with significant findings for gut-level trust on relationships and relationships on success. This finding was made despite gut-level trust's lower correlation with the other forms of trust, which were again both very strongly correlated with relationships.

Three of the superintendents chose to discontinue participation during the survey. One of the superintendents was explicit about her reason for dropping out of the study – she related that projects too often end in legal disputes at some point and she did not want to complicate future litigation through potentially misconstrued positive comments. Two of the superintendents who chose not to participate did engage in lengthy and enlightening discussions as to why they could not be included.

VI. Future Research

As discussed, this paper was developed with only a small sample of school districts. The next logical step would be to obtain the necessary approvals to conduct a study of a larger sample of western Pennsylvania schools. Through this study, we could truly validate the work done by the Pinto *et al.* (2009) study and expand the understanding of the instinct-based trust construct.

Any study of this nature would be tied closely to the work in the field of project management. Cooke-Davies *et al.* (2007) have introduced the complexity theory to that field, and we believe that it bears consideration for trust as well. How do radical unpredictability, nonlinearity, and self-organization each moderate the traditional contractual relationship?

Another potential moderator that could be more clearly uncovered by a more thorough companion study here among school districts is its sensitivity to the environment. The original AMEC study (English, 2006) was conducted amongst individuals living in temporary quarters and on temporary assignments. Many of the contractors and the even the firms themselves were in an exploratory mode. They were developing relationships while testing the workflows, keeping those that worked, jettisoning the ones that proved faulty, and building the infrastructure for completing projects while they built the projects themselves. The superintendents, administrators, and architects of western Pennsylvania work in nowhere near as dynamic an environment. They may have a new Board of Education to contend with every four years or face negative publicity about taxes and school costs, but largely theirs is a smooth process.

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Super Bowl Indicator and Equity Markets: Correlation Not Causation

By BILL SCHMIDT AND RONNIE CLAYTON*

The first discussion of the Super Bowl Indicator relating equity market performance to the league (conference) of the winner of the Super Bowl was in 1978. The intention was to show that correlation does not necessarily imply causation. Various authors examined and discussed this relationship. The Super Bowl has been played for 50 years. This study examines the relationship between the Super Bowl winner's classification and the movement of the equity market utilizing three equity market indexes for the entire period. Over the 50 years of the Super Bowl, the winner's classification has correctly predicted the direction of at least one of the three indexes 86 percent of the time. It seems that the Super Bowl Indicator has maintained a rather close relationship with the equity market throughout the game's history. While correlation does not imply causation, it does provide interesting conversation and teaching points regarding the behavior of the equity markets.

Keywords: Super Bowl Indicator, Correlation, Causation, Equity Markets

JEL Classification: G110, G120

I. Introduction

In the current edition of their *Fundamentals of Investments* textbook, Jordan, Miller, and Dolvin (2015) include a section on inane technical market indicators that have unusual correlations with the stock market. Some of these indicators include the Odd-lot Indicator, the Hemline Indicator, the Daytona 500 Indicator, and the Super Bowl Indicator. And, while it is anyone's guess as to which of these are the most commonly known, the one that seems to get the most attention is the Super Bowl Indicator (SBI). Koppett (1978) appears to be the originator of the SBI and, ironically, his intention was to point out a coincidence that had no predictive value. He simply observed that for the first 11 Super Bowls, "…whenever an old NFL team won the Super Bowl in January, the stock market rose during the next 11 months and finished that calendar year higher than it began. And whenever an old AFL team won, the market finished that year lower." Koppett's point was simply that this was an example of a numerical association that had no causal implications. In fact, Zweig (2011) recounts that in a 2001 interview, Koppett seemed astounded that something he meant as a joke was still part of the consciousness of the investment community. Koppett, who died in 2003, would likely be even more astounded to learn that his indicator is still included in textbooks today, and that it has evolved to better fit the data.

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II. Background

A brief history of professional football may help the reader better understand Koppett's original indicator and how that indicator has evolved. The American Football League (AFL) was created in 1960 as a separate and independent alternative to the existing National Football League (NFL). The AFL began with eight teams and added one more in 1966 and another in 1968. Prior to 1960 the NFL had 12 well-established teams and franchised new teams in 1960, 1961, 1966, and 1967. By 1968, the NFL and the AFL consisted of 16 and 10 teams, respectively (see Table 1).

Table 1: Professional Football Before the 1970 League Merger

Pre-Merger NFL and AFL Teams (current name in parentheses)		
	NFL Teams	**AFL Teams**
1	Atlanta Falcons	Boston Patriots (New England)
2	Baltimore Colts (Indianapolis)	Buffalo Bills
3	Chicago Bears	Cincinnati Bengals
4	Cleveland Browns	Denver Broncos
5	Dallas Cowboys	Houston Oilers (Tennessee Titans)
6	Detroit Lions	Kansas City Chiefs
7	Green Bay Packers	Miami Dolphins
8	Los Angeles Rams	New York Jets
9	Minnesota Vikings	Oakland Raiders
10	New Orleans Saints	San Diego Chargers
11	New York Giants	
12	Philadelphia Eagles	
13	Pittsburgh Steelers	
14	San Francisco 49ers	
15	St. Louis Cardinals (Arizona)	
16	Washington Redskins	

The two leagues were entirely separate until they agreed to have their respective champions play following the 1966 season. Thus, on January 15, 1967, the Green Bay Packers, representing the NFL, and the Kansas City Chiefs, representing the AFL, played in the first World Championship Game (later officially renamed the Super Bowl). The two leagues continued to operate separately for four iterations of the Super Bowl until the leagues decided to merge into one large league made up of two conferences prior to the 1970 season. Koppett's original observation was based exclusively on the alignment of the teams prior to the merger as shown in Table 1.

The new post-merger league would be called the National Football League and would consist of an American Football Conference (AFC) and a National Football Conference (NFC). To balance the number of teams in each conference, the Baltimore Colts, Cleveland Browns, and Pittsburgh Steelers were paid $1 million each to become part of the new AFC along with the 10 pre-merger AFL teams. Thus, the new league began play with 13 teams in both the AFC and the NFC (see Table 2). Some newer definitions of the SBI refer to these post-merger conferences instead of the pre-merger leagues (Gitman and Joehnk, 1996) originally referenced by Koppett (1978).

Table 2: Professional Football After the 1970 League Merger

	NFC Teams (post-merger)	AFC Teams (post-merger)
1	Atlanta Falcons	*Baltimore Colts (Indianapolis)
2	Chicago Bears	Boston Patriots (New England)
3	Dallas Cowboys	Buffalo Bills
4	Detroit Lions	Cincinnati Bengals
5	Green Bay Packers	*Cleveland Browns
6	Los Angeles Rams	Denver Broncos
7	Minnesota Vikings	Houston Oilers (Tennessee Titans)
8	New Orleans Saints	Kansas City Chiefs
9	New York Giants	Miami Dolphins
10	Philadelphia Eagles	New York Jets
11	San Francisco 49ers	Oakland Raiders
12	St. Louis Cardinals (Arizona)	*Pittsburgh Steelers
13	Washington Redskins	San Diego Chargers

*NFL teams who became part of the AFC.

Since the 1970 merger, the NFL has added six more teams giving the league a total of 32 teams. The conference affiliations of the new teams and their classification in terms of the SBI have led to some complications. For example, in 1976, the Tampa Bay Buccaneers and the Seattle Seahawks franchises were established with Tampa Bay in the AFC and Seattle in the NFC, but then these conference affiliations were switched one year later. The Tampa Bay franchise has remained in the NFC since 1977; however, the Seattle franchise was returned to the NFC in 2003. Additionally, the Cleveland Browns franchise (an original NFL team that became part of the AFC) moved to Baltimore and became the Baltimore Ravens in 1996. While it was the Browns franchise that moved, the NFL considered the Ravens to be a "new" team so the original Cleveland franchise was restored in 1999. In terms of the SBI, the Tampa Bay Buccaneers, Seattle Seahawks, and Baltimore Ravens are all relevant because they have all won Super Bowls.

Krueger and Kennedy (1990) provide the first "rigorous examination" of the SBI with what they called the Super Bowl Stock Market Predictor (SB SMP). They begin by using Stovall's (1989) definition of the SB SMP, which is simply that the stock market will finish the year higher than it started if a team from the old National Football League wins that year's Super Bowl, and it will finish the year lower than it started if a team from the old American Football League wins the Super Bowl. Stovall's definition is nearly identical to Koppett's (1978) definition, except that Koppett referred to the stock market rising during "the next 11 months" after the game. At the same time, Koppett also said that the market "finished the year higher than it began." Stovall makes it clear that the entire calendar year is the focus of observation for the market's performance. Krueger and Kennedy (1990) examined the performance of the SB SMP against five different stock market indexes for the first 22 Super Bowls and found that the Super Bowl winner correctly predicted the sign of the annual market return 91 percent of the time. While the accuracy of the SB SMP was remarkable, rational people recognized that it was merely a statistical anomaly that provided little value beyond a classroom exercise in differentiating between association and causation. This is the exact point Koppett sought to make in 1978. Still, an awareness of this association remains after 50 Super Bowl games have been played as the SBI is still mentioned in the popular media, textbooks, and finance classrooms. Thus, one reason for this paper is simply to

update the SBI to include the 28 additional Super Bowl games that have been played since Krueger and Kennedy's original analysis to determine if the coincidental association still exists. Also, in 1990 the definition of the SB SMP used by Krueger and Kennedy (1990) was sufficient to analyze all the previous Super Bowl winners. However, since that time there have been four Super Bowl winners that did not exist when the NFL and AFL were separate entities. Even though Johnson (2014) discussed whether the SBI remains relevant, the question of how, or if, these new teams should be included in the analysis remains unresolved and is an objective of this paper. Finally, since the SBI is so commonly known, this paper will seek to determine whether there is any market reaction consistent with the SBI in the days following the Super Bowl.

III. Results

Of the 50 Super Bowl games that have been played, the winning team has predicted that the stock market will finish the year higher 34 times and lower 16 times (see Appendix 1). For this analysis, we are using the definition of calendar year returns used by Stovall (1989) and Krueger and Kennedy (1990). We also used Koppett's (1978) definition of old NFL teams predicting an increasing market and old AFL teams predicting a decreasing market, but modified the definition to include three Super Bowl winning teams that were not in existence before the 1970 merger. For the teams that did not exist prior to 1970, their predictive input is aligned with their respective conferences as of the date of their Super Bowl win. Tampa Bay and Seattle each won as the representative from the NFC and, therefore, predicted that the market would have an up year. The Baltimore Ravens won twice as a member of the AFC, thus predicting a down market.

The predicted market movement is compared to the actual market movement for each year as measured by the Dow Jones Industrial Average, The New York Stock Exchange Index, and the Standard & Poor's 500 Index. Over the 50 years that the Super Bowl game has been played, these three indexes moved in the same direction in 36 of those years. In the remaining 14 years, one of the indexes moved in the direction opposite the other two. Thus, the association between the Super Bowl winning team and the ensuing stock market performance will vary depending on which index is used. Table 3 summarizes the results for each of the three indexes:

Table 3: Predicted Versus Actual Market Movement

	Annual Return		
	DJIA	**NYSE**	**S&P500**
Correct	40	38	37
Incorrect	10	12	13
Percentage Correct	80%	76%	74%

After 50 Super Bowl games, the association between the Super Bowl winner and the direction of the stock market's returns for the year is still very strong. Collectively, the three indexes have responded in the predicted manner 76.67 percent of the time, a remarkable coincidence.

Even more remarkable is the result of the analysis of the 14 years when the indexes disagree. Lowering the threshold for a successful "prediction" to at least one of the three indexes responding in the predicted manner, yields the results shown in Table 4.

Table 4: At Least One Index Predicts Correctly

At Least One Index Correct	43
All Indexes Incorrect	7
Percentage At Least One Correct	86%
At Least Two Indexes Correct	37
One Index Incorrect	13
Percentage At Least Two Correct	74%
All Indexes Correct	35
At Least One Index Incorrect	15
Percentage All Indexes Correct	70%

The Super Bowl winner has correctly predicted the direction of at least one of the three indexes studied in 86 percent of the 50 Super Bowl years. A threshold of only one index moving in the predicted direction admittedly is posturing the data to make for a seemingly more unlikely result. However, if the purpose of the exercise is to showcase an extreme example of coincidental association, such posturing can be effective. This would appear to be the reason for inclusion in the Jordan, Miller, and Dolvin (2015) textbook, even though their standard was a simple association with a single index.

Turning attention to whether this long running association has any impact when a new Super Bowl champion is crowned provides some interesting results. Since the relationship between Super Bowl winners and market performance is included in popular textbooks and it has been shown to be oddly efficacious, does the market react in the appropriate direction to the new information provided by the crowning of the new Super Bowl champion? The market returns on the day after each of the 50 Super Bowls for each of the three indexes is examined and the results are presented in Table 5.

Table 5: Predicted Versus Actual Market Returns on the Day After

	Day +1		
	DJIA	**NYSE**	**S&P500**
Daily Returns as Predicted	28	26	27
Daily Returns not as Predicted	22	24	23
Percentage as Predicted	56.00%	52.00%	54.00%

As Table 5 shows, the results are not so remarkable. Collectively, the market indexes respond in the predicted manner only 54 percent of the time. Given that teams from the NFL/NFC have won 34 out of the 50 Super Bowls, thus predicting a positive market reaction, the long-term positive trend of the market may be the only explanation necessary for the prediction to be correct slightly more than 50 percent of the time.[1] In fact, if we look at the market returns the day after the game since Krueger and Kennedy (1990) showed the relationship for the entire year, we actually find no relationship whatsoever between the winner of the game and the market returns the following day (see Table 6).

[1] The S&P 500 Index has gone up in 37 out of the 50 calendar years (74 percent) since the first Super Bowl game was played. In the 39 years prior to the first Super Bowl, it went up in 64 percent of the years.

Table 6: Predicted Versus Actual Market Returns Since 1990

Since Krueger and Kennedy (1990)			
	Day +1		
	DJIA	**NYSE**	**S&P500**
Daily Returns as Predicted	13	13	12
Daily Returns not as Predicted	13	13	14
Percentage as Predicted	50.00%	50.00%	46.15%

With next-day returns responding as predicted less than 50 percent of the time, it is safe to conclude that the game and the new champion do not impact the stock market in the immediate short run. While market participants have been aware of the SBI for at least the last 26 games played, they clearly do not adjust their behavior in the day following the game. Thus, investors are not able to realize short-term gains trading on the information from this long-running coincidental association.

Prior to Super Bowl 48, Power (2015) warned that the New England Patriots could deflate the stock market for 2015. It turns out that he was correct, in a sense. The Patriots did win the Super Bowl and the stock market was down for the year, so Power's prediction was accurate, even though one could certainly argue the soundness of his logic. Through 50 iterations of the Super Bowl, the predictive relationship between the winner of the game and the performance of the stock market is still inexplicably strong. However, the fact that market participants do not adjust their behavior immediately following the game is evidence that the relationship is nothing more than a long-running coincidence that makes for amusing classroom anecdotes and entertaining newspaper articles.

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Appendix 1: SBI Predicted Versus Actual Market Returns: 1967-2016

Year	SB	Super Bowl Winner	NFL/AFL	Prediction	DJIA	NYSE	S&P500
1967	1	Green Bay	NFL	+	15.20%	23.12%	20.09%
1968	2	Green Bay	NFL	+	4.27%	9.42%	7.66%
1969	3	NY Jets	AFL	-	-15.19%	-12.51%	-11.36%
1970	4	Kansas City	AFL	-	4.82%	-2.52%	0.10%
1971	5	Baltimore Colts	NFL	+	6.11%	12.34%	10.79%
1972	6	Dallas	NFL	+	14.58%	14.26%	15.63%
1973	7	Miami	AFL	-	-16.58%	-19.63%	-17.37%
1974	8	Miami	AFL	-	-27.57%	-30.28%	-29.72%
1975	9	Pittsburgh	NFL	+	38.32%	31.86%	31.55%
1976	10	Pittsburgh	NFL	+	17.86%	21.50%	19.15%
1977	11	Oakland	AFL	-	-17.27%	-9.30%	-11.50%
1978	12	Dallas	NFL	+	-3.15%	2.13%	1.06%
1979	13	Pittsburgh	NFL	+	4.19%	15.54%	12.31%
1980	14	Pittsburgh	NFL	+	14.93%	25.68%	25.77%
1981	15	Oakland	AFL	-	-9.23%	-8.67%	-9.73%
1982	16	San Francisco	NFL	+	19.60%	13.95%	14.76%
1983	17	Washington	NFL	+	20.27%	17.46%	17.27%
1984	18	LA Raiders	AFL	-	-3.74%	1.26%	1.40%
1985	19	San Francisco	NFL	+	27.66%	26.16%	26.33%
1986	20	Chicago	NFL	+	22.58%	13.97%	14.62%
1987	21	NY Giants	NFL	+	2.26%	-0.25%	2.03%
1988	22	Washington	NFL	+	11.85%	13.04%	12.40%
1989	23	San Francisco	NFL	+	26.96%	24.82%	27.25%
1990	24	San Francisco	NFL	+	-4.34%	-7.46%	-6.56%
1991	25	NY Giants	NFL	+	20.32%	27.12%	26.31%
1992	26	Washington	NFL	+	4.17%	4.69%	4.46%
1993	27	Dallas	NFL	+	13.72%	7.86%	7.06%
1994	28	Dallas	NFL	+	2.14%	-3.14%	-1.54%
1995	29	San Francisco	NFL	+	33.45%	31.31%	34.11%
1996	30	Dallas	NFL	+	26.01%	19.06%	20.26%
1997	31	Green Bay	NFL	+	22.64%	30.31%	31.01%
1998	32	Denver	AFL	-	16.10%	16.55%	26.67%
1999	33	Denver	AFL	-	25.22%	9.15%	19.53%
2000	34	St. Louis	NFL	+	-6.17%	1.01%	-10.14%
2001	35	Baltimore Ravens	***AFC***	-	-7.10%	-10.21%	-13.04%
2002	36	New England	AFL	-	-16.76%	-19.83%	-23.37%
2003	37	Tampa Bay	***NFC***	+	25.32%	29.28%	26.38%
2004	38	New England	AFL	-	3.15%	12.16%	8.99%
2005	39	New England	AFL	-	-0.61%	6.95%	3.00%
2006	40	Pittsburgh	NFL	+	16.29%	17.86%	13.62%
2007	41	Indianapolis	NFL	+	6.43%	6.58%	3.53%
2008	42	NY Giants	NFL	+	-33.84%	-40.89%	-38.49%
2009	43	Pittsburgh	NFL	+	18.82%	24.80%	23.45%
2010	44	New Orleans	NFL	+	11.02%	10.84%	12.78%
2011	45	Green Bay	NFL	+	5.53%	-6.11%	-0.003%
2012	46	NY Giants	NFL	+	7.26%	12.93%	13.41%
2013	47	Baltimore Ravens	***AFC***	-	26.50%	23.18%	29.60%
2014	48	Seattle	***NFC***	+	7.52%	4.22%	11.39%
2015	49	New England	AFL	-	-2.23%	-6.42%	-0.73%
2016	50	Denver	AFL	-	13.42%	9.01%	9.54%

*Highlighted returns indicate results that are not consistent with the predicted result.

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Performance of Cross-Border Acquisitions: Evidence from Canadian Firms Acquired by Emerging Market Firms

By YANG ZHOU AND GAMAL ATALLAH*

This paper studies the impact of M&A of Canadian firms by emerging market firms on the stock performance of the acquired firms from 2000 to 2016, using the short-term window event study. We find that the abnormal return of target firms on the event day is +10.3 percent and the cumulative abnormal return for 11 days is +10.55 percent. In the short term, the performance of Canadian firms acquired by emerging market firms is positive. Technology and mineral firms have significantly positive abnormal return on day 0 whereas energy firms only have small abnormal return for the same time period.

Keywords: Cross-Border Acquisitions, M&A, Emerging Countries, Corporate Performance, Event Studies

JEL Classification: G14, G34

I. Introduction

According to the *World Investment Report* (United Nations, 2016), global foreign direct investment (FDI) rose by 38 percent to $1.76 trillion in 2015, which is the highest level since the 2008 financial crisis. In 2014, a surge in cross-border mergers and acquisitions (M&A) to $721 billion from $432 billion[1] was the principal factor behind the global rebound. Meanwhile, an increasing number of enterprises from emerging market countries have become active in cross-border acquisition activities during the last two decades. In 2015, China, the Republic of Korea, Singapore, and Hong Kong made up three quarters of total outflows from developing Asia. Outward investment from China rose by about four percent to $128 billion. As a result, China is the third-largest investing country worldwide, after the United States and Japan. In Latin America, outward FDI in Brazil rose by a surprisingly strong 38 percent, while in Chile it rose by 31 percent. These figures show that there are many rapidly internationalizing firms from emerging countries becoming a permanent, sizeable, and rising feature of the world economy (OECD, 2006).

Canada is also influenced by this emerging countries M&A wave. From Table 1 we can see that although more than half of inflows to Canada were from the United States, the assets owned by emerging countries are growing continuously. More and more major Canadian firms are acquired by emerging country investors. For example, Tim Hortons merged in 2014 with Burger King, owned by Brazilian private equity firm 3G Capital. Canadian energy firms are widely purchased by emerging market firms. The China National Offshore Oil Corporation (CNOOC), China's third largest national oil company, purchased Nexen, Canada's ninth-largest oil company,

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[1] http://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=1555.

for $15.1 billion in 2012. Considering the upward trend of acquisitions by emerging countries, it is necessary to study the performance of these M&A.

Table 1: Corporations Returns Act (CRA) by Type of Control

Foreign-Controlled Enterprises, $ Millions

	2010	2011	2012	2013	2014
Total					
Assets	1,524,120	1,694,591	1,775,829	1,854,475	1,958,122
Operating Revenues	933,284	1,003,394	1,069,894	1,075,323	1,120,569
Operating Profits	66,621	78,875	71,133	72,702	78,306
U.S.					
Assets	789,880	833,077	876,588	922,665	969,481
Operating Revenues	540,535	558,175	581,911	611,674	622,021
Operating Profits	37,911	45,962	41,516	43,763	44,921
E.U.					
Assets	490,718	560,776	559,869	570,834	597,405
Operating Revenues	245,488	288,815	303,360	280,196	295,586
Operating Profits	17,631	19,877	18,636	18,443	18,912
Other Emerging Countries					
Assets	243,521	300,738	339,372	360,975	391,236
Operating Revenues	147,262	156,404	184,623	183,454	202,962
Operating Profits	11,080	13,036	10,980	10,496	14,473

Source: Statistics Canada, CANSIM, Table 179-0004 and Catalogue no. 61-220-X.

A significant problem in the acquisition performance study is how to measure performance. Several methods were used by previous researchers, such as the short-term window event study,

the long-term window event study, subjective performance measures, and accounting performance. In this paper, we use the short-term window event study. There are several reasons why we use this method. First, it is widely used by most researchers when they study the firms' performance and it has become standard in evaluating the stock price reaction to a specific event. Zollo and Meier (2008) review 88 articles about M&A performance published in top finance journals between 1970 and 2006. They find that the short-term window event study is the most broadly applied method (41 percent of total articles); the long-term accounting method (28 percent of the total) comes second, and long-term window event study is third (19 percent of the total). The second reason is that it is easy to get the data, which makes it possible to study a large number of mergers. Last but not least, since the abnormal return is calculated, data is not subject to industry sensitivity, which means cross-section firms can be studied.

The data in this paper come from several sources. With the help of Innovation, Science and Economic Development Canada, we obtained the list of Canadian firms acquired by emerging market firms. After identifying listed firms, we determined the event date when acquisitions were announced using the website *Marketwired*.[2] Finally, the security prices of the target firms and S&P/TSX (Toronto Stock Exchange) or NYSE (New York Stock Exchange) Composite Index were found on *Yahoo Finance*[3] and *Google Finance*.[4] After analyzing the data, we found that the number of acquisitions by emerging country acquirers increased rapidly after the 2008 financial crisis, with most bidders coming from Asia. The industries of target firms become more diversified; in addition, different countries focus on different sectors. With the Market Model, we calculated the abnormal return and cumulative abnormal return of target firms.

The results indicate that the abnormal return on event day (day 0) is about +10.3 percent, whereas the cumulative abnormal return for 11 days (-5, +5) is about +10.55 percent. This indicates that in the short term, the performance of Canadian firms which are acquired by emerging market firms is positive. The abnormal return increases significantly on the event day 0 and day 1, and it is back to normal after day 1. At the same time, the cumulative abnormal return also increases significantly on day 0 and stays positive till day 5. Technology and mineral firms have significantly positive abnormal return on day 0 whilst energy firms only have small abnormal return for the same time period. The cumulative abnormal return of technology firms is 0.1721, and mineral firms get positive 0.1817 during the event window. However, the cumulative abnormal return of energy firms is negative 0.0692 in the short term.

This paper contributes to the literature on the performance of M&A by focusing on mergers where the acquirers are emerging market firms. Moreover, this is the first study to focus explicitly on the acquisition of Canadian firms by emerging market acquirers. From a policy point of view, the generally positive abnormal returns found in this paper suggest that the Canadian government should relax certain restrictions on FDI. Canada has stricter FDI regulations than the average OECD country. As the positive abnormal returns suggest a positive competitive effect for Canadian firms, the results justify adopting a more liberal approach toward FDI, especially in sectors like technology and minerals, where the abnormal returns are more significant.

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[2] http://www.marketwired.com/.

[3] https://ca.finance.yahoo.com/.

[4] https://www.google.ca/finance?hl=en&gl=ca.

The rest of the paper is organized as follows. Section II summarizes previous research on the acquisition performance and some features of emerging country acquirers. Section III introduces the method used to measure the acquisition performance and calculate the abnormal return. Section IV shows the data collecting steps and analyzes the data. Section V presents the empirical results after conducting the Market Model. Section VI concludes.

II. Literature Review

Although the number of articles which study emerging market acquirers is not as large as that for developed-market acquirers, the rise of emerging countries in M&A has received more attention from scholars in recent years.

A. Different Motives for M&A

There are a number of papers which examine the multi-nationalization motives of emerging country firms. Obviously, different firms have different motives for M&A, and emerging market acquirers have some motives which differ from the way M&A are traditionally pursued.

Firstly, the typical Western model of international expansion is that the firm possesses the related knowledge and technology it needs to meet the needs of the foreign markets, and the cross-border acquisition is undertaken in order to exploit ownership advantages (Dunning, 1988). In emerging markets acquirers aim mainly at cutting costs and creating growth opportunities (Rothenbuecher and von Hoyningen-Huene, 2008).

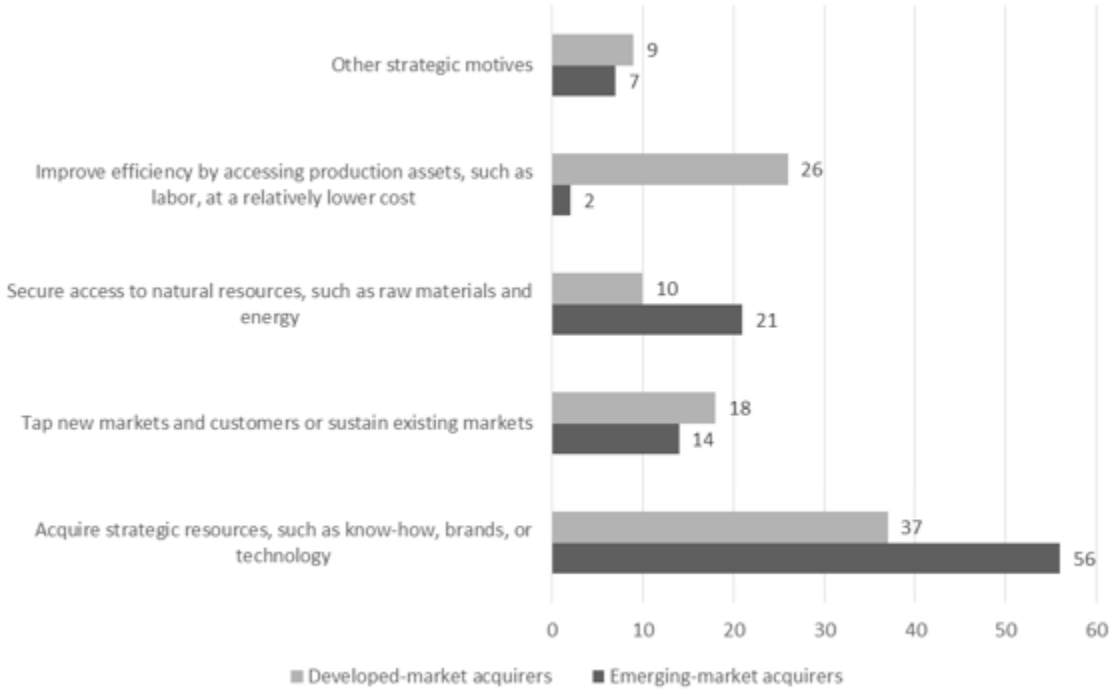
Moreover, several other hypotheses have been identified that can explain the causes of cross-border M&A in developed countries. Rhodes-Kropf *et al*. (2005) view that overall M&A are an outcome of difference in valuation of assets by different economic agents. The overvalued firms should become the acquirer and the undervalued firms should become the target. Based on this hypothesis, Trautwein (1990) argues that if there is information asymmetry or economic shock during the acquisition, then a firm may be acquired by another firm because it is undervalued and there is valuation difference between them. Roll (1986) states the hubris hypothesis that managers of acquirers are so over-confident about their estimation that they overvalue target firms. The hubris hypothesis occurs in the merger activity due to asymmetric information between the bidder and the target firm (Seth *et al*., 2002).

Since cross-border mergers belong to FDI, the foreign exchange rate and its fluctuation can affect FDI flows. Scholes and Wolfson (1990) have found support for the hypothesis that buyers purchase target firms when their currency is strong against the host currency. The firm from the appreciating currency country will be an acquirer and the firm from the depreciating currency country is a target. Senbet (1979) supports the tax arbitrage hypothesis that under different tax policies, if the foreign tax rate is lower than the domestic rate, the value of the firm will be positively influenced. Also, some scholars argue that the cross-border merger may be undertaken for a purely strategic rather than a value-creation purpose (Wilson, 1980; Caves, 1991; Hill *et al*. 1990; Schenk, 1999).

Cross-border acquisitions are a primary mode of investment for many emerging market multinational enterprises to enter developed country markets (Yamakawa *et al*., 2013). Cummins *et al*. (2015) analyze more than 1000 cross-border acquisitions by emerging market companies (Brazil, China, Egypt, Hong Kong, India, Mexico, Peru, Philippines, Republic of Korea, Russia, Thailand, United Arab Emirates, etc.) and they categorize these companies by the most common

motives of acquisition. They conclude that the main motive that emerging market companies reach across borders is to fill capability gaps caused by limited access to strategic resources, for example, intangible assets like management capabilities (Figure 1). They also show that, over the long term, about a third of M&A deals made by multinational companies headquartered in emerging markets have been made to enter new markets, acquire natural resources, and improve efficiency.

Figure 1: Percentage of Cross-Border Deal Motivation in 1095 Emerging Market Acquisitions - 2000-2013



Source: Cogman *et al.* (2015).

After examining motives and performance of cross-border M&A in China, Boateng *et al*. (2008) find that diversification and international expansion are the dominant motives for Chinese firms. Lower institutional constraints also affect outward M&A by Chinese firms, because they tend to gain strategic capabilities to offset competitive disadvantage and target countries have better institutional quality (Rui and Yip, 2008; Deng and Yang, 2015, Zhang *et al*., 2011).

Not only Chinese firms, but also firms from other emerging markets, make acquisitions motivated by vertical expansion and the desire to enter into previously inaccessible markets (Pradhan, 2010). Meanwhile, Nayyar (2008) examines cross-border M&A by Indian firms and finds that they are driven by two factors: greater access to financial markets and liberalization of government policies toward FDI.

B. The Role of the Government

Emerging market governments play an important role in the process of cross-border acquisitions. Governments of emerging countries are eager to enter established markets and grab a share of economic power. Cross-border M&A by government-controlled firms have drawn much attention in the media. Liao (2010) finds that there were over $230 billion across 886 cross-border

M&A deals related to government-controlled entities as acquirers in 2007 and 2008. As discussed in section II.A, acquisition of natural resources is one of the main motives of cross-border M&A for emerging markets. Often, state-owned enterprises (SOEs) are natural-resource seekers; some well-known landmark transactions of this type include Brazilian metals and mining company Vale acquiring Canadian mining company Inco in 2006, and the Chinese oil and gas company Sinopec merging with the large Russian oil firm Udmurtneft that same year (Cummins *et al*., 2015). Liao (2010) shows some evidence that government-controlled firms are more likely to acquire larger target firms, like natural-resource firms, especially when sovereign wealth funds are involved.

Policy changes are the key point in the wake of globalization of firms in emerging markets. Emerging countries and markets have taken a positive attitude towards the internationalization trend. India experienced rapid growth in outwards FDI between 2000 and 2007 after the liberalization of the policy regime by the government (Duppati and Rao, 2015). This is mainly because the policy change removed the shackles which prevented domestic firms from cross-border merging. The Chinese government also made the change in 1999, initiating the "going global" policy to promote Chinese investments abroad. The assistance from the Chinese government comes in the form of access to inexpensive financing, and research and policy support (Guo, 2014). Sometimes, the government of an emerging country is not only a supporter for its firms' cross-border mergers, but also an active investor via control of the SOEs, which means governments represent the largest shareholder in the acquiring firms (Chen and Young, 2010). Based on the study of 450 cross-border M&A in China, Guo (2014) concludes that Chinese SOEs are willing to pay higher premiums compared to non-SOEs. The high acquisition premium means a danger for the acquiring firm's value, since the "overpayment" reduces the gain to the acquirer from merger synergies (Sirower, 1997).

Why do the SOEs in emerging markets offer higher premiums to acquire assets in developed countries? Hope *et al*. (2011) show that the reason is "national pride". Since there is "overpayment," many observers have expressed their concern that the rise of cross-border M&A by SOEs would bring an equivalent rise in inefficient multinational enterprise activities (Guo, 2014). However, inefficiency is not the only concern for the SOEs cross-border mergers; national security is also an important issue. According to a survey by the Asia Pacific Foundation of Canada, Canadians do not trust the SOEs from emerging markets, and they oppose acquisitions by SOEs. Based on the report from the Asia Pacific Foundation of Canada, Hemmadi (2014) points out that Canadians tend to accept investment from state-owned firms controlled by traditional western countries but not from those controlled by emerging countries. And these worries about security issues will also push down the support for economic engagement with emerging countries.

C. Acquiring and Target Firms' Performance

No matter what motive the firm has or whether or not it is a SOE, it should pursue good financial and operating performance. For many years, the study of M&A performance has been part of organizational behavior, corporate finance, and strategic management literatures (Zollo and Meier, 2008). Before we discuss the performance of cross-border M&A, we should define what constitutes a "successful" merger. Bruner (2002) gives three possible outcomes of a merger:

- Value conserved, where investment returns equal the required returns. This does not mean the merger is a failure. For example, when an investor requires a return of 20 percent, he will get it if the value is conserved. In a nutshell, the investor earns a "normal" return.

- Value created, where investment returns exceed the required returns. The wealth will grow higher than the investor's expectation.
- Value destroyed, where investment returns are less than required.

Hereafter we classify the literature findings into two groups of studies: positive returns (value created/conserved), and negative returns (value destroyed).

A first group of studies finds that cross-border M&A are mostly value-destroying. Some researchers state that only about 20 percent of all mergers are successful in the end, and most mergers fail to achieve any financial returns (Grubb and Lamb, 2000). Based on the study of cross-border M&A from 75 nations, Mantecon (2009) finds that a total of $187 billion was lost for the shareholders of the purchasing firms in the three days around the M&A announcement date. Aybar and Ficici (2009) state that on average, cross-border mergers of firms from emerging markets are value-destroying rather than value-creating after analyzing 433 cross-border M&A associated with 58 bidding firms from 1991 to 2004. After studying 39 acquisitions during 2000 to 2008, Chen and Young (2010) find that cross-border M&A by Chinese government owned firms tend to destroy value. Bertrand and Betschinger (2012) study 120 cross-border and 600 domestic M&A in Russia, concluding that domestic and cross-border M&A reduce the performance of acquirers and destroy value. André *et al*. (2004) analyze the average long-run abnormal performance of 267 mergers during 1980 to 2000, and find that in most cases Canadian acquirers underperform significantly over the period after the event; moreover, cross-border mergers perform poorly in the long-run.

A second group of studies concludes that a large portion of cross-border M&A are value-conserving/creating. Based on a study of 27 acquisitions during 2000 to 2004, Boateng *et al*. (2008) find that cross-border M&A by Chinese publicly-listed firms are value-creating mergers. Analyzing 425 cross-border M&A by Indian firms during 2000 to 2007, Gubbi *et al*. (2010) find that these international acquisitions create value for the acquiring firms. Moreover, they show that the institutional advancement of the host country where the acquisition is made is positively correlated with the performance of the M&A. Du and Boateng (2012) summarize the related literature and find that the majority of studies about cross-border M&A in emerging markets report positive returns for acquiring firms and only a few find evidence of value destruction. Kohli and Mann (2012) analyze 202 cross-border and 66 domestic acquisitions by Indian firms; they find that domestic M&A create less wealth gains than cross-border ones. Eckbo and Thorburn (2000) analyze a large sample of U.S. acquirers in Canada and find that bidders from the U.S. earn statistically insignificant abnormal returns. They also show that the most profitable acquisitions are those where acquirer and target have similar total equity sizes.

Some researchers have tried to find what factors affect cross-border M&A performance. Based on a study of cross-border M&A in the Eastern and Central Europe energy market, Bednarczyk *et al*. (2010) find that short-term returns of targets are negatively affected by diversification bids and positively affected by industrially related bids. Gubbi *et al*. (2010) find that performance is related to the host country's institutional development compared to the home country. As discussed in Section II.B, cross-border M&A by SOEs would bring an equivalent rise in inefficient multinational enterprise activities (Guo, 2014). Wright *et al*. (2002) also examine the effect of ownership on the valuation of acquisitions. Some other factors, like payment type (King *et al*., 2008), firm size (Moeller *et al*., 2004), and prior acquisition experience (Haleblian and Finkelstein, 1999) may also influence the performance of cross-border acquisition.

Adding to this literature, our paper is the first study to focus explicitly on the acquisition of Canadian firms by emerging market firms. As we will see, those M&A turn out to be value-creating on the whole, thus supporting the findings of the second group of studies identified above.

III. Methodology

A. Overview

Despite the massive amount of research done, there is little agreement across disciplines on how to measure acquisition performance. Different methods are used in different fields. In this paper, we use the short-term window event study method. An event study is a statistical method to assess the impact of an event on the value of a firm. The short-term window event study method is designed to measure the abnormal stock price change related to an unexpected event such as the announcement of a merger, allowing researchers to conclude whether an event had a positive or negative effect on shareholder wealth. The event window is the period over which the effect of the event is measured. The "short-term" means the analysis is ex-ante, which could help to predict future profitability.

A. Assumptions

The application of the short-term window event study is based on several assumptions. The most important assumption is that the market is efficient. An informationally efficient market is one in which the current price of a security fully, quickly, and rationally reflects all available information about that security.[5] In an efficient market, information such as the announcement of M&A will have an effect on the price of the stock. In this paper, most firms are listed on the TSX, and several are listed on the NYSE. After comparing the primary and secondary market efficiency of the Toronto and New York stock exchanges, Robinson *et al.* (1990) find that Canadian stock markets seem to be reasonably efficient in comparison with those of the U.S. Secondly, the event under study is unanticipated, which means the market price should not be affected by the release of information that is well anticipated. In the third place, there is no "confounding" effect during the window event (Wang and Moini, 2012). Under these assumptions, abnormal returns are used to measure short-term performance.

B. Market Model

There are many models used by researchers to measure the abnormal returns when they use the short-term event study. Some broadly applied methods are the Market Model (Sharpe, 1963), Market-Adjusted Model, Capital Asset Pricing Model, and Fama–French Three-factor Model (Fama and French, 1993). In our paper we use the Market Model to calculate the abnormal returns of the target firms.

The method works as follows: first, define the event and the window,[6] then determine the estimation period prior to the event window. Based on the estimation period result, the method estimates the expected normal return for the event window with the Market Model. Thereafter, the

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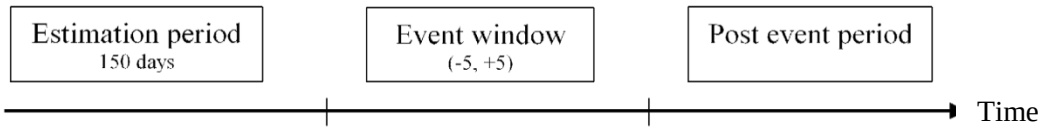
[5] http://www.investopedia.com/terms/e/efficientmarkethypothesis.asp.

[6] The event window is the period of trading days over which we want to calculate abnormal returns.

method deducts this 'normal return' from the 'actual return' to obtain the 'abnormal return' attributed to the event.

In this paper, the event is defined as the announcement day of the merger, abbreviated "0," and the event window includes 11 trading days symmetrically surrounding the identified event day, abbreviated (-5, +5). Then we determine the length of the estimation period as 150 days, which is the period of trading days (before the event date) that is used to estimate the expected return. The timeline is shown below.



After collecting the target stock price data, we calculate the daily returns of both individual share price and market index data. Then, the Market Model is introduced to calculate the expected return of the stock. The definition of the Market Model from NASDAQ is: "The market model says that the return on a security depends on the return on the market portfolio and the extent of the security's responsiveness as measured by beta."[7] This model assumes a linear relationship between the return of the market portfolio and the return of a security. Here we define the following equation for each security *i*:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \tag{1}$$

R_{it} is the return on security *i* at time *t* and R_{mt} is the return on the market portfolio during time *t*. Under the assumption of linearity and normality of returns, ε_{it} is the random error term for security i at time *t*. The return on the market portfolio R_{mt} is calculated from the indices of the TSX (S&P/TSX Composite Index, S&P/TSX Venture Composite Index) and the NYSE. α_i and β_i are the two parameter estimates in the estimation period given by equations (2) and (3) below.

$$\beta_i = \frac{\sum_{i=1}^{n} (R_{mt} - \underline{R}_m)(R_{it} - \underline{R}_i)}{\sum_{i=1}^{n} (R_{mt} - \underline{R}_m)^2} \tag{2}$$

$$\alpha_i = \underline{R}_i - \beta_i \underline{R}_m \tag{3}$$

α_i is the intercept of the regression line and stands for the risk-free rate. β_i is the slope coefficient of the regression line and stands for systematic risk. After we get α_i and β_i, the expected return $E(R_{it})$ of the target firm can be calculated using Equation (1).[8]

The next step is to calculate the daily abnormal return of the share price during the event window. The equation is:

$$AR_{it} = R_{it} - E(R_{it}) \tag{4}$$

[7] http://www.nasdaq.com/investing/glossary/m/market-model.

[8] The expected value of the error term equals zero.

AR_{it} is the abnormal daily return on security *i* in the window period, which equals the actual daily return R_{it} minus the expected return $E(R_{it})$. Furthermore, cumulative abnormal returns are calculated by summing the average AR for the days of the event window:

$$CAR_{it} = \sum_{i=1}^{n} \quad AR_{it} \tag{5}$$

Also, we want to know whether the cumulative abnormal return is caused by the fluctuation of share prices or by other reasons. The *t*-test is necessary to check the statistical significance of the cumulative abnormal returns. The basic method is to see whether the final value generated from the significance test is located in the acceptance region.

IV. Data

A. Data Collection

Since there is no direct outcome data available describing Canadian firms which are acquired by emerging market firms, we collected the related data using the following steps.

(1) Find the list of Canadian firms acquired by emerging market firms. With the help of Innovation, Science and Economic Development Canada, we obtained the list of "Completed Applications for Review and Notifications."[9] This database shows a list of completed decisions and/or notifications of investments by non-Canadian firms in Canada sorted by month from 1985 until November 2016. It contains only the information which may be disclosed under the Investment Canada Act, namely the name of the investors and their location, the name of the business being acquired or established and its location, and a description of the business activities of the Canadian business. According to the information provided by Innovation, Science and Economic Development Canada, foreign investments are divided into three categories:

- "Decisions" refers to an investment in Canada by a non-Canadian firm, where the investment results in the latter acquiring control of an existing business in Canada and the value of the investment exceeds the relevant monetary threshold (e.g. $600 million for a WTO (World Trade Organization), private sector investment). Therefore, the Minister must make a decision regarding them.
- "Notifications – Acquisitions" refers to an investment in Canada by a non-Canadian firm, where the latter acquires control of an existing business in Canada and the value is below the relevant monetary threshold. Compared with the "Decisions", these investments do not require any approvals - the investor simply has to notify the government that the investment occurred.
- "Notifications – New Business" refers to an investment where a non-Canadian firm starts a new business in Canada.

Since the acquisitions are what we're looking for, "Decisions" and "Notifications – Acquisitions" were reviewed for the qualified data.[10]

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[9] https://www.ic.gc.ca/eic/site/ica-lic.nsf/eng/h_lk00014.html.

[10] Note that the data do not include expansion of established foreign firms, only new ones.

(2) Determine which countries qualify as emerging markets. In this paper, the definition of "emerging countries (markets)" is based on the market classification by MSCI,[11] an independent provider of research-driven insights and tools for institutional investors. It has deep expertise in the areas of risk and performance measurement that is based on more than 40 years of academic research and real-world experience. According to the MSCI market classification, the acquisitions whose investors are emerging countries/markets were screened out. We chose the data between 2000 and 2016 because there are few Canadian firms acquired by emerging market firms before 2000. In some cases, the data show a firm is from an emerging country, but it is registered in a developed country; we regard it as an emerging market acquirer.

(3) Find whether the target firm is listed on the TSX or the NYSE. We typed in the name of a firm and searched for the related record in the exchange website. This is a time-consuming process but is necessary. Most target firms acquired by emerging market firms are small and are not listed on the exchange.

(4) Identify the exact event date. If the event was announced on a non-trading day, the next trading day is the correct event day to choose. The event day is defined as the announcement day of the acquisition. Based on the result from step (3), the event date is easier to identify because corporate events such as acquisition or actions of investors in the capital market must be announced publicly. In some cases, investor information is accessible through the website of the firm, and some acquisition announcements can be found on the *Marketwired* website. *Marketwired* is part of NASDAQ that provides news release distribution and a full range of communication solutions to public relations, investor relations, and marketing professionals. We searched for names of the target firms in the "Newsroom"[12] and found which news items are related to the acquisition announcement. As a result of the lack of some information, we identified the exact event date of 4/5 of the listed firms.

(5) Collect the data of the security prices of the target firms and S&P/TSX or NYSE Composite Index. The security prices we use in this event study are closing prices. The data sources where we collected the historical security prices of the target firms are *Yahoo Finance* and *Google Finance*. Some target firms are delisted from the stock exchange, which means that it is difficult to get their historical prices publicly; these are only available from paid sources due to the amount of research involved in determining the identity of delisted securities, surviving entities in merger scenarios, company name changes, symbol changes, and ensuring that the data coverage is complete. Many stocks that are delisted from a major exchange due to financial difficulties are still publicly tradeable companies with their shares continuing to trade as Over the Counter (OTC). Some large companies even have periods where they traded for a period of their history as OTC. All historical stock prices of listed and OTC firms could be found on *Yahoo Finance* or *Google Finance* websites. The length of the estimation period is determined as 150 days, which is the period of trading days before the event date, and the event window is 11 days. Therefore, the data of the security prices of the target firms and S&P/TSX or NYSE Composite Index are collected for at least 170 trading days for each firm.

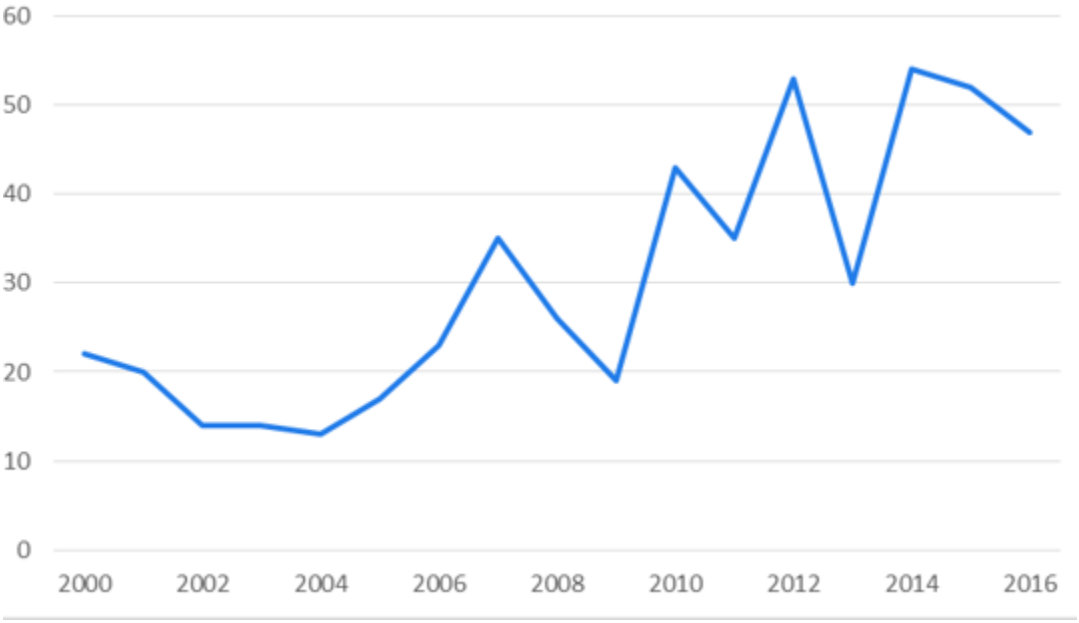
11 https://www.msci.com/market-classification.

12 http://www.marketwired.com/news_room/.

B. Data Analysis

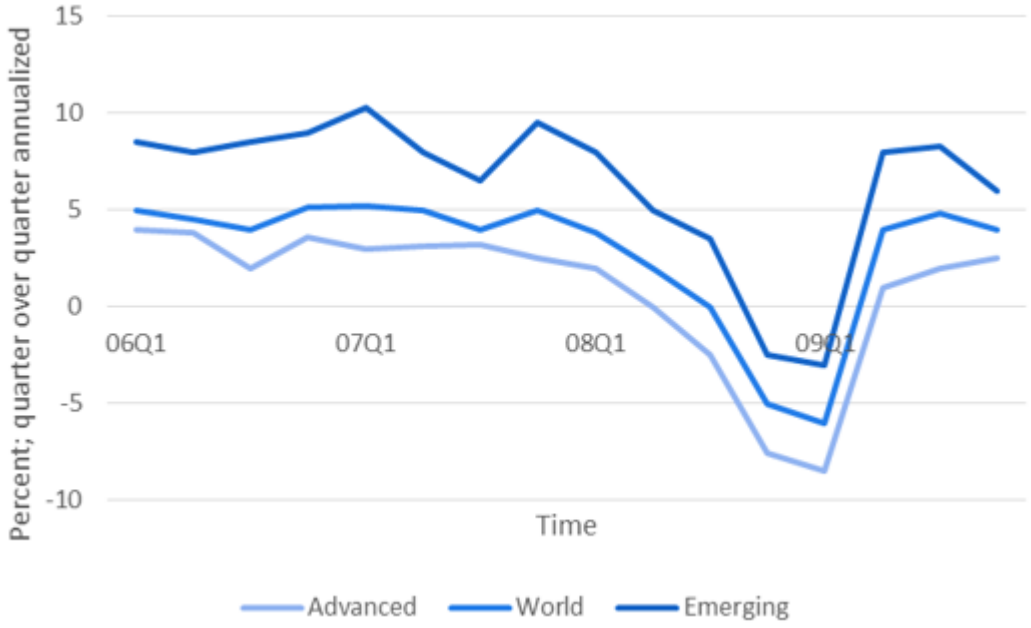
Based on the information given on the webpage "Completed Applications for Review and Notifications" by Innovation, Science and Economic Development Canada, we obtained 533 qualified M&A instances and summarized the data in five categories: time, name of investor, name of target, industry of target firm, and country of origin of the investor. The time trend is shown in figures 2 and 3. From Figure 2 we can see an upward trend from 2000 to 2016 and there is a rapid growth after 2009. The year 2008 is critical, because the 2008 financial crisis is the worst financial crisis since the Great Depression. Also, this year makes a difference when we analyze the acquisition of Canadian firms by emerging country/market bidders. In Figure 3 we can see how the growth rate changes in advanced and emerging countries before and after the 2008 financial crisis; it is obvious that emerging countries performed better than advanced countries. Then it is not surprising when Figure 4 shows that during the period 2000 to 2016, the M&A after 2007 represent about 70 percent of all mergers.

Figure 2: Number of M&A, 2000-2016



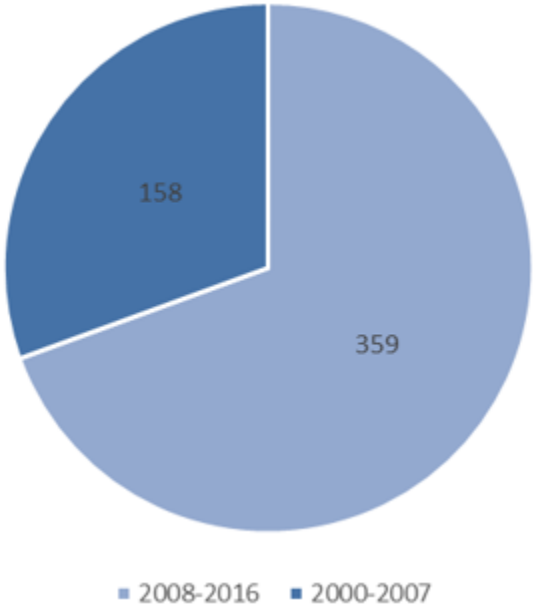
Source: Innovation, Science and Economic Development Canada.

Figure 3: Growth in Advanced and Emerging Countries, 2006-Q1 to 2009-Q4



Sources: IMF, Global Data Source and IMF staff estimates.

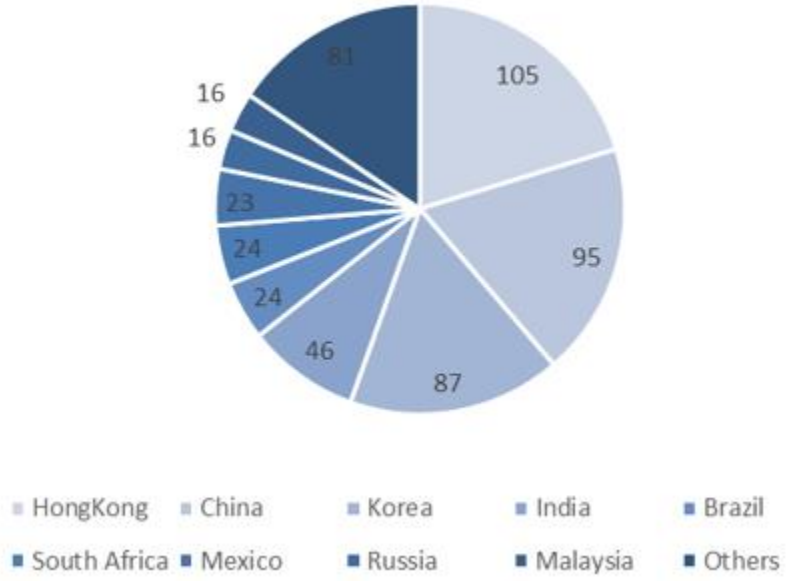
Figure 4: Number of M&A from 2000-2007, 2008-2016



Source: Innovation, Science and Economic Development Canada.

Secondly, we ranked the number of M&A by countries from largest to smallest. As Figure 5 shows, Hong Kong,[13] China, and Korea occupy the top three places. Most countries are Asian countries. Brazil, South Africa, and Mexico take the fifth to seventh places, all having the same number of acquisitions. There are some other emerging country/market acquirers purchasing Canadian firms, such as Russia, Peru, Saudi Arabia, Philippines, Poland, etc. Before 2008, most emerging country acquirers were from Hong Kong and Middle Eastern countries. The purchases of Canadian firms by Chinese, Korean, and Indian bidders started to increase rapidly after the 2008 financial crisis. This is partly because economic growth was higher in these countries compared with developed countries during the financial crisis. Some other reasons such as the desire to enter new markets, acquire natural resources, and improve efficiency can also motivate acquisitions as discussed above.

Figure 5: Number of M&A Sorted by Country



Source: Innovation, Science and Economic Development Canada.

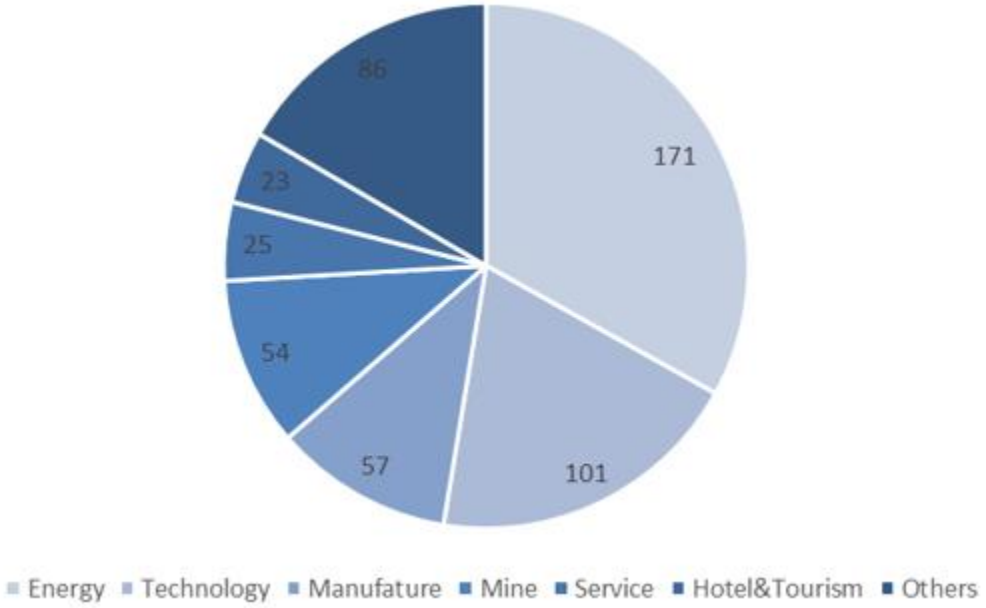
In third place, we focused on the analysis of the industry of target firms and summarized three categories together. Figure 6 shows the industry distribution of target firms. Almost one third of the target Canadian firms belong to the energy industry, which is oil and natural gas. This fact is not surprising since Canada is the fifth largest energy producer in the world,[14] and oil prices decreased more than 70 percent after June 2008, which was a disaster for energy firms.

[13] In the MSCI market classification, Hong Kong is listed in the developed market. However, the transfer of sovereignty over Hong Kong from the United Kingdom to China took place in 1997, which is before 2000, and many Hong Kong firms are subsidiaries of companies in mainland China. Therefore, Hong Kong is regarded as an emerging market in this paper.

[14] According to Natural Resources Canada, the energy sector in 2007 contributed 5.6 percent to GDP and $90 billion in exports.

Technology, which includes information technology, biotechnology, pharmaceuticals, and chemistry, is in second place. According to the 2014 Canadian ICT Sector Profile by Innovation, Science and Economic Development Canada, there are over 36,000 companies in the Canadian Information and Communications Technologies (ICT) sector and it plays an important role in the Canadian economy. Since 2007, the ICT sector has posted stronger growth than the total economy. ICT sector growth was slightly ahead of the overall economy in 2014: the sector increased by 2.7 percent, compared to 2.5 percent for the total Canadian economy.[15] The acquisitions of technology firms show that emerging countries/markets want to acquire strategic assets and invisible wealth through cross-border M&A. Some other industries such as tourism (including hotels, educational services, and real estate) attracted the attention of emerging country bidders in recent years.

Figure 6: Number of M&A Sorted by Industry



Source: Innovation, Science and Economic Development Canada.

When we analyzed "country" and "industry" together, we found it interesting that different countries focus on different sectors. The top buyers for energy firms are China, Hong Kong, Korea, and Malaysia. Most bidder firms are state-owned companies such as China National Offshore Oil Corporation, Korea National Oil Corporation, and Petroliam Nasional Berhad (Malaysia). In these acquisitions, emerging country bidders focus on the highly developed infrastructure owned by Canadian companies as well as the petroleum reserves, and most target firms are located in British Columbia and Alberta. Indian acquirers prefer to purchase technology firms, especially research and information technology companies. Brazilian and Mexican firms tend to buy manufacturing firms, whereas Chilean and Peruvian firms prefer natural resources. Russian and Polish firms also choose to purchase energy firms and natural resources.

Overall, the number of acquisitions by emerging country acquirers increased rapidly after the 2008 financial crisis, with most bidders coming from Asia. The industries of target firms

[15] https://www.ic.gc.ca/eic/site/ict-tic.nsf/eng/h_it07229.html.

became more diversified, and different countries focus on different sectors. In the next section, we conduct the event study and present the empirical results.

V. Empirical Results

After collecting the security prices data, we obtained 35 qualified target firms listed on the TSX or the NYSE. We calculated the abnormal return and cumulative abnormal return using the Market Model. The results show that the abnormal return on the event day (day 0) is about +10.3 percent and the cumulative abnormal return for 11 days (-5, +5) is about +10.55 percent.

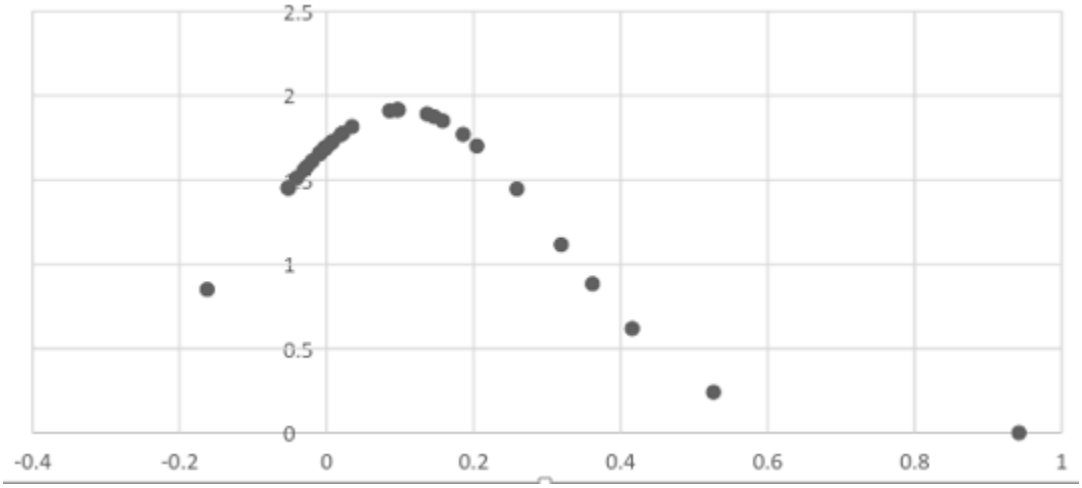
A. Overview

Table 2 shows the abnormal return of target firms from day -5 to day +5. We can see that there is a large variation in returns: the average abnormal return is positive 10.3 percent and the median is positive 0.8 percent on day 0 which means most firms gain positive return when acquisitions are announced. The minimum abnormal return on day 0 is negative 16.25 percent and the maximum abnormal return is positive 94.2 percent which means there are big differences in returns and not all firms benefit from the announcement of acquisitions. The column "average" shows that firms get the highest abnormal return on day 0 and do not gain big abnormal return after the event day. From day 1 to day 5, average and median abnormal returns are very close to 0, which shows that the security price comes back to normal after the announcement day. When we take a look at the standard deviation column, the value on day 0 is still the highest. This proves that there is a big abnormal return difference for different firms. Figure 7 shows the distribution of abnormal returns on day 0.

Table 2: Abnormal Return

	Average	Median	Minimum	Maximum	Stand dev
Day5	-0.01308	-0.00402	-0.18216	0.10367	0.04815
Day4	-0.01133	-0.00700	-0.13045	0.11075	0.04571
Day3	0.00243	-0.00892	-0.11941	0.32712	0.08155
Day2	0.00491	-0.00051	-0.35839	0.41525	0.10504
Day1	0.02676	0.00312	-0.37110	0.79583	0.19770
Day0	0.10271	0.00810	-0.16254	0.94194	0.20513
Day-1	-0.00774	-0.00511	-0.15362	0.22439	0.05864
Day-2	-0.01057	-0.00322	-0.17126	0.05548	0.03621
Day-3	0.00488	-0.00229	-0.07365	0.18760	0.04562
Day-4	0.00047	-0.00398	-0.15286	0.19640	0.05317
Day-5	0.00158	-0.00279	-0.20783	0.15377	0.05339

Figure 7: Distribution of Abnormal Returns on Day 0



For example, Tim Hortons was acquired by Burger King which is majority-owned by the Brazilian firm 3G Capital, in 2014. On the event day August 24 when Burger King announced that it was in negotiations to merge with Tim Hortons for 18 billion US dollars, the abnormal return is 18.57 percent (*t*-test 17.2864, significant at 0.01 level) which is a good return. Meanwhile, when the Russian firm Stillwater Mining Company purchased Marathon PGM Corporation on September 7, 2010, the abnormal return reaches as high as 94.19 percent (*t*-test 18.3876, significant at 0.01 level) which is exceptional.

Table 3 shows the cumulative abnormal return of target firms from day -5 to day 5. The average cumulative abnormal return (0.1055) and the median cumulative abnormal return (0.0126) remain positive after the announcement day. This shows the positive short-term performance for Canadian firms acquired by emerging market firms. However, the minimum cumulative abnormal return is -0.4637, which means there are still some firms losing value after the announcement. The maximum cumulative abnormal return is 1.6279, which is when Indian Gujarat State Fertilizers and Chemicals Ltd. acquired Karnalyte Resources Inc. in Saskatoon on March 14, 2016. The column "standard deviation" shows the obvious cumulative abnormal return change during the event window. From day -5 to day -1, the standard deviation almost remains the same. But after the event day 0, it increases significantly. This indicates that some firms benefit a lot from the merger even though other firms lose in value. Figure 8 shows the distribution of cumulative abnormal returns.

Table 3: Cumulative Abnormal Return

	Average	Median	Minimum	Maximum	Stand dev
Day5	0.10551	0.01262	-0.46374	1.62794	0.35883
Day4	0.11859	0.01628	-0.42728	1.63136	0.35405
Day3	0.12992	0.02201	-0.41811	1.58262	0.34628
Day2	0.12299	0.02406	-0.38121	1.69076	0.34569
Day1	0.11809	0.03929	-0.35086	1.27551	0.29781
Day0	0.09133	0.02213	-0.34414	0.92524	0.21927
Day-1	-0.01138	-0.01532	-0.18160	0.17738	0.06702
Day-2	-0.00364	-0.01535	-0.23859	0.14692	0.07071
Day-3	0.00693	-0.00670	-0.23538	0.19231	0.08395
Day-4	0.00205	0.00071	-0.23122	0.18823	0.07107
Day-5	0.00158	-0.00279	-0.20783	0.15377	0.05339

Figure 8: Distribution of Cumulative Abnormal Returns

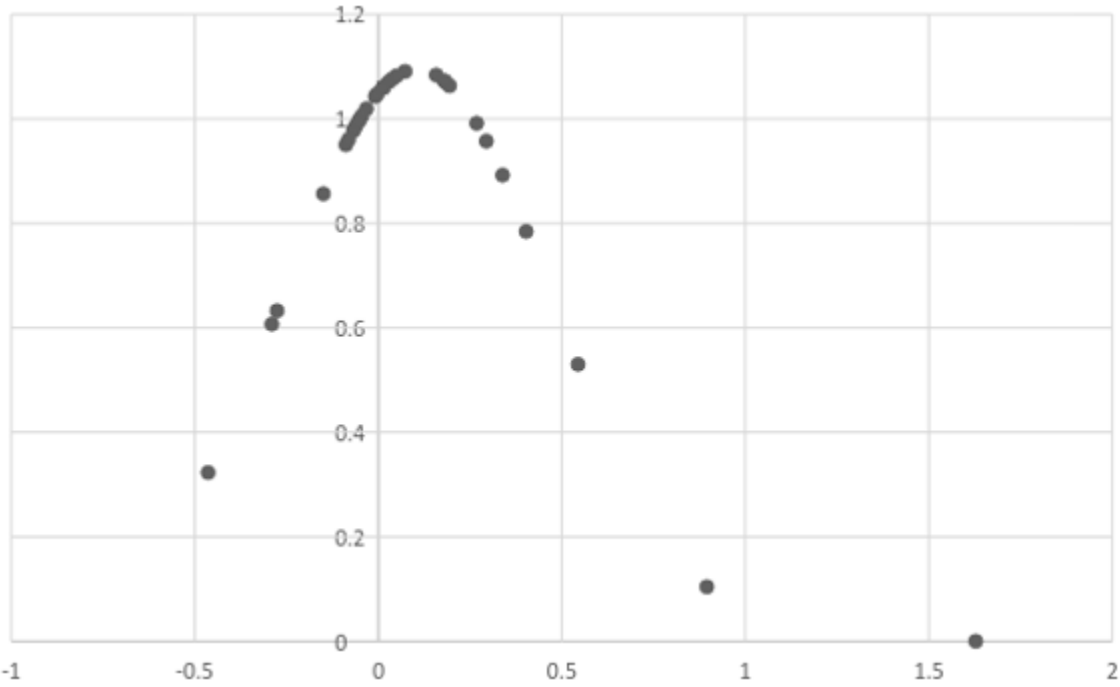


Figure 9 summarizes tables 2 and 3 together and makes the result more clear. It shows a significant increase of abnormal return on the event day 0 and day 1 and it is back to normal after day 1. The cumulative abnormal return also increases significantly on day 0 and stays positive till day 5. As the graph shows, the cumulative abnormal return reaches the maximum at 0.1299 on day 3 and then keeps decreasing after that. Figure 10 also reveals changes of abnormal return and cumulative abnormal return in a more direct way. In the next part, we focus on the industry relationship with abnormal returns and cumulative abnormal returns.

Figure 9: Expected Return, Abnormal Return and Cumulative Abnormal Return During Event Window

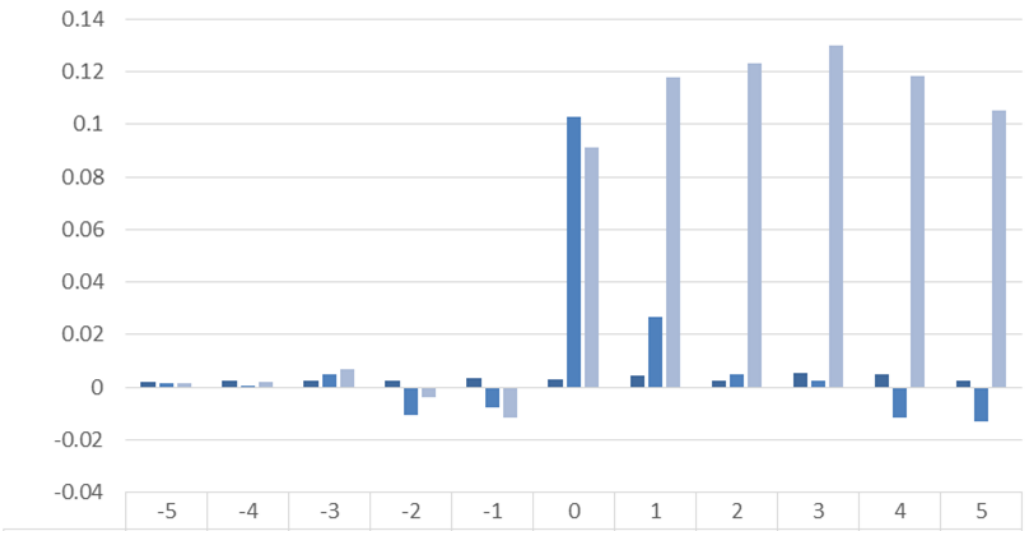
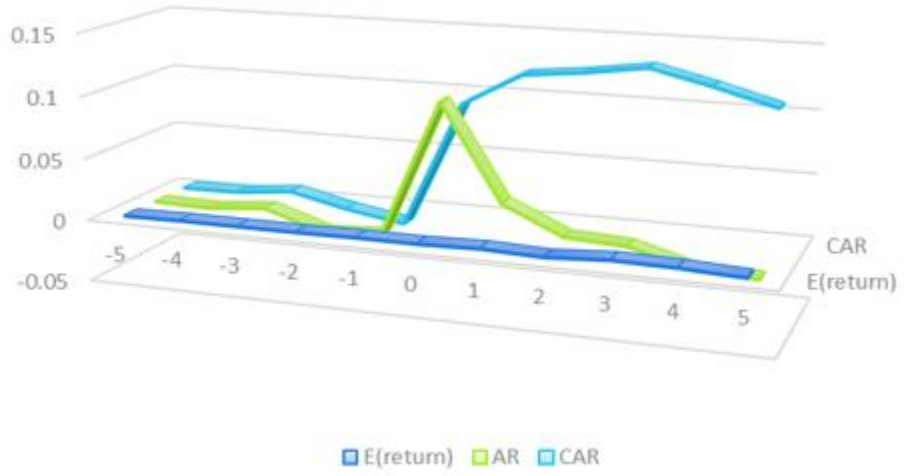


Figure 10: Trend of Expected Return, Abnormal Return and Cumulative Abnormal Return During Event Window



B. Industry Effects

Tables 4 to 9 show abnormal returns and cumulative abnormal returns in three different industries. Out of 35 firms, 32 are in the technology, energy, and mining industries so we analyze these three industries separately. Table 4 shows the abnormal returns of target firms in the technology industry. The average abnormal return on day 0 is +0.0978 which is almost equal to the overall return. The median on day 0 is close to 0 and the standard deviation is 0.1612; the performance of technology firms is slightly positive. The column "maximum" shows technology firms have a significantly positive performance from day 0 to day 2. Table 5 indicates that the

cumulative abnormal return of technology firms is positive during the event window (average 0.1721). In summary, investors and target technology firms are glad to see the positive performance in the short term.

Table 4: Abnormal Return (Technology Firms)

	Average	Median	Minimum	Maximum	Stand dev
Day5	-0.01685	0.00061	-0.16385	0.01203	0.05226
Day4	-0.01706	-0.01049	-0.08994	0.04874	0.03879
Day3	-0.02990	-0.01741	-0.10814	0.00182	0.03381
Day2	0.06273	0.01116	-0.01353	0.41525	0.12690
Day1	0.06806	-0.01811	-0.07498	0.79583	0.25884
Day0	0.09786	0.00531	-0.05248	0.41569	0.16126
Day-1	-0.01553	-0.00597	-0.10769	0.02838	0.03886
Day-2	-0.00582	-0.00531	-0.04806	0.02796	0.01850
Day-3	0.01110	0.00985	-0.01868	0.04597	0.01767
Day-4	-0.00641	0.00493	-0.15286	0.04454	0.05673
Day-5	0.02397	0.00166	-0.00171	0.15377	0.04705

Table 5: Cumulative Abnormal Return (Technology Firms)

	Average	Median	Minimum	Maximum	Stand dev
Day5	0.17214	0.01369	-0.29014	1.62794	0.52806
Day4	0.18900	0.01971	-0.30217	1.63136	0.52881
Day3	0.20606	0.01983	-0.21223	1.58262	0.50198
Day2	0.23595	0.03725	-0.15295	1.69076	0.52694
Day1	0.17322	0.03929	-0.13942	1.27551	0.40294
Day0	0.10516	0.03837	-0.08978	0.47967	0.16496
Day-1	0.00731	0.01016	-0.14767	0.11606	0.06992
Day-2	0.02284	0.01580	-0.10502	0.14692	0.06679
Day-3	0.02866	0.04215	-0.10561	0.15342	0.06547
Day-4	0.01756	0.02095	-0.15158	0.14135	0.07331
Day-5	0.02397	0.00166	-0.00171	0.15377	0.04705

For energy firms, Table 6 shows the average abnormal return on day 0 is only 0.0297 which is the lowest among all industries. Even the maximum abnormal return is only 0.1579, just above the overall average. Table 7 reveals that the cumulative abnormal return of energy firms is negative during the event window. The average cumulative abnormal return on day 5 is -0.0692 while the median is -0.0507. These results mean the acquisition brings bad valuation results to target energy firms in the short term.

Table 6: Abnormal Return (Energy Firms)

	Average	Median	Minimum	Maximum	Stand dev
Day5	-0.01230	-0.00530	-0.07222	0.02552	0.02635
Day4	-0.00637	-0.00676	-0.04271	0.01192	0.01499
Day3	-0.03301	-0.01367	-0.11941	-0.00550	0.03644
Day2	0.00739	0.00230	-0.07958	0.16160	0.05775
Day1	-0.05839	-0.00364	-0.37110	0.03634	0.13143
Day0	0.02974	0.00257	-0.05213	0.15791	0.06944
Day-1	0.02748	-0.00387	-0.01058	0.22439	0.07228
Day-2	-0.00236	-0.00309	-0.01520	0.02459	0.01117
Day-3	0.00410	0.00387	-0.05265	0.05639	0.02612
Day-4	-0.01402	-0.00583	-0.05513	0.00542	0.01827
Day-5	-0.01276	-0.00386	-0.20783	0.04676	0.06768

Table 7: Cumulative Abnormal Return (Energy Firms)

	Average	Median	Minimum	Maximum	Stand dev
Day5	-0.06928	-0.05073	-0.46374	0.29435	0.19877
Day4	-0.05698	-0.07020	-0.42728	0.29445	0.18491
Day3	-0.05061	-0.07295	-0.41811	0.30834	0.18255
Day2	-0.01881	-0.02709	-0.38121	0.31562	0.16359
Day1	-0.02621	-0.02648	-0.35086	0.31612	0.15925
Day0	0.03219	-0.00979	-0.05609	0.33529	0.11489
Day-1	0.00244	-0.02493	-0.06419	0.17738	0.06867
Day-2	-0.02504	-0.02260	-0.23859	0.08205	0.08372
Day-3	-0.02268	-0.00986	-0.23538	0.08252	0.08307
Day-4	-0.02678	-0.00737	-0.23122	0.05218	0.07393
Day-5	-0.01276	-0.00386	-0.20783	0.04676	0.06768

Table 8 indicates that mineral firms have a really good performance when acquisitions are announced. The average abnormal return is 0.15779 on day 0, which is above that of other industries. The dispersion is significantly large, the minimum value is -0.1625 and the maximum is 0.9419. When we take a look at Table 9, the cumulative abnormal return of mineral firms is positive after the announcement day. On day 5, mineral firms can get average 0.1816 positive cumulative abnormal return whereas energy firms get -0.0693. Therefore, it is a wise choice to acquire technology and mineral firms in the short term.

Table 8: Abnormal Return (Mineral Firms)

	Average	Median	Minimum	Maximum	Stand dev
Day5	-0.00904	-0.00544	-0.18216	0.10367	0.05596
Day4	-0.01168	-0.00400	-0.13045	0.11075	0.06259
Day3	0.04665	-0.00161	-0.09235	0.32712	0.10541
Day2	-0.03359	-0.00453	-0.35839	0.09658	0.10561
Day1	0.06036	0.00853	-0.12733	0.65127	0.18580
Day0	0.15779	0.04751	-0.16254	0.94194	0.27789
Day-1	-0.03090	-0.00644	-0.15362	0.00493	0.04837
Day-2	-0.01860	-0.00287	-0.17126	0.05548	0.05292
Day-3	0.00385	-0.00682	-0.07365	0.18760	0.06660
Day-4	0.01838	0.00019	-0.06756	0.19640	0.06424
Day-5	-0.00156	-0.00653	-0.05271	0.13815	0.04412

Table 9: Cumulative Abnormal Return (Mineral Firms)

	Average	Median	Minimum	Maximum	Stand dev
Day5	0.18167	0.09269	-0.08836	0.89531	0.27057
Day4	0.19070	0.13947	-0.08156	0.87930	0.26515
Day3	0.20238	0.13078	-0.08538	0.90084	0.27171
Day2	0.15573	0.08963	-0.15781	0.90453	0.27203
Day1	0.18932	0.15580	-0.15464	0.92812	0.27002
Day0	0.12896	0.03140	-0.34414	0.92524	0.29487
Day-1	-0.02883	-0.01601	-0.18160	0.05046	0.06061
Day-2	0.00207	-0.01522	-0.11091	0.12103	0.05765
Day-3	0.02067	-0.00942	-0.11764	0.19231	0.09216
Day-4	0.01682	0.00103	-0.06926	0.18823	0.06417
Day-5	-0.00156	-0.00653	-0.05271	0.13815	0.04412

In the literature review section the results of the literature were separated between studies concluding that M&A are mostly value destroying, and those concluding that they are value conserving/creating. The results of our study are more in line with the second group of studies, since we conclude that on average acquisitions of Canadian firms by emerging market firms tend to be value creating by generating an abnormal positive return.

VI. Conclusion

We conducted a short-term window event study to measure the performance of cross-border acquisitions in which Canadian firms are acquired by emerging market firms. After analyzing the data from Innovation, Science and Economic Development Canada, we found that the number of acquisitions by emerging country acquirers increases rapidly after the 2008 financial crisis. Most bidders come from Asian countries/markets (Hong Kong, China, Korea and India) and Latin

America (Mexico and Brazil). The industries of target firms become more diversified, and different countries focus on different sectors. The top buyers for Canadian energy firms are China, Hong Kong, Korea, and Malaysia. Meanwhile, Indian acquirers prefer to purchase technology firms, especially research and information technology companies. Brazilian and Mexican firms tend to buy manufacturing firms while Chilean and Peruvian firms prefer natural resources.

Using the Market Model, we calculated the abnormal return and cumulative abnormal return of target firms. The results show that the abnormal return on event day (day 0) is about +10.3 percent and the cumulative abnormal return for 11 days (-5, +5) is about +10.55 percent. This indicates that in the short-term, the performance of Canadian firms which are acquired by emerging market firms is positive. The abnormal return increases significantly on the event day 0 and day 1 and it is back to normal after day 1. At the same time, the cumulative abnormal return also increases significantly on day 0 and stays positive till day 5. Then we analyzed results sorted by industry. Technology and mineral firms have a significantly positive abnormal return on day 0 while energy firms only have a small abnormal return for the same time period. The cumulative abnormal return of technology firms is 0.1721 and mineral firms get positive 0.1817 during the event window. However, the cumulative abnormal return of energy firms is negative 0.0692 in the short term. This suggests that it is better to acquire technology and mineral firms which have better performance in the short term. Outside investors who want to benefit from merger-related activities may also want to buy stocks in the technology and minerals sectors when a cross-border merger in those sectors is announced, and avoid (or sell short) energy stocks.

Our results support those studies in the literature that find mainly positive effects of cross-border M&A (e.g. Boateng *et al*., 2008; Gubbi *et al*., 2010; Du and Boateng, 2012; Kohli and Mann, 2012). On the other hand, they go against the findings of those studies having found mainly negative effects of M&A (e.g. Grubb and Lamb, 2000; Mantecon, 2009; Aybar and Ficici, 2009; Chen and Young, 2010; Bertrand and Betschinger, 2012; André *et al*., 2004). The literature is still far from reaching a consensus on this issue.

From a policy perspective, the results can be related to government restrictions on FDI. The Canadian government places certain restrictions on FDI, including M&A by foreign firms. Acquisition of a Canadian firm by a foreign firm is more likely to generate review and require approval by the Canadian government when the Canadian government considers the investment injurious to national security, when the Canadian firm operates in the cultural business, when the foreign firm is from a non-WTO member, and/or when the Canadian firm is large enough (Investment Canada Act). Using the OECD FDI Restrictiveness Index, Canada comes up as more closed than the average OECD country, and is deemed less open than countries such as France, the U.S., and Belgium (Thomsen, 2013). Some of the major mergers blocked by the Canadian government in recent years include the acquisition of Progress Energy Resources Corp. by Malaysian state-owned Petronas, and the purchase of PotashCorp by Australian BHP Billiton. The positive abnormal returns found in this paper suggest that such mergers tend to make Canadian firms more competitive, and would justify a more liberal approach toward FDI in Canada. The government may be justified in being more open toward mergers in some sectors (like technology and minerals) than in other sectors (like energy).

It has been eight years since the financial crisis, and developed countries are now recovering from the Great Depression. According to the World Bank annual report, the number of M&A should synchronize with economic growth of the country. Therefore, in the next few years, there may not be significant increase in the number of acquirers from emerging countries because their economic growth rates are slowing down.

The firm performance studied in this paper is in short term, specifically, it is 11 days, and the long-term performance is not discussed because of lack of related data. Although there is a positive performance in the short term, some negative long-term performance has been reported in recent years; for example, the acquisition related to energy firms. Companies that look for oil and gas to extract tend to have more volatile life cycles than most value investors. In 2012, the Canadian oil company Nexen which was acquired by the China National Offshore Oil Corporation (CNOOC), seems like the worst in a series of bets on oil and gas by China's state-owned firms. They bought tens of billions of dollars in assets world-wide when oil prices were high. However, many of those investments are worth far less, and the Chinese economy is slowing down and has slackened some energy demand. CNOOC reported nearly $700 million in impairment losses for 2014 that it blamed on operations in North America and the North Sea. Since there are few papers studying the long-term performance of firms acquired by emerging market firms, more research is needed in the future on this topic.

The data used in this paper and most of the studies reviewed here pertain to acquisitions by emerging market firms. There are no clear results from the literature comparing returns to M&A for firms from developing and developed countries. Moreover, since our dataset is limited to acquisitions of Canadian firms by emerging market firms, we cannot compare the returns obtained here to those obtained by Canadian firms when they are bought by other firms from industrialized countries. These are important areas for future research.

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Reducing Call Center Wait Times Through Six Sigma

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The six-sigma process was applied for improvement of efficiency (cost) and quality of customer service at a medical education company. Parametric and nonparametric tests showed (a) a poor capacity utilization of the in-house call center versus outsourced calls and (b) a statistically significant reduction in call wait times and talk times. Cost per call was reduced from $16.70 to $3.50, with overall savings over $125,000 annually. The company transitioned permanently to the outsourced call center. The overall benefit is contingent on the ability of phone operators to answer questions comprehensively and to customers' satisfaction, which has yet to be determined.

Keywords: Six Sigma, Call Center, DMAIC, Quality Control

JEL Classification: M11, M54

I. Introduction

Customer satisfaction is critical to call centers for maintaining both company profitability and viability. Over the past decade, companies have experienced pressure to improve their productivity, quality, and customer service, yet have been required to maintain or reduce operating costs (Akbulut-Bailey *et al.*, 2012). Customer service and cost reductions have received increased focus for companies and call centers across the globe. Ultimately, customer satisfaction is a matter of quality and a measure of "the extent to which a product successfully serves the purpose of customers" (Jahanshahi *et al.*, 2011, p. 254). Furthermore, there is a strong correlation between customer satisfaction and company loyalty that results in company profitability (Jahanshahi *et al.*, 2011).

Six sigma is a business process improvement approach that targets the improvement of the efficiency and quality of output using statistical methods, models, and process improvements (Prasanna and Vinodh, 2013). The six-sigma approach has been applied across many industries and processes within them to analyze the effectiveness of procedures and their impact on quality. This paper discusses the application of six sigma and its Define, Measure, Analyze, Improve, and Control ("DMAIC") procedure (Wang *et al.*, 2014) to define inefficiencies in a call center for a U.S. medical education company with the goal of evaluating improvements and alternative solutions. In systematically outlining the application of DMAIC to improve the quality of the customer service call center in terms of efficiency both for the company in terms of staff cost and for customers in terms of call wait times, this research demonstrates the value of the DMAIC process in improving quality for the company.

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Given the role of customer satisfaction in business success through company profitability and viability, it is important to understand both how changes in areas of customer interaction impact customer satisfaction and how these changes impact operating costs. The case presented herein is motivated by the need to balance these two areas—customer satisfaction and operating costs—for optimal performance and business success. In doing so, this study contributes to the current body of knowledge on application of the six-sigma process for call center profitability and viability through a detailed presentation of the DMAIC process in the case of a U.S. medical education company. In demonstrating the process for the company in this study, this paper emphasizes the value of the DMAIC approach as a business process improvement methodology, and also provides enough robustness in the approach to allow for the methods to be reproduced for similarly situated call centers beyond the case presented herein. To this end, this paper begins with a review of the literature focused on business process, improvement methodologies, the six-sigma process, six-sigma successes, and call center needs, followed by an overview of the methodology, including an introduction to the case study, the problem experienced by the company, and the associated research questions and hypotheses. Next, findings are presented to trace the decisions made by the company, alternatives to these decisions that were considered, and the data supporting each of these decisions. Finally, the discussion addresses the company's ultimate decision to outsource the call center and how this initiative addressed their two problems of wait times and staff costs.

II. Literature Review

A. Business Process Improvement Methodologies

The success of any organization is dependent on its ability to attain acceptable performance quality through identifying opportunities for improvement in its processes to yield a better outcome. Process improvements commonly fall into three categories: quick hits, incremental improvement, and reengineering. Quick hits are low risk improvements that provide immediate rewards; incremental improvements focus on making small changes over time to achieve gradual progress in business results; and reengineering focuses on major changes at the organizational level to yield process transformation and dramatic results (Shin and Jemella, 2002). These business process improvements may focus on the primary processes of an organization that directly relate to the customer or support processes, such as accounting or human resources (Hill *et al.,* 2002).

Research on Business Process Improvement ("BPI") can be carried out using many different approaches. Vero-Baquero *et al.* (2015) argue that while BPI is more of an "art than a science," there are five phases: 1) identify business process models that can be monitored and improved, 2) collect data on the performance of these models, 3) capture behavioral and structural data about the implementation of the models, 4) establish and implement quality control measures, including non-compliance, and 5) use the findings from Steps Two through Four to assess deficiencies in the process identified in Step One, and repeat after the improvement processes have been implemented to continue the BPI method. BPI methodologies have differing procedures and tools, but they all seek to understand processes to improve quality (Rashid and Admad, 2013).

As many BPI efforts continue to fail, it is important to consider both the process and the outcome. Over the last thirty years, many BPI strategies have been touted as superior to others. As many of these methodologies share common features, they are evaluated by their effectiveness (Rashid and Ahmad, 2013). According to Rashid and Ahmad (2013), there are eight distinct BPI

methodologies that are leading the field: model-based integrated process improvement methodology (MIPI), super methodology, benchmarking methodology, PDCA methodology, six-sigma methodology, lean thinking, kaizen methodology, and total quality management (TQM). There is also a hybrid six-sigma methodology and lean methodology, referred to as lean six sigma (Rashid and Ahmad, 2013). This research employs six sigma, defined by Rashid and Ahmad (2013, p. 47) as "a business strategy that aims to determine and remove errors, defects, failure causes in business processes through concentrating on outputs, which are imperative to customers. It is also a quality measure that seeks to eliminate defects using the statistical methods application." As the case company is focusing on improving call center quality, both in terms of wait times and staff costs, the six-sigma process is an appropriate quality measure for this research.

B. The Six-Sigma Process

The six-sigma process is a technique created in 1986 by Bill Smith, an engineer and scientist from the Motorola Company (Godfrey, 2002; Rashid and Ahmad, 2013), but it did not become well known until Jack Welch of General Electric (GE) took the process as his business' central focus in 1995. While six sigma has traditionally been used by manufacturing and logistics companies to improve product quality and produce line efficiencies, it is now widely used in across companies in many different industries as a means to significantly reduce cost, improve cycle times, and increase customer loyalty and satisfaction (Venkatesh *et al.*, 2014). Six sigma is used to improve the efficiency and quality of a process and its output by removing the underlying causes of defects, where defects are defined as any results that do not fall within the specified parameters. The term "six sigma" was derived from σ, a statistical term meaning standard deviation, which indicates a process with extremely low variability and extremely high consistency (Montgomery and Woodall, 2008). As the fastest growing management system in the business industry, six sigma has been claimed to save billions of dollars worldwide for businesses in the past decade. Six sigma combines statistical-based quality improvement methods with organizational support and professional training to tackle problems on a project-by-project basis (Tjahjono *et al.*, 2010). The common goals of these projects are to enable accomplishment of specific processes to meet key requirements with a high degree of consistency.

The basic improvement unit by six sigma is a process, which can be a service, such as customer service, a service provided to customers outside, or an internal process of a business, such as a production or billing procedure (Nakhai and Neves, 2009; Noone *et al.*, 2010; Wang *et al.*, 2014). The purposes of the improvement are to enhance performance outcomes and reduce performance variation, leading to reduction of defects, greater quality of service, improved employee efficiency, and higher profits to the effect of business excellence. These improvements occur through the five phases of DMAIC (Tjahjono *et al.*, 2010; Rashid and Ahmad, 2013; see Table 1).

Table 1: DMAIC

Step	Description
Define	Define the problem, the project goals, and the customer.
Measure	Measure the current process and establish baselines.
Analyze	Analyze the problem to determine the defects and the root causes of those defects.
Improve	Improve the process by eliminating the defects identified.
Control	Establish controls for the new process to eliminate reoccurrence of prior defects.

In the *definition* phase, a problem is defined and a related analysis is performed. In the *measure* phase, the selected problem is operationally defined to enable measurement of a characteristic critical to quality ("CTQ"). In the *analyze* phase, causes and influence factors determining CTQ behaviors are identified. In the *improve* phase, adjustments to the problem are designed, implemented, and applied to improve performance and qualities of CTQ. Lastly, in the control phase, the control system and process management are modified based on results from the analysis and improvement phases (Van den Heuvel *et al.*, 2006). Each of the DMAIC phases contains several steps to guide the project.

As a disciplined approach in quality management, six sigma is unique among many other quality improvement approaches, including the popular total quality management ("TQM") approach. Briefly, the major differences of six sigma can be summarized as (a) it "places a clear focus on achieving financial returns to the bottom line of organizations;" (b) it is important to have strong leadership with "support required for its successful deployment;" (c) its problem solving methodology "integrates human and process elements of improvement;" (d) "it utilizes tools and techniques for fixing problems in a sequential and disciplined fashion;" (e) "it creates an infrastructure of champions, master black belts, black belts, and green belts to lead, deploy, and implement the approach;" (f) "it emphasizes data and decision making based on facts," not assumptions; and (g) "it utilizes statistical concepts, process controls, and experimental design to facilitate defect reduction through variability control" (Antony, 2006, p. 244).

C. Six-Sigma Successes

Six sigma has been applied successfully in manufacturing companies, but its application in service industries is limited comparatively (Arumugam *et al.,* 2012). Multiple service-oriented businesses considered the success of the six-sigma process to be limited to the manufacturing sector, without realizing that it can bring significant financial and other returns to service-based organizations. For instance, most service providing companies perform at sigma quality level less than 3.5 with a 23,000 ppm (parts per million) defect rate or expressed as 97.7%. By using the six-sigma approach to improve the sigma quality level to 4.0, it will result in a drop of the defect rate significantly to 6, 210 ppm or 99.38%, which means clearly an improvement of 3.5 fold in performance and financial return (Arumugam *et al.*, 2012).

Countless business organizations have benefitted from six sigma and its quality-improving approach. To give a few examples, Citibank Group decreased its internal call-backs by 80%, its external call-backs by 85%, its customer cycle time by 67%, and statement process cycle time by 46% (Rucker, 2000). Companies employing six sigma in the healthcare industry increased 33% in radiology throughput, and decreased 21.5% in radiology costs, generating savings up to

$1.2 million dollars (Thomerson, 2001). In addition, British Telecom Wholesale applied six sigma to increase customer satisfaction level and save over $100 million dollars (Best Practices, 2006).

Well-designed studies have been conducted to determine critical success factors (CSFs) in successful deployment of six sigma in service industries (Antony *et al.,* 2007; Chakrabarty and Chuan, 2007). It was found that, among fifteen CSFs, the most important CSF was relating six sigma to business strategy, the second most important was project management skills and customer focus, and the third most important was management involvement and commitment. Determining critical success factors helps to promote continued improvement and establish relations between quality tool uses and company performance.

Wait time for various processes is used as an important performance metric in hospitals. Six sigma can be used to analyze existing hospital processes to determine the root causes of longer average wait time and re-design specific processes to reduce average wait time drastically (Van den Heuvel *et al.,* 2006; Yu and Yang, 2008). Similar six-sigma approaches have been applied to hospitals worldwide to achieve wait time reduction and sustainable cost reduction in wait time of registration (Yu and Yang, 2008), customer cycle time (Kemper *et al.,* 2010), wait time for staff members like nurses, clinicians, and technicians (Gijo *et al*., 2013), wait time for a periodic health evaluation (Wang *et al.,* 2014), and wait time for an outpatient surgery process (Southard *et al.,* 2012).

D. Call Center Needs

Six sigma, since its introduction by Motorola in the 1980s, has been widely implemented in both the manufacturing and service sectors. Its use in the service industry, however, remains controversial (Laureani *et al.,* 2010). Chakrabarty and Tan (2006) argue that implementing six-sigma methodologies for BPI should not be problematic so long as key performance indicators ("KPIs") are identified for the service process and evaluated for critical to quality characteristics ("CRQs"). This is not viewed as a barrier to its use, however, because "six sigma is a generic method. The advantage of such methods is that they are versatile" (de Mast and Lokkerbol, 2012, p. 605). The procedures can thus be adapted to the service industry accounting for KPIs and CRQs, as recommended by Chakrabarty and Tan (2006). Specifically relevant to this study, a six-sigma approach has been successfully applied to service-oriented companies to improve call center wait times, reduce variation in customer service procedures in call centers, and reduce related costs (Laureani *et al.,* 2010). Call centers are critical for multiple businesses that are struggling to provide better services at a lower cost. Given the large operating volume of call centers, even a slight improvement in sigma value is expected to reduce the defect rate –which in the case of calls translates to satisfactory responses to calls— and increase financial benefits to the bottom line of organizations. The present study used DMAIC tools to solve problems and to improve the first call resolution, increase customer service satisfaction, and achieve significant cost improvement.

E. Shortcomings in the Literature

Although the six-sigma process and associated successes have been well documented in the literature in the areas of manufacturing and the service industry, there is a paucity of research that systematically demonstrates how KPIs and CRQs can be incorporated in real examples with robust data provided for reproducibility. Given that six sigma has been labeled a "generic method" (de Mast and Lokkerbol, 2012), it is important to advance the literature to demonstrate the many

ways in which it can be used to improve business performance and viability. Furthermore, there is limited research presenting the use of the DMAIC process in improving call centers for benefiting the bottom line of organizations; yet, organizations are increasingly reliant on call centers for customer service. Thus, the literature is ripe for more research demonstrating the application of the six-sigma DMAIC process in decisions related to call centers.

III. Methodology

Case studies are the preferred research design for the implementation of six-sigma methodologies and the application of DMAIC given the in-depth nature of the process (de Mast and Lokkerbol, 2012). Based on the review of BPI methodologies dominant in the extant literature, six-sigma methodologies were determined to be most suitable for the case of a Jacksonville, Florida, not-for-profit company that provides medical education programs to physicians and healthcare professionals, herein referred to by a pseudonym, "MedicEd." This section systematically outlines the implementation of the DMAIC procedures in the case study company, beginning with an overview of the case to which the DMAIC methods were applied and the steps taken in regards to the case as prescribed by the DMAIC method. In the next section, Findings, we present the findings from each of the steps, including the actions taken as the result of each finding, and the outcome of the process. These findings are then presented and discussed in the next three sections, Results, Discussion and Conclusion.

This research applies six-sigma methodologies to the case of MedicEd. The company owned and operated the call center in-house until 2015, staffing the center with both full-time and part-time employees, for the purpose of providing clients and customers with a customer support center for questions or concerns. By employing a six-sigma approach in evaluating the customer support call center, we could identify and eliminate non-value-added steps to help the company achieve better customer interaction through improved services, reduced wait times, and reduced costs. This paper thus describes how the six-sigma DMAIC process could be applied in the case of MedicEd, and also demonstrates the value of the process for this case and more broadly through revealing the outcomes of the process.

A. Overview of the Problem

MedicEd experienced pressure to improve productivity, quality, and customer service while being able to maintain or reduce costs. The company identified a potential area for substantial improvement by outsourcing customer service calls instead of maintaining an in-house customer service call center. This research employed the six-sigma DMAIC process to evaluate the move to an outsourced call center (see Table 2). We began the assessment by reviewing the problems described by MedicEd regarding productivity, quality, and cost in regards to customer service. Next, we developed baseline measures of two KPIs—capacity utilization and staff costs— for the purpose of providing a better understanding of the use and for having a baseline to compare against once changes have been implemented. We then analyzed the preferences of the managers in regards to staff costs and wait times for each of four potential call center strategies. Based on this review, one of the strategies—outsourcing the call center—was identified as the most suitable for meeting the needs of the company, and this change was implemented in the "improve" step of the process. Finally, we evaluated the change through an assessment of the key variables to determine that the BPI strategies were effective for the case company.

Table 2: DMAIC Study Application

Step	Application
Define	MedicEd problem defined as pressure to improve productivity, quality, and customer service while maintaining or reducing costs.
Measure	MedicEd's pre-outsourcing capacity utilization and staff costs measured to determine baselines (see tables 3 and 4).
Analyze	MedicEd's problems analyzed and identified through baseline data.
Improve	MedicEd's process improved through decision to outsource the call center.
Control	MedicEd's decision evaluated through assessment of talk and wait times at outsourced call center.

B. Research Questions and Hypotheses

Through these five steps of the six-sigma DMAIC process, we are addressing two research questions, each with an associated null and alterative hypothesis. The research questions focus on the outcome KPI of wait times, as a measure of quality that was identified as not meeting standards in the in-house call center and expected to improve by outsourcing the call center.

Research Question 1: Is there a significant difference in customer wait times between the in-house call center and the outsourced call center after the outsourcing was completed?

$H1_o$: There is no significant difference in customer wait times between the in-house call center and the outsourced call center after outsourcing was completed.
$H1_a$: There is a significant difference in customer wait times between the in-house call center and the outsourced call center after outsourcing was completed.

Research Question 2: What is the relationship between talk times and wait times in both the in-house call center and the outsourced call center?

$H2_o$: There is no significant relationship between talk times and wait times in both the in-house call center and the outsourced call center.
$H2_a$: There is a significant relationship between talk times and wait times in both the in-house call center and the outsourced call center.

IV. Findings

We now present the DMAIC process following the steps outlined above. While this section provides evidence collected for analysis of the BPI change for the case company, these changes are further discussed in the sections, Discussion and Conclusion.

A. Define the Problem

The researchers worked closely with the company management to determine the information needed for each of the six-sigma DMAIC processes. The data from phone analytics reports were reviewed, as well as financial statements from the accounting system, to identify two correlated problem statements:

> **Problem Statement 1**: The average wait time for a customer on hold is around five minutes, which is outside what the company deems as acceptable for providing superior customer service (i.e., ideal maximum hold time of less than one minute).
> **Problem Statement 2**: Call center payroll is 557% over budget. The annual labor cost for staffing to support the call center is $167,076; payroll costs to support the call center exceed the company's budget for that expenditure, which was set at $30,000.

The remainder of the steps focused on employing an evidence-based strategy that addressed these two indicators: wait time and staff cost. In improving these indicators, we were improving both customer satisfaction and company costs. Thus, these KPIs have been identified as essential for improving overall quality for MedicEd.

B. Measure Capacity Utilization of Call Center

First, consideration was given to capacity utilization at the call center. Collecting this data was beneficial for baseline data in the event of a move to outsource the call center, but it revealed longitudinal inequalities in capacity utilization that could be used to better understand issues relating to wait times and staff costs. To measure call center capacity, we compared the number of calls each representative was able to take in a given work day and divided it by the total number of calls they were expected to take. Based on the results in Table 3, the company call center was heavily under-utilized relative to its capacity, only reaching full capacity ($\geq$ 85%) four out of the twelve months they were measured. As the call center was not working to capacity the majority of the time, the heavy financial burden of the fixed costs required to employ the call center staff represented wasted resources. This, in part, provides an explanation for this issue of high staffing expenditures and will be used to assess improvement in the problem following process changes.

Table 3: MedicEd Capacity Utilization

Month	Capacity Utilization	Capacity Utilization %
January	High	0.80
February	High	0.80
March	Low	0.39
April	Medium	0.64
May	Full	0.85
June	Full	0.85
July	High	0.80
August	High	0.80
September	Full	0.85
October	Full	0.85
November	Medium	0.64
December	Low	0.39
Average	-	72.2

Note: *SD* = 17.2; full = 81% - 85%, high = 65% - 80%, medium = 40% - 64%, low < 39%.

Next, we turned our attention to better understanding the company's issues surrounding staff cost. Weekly total staff salary was $3,213 on average, totaling $167,067 annually. The in-house call center handled 10,000 annual incoming calls at an average of $16.70 per call. Labor costs of call center employees typically account for 60% to 70% of operating costs for call centers (Gans *et al*., 2003). As the company set the call center budget at $30,000, the labor costs were well beyond the operational budget. While call center costs can be somewhat improved through better operations management, in the case of this company, it made sense to employ six-sigma methodology to research alternative call center solutions. More information is provided in its applicability in the literature review section of this paper.

C. Analyze Alternatives Considered by the Call Center

The company's need to manage its call center capacity and processes, while reducing costs, resulted in evaluating alternatives to the slated move to outsource their customer support call center to a third party company that specializes in handling inbound calls. These alternatives included (a) leaving the call center "as is," (b) reducing staff, (c) increasing staff, (d) outsourcing to a shared third party call center, or (e) a combination thereof. The key values for the company were wait times, staff costs, and service levels. Based on MedicEd management's input, we created a weighted table to help evaluate the alternatives based on these three key inputs in which a score for each of the inputs was computed for each of the alternative solutions. All scores are out of 10 (highest) and then adjusted by the weights assigned to each value. The results, as provided in Table 4, indicate that outsourcing, with a combined weighted score of nine out of ten, was perceived as the most beneficial option, while leaving the call center "as is," with a combined score of one out of ten, was perceived as the least beneficial option. Thus, this step of the analysis revealed that in regard to wait times, outsourcing was perceived by company management to be the best option among those considered, while doing nothing—leaving it "as is"—was considered to be the least beneficial option. While increased staff was perceived as a beneficial option for

reducing wait times, the data revealed that this would not address the issue of staff costs. In fact, this would most likely increase the already astronomical staff costs. Thus, in regard to staff costs, reducing staff and outsourcing were perceived as equally suitable options. Finally, for service level, outsourcing was again viewed as the option that would be best for addressing the two aforementioned problems. While it is clear that leaving the call center "as is" would not be an appropriate solution to the problems (as would also be confirmed by business process improvement models), the combined weighted scores of reducing staff and increasing staff fell short of outsourcing as each of these options relating to changes in staffing levels would only shift the balance of problems: a staff increase would reduce wait times, but increase staff costs, while a reduction of staff would reduce staff costs, but increase wait times.

Table 4: Values Important to MedicEd Company

	Wait Times			**Staff Costs**			**Service Level**			
Alternative Solutions	Rank	Weight	Weighted Score	Rank	Weight	Weighted Score	Rank	Weight	Weighted Score	Combined Weighted Score
Reduce Staff	2	0.5	**1**	8	0.25	**2**	2	0.25	**0.5**	**3.5**
Increase Staff	7	0.5	**3.5**	1	0.25	**0.25**	6	0.25	**1.5**	**5.25**
Outsource	9	0.5	**4.5**	8	0.25	**2**	10	0.25	**2.5**	**9**
Leave "As-is"	1	0.5	**0.5**	1	0.25	**0.25**	1	0.25	**0.25**	**1**

D. Improve: The Decision to Outsource

Based on our joint discussions with management regarding the weighted priorities, customer complaints of long wait times, and the vision for the direction the company wanted to take, the decision was made to outsource the call center to a third party, a measure that would have the most benefit to the company's wait time, service levels, and costs, as supported by the above table. When measuring the call center's success, we analyzed the following variables: wait times, talk times, wait time per staff member, staffing cost, and capacity utilization. This decision was further supported by the high labor costs of MedicEd's call center relative to its operating costs. Based on the findings, it was determined that the company could improve customer service while reducing call center costs by utilizing a third-party call center that used a shared resources system and a pay-per-call model. The outsourced call center has professionally trained staff, with team leaders, and is managed by operational experts and experts in the field of customer service. The outsourced call center has a high standard for call wait times, including a call pickup time of thirty seconds or less upon the first ring, which is considerably less time than the approximate five minutes of the medical education company's standard wait time. They are also able to reduce costs for the medical education company by utilizing a shared resource system that allows them to only charge the companies support for the calls that come in for that company, rather than a standard labor rate. By transitioning to a third-party call center, the company has positioned itself to not only reduce costs, but also to improve the level of customer service by reducing wait times. The purpose of this study is to use six-sigma approaches to evaluate the company's decision to outsource through

a comparison of the effectiveness, both in terms of talk and wait times and cost, of the outsourced call center to that of the company when it was operated in-house.

E. Evaluation

E.1. Data Collection

For evaluation, data were compared between the in-house call center in 2014 and the outsourced call center in 2015. The 2014 baseline data consisted of a random sample of calls made to the company's own intake center during the months of January, February, March, May, June, and July of 2014, and another random sample taken from the outsourced call center during the same months during 2015. The company did not supply data for April due to low call volume during that month; hence April was excluded for both samples. The total *N* was 6,180, evenly split between the two years. The variables collected from both samples were date of call, time of call, hold time measured in seconds, and talk time measured in seconds.

E.2. Evaluation Data Analysis

The analysis relied on descriptive statistics, graphical displays of data, and both parametric and nonparametric tests. The nonparametric tests were used to deal with the problematic distributions of the hold and wait time variables, which remained non-normal even after a log transformation.

Kendall's Tau was used to determine if there was a relationship between hold times and talk times. Just like the more familiar Pearson's *r*, Kendall's tau ranges from negative one (a perfect negative correlation) to positive one (a perfect positive correlation), with zero representing no association at all. Following Cohen's (1988) criteria, a correlation of .1 indicates a small effect size, .3 indicates a medium effect size, and .5 indicates a large effect size.

An independent samples *t* test adjusted for unequal variances along with a Mann-Whitney U test were used to determine if the average hold times and talk times varied between the two samples. The independent samples *t* test determines if there is a statistically significant ($p < .05$, two-tailed test) difference in means between two groups. It assumes equal variance and normal distributions in both groups. Tests rejected the null hypothesis, indicating that the equal variance assumption was met ($p < .001$), thus adjusted *t* tests for unequal variances are presented below. The lack of normality in the variables remained even with a log transformation, thus violating the second assumption. The Mann-Whitney U test also can be used to compare the central tendency of two independent groups, but it does not require any distributional assumptions. Thus, *p*-values for the Mann-Whitney U test are presented as robustness tests to complement the *t* tests. Cohen's *d* is presented as the effect size. Following Cohen's (1988) criteria, a value of .2 indicates a small effect size, .5 indicates a medium effect size, and .8 indicates a large effect size. The sample size was adequate to achieve .8 power for two-tailed tests with alpha set at .05 for moderate effect sizes.

V. Results

Table 5 presents summary statistics for the whole sample and each year separately. It also stratifies the values by month. The table shows a large decline in mean hold times (in seconds) between 2014 (M = 338.69, SD = 444.94) and 2015 (M = 52.28, SD = 105.92). It shows a much more modest decline in talk times from 2014 (M = 285.42, SD = 372.99) to 2015 (M = 221.69, SD = 247.18). Given that times cannot be less than zero, the large standard deviations accompanying the means in the table indicate substantial skew in the data. This was confirmed though boxplots (not shown).

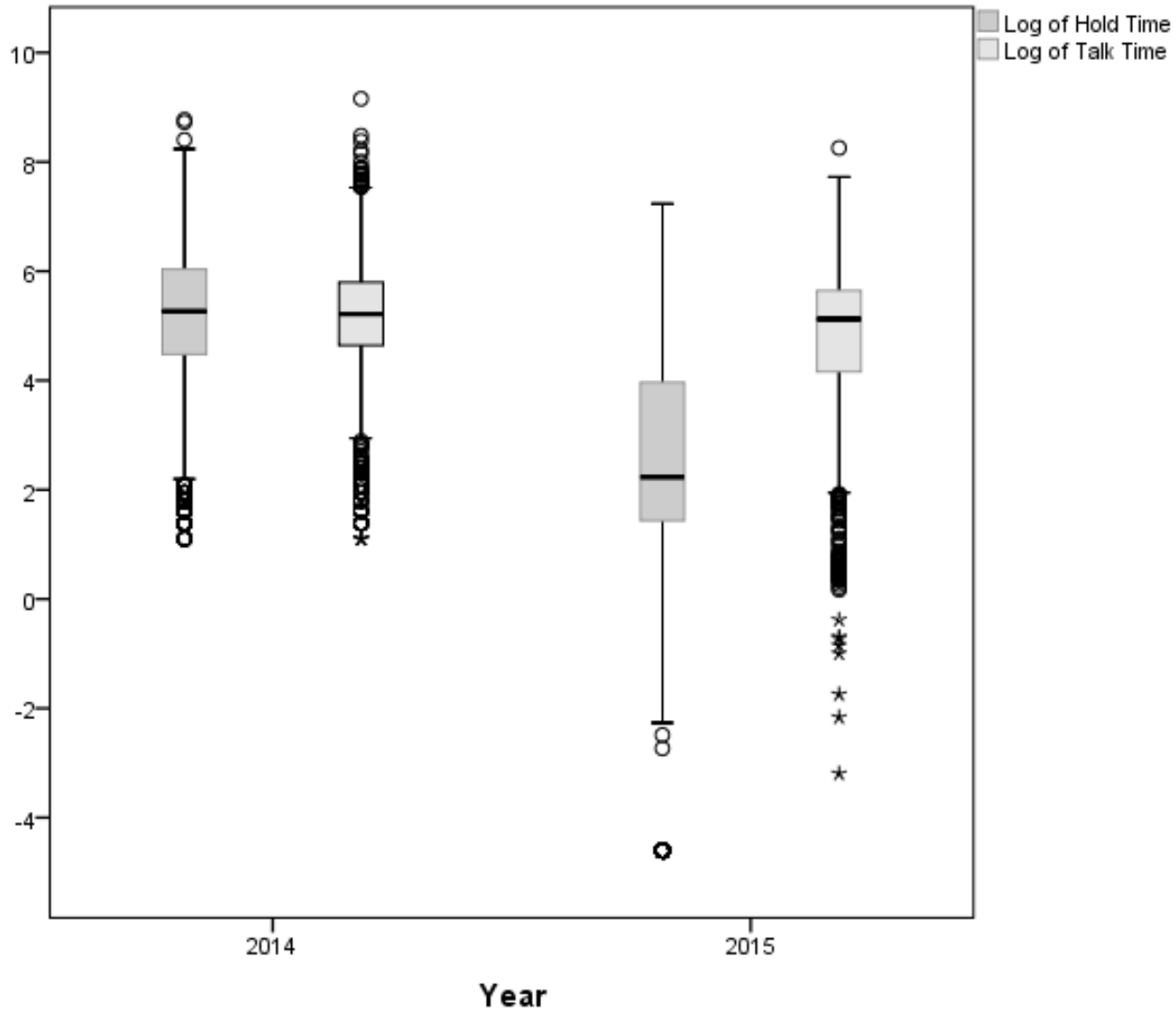
Table 5: Descriptive Statistics for Wait Times and Talk Times (in Seconds)

Time	**Whole Sample**		**2014**		**2015**	
	M	*SD*	*M*	*SD*	*M*	*SD*
Average Hold Times (All Months)	195.49	353.68	338.69	444.94	52.28	105.92
January	169.48	303.32	267.52	378.24	71.45	147.77
February	157.63	308.87	277.69	398.27	37.57	59.84
March	252.82	456.40	459.18	568.50	46.45	91.58
May	205.54	409.08	365.96	523.15	45.12	98.68
June	167.92	200.86	269.96	220.15	65.88	107.03
July	159.44	202.72	275.75	219.10	43.12	84.63
Average Talk Times (All Months)	253.55	317.98	285.42	372.99	221.69	247.18
January	290.43	282.46	355.97	291.12	224.89	257.56
February	267.92	272.14	294.18	225.69	241.65	309.93
March	199.22	175.32	181.50	161.56	216.94	186.50
May	218.45	247.00	261.92	218.74	174.98	265.50
June	333.94	578.42	408.95	768.87	258.93	259.98
July	271.19	348.08	299.91	427.72	242.48	240.85

Note: N = 6180 (January n = 1242, February n = 578, March n = 1636, May n = 1134, June n = 742, July n = 848).

Based on the observation of this skew, the wait and talk variables were logged. As Figure 1 shows, taking logs of the two variables improved the symmetry of the distribution, but the distributions remained too heavy tailed to be considered truly normal. Thus, the statistical tests used were both parametric and nonparametric (i.e., distribution free). Figure 1 also gives the impression of a substantial decrease in wait times, consistent with Table 5. Also consistent with Table 5 is a smaller decline in average talk times.

Figure 1: Box Plots of Log Transformed Variables by Year



The first hypothesis was that there is a relationship between talk times and hold times. This was tested using Kendall's tau both on the data aggregated for the two years, as well as separately for each year.

[1] The results found a statistically significant, but substantively small, effect for the pooled data (τ = .091, p < .001). The relationship was not significant in 2014 (τ = -.022, p = .068). The significance found for the pooled data was driven by a stronger, though still substantively small, relationship in 2015 (τ = .184, p < .001). The positive sign on the estimate means that customers who spent more time on hold also tended to talk more, but only after the outsourcing call center took over. This relationship was not strong, however, and not reflected at all in the 2014 data.

[1] Because Kendall's tau is based on ranks, it is equivalent whether estimated on the logged or unlogged versions of each variable.

The second hypothesis was that hold times and talk times changed systematically between 2014 and 2015. Table 6 displays the results of independent samples *t* tests complemented by *p*-values from the nonparametric Mann-Whitney U test. The results agree that the changes observed in Figure 1 are statistically significant; in other words, the log of both hold and talk times decreased significantly between the years. In addition to both comparisons being significant ($p < .001$), the effect size for the decrease in hold times was quite large ($d = 1.395$). The effect size for talk times was much smaller ($d = .370$), indicating that the outsourcing company was more effective at reducing hold times than actual talk times.

Table 6: Parametric and Nonparametric Independent Samples Comparisons

	Mean Diff	***SE***	***t***	***df***	***p***	***p* from Mann-Whitney Test**	**Effect Size (*d*)**
Log Hold Times	2.998	0.055	54.82	4543.26	< .001	< .001	1.395
Log Talk Times	0.457	0.031	14.532	5620.64	< .001	< .001	0.37

In sum, although there is (at best) weak evidence that hold times are related to talk times, the results show that outsourcing the call center did yield savings in both. Using the KPIs to evaluate the improvement to the business processes of MedicEd, we conclude that the decision to outsource had a positive BPI impact on quality.

VI. Discussion

This research is a study of quality and how quality can be improved and measured using the DMAIC processes. Jahanshahi *et al*. (2011, p. 254) define quality as "fitness for use, or the extent to which a product successfully serves the purposes of customers." Call center customer service is thus an organizational process that has a strong relationship with customer satisfaction and loyalty. We both determined the move to outsourcing and evaluated its effectiveness using quantitative metrics of quality. As a result of systematic considerations of the pre-determined KPIs and in light of the stated issues experienced by management, the company chose to outsource its customer support call center to a third-party company that specialized in handling inbound call centers. To assess the quality impact of this move, we compared 2014 in-house call center wait times and talk times to that of the 2015 outsourced call center.

The root problems were identified within this research as (a) wait times and (b) staff costs. Thus, the success of the change for the company was measured by changes in these KPIs. We have identified the root causes for each of these as follows:

1. Wait times: not enough support during peak times; no motivation for productivity;
2. Staff costs: fixed costs; paying for staff during downtime; benefits expenses.

By outsourcing the call center, the company attempted to solve these identified items in the following ways:

1. Wait times: Outsourced call center (OCC) guarantees wait times no longer than thirty seconds and staffs accordingly; OCC is open twenty four hours a day / seven days a week, which should help alleviate backlogs;
2. Staff costs: MedicEd will only be paying $3.50 per call taken, regardless of how long the call is, which means MedicEd is only paying around $35,000 per year (assuming 10,000 incoming calls for the year) for call center services and will save over $125,000 annually.

As noted in several places within this report, MedicEd will be looking for improvements in wait times and costs, while increasing existing service levels. Over time, MedicEd will request from OCC various reports to help identify whether these improvements are being implemented, and whether customer wait time and talk time have decreased, along with running a customer satisfaction scale. These reports will be as follows:

1. Every day, a phone analytics report is sent to MedicEd showing the time of day, day, wait time, and talk time for each call. This will allow for the KPIs assessed within this research to continue to be assessed to ensure that the decision to outsource maintains its value over time. In the event that the outsourced call center does not meet the established standards, the same DMAIC process can be used to determine the BPI most suitable for the new problem.
2. Every week a cumulative report showing the same phone analytics is sent to MedicEd. This will allow the company to monitor the KPIs and to address any issues that appear in the reports before they become trends and impact customer satisfaction. Early detection of issues might allow "quick hit" solutions that are less costly to the company than re-engineering the processes.
3. Once per week a MedicEd employee will visit the call center to listen to calls live to ensure service level expectations are being met. Training sessions will be provided if the provision of service does not meet the expected service level. Training will also be provided when there are any changes to the MedicEd products or services to ensure that the customer service provided by the outsourced company is equivalent of that which would have been received in-house to ensure customer satisfaction.
4. Finally, since all calls are recorded, once per month MedicEd will randomly select ten calls to listen to in order to ensure that quality expectations are met. The random selection provides that all customer service representatives have an equal chance of being audited for quality. As the primary form of assessment is wait times, this will ensure that beyond their initial wait, customers are still receiving quality attention for the customer service representatives.

The results show that MedicEd clearly took advantage of economies of scale by outsourcing its call center operations to reduce wait times. Following the recommendation of Chakrabarty and Tan (2006) for focusing on KPIs, we were able to successfully use the six-sigma DMAIC process to improve quality in this case study. In doing so, we also contributed to the academic debate regarding the ability of the six-sigma methodologies to be effectively applied in the service

industry and have advanced this field of study. Specifically, this research builds upon the work of Chakrabarty and Tan (2006) and Laureani *et al.* (2010) in that the systematic implementation was outlined to both evaluate the process and outcomes for the company, and also to demonstrate the value of six sigma's DMAIC as a BPI model for the service industry. This also seemed to lead to shorter talk times, although the time savings is much smaller for talk times compared to wait times. The reduction in hold times should have the positive downstream effect of improving customer satisfaction as well, as customers no longer have to experience frustrating waits. These metrics are treated as proxy to customer satisfaction and overall quality, given the established relationship between these variables (Jahanshahi *et al.*, 2011).

There remain some considerations that need to be addressed, however, in the assumption that shorter wait times yield higher level of customer satisfaction. This relationship will, of course, be contingent on how well the outsourced call center is able to answer customer questions compared to employees from inside the company. If the call center has less subject expertise, then some of the goodwill garnered from reduced wait times may disappear as a result of less effective resolution of customer questions and concerns. Whether this happens is a topic for future research, as customer satisfaction data are currently unavailable. Perhaps a system of transferring questions needing more precise knowledge to a small in-house operation, while maintaining the bulk of simple questions for outsourcing, could be developed.

Another implication is that there is still room to reduce talk times and thereby yield additional savings. This research has revealed that the 2015 outsourced call center shows an improvement over the 2014 in-house call center, but also that the process will continue to be tracked to monitor effectiveness over time. Tracking customer calls, and having a display of answers ready for the most common questions, may help bring down talk times further, while simultaneously addressing the customer needs.

VII. Conclusion

In conclusion, MedicEd decided to outsource the call center. By using six-sigma processes MedicEd evaluated alternatives, developed a plan, and had a procedure in place to ensure that the results are measurable and easy to analyze and that improvements are being made and controlled. By completing this project and following these processes, the company expects the following results:

1. Customer wait times will decrease from over five minutes per call to less than one minute.
2. Call center staff costs will decrease from over $150,000 per year to less than $40,000 per year.
3. Customer satisfaction will increase due to highly trained customer service staff.
4. Although the customer service staff at OCC is highly trained in customer phone service, we have yet to determine whether their expertise in responding to questions requiring basic and more-than-basic knowledge of MedicEd will be sufficient to ensure customer satisfaction for most calls.

Thus, the evidence-based decision to outsource their call center is anticipated to save the company well over a million dollars in the next few years through decreased staff costs and increased customer satisfaction and loyalty. Although this research cannot determine the exact relationship between call center experience and customer retention, the staff cost alone will allow the company to focus on other processes to improve overall quality. By using a systematic process

and following the six-sigma principles, MedicEd should be able to reduce wait times, decrease annual expenses, and improve customer service. DMAIC has thus been demonstrated as a valuable resource in this case, as outlined through the benefits to MedicEd above, but it was also demonstrated to be a valuable tool BPI methodology for service industry business process considerations. The overall benefit is contingent on the ability of phone operators to answer questions comprehensively and to the customer's satisfaction. Callers who do not have their questions answered in enough detail may be dissatisfied, which may offset the benefits of reduced talk times. This remains to be determined by further study.

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