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National Chung Cheng University, Chiayi, Taiwan

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Editorial

Eldon Y. Li ^{1, 2*}
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Editorial Objective

JBM is a double-blind refereed journal addressing working or potential business and management theories or practices and the emerging issues of interest to academics and practitioners. The primary editorial objective of the *JBM* is to provide a forum for the dissemination of theory and research in all areas of business, management, and organizational decisions. We invite research articles, comprehensive reviews, and case studies that provide insights into the daily business phenomena. Authors of *JBM* are always encouraged to offer recommendations to readers exemplifying the applicability of their research findings.

Research Topics

In this issue of *JBM*, we have included four research articles. First, Gary A. Patterson, Wei Guan, and Huijian Dong co-author the first article, entitled “Ethical fund volatility and inconsistency of investor sentiment.” They use 1,397 regionally-based ethical funds from the US, European, and Asia-Pacific markets and globally oriented funds to examine changes in volatility patterns before, during, and after the 2008 global financial crisis. They find that ethical equity funds offer significantly lower downside risk than equity benchmarks before and during the global financial crisis. It is the first study to focus on the volatility patterns of ethical funds across a business cycle while incorporating changes in investor sentiment analyzed from a frequency domain perspective.

The second article is “The role of entrepreneurship education on student entrepreneurial intentions: Mediating effect of attitude, subjective norms, and perceived behavioral control.” Messele Kumilachew Aga and Amanpreet Singh conduct a cross-sectional survey of four universities in Ethiopia (both public and private) with a sample size of 335 regular undergraduate graduating students who had taken entrepreneurship courses. They confirm that the antecedents of entrepreneurial intentions can serve as predictor variables and mediate the relationship between entrepreneurship education and entrepreneurial intentions.

Next, Ronel Simon and Merlin Teodosia Suarez discuss a study “Examining the behavioral intention of Philippine MSMEs toward business intelligence adoption.” The study focuses on understanding the factors affecting the behavioral intention of micro, small, and medium enterprises (MSMEs) in the Philippines towards business

intelligence and analytics (BI&A) systems adoption. It applied Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the data collected from 202 MSMEs in the manufacturing, wholesale and retail, and services sectors. The research findings revealed that perceived relative advantage, complexity, top management support, competitive pressure, and innovativeness are determinants of behavioral intention to adopt business intelligence. Of these factors, personal innovativeness and relative advantages were identified as the strongest determinants of MSMEs' adoption intention.

In the last and fourth study, AFM Jalal Ahamed and Wen Gong present a study on "What drives high penetration rates of social media? A qualitative comparative analysis across countries." The study examines the drivers of high social media penetration rates (SMP) across countries by considering the concurrent causation of cultural and socio-economic conditions. Ninety-four countries across continents were analyzed using the set-theoretic configurational approach fuzzy set Qualitative Comparative Analysis (fsQCA 3.0). The results reveal that adult literacy is necessary, and four causal combinations for high social media penetration rates were identified.

Acknowledgment

This issue of *JBM* is the second issue officially published by the College of Management at National Chung Cheng University (CCU-COM) in Chiayi, Taiwan. The International Consortium for Electronic Business (ICEB) had authorized CCU-COM to be the publisher of *JBM* in September 2021. Furthermore, the journal is officially a Gold Open Access journal licensed under Creative Commons Attribution-NonCommercial 4.0 International License (CC BY-NC 4.0).

For this issue of Vol. 28, No. 1, we thank the authors for sharing their knowledge through the research projects and the reviewers for taking their precious time to review the articles and offer constructive suggestions to the authors. In addition, special thanks go to the College of Management at CCU in Taiwan for the administrative support and the ICEB for being a partner to recognize *JBM* as its official publication since the issue of Vol. 26, No. 2 in September 2020.

The publication of *JBM* cannot sustain without the institutional partners and the contributing scholars. Please note that the views expressed in these articles belong to the authors, not the editors, editorial board, *JBM*, ICEB, and CCU. We hope the articles are interesting and beneficial to your future research. On behalf of the Editorial Board, I thank you very much for your continuous support. Finally, we would like to take this opportunity to wish you all to be safe and healthy under the recent coronavirus epidemic. We hope the COVID-19 contagion ends soon, and we, the people, can get back to our healthy everyday lives.

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Chang's research outcomes have contributed to both theoretical and practice. Based on the research areas, he authored/co-authored over 80 refereed journal articles (e.g., *Information & Management*, *Decision Support Systems*, *Journal of Information Systems*, *Information Systems Management*, *Communication of AIS*, *Journal of Global Information Management*, *Information System Frontiers*) and published ten textbooks.

Ethical Fund Volatility and Inconsistency of Investor Sentiment

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Abstract

Purpose – This paper examines the volatility patterns and risk-adjusted performance of ethical funds compared to conventional benchmarks across an entire business cycle, including the global financial crisis. The focus on risk coincides within the context of investor sentiment and the investment community's relative attachment to ethical funds. Investor sentiment affects the fund flow of ethical funds and shifts the role and function of ethical funds in the eyes of investors.

Method – The sample comprises 1,397 regionally based ethical funds from the U.S., European, and Asia-Pacific markets and globally oriented funds. The study examines changes in volatility patterns before, during, and after the 2008 global financial crisis. The authors employ the exponential generalized autoregressive conditional heteroskedastic (EGARCH) model to compute fund volatility and use the wavelet method to assess changes in investor sentiment.

Findings – The study finds that ethical equity funds offer significantly lower downside risk than equity benchmarks before and during the global financial crisis. These periods coincide with investor sentiment patterns where investors regard ethical funds as a shelter for risk. After the global financial crisis, a shift occurs in volatility patterns where ethical funds generate greater risk than their respective equity benchmarks. These new volatility patterns coincide with changes in investor sentiment, suggesting that changes in market volatility reflect rational adjustments to investor sentiment.

Limitations – The study spans an entire business cycle and includes a global financial crisis. Multiple cycles may provide additional insight into the evolving volatility behavior of ethical funds.

Implications – The study provides evidence into the evolving status of ethical funds. The growing acceptance and popularity of such funds coincide with significantly greater cash inflows into the funds, which may continue to impact the volatility behavior of such assets. Furthermore, the growing worldwide attraction and acceptance of ethical funds may

generate sufficient cash inflows so that these funds behave the same way as non-ethical funds in the future.

Originality – The study fills the ethical fund volatility research gap that focuses mainly on returns. This study proposes a fund volatility cycle that begins as premium assets with limited capital inflows and ends as commonly accepted assets with abundant capital inflow. To the best of the authors' knowledge, this is the first study to focus on the volatility patterns of ethical funds across a business cycle while incorporating changes in investor sentiment analyzed from a frequency domain perspective. In addition, this study uses a significantly larger sample of ethical funds than most studies of ethical funds, so its analysis spans major international markets to obtain regional variation and differences in systematic risk exposure.

Keywords: ethical funds, volatility, performance, crisis, sentiment

Reference to this paper should be made as follows: Patterson, G. A., Guan, W., & Dong, H. (2022). Ethical fund volatility and inconsistency of investor sentiment. *Journal of Business and Management*, 28(1), March 2022, 1-29. DOI: 10.6347/JBM.202203_28(1).0001.

Introduction

Investors increasingly engage in financial decisions that align with their social positions. They acquire holdings in mutual funds that perform positive or negative screening to include “ethical” industries and their corresponding companies. Earlier studies of ethical funds often emphasize the return performance measure in comparative analyses with conventional funds. These studies frequently ask whether limiting the investment universe compromises the portfolio’s performance. For example, Trinks and Scholtens (2017) observe that investors incur opportunity costs by applying negative screening in Socially Responsible Investment (SRI) funds. On the other hand, Climent and Soriano (2011) investigate returns of U.S. green funds and find no differences in the latter period of their study. Thus, researchers propose a tradeoff between the benefit of not investing in the industries on the negative list versus the potential benefit of greater returns by not limiting the investment universe.

Studies focusing on the performance of ethical funds relative to conventional funds generate inconsistent findings. Cortez *et al.* (2009) evaluate ethical European funds and do not observe a tradeoff between a limited investment universe and reduced investment performance. Mansor and Bhatti (2011) observe mixed results when examining the fund performance measures of Islamic and conventional funds. These studies focus on funds’ returns and monetary benefits rather than the uncertainty that a fund carries for the entire portfolio.

Other studies produce results suggesting that ethical funds outperform other fund groups. Ooi and Lajbcygier (2013) find evidence of superior performance by SRI fund managers after they incorporate SRI investment constraints to recalibrate risk factors. Nofsinger and Varma (2014) observe that ethical U.S. funds outperform conventional funds during financial crises, primarily through the reduction of downside risk. Brzeszczyński and McIntosh (2014) and Wu *et al.* (2017) find that British ethical funds perform better even during economic crises. Finally, Wu *et al.* (2017) identify a superior recovery among ethical funds during the post-crisis period, though mixed results emerged during earlier expansionary periods. These studies prove that ethical funds do not underperform relative to unrestrictive funds.

Given inconsistent results from studies examining ethical fund performance, Rathner (2013) conducts a meta-analysis of 25 studies to detect trends. The review identifies that an emphasis on U.S. ethical funds increases (decreases) the over-performance (under-performance) of ethical funds relative to conventional peers. Later, Bertrand and Lapointe (2018) find that socially responsible firms comprise an underweighted component in risk-based portfolios. The authors suggest that one plausible explanation may be the lack of understanding of the components of ethical stock risk and volatility performance.

Despite the focus on the return performance of ethical funds, research has not devoted much attention to their volatility, though portfolio construction emphasizes the importance of minimizing portfolio variance while optimizing return performance. Studies such as Behr *et al.* (2013) and Hirshleifer *et al.* (2013) highlight the importance of asset variance during portfolio construction to obtain portfolio optimization. Jordan and Riley (2015) focus on the measurements of fund volatility and affirm that asset volatility, rather than the ability of fund managers, usually generates mutual fund alphas. Additionally, Moreira and Muir (2017) assert that constructing volatility-managed portfolios can enhance Sharpe ratios and produce large alphas to benefit mean-variance investors. In addition to the screening used to construct ethical funds, these studies of conventional funds support the investigation of ethical fund volatility.

Investors in ethical and conventional funds may be partially motivated by similar reasons, yet their behavior may reflect different emphases on sentiment, information, or attitude. Markowitz (1952) epitomizes the classic investment approach, focuses almost exclusively upon financial performance, and views investors as rational and wealth maximizing. Yet investors in ethical funds also emphasize environmental, societal, or governance criteria in their decisions which constrain the investment universe and expose themselves to the non-systematic risk and impact long-term performance. Laurel-Fois (2018) takes an alternative position and argues that screening enables managers of ethical funds to obtain more information than conventional fund managers since they construct their portfolios with ever-increasing selectivity to counter the diversification

challenges created by a smaller investment universe. Ballestero *et al.* (2012) attempt to balance the factors motivating ethical investors with a financial-ethical factor model where investors combine traditional financial goals and incorporate an ethical goal within the same utility framework. Their model extends to the socially responsible rating system of mutual funds, which forms a common basis in ethical investing.

The universe of ethical investors may contain significantly different participants with varying degrees of expertise, emphases on financial performance, and time horizon. Regardless of the diversity among ethical investors, U.S. SIF (2012) observes that ethical funds are establishing a significant presence in public market investments and that from 2001 to 2012, professionally managed assets in the U.S. aligned with an ethical basis grew 61.2% from \$2.32 trillion to \$3.74 trillion. Institutions own a significant portion of securities in developed markets, and given the importance of corporate security ownership, researchers such as Bushee (1998) and Cox and Wicks (2011) examine the attributes of different types of institutional owners. Bushee (1998) categorizes investment institutions as dedicated or transient. The greatest difference between these two groups is their investment time horizon and their accompanying trading patterns, which resonate with management decisions of firms in their holdings. For example, firms with high institutional ownership also have high turnover engage in lower R&D to reverse an earnings decline. Cox and Wicks (2011) identify investor demand for ethical securities as a part of the long-term factor in ownership while short-term market liquidity and portfolio construction needs comprise the other demand requirements. Cox and Wicks (2011) observe that dedicated institutions consider corporate responsibility as important as portfolio theory in security selection. Transient investors place the greatest emphasis on market liquidity and the least on ethical factors. Such differences in trading and holding patterns may impact the volatility of the investors' underlying assets.

Chen and Gavigous (2015) examine the role ethical positions have on three types of investors: 1) the marginal investor trading shares on an exchange; 2) an investor making large transactions outside the exchange, e.g., merger and acquisition; and 3) the institutional investor. The authors observe that marginal investors place greater value on the social component of the investment, whereas the other two groups trading on better information do not believe that firms' ethical positions create greater profit potential. The findings suggest that the price premium of a firm's ethical position is driven by less informed marginal investors' emphasis on positive benefits to society that need not be linked directly with benefits to the firm.

Analysts often rely upon different theoretical frameworks to examine ethical investing. Market performance, with repeated over- and under-pricing, suggests that modern portfolio theory may not adequately explain the collective decisions of investors nor reflect their sentiment. Shefrin and Statman (2000) develop a behavioral portfolio theory (BPT) where investors make positive choices under uncertainty. Investors may construct a multi-layered portfolio with each layer addressing one of their goals, yet with

minimal attention to the covariance between the layers. Investors may incorporate a broader group of factors instead of focusing on risk and return. Bilbao-Terol *et al.* (2016) argue that BPT and mental accounting help explain ethical investing and suggest that each layer in the BPT reflects a form of an individual mental account of the investors. Within each layer, investors establish parameters relevant to a specific ethical goal that may incorporate adherence toward risk and return. Such objectives may not construct portfolios that fit the efficient frontier, but they produce funds that attract a growing market of investors.

Our paper fills the gap in the literature that focuses on volatility from the scope of market divergence and the timing of financial performance. This study examines the risk behavior of ethical funds and compares this pattern to conventional equity benchmarks to determine if higher risk helps explain the return premium found within ethical equity funds and the impact of timing upon risk. We also place this analysis within the context of investor sentiment and the investment community's relative attachment to ethical funds. This study uses the term "ethical funds" loosely to include fund groups focusing on socially responsible or sustainable investing (SRI) or Environmental, Social, or Governance (ESG). We conduct this study across an entire global economic cycle: before, during, and after the 2008 global financial crisis. Additionally, we work with a much larger sample of funds than most studies and focus on funds trading in all major financial markets, so our study provides significant breadth and depth to analyzing ethical funds.

The contribution of this paper goes beyond filling the gap of ethical fund volatility left by the past literature that focuses mainly on fund returns. Our study also expands the discussion of volatility to the fund life and new financial instrument perspective. We propose a fund volatility cycle that initiates from premium assets with limited capital inflow and matures at widely accepted assets with abundant capital inflow. While previous studies take two snapshots during the asset life, namely, initiation and maturity, our study contributes their evolution to this field's research.

We observe that investors of ethical funds incur downside risks significantly lower than conventional benchmarks during the pre-crisis (expansionary) and financial crisis periods. Our tests also uncover regional differences in volatility patterns, so investors of ethical funds do not experience consistent benefits of lower risk geographically. We observe changes in investor sentiment across these periods, suggesting that investors experienced a high level of uncertainty during these periods and appeared to favor ethical funds initially during periods of greater uncertainty. These changes in investor sentiment coincide with the fluctuating performance pattern of ethical funds relative to their conventional benchmarks over the business cycle.

Our study identifies a reversal in the volatility patterns among ethical funds during the post-crisis period, where investors of ethical funds experience greater volatility than those of their conventional benchmarks. The ethical funds also show

greater regional variation in volatility in the post-crisis period than in the other periods in the study. These reversals occur along with an increase in the noise impacting investor sentiment after the financial crisis, indicating that investors no longer regard ethical funds as a shelter from market volatility. These findings concur with other studies. For example, Parida and Wang (2018) observe that funds flowing into ethical funds after the global financial crisis diminish relative to more conventional funds, which would impact volatility patterns. Lower capital inflows and the expansion of asset pools of ethical funds increase fund volatility due to greater asset concentration and limited capital budgets. The post-crisis sentiment decline exacerbates capital flow away from ethical funds to conventional funds, hence the high volatility of the ethical funds.

This paper continues as follows: Section 2 presents the data management for the research, including settings and rationale for the regional markets and sub-periods; Section 3 develops the hypotheses; Section 4 introduces the empirical findings; Section 5 concludes and provides potential areas for exploration with ethical funds; while Appendix A explains the computation of fund volatility with the exponential generalized autoregressive conditional heteroskedastic (EGARCH) model within the context of investor sentiment, the wavelet method, and the rationale of subperiods identification.

Data and Methodology

This study examines ethical funds obtained from Thomson Reuters Lipper that are domiciled in the U.S., Europe, and Asia-Pacific regions and those having a global focus. The study spans over 3,388 trading days from January 2, 2001, to December 31, 2013. From a universe of 4,807 ethical funds, we eliminate those with short survival periods of less than four years in full records containing daily net asset value. It yields 2,850 funds with at least 1,042 trading days (about 4 years) of net asset value records. We emphasize equity funds and construct a final sample of 1,397 ethical equity funds after removing bond, money market, real estate, commodity, pure hedge and arbitrage, target maturity, and mixed asset funds. Using only equity funds, our volatility conclusions become consistent with the composites and components of our benchmark indices.

We compute the volatility performance from the daily net asset value data of the ethical funds in the sample. Following the conclusion of Hickey *et al.* (2015), which argues that the number of assets in a fund portfolio selection universe is irrelevant to its performance, our study does not apply additional filters on the number of holdings of each mutual fund. Specifically, we estimate two versions of fund volatility for comparative purposes: 1) the EGARCH model proposed by Nelson (1991), with modifications from Ederington and Guan (2005, 2010); and 2) the simple estimated volatility from the standard deviation of daily fund returns. Furthermore, we capture volatility performance of funds from two dimensions: 1) geographical, including regional areas of the U.S., Europe, and Asia-Pacific as well as global; and 2) chronological,

emphasizing three distinct periods: pre-financial crisis (expansionary); global financial crisis, and the post-crisis (recovery).

Our approach of separating regional data is consistent with Cowan (2017), who advocates the leading position of the U.S. equity market that develops the socially responsible fund field and implies the importance and legitimacy of separately measuring U.S.-domiciled ethical funds. Hau and Rey (2008) also identify the importance of regional data at the fund level. Our additional review of broad global indices is echoed by Michelucci (2017), who documents that the Social Impact Investment (SII) market is most highly developed in Anglo-Saxon countries. Yet, organizations embracing SII can play important roles in promoting SII across the global markets.

Cresson (2009) asserts that tradable benchmarks perform well in tracking non-tradable benchmarks. This linkage implies that the study of return and volatility performance of ethical funds needs less consideration on the benchmark tradability. Our study selects the structural breaks consistent with the market environment of ethical funds and the standard business cycle dating promoted by the National Bureau of Economic Research. In addition, we select equity benchmarks to reflect appropriate regional or global orientation for comparison with the ethical funds. Table 1 provides the details of the periods and tradable benchmarks used in this study.

Table 1. Periods and Geographical Categories of Fund Performance Comparison

Panel A: Time Periods		Panel B: Geographical Performance Benchmark	
Whole Period	January 2, 2001 - December 31, 2013	Global	Dow Jones Global Total Stock Market Index
Pre-Crisis	January 2, 2001 - November 30, 2007	United States	Standard and Poor's 500 Index
Crisis	December 1, 2007 - June 30, 2009	Europe	STOXX Europe 600 Index
Post-Crisis	July 1, 2009 - December 31, 2013	Asia-Pacific	Dow Jones Asian Titans 50 Index

This table in Panel A reports the dates of the whole sample period and subperiods used in the analysis. Panel B in the table presents the equity benchmarks selected for the global and regional ethical funds

Hypothesis Development

Equity fund managers construct ethical funds using positive and negative screens on the universe of equities and attract different types of investors as previously described. The volatility of these constrained portfolios may behave differently from conventional funds as economic conditions change and generate various responses from investors. Research on the performance of ethical fund returns relative to conventional funds generates inconsistent findings, but little attention has been given to the volatility of these funds. To achieve the objective of this study, we propose two hypotheses.

The first hypothesis focuses upon the relative volatilities between ethical and conventional funds during the sub-periods of this study:

H1: *The volatility of ethical funds will exceed the volatility of conventional counterparts in all sub-periods.*

Modern portfolio theory, as presented by Markowitz (1952), proposes that fund managers would expose investors to market risk since risks associated with the volatility of individual securities brought by the non-systematic risk can be eliminated through diversification. Yet ethical fund managers rely upon positive and negative screening processes that may prevent the elimination of idiosyncratic risk. This is because the truncated list of asset candidates may share a new systematic risk exclusively carried by ethical assets.

The second hypothesis focuses on the risk-return performance of ethical funds across the different sub-periods of this study:

H2: *The risk-adjusted performance of ethical funds will be comparable to those of their respective conventional benchmarks in all sub-periods.*

Across a complete business cycle, as this study spans 2001 to 2013, investors will react to different market environments based upon their objectives and information. During an expansionary period, one should expect a more stable, robust macroeconomic environment that encourages greater investment. The onset of a global financial crisis would introduce massive upheavals into the macroeconomic system and create a more challenging setting for investors where fund volatility should increase significantly with a correspondingly strong impact upon return pattern. The end of a global financial crisis should witness an uneven reemergence of a more stable macroeconomic environment since different regions experience the crisis with varying intensity and different abilities to absorb and then recover from the global shocks. Thus, the global financial environment may take much time to converge to the new macroeconomic equilibrium in a long recovery period. Our tests will identify the volatility patterns of ethical funds and their respective benchmarks across a business cycle.

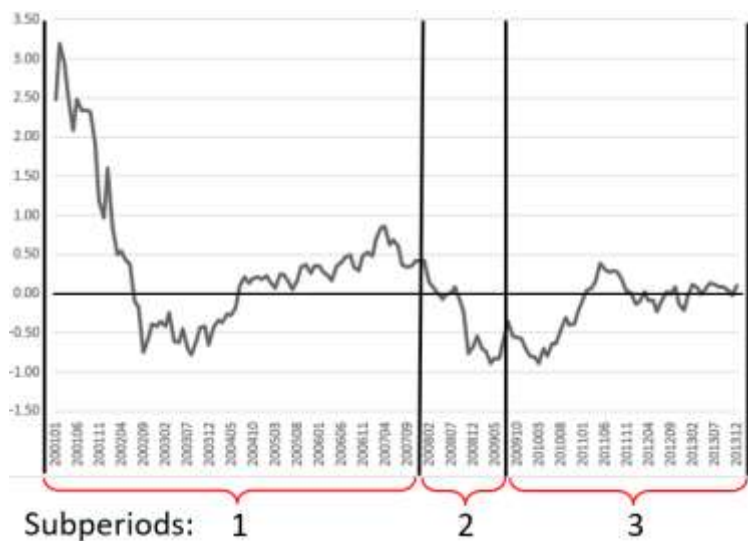
Results and Discussion

This study examines ethical fund volatility, and the impact that changes in investor sentiment have upon the volatility patterns.

Investor Sentiment

Our analysis of investor sentiment relies upon the Baker and Wurgler (BW) Sentiment Index, which proxies for investor sentiment across the business cycle. We plot the BW Sentiment Index for our sample period in Figure 1, which shows sharp declines

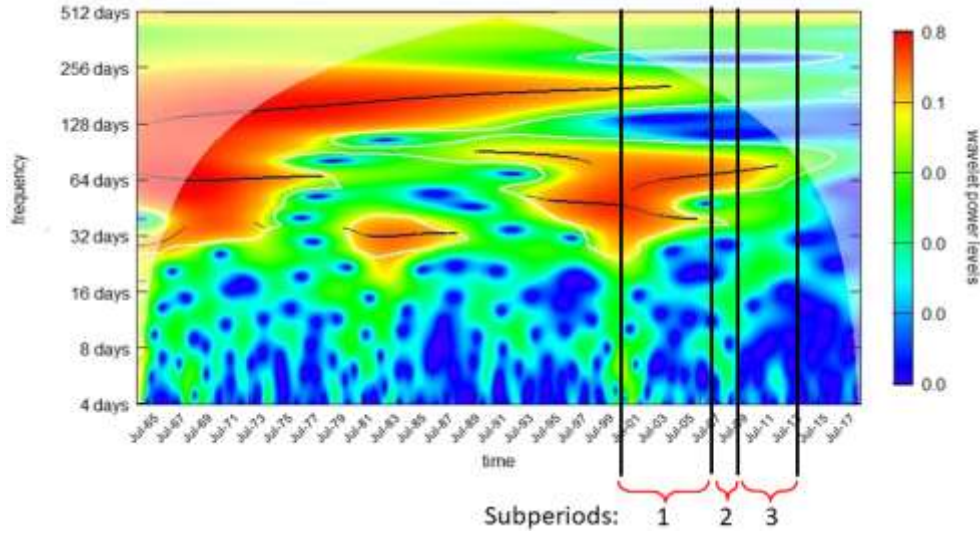
and periods in negative territory, signifying very poor sentiment after the dot com crisis and during the 2008 global financial crisis, while sentiment remains largely anemic during most of the post-crisis period. (The volatility index provides results comparable to the Baker and Wurgler Sentiment Index and is available upon request.).



This Figure presents the Baker and Wurgler Sentiment Index with the three subperiods of this study highlighted.

Figure 1. Baker and Wurgler Sentiment Index

We use the Morlet wavelet analysis of the Baker and Wurgler Investment Sentiment data to construct the power spectrum in Figure 2, with details in Appendix B. The figure presents the power spectrum spanning 1965 to 2018 to provide a context for investor behavior during the business cycle and three subperiods of our study. The long history of investor sentiment presents a persistent and robust turnover at a lower frequency level for about four decades before the 2008 global financial crisis interrupts the pattern. The power spectrum shows that around 2007-2008, the higher frequency turnover of sentiment becomes significant and overlaps with the lower frequency turnover, increasing the induced volatility. The significantly high volatility of investor sentiment during the 2008 financial crisis occurred at the 32-day frequency spectrum, suggesting that investor sentiment segmented the market by inflating the performance fluctuation. From 1965 to 2005, the investor sentiment evolved at a much slower pace, roughly every half year or 252 trading days. However, the investor sentiment turnover frequency spiked before and during the 1987 market crash and during the 1997 crisis in Asia. This pattern suggests that the power spectrum of investor sentiment provides a meaningful instrument for predicting market crises. (We conduct the same analysis with the University of Michigan Consumer Sentiment time series and arrive at similar conclusions. The results are available upon request.)



This Figure presents the Power Spectrum of the Baker and Wurgler Sentiment Index with the three subperiods of this study highlighted

Figure 2. Power Spectrum of the Baker and Wurgler Investor Sentiment

Additionally, Figure 2 depicts a reduction of higher frequency turnover mid-way into the post-crisis period, which indicates an increase in the degree of insignificant return patterns and, thus, greater noise in the market for investors. Figure 2 presents no overlap of frequency between 2001-2002 during the dot-com crisis, suggesting no significant change in investor sentiment during this period. These findings suggest that the relatively small decline in volatility for the ethical funds represents a shift in investor sentiment and does not come from core inadequacies with the ethical funds. Instead, the volatility pattern reflects the reverse of the “flight to safety” that appears to occur at the earlier subperiods, with investors resuming their preference for conventional assets when their sentiment is low because conventional assets offer an unlimited selection spectrum for investors and ease of portfolio diversification. This pattern with investor sentiment coincides with diminished fund inflows for individual ethical funds and the expansion of asset pools of ethical funds, leading to higher fund volatility, as documented by Parida and Wang (2018).

Fund Volatility

We focus on the volatility of ethical funds domiciled in major geographical regions and compare their behavioral patterns to their respective conventional benchmarks across an economic cycle. Our study finds that the volatility patterns of the ethical funds demonstrate behavior consistent with the calculations of the volatility index, which measures the expected volatility of the stock market, proxied by S&P 500 index options. For example, the mean of volatility index over our entire sample period is 21.28, which suggests that the annualized daily standard deviation of returns of the S&P 500 index is 21.28%, which is $\sqrt{252}$ times the daily volatility. As a robustness check, this study computes and compares the means of volatility estimated from the EGARCH model to

the simple estimation of volatility, calculated as the standard deviation of the fund's daily returns of net asset value.

Table 2 shows that the values of the volatility of the regionally-based ethical funds during the pre-crisis period are significantly lower than their comparable regional benchmarks. The benefits to downside risk vary among the regional ethical funds. During this expansionary period, EGARCH estimated that volatility values of the U.S. and European domiciled ethical funds are over 4% lower than the respective benchmarks, while those of the Asia-Pacific domiciled ethical funds are over 7% lower than their respective benchmarks. These ethical funds demonstrate an ability to suppress daily fluctuation, regardless of the investment universe, which is a key feature of such funds and may reflect a more conservative nature of assets within the funds. Our findings are consistent with those of Bertrand and Lapointe (2018), who observe that European stocks from an SRI universe offer positive contributions to risk-adjusted performances of portfolios. Similarly, Galema *et al.* (2008) and Lee *et al.* (2010) observe lower risk in their study of SRI portfolios based in the United States.

While the global equity ethical funds generate volatility values lower than regionally-based peers, their estimated volatility values exceeded conventional global benchmarks. The volatility pattern in Table 2 suggests that diversification benefits exist on a worldwide scale since the global benchmark generates volatility significantly lower than the regional benchmarks, and the global equity funds offer downside risk lower than all regional ethical funds. These findings suggest that regional benefits of reduced volatility created by ethical funds may be diminished for broad global investments since greater diversification benefits within the cross-boundary portfolio provide lower volatility than the regional one.

The volatility of global ethical funds, which is lower than the other regional ethical funds, generates over 18% more volatility than their benchmarks (Simple Estimated Mean: 15.29 versus 12.93). Yet it is not the higher volatility of global ethical funds that creates this condition but the lower benchmark volatility. As presented in Table 2, the global equity index generates significantly lower volatility than all other U.S., Europe, or Asia-Pacific equity indices, whose volatility values range from 16.40% to 19.32%. These higher volatility values suggest that the benefit of reduced volatility created by global ethical funds generally impacts global equity investments. Thus, any advantage in volatility reduction may be less pronounced for broad, global investments since the volatility of the cross-boundary portfolio appears naturally lower due to greater benefits of diversification. Nevertheless, the volatility patterns demonstrate that ethical funds can suppress daily fluctuation, despite the constraints placed upon their construction through screening. These findings for the pre-crisis period reject H1 since only the global ethical funds generate greater volatility than their conventional benchmarks.

Table 2. Ethical Fund Volatility: Pre-Crisis Period

	Number of Funds	Ethical Fund Volatility	Index Volatility	Percentage Difference
U.S. Equity Ethical Funds				
EGARCH Fitted Mean Volatility	136	15.65	16.40	-4.56%***
Simple Estimated Mean Volatility	136	15.92	16.93	-5.93%***
Europe Equity Ethical Funds				
EGARCH Fitted Mean Volatility	337	17.23	17.96	-4.04%***
Simple Estimated Mean Volatility	337	17.37	18.50	-6.13%***
Asia-Pacific Equity Ethical Funds				
EGARCH Fitted Mean Volatility	63	17.83	19.32	-7.69%***
Simple Estimated Mean Volatility	63	17.93	19.32	-7.16%***
Global Equity Ethical Funds				
EGARCH Fitted Mean Volatility	319	15.16	12.65	19.80%***
Simple Estimated Mean Volatility	319	15.29	12.93	18.28%***

*** denotes 0.01 significance level of t-statistics; this table reports the sample sizes and volatilities of the regional and global ethical funds during the Pre-crisis period, January 2, 2001 – November 30, 2007. In addition, we present two volatility measures, EGARCH fitted mean and simple estimated mean, for the ethical funds and their respective equity benchmarks. The table also reports the percentage difference in volatilities and their statistical significance.

The worldwide financial crisis of 2008 tested the effectiveness of many risks management tools within the financial industry. Table 3 shows that the estimated volatility values of all ethical funds increased significantly during the crisis period, relative to that of the expansionary period in Table 2. The increases ranged from 79% in the Asia-Pacific ethical funds (simple estimated mean: 17.93 versus 32.18) to 97% in the U.S. equity ethical funds (EGARCH fitted mean: 15.65 versus 30.88). The regionally based ethical funds in the U.S. and Asia-Pacific and the global fund all had smaller increases in values of volatility than their respective conventional benchmarks. The volatility values of all equity benchmarks increase over 100%, with the U.S. benchmark experiencing the largest spike at 143% (EGARCH fitted mean: 16.40 versus 39.91). The European benchmarks generated the smallest volatility increase with a rate of 83% (simple estimated mean: 18.50 versus 33.79), which was comparable to that of all European ethical funds. These findings highlighting superior risk performance of the regional and global ethical funds offer evidence conflicting with that of Bertrand and Lapointe (2018), focusing on European-based markets. Their paper identifies underweight in ethical firms within risk-based asset allocation strategies. In our paper, the smaller increases in volatility among most of the ethical funds are consistent with the findings of Lee *et al.* (2010) and Laurel-Fois (2018) and may reflect a lower systematic risk for these funds based upon the non-financial screens used in the portfolio construction that reduced their investment universe.

The results in Table 3 show that all ethical funds generate lower values of volatilities and provide consistently lower risk exposure than their respective conventional benchmarks during the global financial crisis. The ethical funds appear to absorb volatility created by the broader equity market within the three regions and a global context. We observe the greatest level of superior volatility performance relative to the benchmark at almost 23% with the U.S.-based equity funds (EGARCH fitted mean:

30.88 versus 39.91). The globally-oriented ethical funds and benchmarks all had lower volatility values than the other regionally based funds, suggesting greater diversification benefits with this broader focus. Yet, in the crisis period, the global equity ethical fund absorbed more market volatility than the global benchmark, with volatility benefits over 2% lower (Simple Estimated mean: 29.29 versus 29.99). Our findings are consistent with Nofsinger and Varma (2014), who observe that socially responsible mutual funds dampen the downside risk during periods of market crisis relative to conventional mutual funds. Thus, our tests show that ethical funds absorbed more volatility created by the broad equity market during the global financial crisis. These funds also provide an acceptable form of market stabilization, regardless of the region, though the greatest benefits were in the Asia-Pacific and U.S.. The test results from the crisis period reject H1 since all ethical funds generate greater volatility than conventional benchmarks.

Table 3. Ethical Fund Volatility: Crisis Period

	Number of Funds	Ethical Fund Volatility	Index Volatility	Percentage Difference
U.S. Equity Ethical Funds				
EGARCH Fitted Mean Volatility	126	30.88	39.91	-22.62%***
Simple Estimated Mean Volatility	126	30.39	38.30	-20.65%***
Europe Equity Ethical Funds				
EGARCH Fitted Mean Volatility	388	32.65	33.69	-3.09%***
Simple Estimated Mean Volatility	388	32.14	33.79	-4.89%***
Asia-Pacific Equity Ethical Funds				
EGARCH Fitted Mean Volatility	88	32.36	38.97	-16.98%***
Simple Estimated Mean Volatility	88	33.18	39.03	-17.55%***
Global Equity Ethical Funds				
EGARCH Fitted Mean Volatility	512	29.67	30.72	-3.42%***
Simple Estimated Mean Volatility	512	29.29	29.99	-2.33%***

*** denotes 0.01 significance level of t-statistics; this table reports the sample sizes and volatilities of the regional and global ethical funds during the Crisis period, December 1, 2007 – June 30, 2009. In addition, we present two volatility measures, EGARCH fitted mean and simple estimated mean, for the ethical funds and their respective equity benchmarks. The table also reports the percentage difference in volatilities and their statistical significance.

The post-crisis period reveals a reversal in volatility patterns among ethical funds and their conventional benchmarks. Table 4 shows that all ethical funds generated greater volatility than their respective benchmarks during the recovery period, even though they exhibited relatively lower volatility values throughout the financial crisis. The U.S. market generates the smallest difference between the ethical fund and benchmark volatility; the U.S. ethical fund volatility exceeded their conventional benchmark by slightly more than 1% (Simple Estimated Mean: 17.19 versus 16.99). The largest difference occurs in the European region, where its ethical fund volatility exceeds its equity benchmarks by 69.51% (EGARCH fitted mean: 20.06 versus 17014). Our findings align with Leite and Cortez (2015), focusing on French SRI funds during crisis and non-crisis periods. The results show that ethical funds lag their broader-based conventional benchmarks in recovering from the global market turmoil across all geographical regions and with globally focused funds. We also provide results consistent with those of Mansor *et al.* (2019), which document that ethically based Islamic funds outperform conventional

funds in Malaysia and that their performance is more persistent in the pre-crisis periods of the Asian and global financial crises.

Table 4. Ethical Fund Volatility: Post-Crisis Period

	Number of Funds	Ethical Fund Volatility	Index Volatility	Percentage Difference
U.S. Equity Ethical Funds				
EGARCH Fitted Mean Volatility	132	16.99	16.68	1.86%
Simple Estimated Mean Volatility	132	17.19	16.99	1.15%
Europe Equity Ethical Funds				
EGARCH Fitted Mean Volatility	401	29.06	17.14	69.51%*
Simple Estimated Mean Volatility	401	22.59	17.41	29.81%***
Asia-Pacific Equity Ethical Funds				
EGARCH Fitted Mean Volatility	102	19.60	17.48	12.17%***
Simple Estimated Mean Volatility	102	19.76	17.58	12.39%***
Global Equity Ethical Funds				
EGARCH Fitted Mean Volatility	608	17.70	15.19	16.52%***
Simple Estimated Mean Volatility	608	17.89	15.35	16.51%***

* denotes 0.10 significance level of t-statistics; *** denotes 0.01 significance level; this table reports the sample sizes and volatilities of the regional and global ethical funds during the Post-crisis period, July 1, 2009 – December 31, 2013. We present two volatility measures, EGARCH fitted mean and simple estimated mean, for the ethical funds and their respective equity benchmarks. The table also reports the percentage difference in volatilities and their statistical significance.

Our findings demonstrate that ethical funds underperform conventional funds in the recovery period after previously offering superior protection of downside risk to investors during the great financial crisis. These observations align with Hirshleifer (2008), who suggests that investors should pay closer attention to corporate behavior during financial crisis, an environment that would benefit ethical funds. These observations also align with Salganik-Shoshan (2017), who suggests that the flow patterns of institutional and retail funds vary across the business cycle. The findings suggest that institutional investors change behavior and do not strongly pursue returns during bad economic periods. In fact, investors of both fund types tend to punish managers with higher market exposure. Yet, Nofsinger and Varma (2014) also find that ethical funds underperform for their investors during non-crisis periods, reflecting their non-systematic risk from limiting the portfolio sample.

In Table 4, the ethical funds consistently generate higher volatility than their respective benchmarks during the post-crisis period. The values of the volatility of the U.S. funds are closest to those of their conventional benchmarks, which may suggest a maturing of these ethical funds within the investment community. The European ethical funds and their benchmarks experienced lower drops in volatility from the crisis period than all other groups of funds in our sample. Additionally, European ethical funds generate the greatest volatility values of all ethical funds and offer the greatest disparity in volatility with their benchmark, reflecting an inability to absorb continued market gyrations from the European debt crisis that emerged when the global financial crisis ended. This underperformance of European ethical funds may reflect the constraints imposed upon their construction through screenings that reflect existing systematic risk. The global index benchmarks produce the lowest volatility measures, which suggests the

benefits of greater diversification are found within a cross-boundary portfolio. Overall, investors in ethical funds experience significantly greater volatility than more fully diversified investors in the post-crisis period. Our findings from the post-crisis period do not reject H1 since no ethical fund generates significantly lower volatility than its conventional benchmarks. Yet our overall results provide sufficient evidence to reject the first hypothesis.

Studies conducted by Bollen (2007), Benson and Humphrey (2008), and Renneboog *et al.* (2008, 2011) find evidence that investors in ethical funds differ in behavior from those of conventional investors, partly because they focus more on the “ethical” component of their investments that may diminish the role of return performance. Renneboog *et al.* (2008, 2011) also observe that ethically based money flows in all market regions demonstrate less sensitivity to past negative returns than conventional fund flows. These findings reveal that investment decisions of ethical-fund investors incorporate nonfinancial attributes, which could distort the typical risk-return relation. Yet a later study by Parida and Wang (2018) provides evidence that investment flows into mutual funds with higher ethical holdings while lagged funds flow with more conventional holdings during the pre-financial crisis period. This pattern reversed during the financial crisis, with ethical funds receiving greater investment flows. The authors argue that these findings reflect a “flight to quality” as investors perceive funds with high ethical ratings to be relatively more trustworthy or of higher quality, especially during a period of negative shocks to overall social trust in financial markets and institutions. Significantly, Parida and Wang (2018) also reveal that flow intensity into ethical funds diminished relatively more conventional funds during the post-financial crisis period. Such a reduction of fund flow to ethical funds would increase the relative volatility of these funds during this recovery period, as substantiated in our study.

Our results align with those of Jiang and Yüksel (2019), who identify changes in fund flows driven by mutual fund investor sentiment, reflecting subjective views of market conditions. Consistent with Frazzini and Lamont (2008) and Chiu and Zhu (2017), the authors observe greater participation of investors of retail equity funds when sentiment is high, with the flows increasing especially to smaller or growth-oriented funds. Additionally, institutional investors demonstrate less sensitivity to sentiment variations in their trading patterns.

The end of the 2008 global financial crisis witnessed a steep decline in volatility among financial securities, reflecting a period of lower risk for investors. Yet, a comparison of volatilities in Tables 3 and 4 reveals that the volatility values of all ethical funds did not decline as sharply as their conventional benchmarks. Thus, all regionally and globally focused ethical funds generated greater volatility than their conventional benchmarks during the recovery period. The U.S. ethical funds experienced the steepest drop in volatility among all ethical funds from its crisis period high with a decline of 45% (EGARCH fitted mean: 30.88 versus 16.99). The smallest decline occurred with European-based ethical funds that fell only 11% (EGARCH fitted mean: 29.06 versus

32.65), though this period includes the European debt crisis. Among the conventional benchmarks covered in this study, we observe that the volatility of the U.S. equity benchmark fell the most at 58% (EGARCH fitted mean: 16.68 versus 39.91), while the smallest decline occurred with the European equity benchmark at 48% (simple estimated mean: 17.41 versus 33.79). Our findings are partially consistent with those of Leite and Cortez (2015), who find that French SRI funds match the performance of their conventional peers during market crises yet underperform in non-crisis periods. Conversely, our overall findings differ from Wu *et al.* (2017), who observe that a British SRI portfolio recovers its values more quickly after economic turmoil than its conventional peer. Our study focuses on the performance of many ethical funds with different regional and global emphases.

The post-crisis period should reflect a market that reverts to more commonly held patterns after the disruptions of the global financial crisis. Yet values of volatility among all ethical funds stabilize at levels consistently greater during the post-crisis period than what occurred prior to the financial crisis. The U.S.-based ethical funds exhibit the smallest increases in volatility from the pre-crisis period with an increase of 3% (estimated median: 16.74 versus 16.18), and these funds exhibit patterns similar to their U.S. equity benchmarks. The European-based ethical funds show higher levels of volatility relative to the pre-crisis period, while their conventional benchmark experiences a decline in volatility relative to their pre-crisis levels. The heightened volatility may reflect the impact of the European debt crisis that impacted the financial markets of this region. The Asia-Pacific and Global ethical funds also show slightly higher volatilities than their pre-crisis period performances. Overall, the benchmarks show mixed results. The U.S. and Global counterparts provided greater volatility in the post-crisis period, while the European and Asia-Pacific benchmarks experienced comparatively lower volatility in the post-crisis period. Yet all ethical funds in the crisis period demonstrate persistence in volatility that none of the equity index benchmarks displays. Our findings of volatility persistence in all ethical funds are comparable to those of Sabbaghi (2011), who finds strong evidence of persistence in volatility in a sample of green exchange-traded funds. We also consider Beaumont *et al.* (2008) who argue that investor sentiment plays a role in explaining the stock returns, and the noise traders who carry high sentiment follow bad market timing. This sentiment rationale may help explain the high volatility of the ethical funds relative to their benchmarks during the post-crisis period.

Our tests on the volatility of ethical funds and their respective benchmarks across an entire business cycle highlight the relative abilities of these ethical funds to absorb downside risk for their investors. While our empirical tests rely on a sample of ethical funds larger than similar studies, the results do not support H1 across the business cycle. This study reveals that values of volatilities of ethical funds are lower than those of their respective conventional benchmarks during the pre-crisis and global financial crisis subperiods. The constraints imposed with positive and negative screening, combined

with a limited asset pool, do not appear to expose investors of ethical funds to unnecessary downside risk. This pattern reverses during the post-crisis period when the volatilities of ethical funds exceed those of their benchmarks. Test results show that ethical funds do not experience significant volatility declines as we observe in their conventional benchmarks during the post-crisis period. The empirical results in the recovery period lead to a rejection of H1, while the overall empirical results emphasize inconsistent findings that have long characterized research into ethical funds.

Fund Performance

Our previous tests focus on volatility measures to assess the downside risk exposure facing investors of ethical funds from positive and negative screening. We also conduct tests of risk-adjusted returns on the ethical funds and their conventional benchmarks to measure how much risk exposure occurs to generate the returns. This test provides a simple measure of relative risk-adjusted performances of the ethical funds across an entire business cycle. We present the Sharpe ratio as

$$Sharpe = \frac{R_p - R_f}{\sigma_p} \quad (1)$$

where R_p represents the annualized average daily log portfolio return, R_f the risk-free rate from the annualized average monthly T-bill rates, and σ_p is the annualized standard deviation of the daily log portfolio returns.

Table 5 shows the Sharpe ratios of the ethical funds and their conventional benchmarks across the three sub-periods and presents the percentage differences between the ratios. Our prior results on volatility suggest that ethical funds may offer investors superior protection from downside risk for the first two sub-periods while also providing a socially responsible investment option according to their sentiments. However, our risk-adjusted results show that three of our ethical funds outperform their respective benchmarks only in the pre-crisis period, while the U.S.-based ethical funds do not generate significantly superior performance. Our tests suggest that only during this expansionary period do the ethical funds outperform their conventional benchmarks. Our findings from the global and regionally oriented ethical funds in the post-crisis concur with the study of British funds by Wu *et al.* (2017). The Asia-Pacific ethical funds provide the only example where ethical funds outperform their benchmarks during the post-crisis period. But our overall findings show that ethical funds underperform their benchmarks during and after the financial crisis. Thus, these funds offer fewer desirable options for investors from a performance perspective.

Table 5. Sharpe Ratio Comparison: Ethical Funds and Benchmarks

	Number of Funds	Ethical Fund Sharpe Ratio	Index Sharpe Ratio	Percentage Difference
U.S. Equity Ethical Funds				
Pre-crisis	136	-0.01	-0.05	79.14%
Crisis	126	-0.93	-0.82	-13.75%**
Post-crisis	132	0.83	0.9	-8.41%**
Europe Equity Ethical Funds				
Pre-crisis	337	0.57	-0.12	566.36%**
Crisis	388	-1.24	-1.14	-9.36%**
Post-crisis	401	0.43	0.58	-26.17%**
Asia-Pacific Equity Ethical Funds				
Pre-crisis	63	0.71	0.09	680.3%**
Crisis	88	-0.87	-0.76	-14.82%**
Post-crisis	102	0.44	0.35	25.38%**
Global Equity Ethical Funds				
Pre-crisis	319	0.47	0.23	100.39%**
Crisis	511	-1.09	-1.07	-1.54%
Post-crisis	608	0.46	0.7	-33.97%**

** denotes 0.05 significance level of t-statistics; This table reports the sample sizes and Sharpe ratios of the regional and global ethical funds and their equity benchmarks across all subperiods. The table also reports the percentage difference in Sharpe ratios and their statistical significance.

While the ethical funds have the feasibility of utilizing hedging tools and techniques to suppress volatility, the extra costs of applying the constraints to portfolio construction and then risk management should decrease the net return of the funds by increasing their expense ratios. Before the 2008 global financial crisis, the market sentiment remains positive with lower turnovers. The consistently positive equity returns consolidate investor expectations on the foreseeable returns, increasing the fund's demand. However, investor sentiment remains largely anemic after the financial crisis since investors do not agree on the end of the global crisis that was complicated by the emergence of the Eurozone debt crisis. As Parida and Wang (2018) observe, investors shifted their capital flows to conventional funds after the global crisis, increasing their volatility of ethical funds. The consequences of the investment constraints and changes of investment sentiment would likely reduce the risk premium or increase volatility, resulting in lower Sharpe ratios for ethical funds.

Conclusions

This study investigates the volatility of ethical funds in different regional financial markets over a business cycle that includes the 2008 global financial crisis. The volatility patterns across three subperiods may also reflect changes in investor sentiment regarding ethical funds. In the pre-crisis period, the regionally-based ethical funds provided

investors with lower risk options, and this role strengthened during the crisis period when all the ethical funds played the role of portfolio risk hedger. Our results show a shift in volatility patterns and investor sentiment during the post-financial crisis period when ethical funds underperform their conventional alternatives.

The finding that ethical funds outperform their conventional benchmarks only in one subperiod (see Table 5) conforms to the inconsistent findings of studies related to ethical-fund performance. Wu *et al.* (2017) suggest these inconsistencies that span decades may be caused by methodological assumptions. The sample used in this study comprises a much larger group of ethical funds and includes a longer period for the pre-crisis period than similar studies. Yet, Wu *et al.* (2017) observe that the firms' internal organizational factors of these funds may affect the findings, with the most common organizational changes including mergers, acquisitions, divestments, management buyouts, and restructuring. Our findings in Table 5 reject H2, which anticipates ethical funds maintaining comparable risk-return performances throughout the business cycle. The constraints imposed in the construction of the ethical funds do not expose investors to excessive downside risk during the crisis period, nor does the ethical fund volatility increase more than the benchmarks at that time. While the ethical funds experience lower volatility during the recovery period, their volatility does not decline as much as their benchmarks, which coincides with lackluster investor sentiment. Thus, in the post-crisis period, investors of ethical funds experience lower declines in volatility from the prior sub-period and maintain greater risk exposure for investors.

Our conclusions indicate a few caveats for the investment management industry and investors at large. The buy-side pursues quality assets during a market-stress period, and the limited initial interest warrants lower volatility. However, after a new financial instrument or asset is introduced to the market, growing fund inflows increase its volatility and compromise its attractiveness. The findings of our paper pertain to a broader meaning than ethical funds. We reasonably believe that the increasing volatility phenomenon pertains to other newly introduced assets, as Parida and Wang (2018) suggested that funds flowing into ethical funds after the global financial crisis would impact volatility patterns.

Our research contributes to the greater understanding of ethical funds by focusing on the risk side of performance instead of the more common emphasis on returns. We also greatly expand the breadth and depth of analysis with our sample of regionally based and globally focused funds. Our study finds consistent volatility behavior among regionally-based ethical funds relative to their conventional benchmarks. Importantly, this consistent pattern holds across the entire sample period. In addition, we find that the performance in volatility of ethical funds relative to their benchmarks changed after the 2008 global financial crisis. As a result, these funds no longer offer investors superior risk hedging benefits relative to their conventional benchmarks, which corresponds to a shift in investor sentiment.

The second feature should draw attention from researchers and practitioners. The source of the recent volatility inflation needs to be identified from the theoretical perspective, and more detailed ethical fund products need to be developed, tested, and implemented from the practical perspective. As the size of the net asset values of ethical funds in the global equity market grows, a universal tag of an ethical asset does not serve the demand of multi-dimensional return and risk profiles well. One possible trend of the ethical-fund industry is to sub-categorize the funds by sector, industry, dividend profile, and other common attributes of the equities. The specialization of ethical funds also assists the process of identifying the source of excess return and volatility.

Additionally, a meaningful exploration would be the cross-sectional estimation of ethical funds to examine the existence of an ethical premium, which would be a possible new risk factor. If the risk loading of such a factor were stable and significant, then the excessive intercept of the regression would help future studies separately identify the excessive returns created by the skill of the ethical fund managers versus returns associated with positive attributes of ethical assets within the funds.

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Appendix A: The EGARCH Model

Analyzing time series of financial data often presents specific characteristics that modeling must attempt to accommodate, such as leptokurtic distributions (fat tails) and

asymmetric reactions to shocks. This study employs the EGARCH¹ model to estimate fund volatility given the characteristics within the financial data (Bollerslev *et al.*, 1992). In addition, Ederington and Guan (2010) suggest that the EGARCH model fits a wide variety of markets and forecast horizons and tends to have a longer memory than GARCH.²

The EGARCH (1,1) model uses the form:

$$\ln(v_{t+1}) = \alpha_0 + \beta \ln(v_t) + \gamma_1 |r_t/\sigma_t| + \gamma_2 (r_t/\sigma_t) \quad (1)$$

where r_t is the excess log return (i.e., $r_t = R_t - E_{t-1}(R_t)$, where $R_t = \ln(P_t/P_{t-1})$ and P_t is the net asset value of a fund at time t , and v_t is the expected variance of r_t .³ Consistent with Ederington and Guan (2010), this paper defines the integrated volatility V_{t+s} as the geometric average of volatilities from $t + 1$ to $t + s$, and the logarithmic integrated volatility is

$$\ln(V_{t+s}) = \left(\frac{1}{s}\right) \sum_{k=1}^s \ln(v_{t+k}) = \lambda_{1s} + \lambda_{2s} \sum_{j=0}^J \beta^j |r_{t-j}/\sigma_{t-j}| + \lambda_{3s} \sum_{j=0}^J \beta^j (r_{t-j}/\sigma_{t-j}) \quad (2)$$

The implied λ parameters are

$$\lambda_{1s} = \left(\frac{1}{s}\right) \sum_{k=1}^s [(\alpha + \gamma_1 \sqrt{2/\pi}) \sum_{j=0}^{k-2} \beta^j + \alpha' \beta^{k-1}] \quad (3)$$

$$\lambda_{2s} = \left(\frac{\gamma_1}{s}\right) \sum_{k=1}^s \beta^{k-1} \quad (4)$$

$$\lambda_{3s} = \left(\frac{\gamma_2}{s}\right) \sum_{k=1}^s \beta^{k-1} \quad (5)$$

We calculate volatility at both the mean and the median levels and use the latter as a robustness check of our conclusion. We find no systematic pattern of volatility bias in the different financial markets nor during the three sub-periods. Furthermore, test results show that the mean volatilities are symmetrically distributed around the median volatilities, though our paper presents only mean results.

¹ Like GARCH, EGARCH is used to model financial time series that exhibit time-varying volatility and volatility clustering. The EGARCH is an improved form of GARCH because it better captures the volatility asymmetry in which negative shocks (events, news, and so on) tend to impact volatility more than positive shocks.

² Ederington and Guan (2005) observe that the GARCH (1,1) model generally produces greater accuracy than the historical standard deviation and exponentially weighted moving average models. However, their study finds no overwhelming advantage between GARCH and EGARCH.

³For example, over the pre-crisis period, the parameters of the EGARCH estimation for the S&P 500 index are: $\alpha_0 = -0.1372$; $\beta = 0.9854$, $\gamma_1 = 0.0641$, $\gamma_2 = -1.7051$.

Appendix B: The Wavelet Method

We examine the impact of investor sentiment on fund volatility behavior and use the wavelet approach to transform the time domain series of sentiment into the time-frequency domain (See Chaudhuri and Lo, 2019.). This process allows us to examine investor sentiment across our sample period and detect significant changes, particularly if a time-varying lead-lag relation exists, as emphasized in Alzahrani *et al.* (2014) and Chaudhuri and Lo (2019), and identify appropriate structural breaks in the data.⁴

The transformation function of the mother Morlet wavelet is

$$\psi(t) = \pi^{-1/4} e^{i\omega t} e^{-t^2/2} \quad (6)$$

where $\psi(t)$ is the transfer operator, and t is the time scale of the time series variables.

The angular frequency ω is 6, and the measurement period is $\pi/3$. This wavelet transforms an asset return r_t and sentiment $sent_t$ in the time domain to a set of wavelets with different time τ and scale s :

$$Wave.r(\tau, s) = \sum_t r_t \frac{1}{\sqrt{s}} \psi^* \left(\frac{t-\tau}{s} \right) \quad (7)$$

$$Wave.sent(\tau, s) = \sum_t sent_t \frac{1}{\sqrt{s}} \psi^* \left(\frac{t-\tau}{s} \right) \quad (8)$$

where τ is the shift variable and s is the control variable of frequency. The square of the amplitude is the wavelet energy density of a time series. We adopt the wavelet power spectrum in this study; it demonstrates the density of return and investor sentiment under investigation at multiple frequency levels on the time axis. We calculate the power spectrum as:

$$Power(\tau, s) = \frac{1}{s} \cdot |Wave(\tau, s)|^2 \quad (9)$$

We measure the co-movement between investor sentiment and the asset return in time and frequency domains using the wavelet power spectrum in Eq. (9), which remains between 0 and 1. A higher value reflects a stronger co-movement, with the synergy between the two values strengthening as the value increases. Thus, we can identify those periods where investor sentiment moves together with returns in the time and frequency domains by observing the period and frequency spectrum.

⁴ Appendix C provides details for our designation of these subperiods.

Appendix C: Time Periods

Our study focuses upon the 2008 global financial crisis without isolating the 2001 tech bubble crisis in our review for reasons besides not being supported by the Morlet wavelet analysis. First, according to Bernstein (2014), the dot com bubble centers upon losses in equity investments. Equity speculation occurs primarily in the U.S., where most of the stock market wealth accrues to the top 10%, with more than 30% owned by the top 1% of household income shareholders. Thus, the dot com crisis does not introduce an overwhelming contractionary cycle. The outflow from the high-tech company shares remains a consistent investment preference in the ESG shares within the commonly accepted range of market correction rather than a crisis. We observe such investment behavior with the moderate drop of the Dow Jones Industrial Average. The Dow lost 6.17%, 5.35%, and 16.76% of its value in 2000, 2001, and 2002, while the Nasdaq Composite Index lost 39.28%, 21.05%, and 31.53% during the period of the global financial crisis in our study.

Additionally, the 2008 financial crisis leads to an outflow of capital from the financial markets due to the weakening operating cash inflows of institutional investors. This outflow of capital does not proportionately reduce the performance of assets across various asset classes. Instead, it skews the risk preference and redevelops the priorities of strategic portfolio allocation. Hall (2013) explains that the difference between the 2001 dot com bubble and the 2008 financial crisis resides most clearly in their different impacts on the U.S. financial system. In 2001, the value of business asset valuation fell dramatically, particularly in tech-related industries, but the financial system, while volatile, showed no signs of fundamental stress. A second difference between the dot com and global financial crises revolves around high-frequency trading strategies and algorithm implementations that increasingly impact the equity market's volatility. At the time of the dot com bubble, technological limits greatly reduce the effect of such trades. However, high-frequency trading strategies are pervasive by the time of the 2008 financial crisis. As a result, the volatilities of the two periods, the first being fear-driven and the second being order-driven, are less comparable because of such technical and institutional developments.

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The Role of Entrepreneurship Education on Student Entrepreneurial Intentions: Mediating Effect of Attitude, Subjective Norms, and Perceived Behavioral Control

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Abstract

Purpose – *The effect of entrepreneurship education (EE) in universities has been recognized as one of the important factors that help students to understand and foster an entrepreneurial mindset. Hence, this study examined EE's role in entrepreneurial intentions and its antecedents. Besides, it tested the mediating role of the antecedents of entrepreneurial intentions based on the theory of planned behavior (i.e., attitude toward entrepreneurship, subjective norm, and perceived behavioral control) in the causal relationship between EE and entrepreneurial intentions.*

Method – *A cross-sectional survey was conducted with a sample size of 335 regular undergraduate graduating classes of 2018 students who had taken the entrepreneurship course in four universities (both public and private) founded in Ethiopia. The standardized instrument was adopted from a previous study based on a seven-point Likert scale ranging from strongly disagree to strongly agree. And confirmatory factor analysis was performed to confirm the reliability and validity of the constructs. Then hypotheses were tested by path analysis using structural equation modeling software.*

Findings – *The results showed that EE positively and significantly influences entrepreneurial intentions and their antecedents and that all antecedents of entrepreneurial intentions (attitude toward entrepreneurship, subjective norm, and perceived behavioral control) partially mediate between EE and entrepreneurial intentions.*

Limitations – *The present study focused on primary cross-sectional data collected from a limited sample of regular undergraduate students at only four universities in Ethiopia. Thus, longitudinal data that inculcate more sample size to investigate the long-term effect*

of mediators on EE-entrepreneurial intentions relationships with more variables suggested for further research.

Implications – *The research findings are useful for academicians and policymakers. The study suggested that antecedents of entrepreneurial intentions serve as predictor variables and mediate the relationship between EE and entrepreneurial intentions, consistent with the theory of planned behavior. Also, there is strong evidence urging Ethiopian universities to strengthen EE through entrepreneurial initiatives, programs, and projects to produce more entrepreneurial-minded graduates engaging in business startup activities after graduation.*

Originality – *Using antecedents of entrepreneurial intentions as mediator variables has been unexplored so far. Hence, the present study introduces a new way of researching entrepreneurial intentions and taking antecedents of entrepreneurial intentions as a mediator in the causal relationship between EE and entrepreneurial intentions.*

Keywords: entrepreneurship education; entrepreneurial intentions; theory of planned behavior; and Ethiopia.

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Introduction

Nowadays, entrepreneurship plays a profound role in socio-economic development worldwide (Fayolle, Gailly, & Lassas-Clerc, 2006; Stamboulis & Barlas, 2014). As a result, governments in every country should nurture and develop entrepreneurship. Entrepreneurship is nurtured via entrepreneurship education (EE) and training (Jwara & Hoque, 2018). Entrepreneurship education is one aspect of education that familiarizes learners with entrepreneurial attributes and competencies; and creates in person the attitude to take risks of creating an enterprise by applying knowledge, skills, and attitude obtained from learning (Nwosu & Ohia, 2009). Entrepreneurship education can be included in the curriculum and designed as a program that provides students with the necessary knowledge, skills, and attitudes to set up their enterprise after graduation (Ekpoh & Edet, 2011; Keat, Selvarajah, & Meyer, 2011). According to Davidsson (2004), EE has become a prominent field of study, especially in developed nations. This field has emerged from multiple disciplines such as Management, Economics, Education, Psychology, and Technical studies (Othman, Hashim, & Ab Wahid, 2012; Fayolle *et al.*, 2006). Entrepreneurship education is growing worldwide since it is vital for nurturing

the entrepreneurial spirit (Katz, 2003). Entrepreneurship courses focusing on theoretical and practical knowledge and skills seem to be an effective means of promoting entrepreneurship (Nyakudya, Simba, & Herrington, 2018). Thus, the Ethiopian government emphasizes EE since graduate unemployment has been a serious issue in the country. As a result, the Education Development Roadmap of Ethiopia (2018-2030) urges higher education institutions to give attention to entrepreneurship and entrepreneurial development that would enable graduates to be self-employed rather than job seekers.

The increment of the unemployment rate has been a worldwide phenomenon. Even though its extent differs from country to country due to economic development and job culture, it remains a problem everywhere (ILO 2020; Matsumoto *et al.*, 2012). It is severe in developing countries like Ethiopia due to their economic backwardness and low job culture (Kibret, 2014; Dale, 2014). African Center for Transformation (2016) report revealed that 50% of graduates of higher education institutions have no jobs in Africa. Ethiopia is the second-most populous country in Africa, next to Nigeria, suffering from youth unemployment (Asmare & Mulatie, 2014). In Ethiopia, a decade ago, a university degree was a guarantee for employment in either public or private or non-governmental organizations, but students and their families/guardians still hold this view despite that the reality has been completely changed. Since higher education institutions and graduates dramatically increase, a university degree does not guarantee employment. Nowadays, it is common to see university graduates who have been jobless for two years or longer in Ethiopia. The average duration of the unemployment period in urban Ethiopia was longer than one year (Serneels, 2004). From 2009 to 2014, a survey on employment and unemployment was conducted by the central statistical authority (CSA) of Ethiopia and found that the overall unemployment rate is higher than illiteracy. For instance, a recent survey in Addis Ababa, the capital city of Ethiopia, indicates that there are 135,000 unemployed people in the city, 20,000 of whom are university graduates (Bereket, 2017). This number is higher in the country where the tertiary school enrollment rate was 8.1% in 2014, according to a World Bank report of 2019. The same or worse scenario exists now in all country's regional states since there are much fewer job opportunities than in the capital city.

Though many scholars had suggested that entrepreneurship was one of the career options to alleviate unemployment for youth and university graduates (Beek & Rimmington, 2011; Buang, 2011), entrepreneurship development is still in its infancy in Ethiopia (Mudde *et al.*, 2015). For instance, Ethiopia's Global Entrepreneurship Index of 2019 was 18.3% and ranked 110th among 137 countries in total entrepreneurial activities. Li *et al.* (2003) stated that countries with higher entrepreneurial initiative indexes were more likely to create job opportunities, but the Ethiopian index has been very low and could not reduce unemployment rates. Thus, in Ethiopia, considering entrepreneurship as a career option is a less preferred alternative among highly trained/educated human resources (Hailay, 2007), including those who take an entrepreneurship course during their study period. Previously, a few studies have reported entrepreneurial intentions

and their antecedents in Ethiopia (e.g., Buli & Yesuf, 2015; Tessema Gerba, 2012; Ayalew & Zeleke, 2018; Amha, Woldehanna, Tamrat, & Gebremedhin, 2015), but none has examined the role of EE on entrepreneurial intentions of university students and its antecedents. Moreover, the present research is unique in testing the mediating effect of antecedents of entrepreneurial intentions (attitude towards entrepreneurship, subjective norms, and perceived behavioral control) for the causal relationship between EE and entrepreneurial intentions extending the theory of planned behavior (TPB).

According to TPB (Ajzen, 1991), attitude towards entrepreneurship (ATE), subjective norms (SN), and perceived behavioral control (PBC) had a predicting power on intentions. And much extant literature has confirmed that these variables have a significant and positive influence on entrepreneurial intention (EI) (Malebana, 2014; Iakovleva, Kolvereid & Stephan, 2011). Consequently, the intention is considered the best single predictor of actual behavior (Luthje & Franke, 2003; Sun & Wei, 2011; Yar Hamidi, Wennberg, and Berglund, 2008). Based on such empirical evidence, entrepreneurship involves the activities of human beings and their intentions to start up a new venture. In other words, business organizations cannot incredibly emerge; there must be an individual commitment, dedication, and determination behind its formation and existence. To be an entrepreneur does not come by chance; it is an individual thought of direction of creating a business venture (attitudes), perception of socially acceptable endeavor by people around them (subjective norms), and perception of the creation of the new venture within one's own competence and capacity (perceived behavioral control). Indeed, venture creation, action, or behavior is unlikely to occur without intention (Owoseni & Akambi, 2010). The intention is the burning point for the actual behavior to happen.

The previous empirical evidence found that EE enhances entrepreneurial activities based on a systematic review of the literature (Pittaway & Cope, 2007). However, the current research is based on primary data collected from students. Other evidence indicated that EE did not always enhance entrepreneurial activities (Farhangmehr, Gonçalves, & Sarmiento, 2016), but the present study's findings were methodologically different. For instance, EE was used as a moderator, and data were collected from both graduate and undergraduate students. But in the current study, EE is taken as an exogenous variable, and data were collected only from undergraduate students. Therefore, such existing differences in extant literature deemed the present study. Besides, previous literature confirmed the impact of these antecedents on EI (see Izquierdo & Buelens, 2011; Engle *et al.*, 2010; Krueger *et al.*, 2000). But there is a gap in how the antecedents of EI are developed and nurtured; and whether antecedents play a mediating role between EE and EI. However, the effect of EE on EI was underexplored (Pittaway & Cope, 2007; von Graevenitz, Harhoff, & Weber, 2010).

Moreover, there is a lack of research in developing countries into the effect of EE on EI (Pfeifer *et al.*, 2016). Thus, to fill this gap, the present study investigates the role of

EE on EI and its antecedents. In addition, it tests whether antecedents of EI of the TPB (i.e., ATE, SN, & PBC) mediate the relationship between EE and entrepreneurial intentions (EIs). The primary data are collected from selected undergraduate students in four universities of Ethiopia.

Therefore, this research has the following contributions. Firstly, this study aims to examine the effect of EE on ATE, SN, & PBC, and EIs. Its findings could enable the Ministry of Sciences and Higher Education (MoSHE) of Ethiopia to standardize and improve attention given to EE in the universities. Secondly, the effect of ATE, SN, & PBC on EIs from low-income country context is tested by using TPB that was scant in empirical evidence. Thirdly, this study has tested the mediating effect of ATE, SN, & PBC in the causal relationship between EE and EIs, extended TPB by adding EE as an exogenous variable, and used antecedents of EIs as mediators. Such findings, in turn, inform MoSHE, universities, educators, and policymakers of the role of EE on EIs development and its antecedents for future policy design, initiatives, programs, and projects that would foster and nurture entrepreneurship development in Ethiopian universities.

The remaining part of this article is structured as follows. The next section discusses the theoretical and empirical review of literature upon which the hypotheses and conceptual framework are formulated. Then, the study's methodology includes research philosophy and approach, sample, instrument development procedure, reliability and validity of the instrument, data analysis, and ethical consideration. After that, the results are presented and followed by discussions. The last section comprises conclusions, limitations, and recommended future research.

Review of Literature and Conceptual Framework

This section reviews the theoretical and empirical literature related to EE, EIs, the antecedents, and the mediating role of the antecedents. Based on this review, hypotheses were formulated, and the conceptual framework that guided this study was developed.

Entrepreneurship education and its effect on EIs and its antecedents

Whether entrepreneurs are born or made has been debatable for a long time. But currently, many scholars argue that entrepreneurs can be made and that entrepreneurial knowledge, skills, and attitude could be taught (Low, 2011; Volery & Mueller, 2006; Nian *et al.*, 2014; Woollard *et al.*, 2007). Raposo and Paco (2011) also said that entrepreneurship is neither magic nor generic, but it is a discipline that can be learned. Based on this argument, EE is included in the curriculum of higher education institutions as a program and/or course. Moreover, the concept of EE is nebulous and defined by different scholars. For instance, Lo (2011) defined it as a process through which entrepreneurial knowledge, skills, and attitude are taught so that students can scan the existing business opportunities

in their environment. Kourilsky (1995) elucidated that EE was characterized by opportunity recognition, firm creation, and resource allocation, taking the accompanying risks. Samwel Mwasalwiba (2010) defined EE as a process through which learners' entrepreneurship attitudes, behavior, values, and/or intentions develop. In this study, we define EE as one aspect of education that familiarizes learners with entrepreneurial attributes and competencies and creates in them the attitudes to take risks of creating an enterprise by applying knowledge, skills, and attitude obtained from learning (Fatoki, 2010; Nwosu & Ohia, 2009). Entrepreneurship education is inevitable in the socio-economic development of a nation since it fosters entrepreneurship (Levie & Autio, 2008). It creates awareness about entrepreneurial activities as a career option and fosters innovation. That is why EE has attracted the remarkable attention of policymakers and educators globally. To date, higher education institutions have also taken as their mandate area to teach, train, conduct research, and consult on it. Providing quality education for entrepreneurship enables a country to achieve greatness and ensure socio-economic development (Alufohai, 2014).

Entrepreneurial education is a model for changing knowledge, skills, attitudes, and motives, promoting responsibility and entrepreneurial thinking (Jwara & Hoque, 2018). It allows students to get the knowledge and skills needed to start and grow their own business in the future (Woollard *et al.*, 2007; Low, 2001, Trivedi, 2017). According to Deakins *et al.* (2005), the main purpose of EE is to help foster an entrepreneurial culture among students to improve their career choices towards entrepreneurial activities. Olakitan (2014) conducted the research in Nigeria and found a positive relationship between EE, the development of self-efficacy, and entrepreneurial intent. Liñán (2004) has recommended that EE delivered to students could strengthen the intention to become an entrepreneur. Universities are currently emphasizing EE to change attitude, subjective norms, and perceived behavioral control of students and, in turn, enhance EIs of students as confirmed by previous researchers (Ekpoh & Edet, 2011; George *et al.*, 2008; Keat, Selvarajah, & Meyer, 2011). Though educational institutions' orientation is influenced by students' career interests, choices, and actions (Porter, 2006), entrepreneurship is still in its early development phase and concentrated mostly in business schools in the Ethiopian universities. But now, it extends to engineering and technology, agriculture, applied sciences colleges. Entrepreneurship promotion centers are also scarce at the country level. Though there is a clear policy on entrepreneurship teaching in Technical and Vocational Training Centers, there is no clear and universal policy regarding EE in universities in Ethiopia. The link between EE and EI and its antecedents is generally under-researched in Ethiopia. The country thus needs to integrate entrepreneurship into the curricula while establishing centers of entrepreneurial excellence (Tessema Gerba, 2012). To upscale the existing EE, it is worth knowing about the contribution of the existing EE for the students who have been taking the course of entrepreneurship. Hence, this study focuses on bridging this gap from the Ethiopian context by investigating EE's effect on entrepreneurial intention and its antecedents.

According to Popescu *et al.* (2016), one's performance depends on attained education level. Even though whether entrepreneurial characteristics can be learned through education or not is debatable, educational institutions can promote the attributes associated with successful entrepreneurship (Maresch *et al.*, 2016). Gorman, Hanlon, and King (1997) conducted a ten-year extensive review of the literature and then concluded that most empirical studies have indicated the principles of entrepreneurship and that being an entrepreneur is teachable or can be encouraged by EE. The influence of EE in a higher education institution has been recognized as one of the important factors that help students understand and foster an entrepreneurial attitude (Peterman & Kennedy, 2003; Kourilsky & Walstad, 1998).

Entrepreneurial education is based on the argument that exposure to certain educational and entrepreneurship-related pedagogies can contribute to developing motivation, knowledge, and skills that favor the decision to become an entrepreneur/self-employed. Numerous scholars have discovered that exposure to entrepreneurial education significantly increases participants' EIs (Luthje & Franke, 2003; Fayolle *et al.*, 2006; Pittaway & Cope, 2007; Zhao *et al.*, 2005). Hattab (2014) and Ibrahim *et al.* (2015) confirmed a significant association between EE and EIs. The effectiveness of EE is measured by its contribution towards EIs and its antecedents (Murugesan & Jayavelu, 2015; Pickernell *et al.*, 2011). However, there is also empirical evidence that EE has no significant effect on entrepreneurial intention and its antecedents (see Farhangmehr, Gonçalves, and Sarmento, 2016; Gurel, Altinay, & Daniele, 2010; Mahendra, Djatmika, & Hermawan, 2017). From such inconsistent empirical evidence, it is impossible to say that EE programs improve students' entrepreneurial thinking and skills. Those students who had the chance to take an entrepreneurship curriculum in any field of study may not have a high probability of becoming nascent entrepreneurs after graduation. Therefore, there are contrary findings on the effects of EE on EI and its antecedents. To test the significance of these effects, the following hypotheses are postulated in the present study:

H1a: *Entrepreneurship education positively influences students' entrepreneurial intentions.*

H2a: *Entrepreneurship education positively influences students' attitudes towards entrepreneurship.*

H3a: *Entrepreneurship education positively influences students' subjective norms.*

H4a: *Entrepreneurship education positively influences students' perceived behavioral control.*

The effect of antecedents on EIs

EIs have psychological nature. Psychologists have confirmed that intentions are the best estimators of any planned behavior, particularly when the behavior is difficult to observe within a given time (Krueger *et al.*, 2000). According to Amanamah,

Acheampong, and Owusu (2018), it refers to the determination and motivation of a person to create a new business venture, which can be affected by personal traits and the environment in which an entrepreneur is intended. Various researchers have defined intentions as a predictor of becoming an entrepreneur and approved that it is the most immediate antecedent of a given behavior. Bird (1988) defines intention as the state of mind taking a person's attention and action towards certain behaviors. Wu and Wu (2008) and Wilson *et al.* (2009) stated entrepreneurial intention as an individual's state of mind towards creating a new venture.

The intention to initiate business activities is the antecedent of real engagement in creating one's own business enterprise (Fayolle *et al.*, 2006), and the intention is regarded as a single best predictor of actual behavior (Ajzen, 1991). EIs are therefore pivotal for a better understanding of entrepreneurial behavior in the process of discovering, creating, and exploiting opportunities in the environment. Entrepreneurial activity cannot happen overnight; rather, it is a planned, conscious thought that can be realized after developing an intention. Among the existing theories on intentions, the TPB is commonly used as a framework to explain intentions (Ajzen, 1991; Ajzen & Fishbein, 2005). According to the TPB, the three antecedents of EIs are attitudes towards behavior (i.e., do I want to do it?), subjective norms (i.e., do other people want me to do it?), and perceived behavioral control (i.e., do I perceive I am able to do it). Using this theory, many scholars have tried to predict students' EIs in different countries (Miranda *et al.*, 2017; Nguyen, 2017). Liñán and Chen (2009) revealed that TPB is the most widely used theory to study EIs. Thus, this theory is preferable over others in studying students' EIs. The EIs are closely linked to attitudes towards entrepreneurship, subjective norms, and perceived behavioral control (Fretschner & Webber, 2013). Therefore, entrepreneurial intention plays a significant role in enhancing entrepreneurial action and business creation practices. But this might change from place to place due to socio-cultural differences. Therefore, in the current paper, testing the ability of the TPB to predict students' EIs could assist in the efforts in promoting entrepreneurship development. Moreover, it helps to know how each factor influences students' EIs in Ethiopia.

Attitude towards entrepreneurship (ATE) - is the extent to which an individual evaluates an entrepreneurial activity or action to be helpful or not. Douglas and Shepherd (2002) have found that a highly positive attitude towards risk and independence leads to stronger EIs. The study conducted by Izquierdo and Buelens 2011 has found that attitude towards entrepreneurial activities positively affects the intentions to create new ventures. A positive attitude towards entrepreneurship indicates that students favor an entrepreneurial career more than organizational employment (Galloway & Brown, 2002; Kolvereid, 1996; Miranda *et al.*, 2017; Nguyen, 2017; Yang, 2013). Jwara and Hoque (2018) have found that producing graduates with limited knowledge, skills, and attitude about entrepreneurship is a waste of time and money. However, Zhang, Wang, and Owen (2015) found that attitude does not affect EIs. Therefore, such inconsistent results confuse HEIs on changing the mindset of their graduates towards an entrepreneurial career

through EE. Besides, the extent to which attitude toward entrepreneurship influences EIs needs further investigation in the Ethiopian context. Thus, the present study investigates the effect of ATE on students' EIs.

Subjective norm (SN) - refers to an individual perception of the social pressure for or against performing certain behaviors (Ajzen, 1991). It demonstrates social factors which influence a person's actual behavior of carrying out a certain entrepreneurial activity (Mohammed *et al.*, 2017; Krueger *et al.*, 2000). Moreover, social norms are influenced by external variables. Although individuals tend to plan their behavior, they still consider the influence of surrounding pressures such as families, friends, neighborhoods, classmates, and role models (Crandall, Eshleman, & O'Brien, 2002). Thus, perception of societies (social norms) impacts one's decision regarding the entrepreneurial career. But there are inconsistent extant empirical findings regarding the effect of subjective norms on EIs. For example, some evidence reckoned that SN positively affects EIs (Engle *et al.*, 2010; Iakovleva & Kolvereid, 2009; Zhang *et al.*, 2015). However, others elucidated that SN had no significant direct effect on EIs (Liñán & Chen, 2009; Huda *et al.*, 2012; Nguyen, 2017; Khuong & An, 2016). And others indicated that SN harms EIs (Maresch *et al.*, 2016; Shook & Bratianu, 2010). In countries like Ethiopia, where being a white-collar after graduation from university is accustomed, the influence of social norms to become an entrepreneur is expected. Thus, to support or refute the existing empirical evidence, the impact of SN on EIs needs further research.

Perceived behavioral control (PBC) - is related to self-efficacy, which focuses on the individual perception towards the simplicity and/or complexity of behavior or perceived ability to implement certain behavior (Ajzen, 1991; Bandura, 1997). Perceived behavioral control refers to one's beliefs towards various factors associated with the issues and could ease them or not to perform certain activities (Yean *et al.*, 2015; Engle *et al.*, 2010). It simply means the perceived ability of a person to participate in entrepreneurial activities. According to Krueger *et al.* (2000), in the field of entrepreneurship, entrepreneurial perceived behavioral control has been proved as a remarkable predictor of entrepreneurial intention and supported by literature (see Karimi *et al.* 2016; Krrueger *et al.*, 2000; Bux, 2016; Sesen, 2012). However, there are findings that PBC does not affect EIs (see Yap, Othman, & Wee, 2013; Engle *et al.*, 2010; Zhang *et al.*, 2015). Besides, the influence of perceived behavioral control on EIs was under-researched in the Ethiopian context. These urge us to test the effect of PBC on EIs.

Therefore, relying on inconsistent empirical evidence and the scarce studies from Ethiopia on the efficacy of antecedents of EIs based on TPB (i.e., ATE, SN, and PBC), we have formulated the following hypotheses:

H5b: *Attitude towards entrepreneurship positively influences students' entrepreneurial intentions.*

H6b: *Subjective norms positively influence students' entrepreneurial intentions.*

H7b: *Perceived behavioral control positively influences students' entrepreneurial intentions.*

The mediating role of antecedents of EIs

The mediating effect exists when a new third variable/construct intervenes between two causally related variables. It highlights the distinction between direct and indirect effects. Its direct effects are the relationship between two constructs with a single arrow, and the indirect effects are via other intervening variables between exogenous and endogenous variables (Hair *et al.*, 2019). Entrepreneurship, EE, and EIs are widely researched nowadays. The TPB is widely used as a theoretical foundation in studying EIs and actions. That means the effect of attitude towards the behavior, subjective norms, and perceived behavioral control on EIs (Ajzen, 1991; Krueger *et al.*, 2000). But there were limited studies that take the predictors of EIs as a mediating variable between EE and EIs. For example, the study conducted in Malaysia on public university students has proved perceived behavioral control and subjective norms are significant mediators in relationships between individual entrepreneurial orientation and EIs (Awang *et al.*, 2016). In this case, even the exogenous variable used was entrepreneurial orientation and not EE. Oyugi (2015) conducted research in Uganda on the mediating effect of self-efficacy on the relationship between EE and EIs of university students and found that self-efficacy partially mediated the relationship. Rengiah and Sentosa (2016) found that ATE mediates the causal relationship between EE and EIs. Therefore, this study fills the gap in current literature applying the mediating role of antecedents of EIs (ATE, SN, and PBC) on the relationship between EE and EIs from the Ethiopian context. Thus, the following hypotheses were posed in the current study:

H8c: *Attitude towards entrepreneurship mediates the relationship between entrepreneurship education and students' entrepreneurial intentions.*

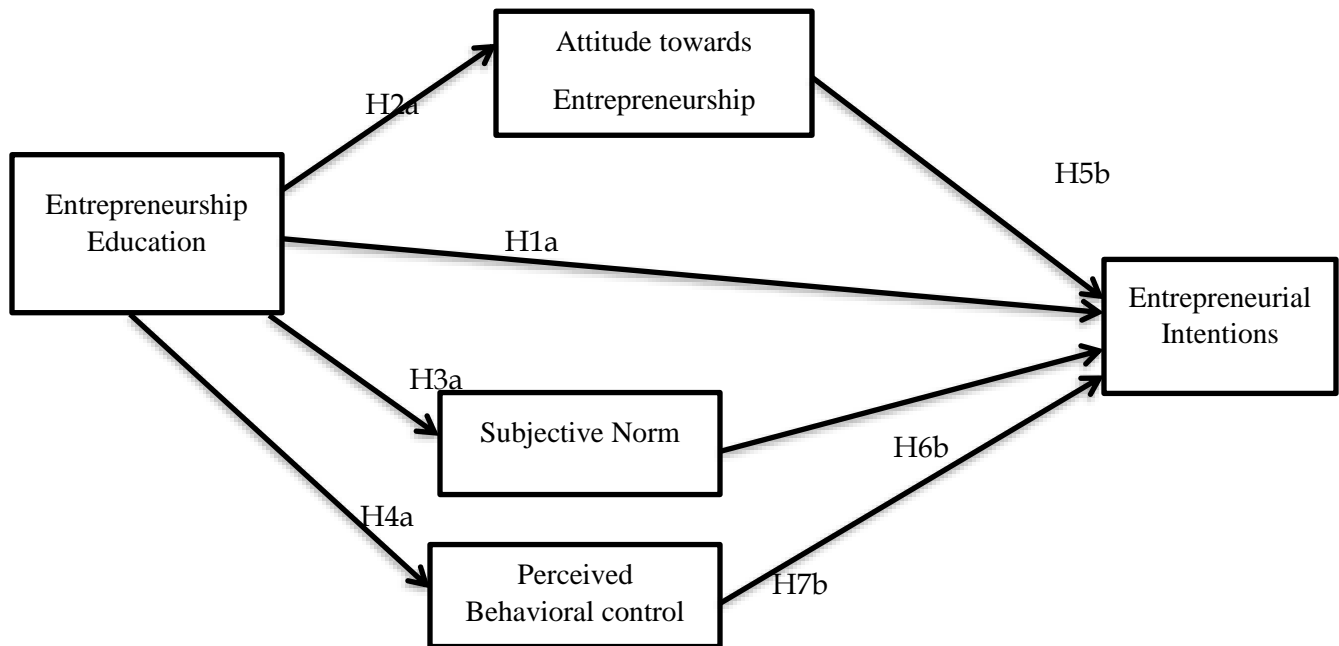
H9c: *Subjective norms mediate the relationship between entrepreneurship education and students' entrepreneurial intentions.*

H10c: *Perceived behavioral control mediates the relationship between entrepreneurship education and students' entrepreneurial intentions.*

Conceptual Framework

This study extends TPB by adding a new exogenous variable. Thus, the model below (Figure.1) revealed that EE is considered an exogenous variable that directly and indirectly influences attitude towards entrepreneurship, subjective norms, perceived behavioral control, and EIs. Thus, this research investigates the effect of EE on the antecedents of EIs (attitude toward entrepreneurship, subjective norms, and perceived behavioral control), their effect on EIs, and the mediating role of the antecedents of EIs in the predictive relationship between EE and EIs of university students in Ethiopia. Hence,

this model adds values to the previous models in three ways. First, it explores the effect of EE on EIs and the antecedents. Second, it examines the effect of antecedents of EIs on EIs in a country with a low income. Third, it examines whether the antecedents of EIs play a mediating role in the relationship between EE and EIs. This mediation has not been tried so far by any researcher. As a result, the present research extends the TPB.



Source: Adapted from Ajzen's (1991).

Figure 1: Conceptual model and hypothesized relationship

Methodology of the Study

Research Philosophy and Approaches

According to Bajpai (2011), research philosophy portrays the source, nature, and knowledge development. It reflects the assumptions taken by the researcher in investigating the phenomenon. In business studies, usually, there are four main research philosophies: pragmatism, positivism, realism, and interpretivism (Guba & Lincoln, 1994). The current study uses positivism research philosophy since the researchers and the phenomenon under investigation are separate and independent. Besides, highly structured instruments, large samples, and quantitative data were used. The role of researchers is to collect and interpret data objectively. As a result, the findings are observable and quantifiable using statistical parameters. Crowther and Lancaster (2008)

have stated that research following positivist philosophy adopts the deductive approach as a general rule. The present research approach is deductive since it focuses on testing and validating theories about how and why phenomena occur (Johnson & Onwuegbuzie, 2004). Sekaran and Bougie R. (2013) argued that the deductive approach was to test theories through fixed, predetermined research design and objective measures. In addition, the TPB has been used as a theoretical framework to develop hypotheses tested in a low-income country, Ethiopia. In a nutshell, this research is best served with the positivist research philosophy and deductive research approach.

Sample

This research has employed the explanatory research design to test the causal relationship among variables using the structural equation model (SEM) as hypothesized above (See Figure 1). The SEM approach was used because the relationship is complex and includes multiple-item latent constructs. For instance, one exogenous variable (EE) includes sixteen items and four endogenous variables; ATE, SN, PBC, & EIs include seven, six, seven, and seven items, respectively. Hence, investigating the direct, indirect, and total effect of each antecedent and the overall explanatory power of the model covariance simultaneously based on SEM is helpful (Hair *et al.*, 2019).

The population of this study consisted of graduating class of 2018 regular undergraduate students of four universities in Ethiopia. That is, students who had taken the entrepreneurship course in these three public universities (i.e., Haramaya University, Madda Walabu University, and Mettu University) and one private university (i.e., Rift Valley University) were considered since we wanted to investigate the role of EE on EIs and its antecedents and the mediation effect of antecedents in the relationship between EE and EIs. The sample size was determined based on Yamane's (1967) formula, and then stratified sampling was adopted to select the participants. The size of participants for each higher education institution was determined using proportionate stratified sampling. Accordingly, 152 are from Rift Valley University (Private University) and 183 from public universities (69 from Haramaya University, 51 from Madda Walabu University, and 63 from Mettu University). The sample respondents are students from multidisciplinary fields of study, such as business and economics, agriculture, engineering and technology, social sciences, and humanities. Hence, the findings are generalizable in Ethiopia since an adequate sample size and random selection of participants from different fields of study were used. The background of students who participated in the current research revealed that 213 (63.6%) were males and the remaining 122 (36.4%) were females, which is in line with the gender composition of students in Ethiopian universities. The average age of the respondents was 23.77 with a standard deviation of 3.44, and 202 had a rural birthplace (60.3%) and 133 (39.7%) urban areas.

Instrument Development Procedure

The source of data for this study was primary. Self-administered questionnaires were given face to face during class with the aid of class representatives to select students randomly. The process of constructing a questionnaire is essential to collect reliable and valid data from respondents. Hence, the purpose of the research, layout, length, wording, and appearance have been taken into account (Wilson, 2014; Sekaran & Bougie, 2013). For this purpose, the researchers adopted the Entrepreneurial Intention Questionnaire (EIQ) developed by Liñán (2005). Besides, EE questions adopted came from the questions developed by Luthje and Franke (2003) and Qi (2017). The items were measured using a 7-point Likert scale, varying from 1 (strongly disagree) to 7 (strongly agree). The entire construct used was the latent variable and measured with several questions. Accordingly, the entrepreneurial intention is an endogenous variable that was measured through 7 questions, attitude towards entrepreneurship measured through 7 questions, social norms measured through 6 questions, perceived behavioral control measured through 7 questions, and EE measured through 16 questions (See Table 1)

Reliability and Validity of the Instrument

The instrument used in the current study was tested for reliability and validity by using Cronbach alpha coefficient, composite reliability (CR), and the average variance extracted (AVE). As depicted in Table 1, the alpha coefficient is 0.855 for subjective norms, 0.928 for perceived behavioral control, 0.929 for EIs, 0.943 for attitude towards entrepreneurship, and 0.953 for EE. All of them are greater than the 0.70 threshold suggested by Nunnally (1978) and George & Mallery (2003). The CR and AVE are also greater than 0.70 and 0.50, respectively, satisfying the minimum required level (Fornell & Larcker, 1981; Bagozzi and Yi, 1989; Hair & Lukas, 2014). The results of CR explain that the measurement models of all constructs used in the present study reach the required level of internal consistency between their indicators. And the results of convergent validity indicated there is a good degree of correspondence between the latent variables and their indicators.

Table 1: Cronbach alpha (α), composite reliability and average variance extracted

Construct	No. of Items	Cronbach Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Entrepreneurship Education	16	0.953	0.953	0.558
Attitude towards entrepreneurship	7	0.943	0.943	0.704
Subjective norms	6	0.855	0.854	0.502
Perceived behavioral control	7	0.928	0.924	0.635
Entrepreneurial intentions	7	0.929	0.930	0.657

According to Kline (2010), a set of variables were presumed to measure different constructs showing discriminant validity if their intercorrelations are not too high. In other words, it indicates that if two measures should not be related are not related. That means discriminant validity exists if the AVE of each construct used in the study is greater than the squared correlation between constructs. According to Chin (1998), the AVE results can also help assess the existence of discriminant validity by calculating the square root of the AVE and comparing them with the correlations among the latent variables. In other words, discriminant validity exists if the square root of the AVE is greater than the correlations among the latent variables; an indication of more variance is shared between the latent variable and its own set of items than with other latent variables represented with another set of items. The present study also confirmed that the square root of AVE for each construct was greater than the correlations between the latent variables (see Table 2 below). Before SEM was applied, confirmatory factor analysis was done and confirmed that the model fit with Chi-square (X^2) =1323.732, X^2/DF =1.591 GFI=0.846, CFI=0.954, and RMSEA=0.042 (See Browne & Cudeck, 1993; Chau & Hu, 2001; Kline, 2010; Hair *et al.*, 2019). Thus, each variable had good reliability and validity and a satisfactory model's goodness-of-fit that allowed structural equation modeling analysis.

Table 2: Model discriminant validity measures

Construct	Attitude towards entrepreneurs hip	Subjective Norms	Perceived behavioral control	Entrepreneurial Intentions	Entrepreneurs hip Course Contribution
Attitude towards entrepreneurs hip	0.839*				
Subjective Norms	.382**	0.709*			
Perceived behavioral control	.487**	.512**	0.797*		
Entrepreneurial Intentions	.503**	.469**	.608**	0.811*	
Entrepreneurs hip Course Contribution	.485**	.402**	.490**	.526**	0.747*
** $p < 0.01$ level (2-tailed). * indicates the square root of Average Variance Extracted (AVE) and others are correlations of each construct					

Finally, we check if common method bias exists in the data set due to measurement errors or researchers' or respondents' bias. Harman's single factor test was used to check common method variance in the current study. Common method variance is a problem

if only one factor, which explains all the variance, is extracted from the factor analysis. However, it is not a major problem if multiple factors are extracted; or when all items run together, the restricted one-factor analysis generates the variance of less than 0.50 (Peterman & Kennedy, 2003). After all the assumptions of factor analysis were checked, all the items for the factors were entered into the factor analysis. The unrotated factors solutions revealed that five factors have emerged from the factor analysis. In another way, when we restricted to extracting only one factor, it produced a variance of 0.397, which is less than the threshold of 0.50. This finding indicated that common method variance was not a problem in the measures used in the current study.

Data Analysis

The quantitative data analysis technique was applied in the present study. First, the correlation coefficients were computed to investigate how the different variables were related to each other and to check multicollinearity issues. Then, descriptive statistics, such as means and standard deviations, were used to measure the mean response and the difference between the responses for each variable. Finally, hypotheses were tested using Structural Equation Modeling (SEM) path analysis based upon $p < 0.05$.

Ethical Consideration

According to Mugenda and Mugenda (2003), researchers are those people who are concerned with other peoples' quality of life and dignity. Initially, the researchers must respect the respondents' rights, needs, values, and desires (s). They must, therefore, be people of integrity who don't take research for personal gain or hurt others. There are various ethical issues that a researcher should avoid or not practice when undertaking research, such as confidentiality and privacy, anonymity, plagiarism, and fraud, among others. The involvement of human beings either directly or indirectly in almost all research gives rise to ethical issues. The confidentiality of the respondents was highly maintained. However, consent is obtained before giving the questionnaires, and they can participate if and only if they have agreed voluntarily. No disclosure of the name of the respondents in any means in the questionnaire should be there. Hence, the participants' views in the present study would not affect them. The study protocol was approved by the ethics committee of the school of management studies, Punjabi University.

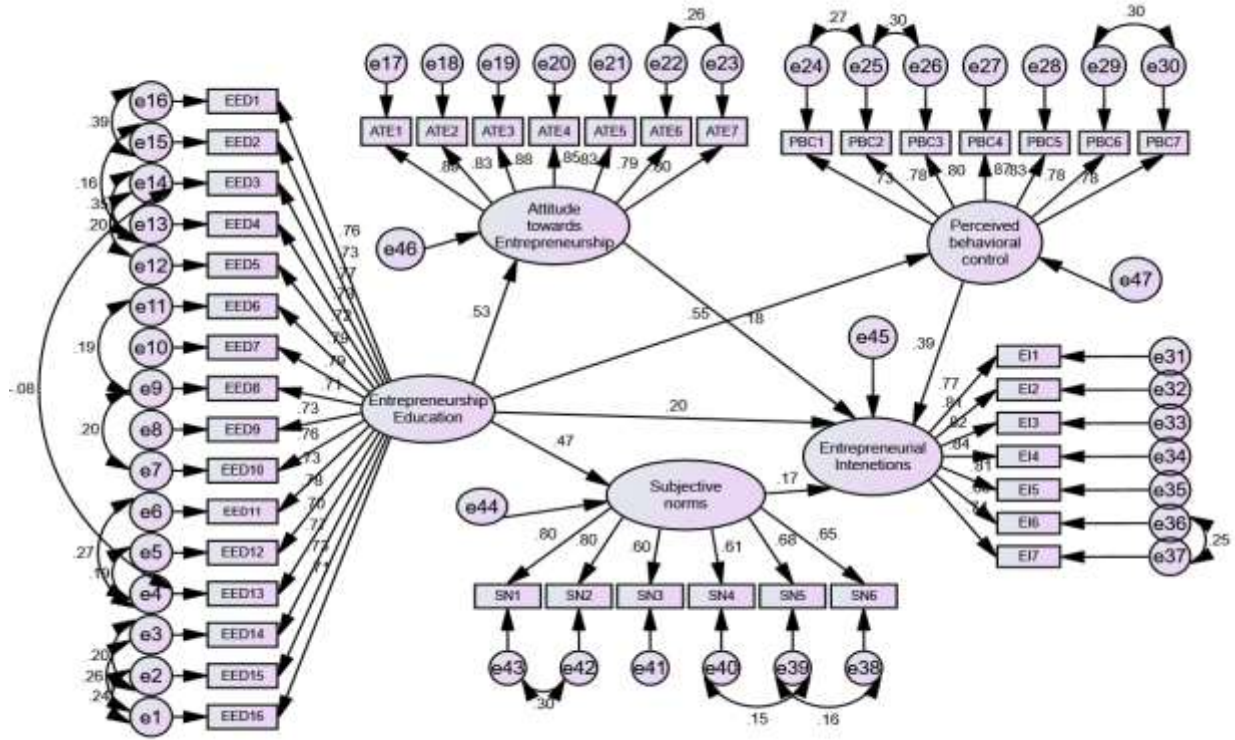
Results and Discussions

Based on the results, all of the hypotheses were tested. And these have been reported in consecutive tables and figures below.

Table 3: Descriptive analysis, means, standard deviations, and correlations

Constructs	Mean	Standard Deviation	ATE	SN	PBC	EED	EI
Attitude towards entrepreneurship (ATE)	4.85	1.51	1				
Subjective norms (SN)	4.20	1.23	.382**	1			
Perceived behavioral control (PBC)	4.87	1.40	.487**	.512**	1		
Entrepreneurship Education (EED)	5.02	1.04	.485**	.402**	.490**	1	
Entrepreneurial Intentions (EI)	5.01	1.41	.503**	.469**	.608**	.526**	1
** $p < 0.01$ level (2-tailed).							

Table 3 tabulates the correlation coefficient matrix among the variables considered in the present research and their significance level (p-value). As can be seen, the strongest correlations exist between EIs and perceived behavioral control with $r = .608^{**}$, the second strong correlation is between EE and EIs with $r = .526^{**}$, and the third strong correlation is that between EIs and attitude towards entrepreneurship with $r = .503^{**}$. The weakest correlation value has been found between subjective norms and attitude towards entrepreneurship $r = .382^{**}$, and EE and subjective norms $r = .402^{**}$, respectively. In general, the results show that correlation exists between all variables identified in this research based on the data collected from the students at $p < .01$ level. The multicollinearity problem should be corrected when the correlation between variables is above 0.80 (Cooper & Schindler, 2009; Kennedy, 2008), but in this study, the maximum correlation value was 0.608. Hence, this shows the absence of multi-collinearity problems among the predictor variables. From this, it is possible to conclude that the constructs used in the present study have a moderate correlation. Thus, it is possible to investigate their causal relationship further.



Legend: EED1-16=Items used to measure entrepreneurship education; AT1-7=Items used to measure attitude towards entrepreneurship; PBC1-7= Items used to measure perceived behavioral control; SN1-6=Items used to measure subjective norm; EI1-7=Items used to measure EIs.

Figure 2: Path coefficients of the model of EIs

Table 4: Regression weights between constructs and significance for each path

Path Analysis	Estimate	Std. Estimate	S.E	C.R.	<i>p</i> Value	Results
Entrepreneurship Education → Subjective norms	0.540	0.472	0.080	6.750	***	Supported H3a
Entrepreneurship Education → Attitude towards entrepreneurship	0.927	0.528	0.105	8.844	***	Supported H2a
Entrepreneurship Education → Perceived behavioral control	0.730	0.548	0.087	8.385	***	Supported H4a
Attitude toward entrepreneurship → EIs	0.152	0.182	0.045	3.392	***	Supported H5b
Subjective norms → EIs	0.216	0.169	0.072	2.997	0.003	Supported H6b
Entrepreneurship Education → EIs	0.298	0.203	0.102	2.916	0.004	Supported H1a
Perceived behavioral control → EIs	0.425	0.386	0.067	6.347	***	Supported H7b

*** $p < 0.001$

As shown in Table 4, the results of the hypotheses (H1a-H7b) have been accepted with $p < 0.01$. Specifically, entrepreneurship education has a positive effect on the antecedents of EIs with the standardized coefficient for subjective norms ($\beta = 0.472$, $p < 0.001$), attitude towards entrepreneurship ($\beta = 0.528$, $p < 0.001$), perceived behavioral control ($\beta = 0.548$, $p < 0.001$), and EIs ($\beta = 0.203$, $p < 0.005$). Moreover, attitude towards entrepreneurship has a positive and significant effect on EIs ($\beta = 0.182$, $p < 0.001$), subjective norms have a positive and significant effect on EIs ($\beta = 0.169$, $p < 0.005$), and perceived behavioral control has a positive and significant effect on EIs ($\beta = 0.386$, $p < 0.001$). The results above confirm that all the paths were significant. The strongest path was exerted between perceived behavioral control and EIs, which means a higher variance of dependent variable came from perceived behavioral control. The weakest path was observed between subjective norms and EIs (path coefficient = 0.17, $p < 0.005$). As depicted in Figure 2, the effect of EE significantly and positively accounted for variances in attitude towards entrepreneurship, subjective norms, perceived behavioral control, and EIs with R^2 of 0.28, 0.22, 0.30, and 0.50, respectively. In addition, all the associations revealed statistically significant relationships. Chin (1998) recommended that the associations between variables with path coefficients greater than 0.2 be considered strong. Hence, the strongest relationships were observed between EI and perceived behavioral control, attitude towards entrepreneurship, and subjective norms. Besides, perceived behavioral control and EIs and effects of EE and EIs have a strong relationship.

As a result, all the hypotheses in the conceptual model of the present research were accepted. Furthermore, the results confirmed that attitude towards entrepreneurship, subjective norms, and perceived behavioral control were partially mediated the relationship between EE and EIs since all the standardized path coefficients were significant at $p < 0.01$.

The present study was compatible with Von Graevenitz, Harhoff, and Weber (2010); Jain & Chaudhary (2017) found that an entrepreneurship course has a significant positive impact on entrepreneurial intention and its antecedents. Ojogbo, Idemobi, and Ngige (2016) also noted a positive relationship between EE and EIs of students. Sanchez (2011) has found that entrepreneurial competencies (self-efficacy, pro-activeness, and risk-taking) and intentions towards entrepreneurial activity increase among students who took an entrepreneurship course. According to Dogan (2015), there was also a positive relationship between EE and EIs. Nguyen (2017), based on the study conducted in Vietnam, stated that attitude towards entrepreneurship and perceived behavioral control are positively related to EIs. Pandit *et al.* (2018) have found that EE can positively influence graduates' future career intentions and make them better entrepreneurs. The study conducted in Uganda has also confirmed that exposure to EE can enhance self-efficacy and EIs (Oyugi, 2015). As a result of the influence of EE, higher education institutions are increasing investment in entrepreneurship promotion (Gwynne, 2008). However, contrary to the present findings, Dohse and Walter (2012) found that EE was

positively related to ATE and SN or PBC. Also, Gurel, Altinay, and Daniele (2010), and Mahendra, Djatmika, and Hermawan (2017) have found that EE did not play a significant role in promoting entrepreneurial traits and intentions among university students. Karimi *et al.* (2016) have reported that EE did not show a significant effect on EIs. Hsiao *et al.* (2012) revealed no correlation between EE offered in higher education and students' EIs. Although some empirical evidence contradicts the present study, most of them support the positive influence of EE on EI and its antecedents. Therefore, universities in low-income countries like Ethiopia could prioritize EE to make graduates job creators instead of job seekers.

To test the indirect effect of the independent variable (EE) on the dependent variable (EIs) through the mediators (attitude towards entrepreneurship, subjective norms, and perceived behavioral control), the bootstrap test was performed at a 95% confidence interval with 2000 bootstrap samples.

Table 5: Summary of the standardized direct, indirect, and total effects of the bootstrapping results

Path	Estimate	Product of coefficients		Bootstrapping 2000 times 95% CI					
		SE	CR	Biased corrected percentile			Percentile		
				Lower	Upper	P	Lower	Upper	P
EED→EI	0.204	0.065	3.14	0.076	0.342	0.013	0.081	0.352	0.010
Standardized indirect effect									
EED→ATE→EI	0.141	0.051	2.76	0.047	0.249	0.007	0.045	0.240	0.010
EED→SN→EI	0.113	0.049	2.31	0.036	0.251	0.011	0.007	0.231	0.025
EED→PBC→EI	0.312	0.071	4.39	0.207	0.474	0.005	0.194	0.456	0.010
Total standardized indirect effect	0.386	0.050	7.72	0.294	0.484	0.006	0.273	0.476	0.010
Total standardized effect	0.590	0.048	12.29	0.482	0.671	0.026	0.485	0.680	0.010

Note: EED-Entrepreneurship education, EI-Entrepreneurial intention, ATE-Attitude toward entrepreneurship, SN-Subjective norms, PBC-Perceived behavioral control

Table 5 exhibits the bootstrap results of the direct effect, specific indirect effects of mediator, total indirect effect, and total effect (i.e., the sum of direct and total indirect effect) on the relationship between EE and EIs with each significance level at 95% confidence interval.

The mediating effect of attitude towards entrepreneurship (coefficient of indirect effect=0.141, $p<0.05$). This result enables us to support the hypothesis that attitude towards entrepreneurship has a mediating effect on the relationship between EE and EIs of students. The second indirect effect was that of perceived behavioral control

(coefficient of indirect effect=0.312, $p<0.05$), which is also evidence to accept the hypothesis that perceived behavioral control has a mediating effect on the relationship between EE and EIs of students. The third indirect effect was the social norms (coefficient indirect effect=0.113, $p<0.05$), which supports the hypothesis that subjective norms have a mediating effect on the relationship between EE and EIs of students. Further, investigation of the lower and upper-level confidence intervals of the three mediated paths revealed that the entire path intervals had excluded zero; hence they were statistically significant. From this, we can conclude that the three hypothesized mediators, namely attitude towards entrepreneurship, subjective norms, and perceived behavioral control, had a statistically significant mediation effect on the relationship between EE and EIs of students with a p -value of less than 0.05. In a nutshell, EE affects EIs of students both before and after the mediators are included in the model. This is an indicator of partial mediation for all mediators since all paths were significant even after mediating variable entered into the model.

The study conducted in Malaysia on public university students proved perceived behavioral control and subjective norms as significant mediators on the relationships between individual entrepreneurial orientation and EIs (Awang *et al.*, 2016). Although this finding was compatible with the present study, the exogenous variable used is not the same. Oyugi (2015) has conducted research in Uganda on the mediating effect of self-efficacy (perceived behavioral control) on the relationship between EE and EIs of university students and found that self-efficacy partially mediated the relationship between EE and EIs. Pfeifer *et al.* (2016) have also supported the mediating role of self-efficacy on the relationship between education and EIs based on the study conducted in Croatia.

The present study applies the TPB and contributes to EE in universities. For future research on EE, attitude towards entrepreneurship, subjective norms, and perceived behavioral control can serve as predictor variables that influence EIs and as mediating variables in the causal relationship of any other exogenous variables (for example, EE in this study) with EIs. For stakeholders, to accelerate the willingness of graduates to consider entrepreneurship as a career option, universities should work by initiating different projects and programs that could change the students' mindset while on campus. The traditional EE, only as a single one-semester course for students studying in selected programs, should be changed to programs at the undergraduate level and/or graduate level and compulsory course for every field of study because the findings have confirmed that EE plays a role in enhancing EIs and its antecedents. Furthermore, the methodology for teaching entrepreneurship should be changed from a conventional theory-based lecture method to a practical student-centered approach, such as business idea generation, business creation exercises, and feasible business plan development. Finally, the policy makers, the Ethiopian ministry of sciences and higher education (MoSHE), respective universities, and educators are expected to develop institutional systems and strategies through which EE is nurtured for students and societies since it is

a key priority to alleviate unemployment and ensure sustainable socio-economic development.

Conclusions, Limitations, and Future Research

Conclusions

This study investigates the role that the current EE in Ethiopian Universities plays in enhancing EIs and their antecedents. Besides, the unique feature of the current study was to test the mediating role of attitude towards entrepreneurship, subjective norms, and perceived behavioral control in the predictive relationship between EE and EIs.

It can be concluded that EE is essential to foster and nurture entrepreneurship thinking and spirit. Hence, it has a remarkable connection with policymakers and educators. Furthermore, it is a means to alleviate the unemployment of graduates from higher education institutions and build an entrepreneurial-minded youth of graduates. However, in Ethiopia, EE is in its infancy, and further work is deemed necessary to bring change in the entrepreneurial ecosystem of universities in particular and that of the country in general.

In addition, the findings of the study have revealed that (1) EE positively and significantly influence EIs and their antecedents, (2) all antecedents (perceived behavioral control, attitude towards entrepreneurship, and subjective norms) positively and significantly influence EIs, and (3) attitude towards entrepreneurship, subjective norms, and perceived behavioral control partially mediated the relationship between EE and EIs. Furthermore, the mediating effect was tested using the bootstrapping method, which found consistent results. Hence, the study's findings validate the effect of EE on EIs and their antecedents. As a result, higher education institutions are motivated to promote entrepreneurship and encourage graduate students with an entrepreneurial mindset to become nascent entrepreneurs after graduation. Finally, we believe that the present study findings provide new insights into the understanding of TPB and EE and EIs of students in higher education institutions.

Limitations and Future Research

The present study has several limitations that could indicate avenues for future research. Firstly, the present study is based on primary cross-sectional data collected from a limited sample of undergraduate students of only four universities based in Ethiopia. Hence, in the future, longitudinal research should be conducted to investigate the long-term effect of mediators on EE-EIs relationships from more universities and students with

diversified educational backgrounds to confirm the proposed model's robustness. In addition, the longitudinal research also helps examine changes in EIs and its antecedents over time and assess students' possibility of engagement in actual entrepreneurial activities after graduation.

Secondly, EE is the only factor in the present study as an exogenous variable that influences EIs and their antecedents. But different personal, psychological, and environmental factors can be considered for the future endeavor either as exogenous variables and/or mediators. Thirdly, in the present study, all measures taken indicate undergraduate students' perceptions, possibly leading to bias. But, in the future, other stakeholders such as university management, educators, and the government should be included. Fourthly, this research cannot compare the public with private university students in EIs and their antecedents. In the future, informative conclusions can also be drawn by conducting a comparative study of students from public and private universities on the current phenomenon.

Finally, in the future, such research may be experimental research, such as before and after availing entrepreneurship course, what happened to the level of EIs, antecedents, and the mediating role should be conducted. Thus, such research helps to provide conclusive rational evidence that enables universities to invest more in EE and entrepreneurship promotion for their students.

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Examining the Behavioral Intention of Philippine MSMEs Toward Business Intelligence Adoption

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Abstract

Purpose – *This work focuses on understanding the factors affecting the behavioral intention of micro, small, and medium enterprises (MSMEs) in the Philippines towards business intelligence and analytics (BI&A) systems adoption.*

Method – *The study applied Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine the data collected from 202 MSMEs in the manufacturing, wholesale and retail, and services sectors.*

Findings – *The research findings revealed that perceived relative advantage, complexity, top management support, competitive pressure, and innovativeness are determinants of behavioral intention to adopt business intelligence. Of these factors, personal innovativeness and relative advantages were identified as the strongest determinants of MSMEs' adoption intention.*

Limitations – *The study has limited generalizability considering that the data used are only from the three largest MSME industry sectors.*

Implications – *The study contributes to research and practice and enables the adoption of BI&A in small businesses. The findings also provide valuable insights into developing government strategies and policies to build technological capabilities and understanding the importance of innovation advancement among MSMEs.*

Originality – *This empirical study is based on the combined concepts of the Technology-Environment-Organization framework and Personal Innovativeness in the Domain of Information Technology to understand the underlying factors affecting the behavioral intention to adopt advanced technology in the context of small businesses and non-adopters.*

Keywords: SMEs, PLS-SEM, business intelligence, Technology-Organization-Environment framework, Personal Innovativeness in the Domain of IT

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Introduction

The emergence of the digital revolution is fundamentally changing organizations' value chains that lead to the increasing strategic significance of information technology (IT) in businesses. In the new data-driven environment, firms recognized the importance of transforming data into valuable information resources for decision making. These changes led to the emergence of decision support technologies commonly known today as business intelligence and analytics (BI&A) (Cristescu, 2016). The onset of the knowledge economy and rapid development in IT resulted in further advancement of BI&A technology that significantly lowered its implementation costs (McLuhan, 2020; Tutunea & Rus, 2012). Establishing BI&A capability provides potential benefits even for small business organizations to enable data-driven processes and decision-making. Previous empirical evidence maintains that BI&A helps organizations gain competitive advantage (Wang, Yeoh, Richards, Fan, & Chang, 2019) and enhance firm performance (Popovic, Puklavec, & Oliveira, 2018). For instance, small retail businesses can use basic descriptive analytics to identify their fast-moving and most profitable products for store layout strategies, managing stocks, and marketing promotions (McLuhan, 2020). In addition, the combined use of social media and BI&A can also provide a strategic advantage for small and medium enterprises (SMEs) to monitor consumer behavior during the spread of COVID-19 as most buyers shifted to online shopping and collaborative commerce.

In the Philippines, a micro, small, and medium enterprise (MSME) refers to any form of business with a maximum asset size of Php100,000,000 and an employment size of fewer than 200 employees (MSMED Council, 2017). Around 99.5% of the total business population in the Philippines are MSMEs, and their utilization of IT is still limited to simple applications (DICT, 2017). This business sector plays an essential role in the country's economy, and their IT knowledge and skills are crucial to this modern business landscape. However, extant literature in technology adoption emphasized that, unlike large enterprises, most small businesses are hesitant to adopt new technologies despite the benefits and availability of relevant information systems (IS) (Boonsiritomachai, McGrath, & Burgess, 2016; Ramayah, Ling, Taghizadeh, & Rahman, 2016). The Lack of resources and internal IS experts is the main barrier to their inclination to adopt innovations (Ghobakhloo *et al.*, 2011).

Prior studies have produced valuable contributions toward understanding the different aspects related to BI&A, including adoption (Popovic *et al.*, 2018), value creation (Bozic & Dimovski, 2019), maturity (Tan, Sim, & Yeoh, 2011), and capability (Kulkarni, Robles-Flores, & Popovic, 2017). However, previous studies have focused on large enterprises, current adopters, implementation processes, and critical success

factors, while understanding non-adopters, especially those from developing countries, has received less attention. This particular area in the IS adoption literature also needs critical examination as previous empirical findings revealed significant differences between existing adopters and non-adopters of innovation (Ghobakhloo *et al.*, 2011; Thong, 1999). Furthermore, frameworks and empirical findings from the context of large enterprises cannot be generalized to MSMEs because of their differences in terms of resources and IS capabilities (Ramayah *et al.*, 2016).

This work aims to address this gap by investigating the factors affecting the intention of MSMEs in the Philippines towards the adoption of BI&A from the lens of the Technology-organization-environment (TOE) framework (DePietro, Wiarda, & Fleischer, 1990), Diffusion of innovations (Rogers, 1962), and Personal innovativeness in the domain of IT (PIIT) (Agarwal & Prasa, 1998). The study contributes to business and IS literature by providing a basic framework for future researchers focusing on emergent technologies for small businesses. The test of the research framework also contributes to empirical findings from the perspective of non-adopters by explaining their difference with current adopters of BI&A. Furthermore, the results of this work also provide strategic insights for the development of IT capability programs for MSMEs in the country. Accordingly, this study seeks to address the following research question: “What factors significantly influence Philippine MSMEs’ intention of adopting business intelligence and analytics?”.

The remainder of this paper covers the following: Section 2 presents a literature review of BI&A, Philippine MSMEs, and technology adoption of small and medium enterprises (SMEs). Section 3 discusses the conceptual model and hypothesized relationship of latent variables. The methodology applied in the study is outlined in Section 4, and the results of quantitative data analysis are presented in Section 5. Section 6 covers a discussion and interpretation of the findings, while Section 7 and 8 discuss the limitation, recommendations for future research, and conclusion.

Literature Review

Business intelligence

Negash (2004) defines business intelligence as a method that involves “data gathering, data storage, and knowledge management using relevant tools for analysis to present complex and competitive information to decision-makers”. The earlier version of BI&A platforms evolved from decision support systems and is commonly known today as traditional enterprise BI&A. Williams & Williams (2007) emphasized that the technology has provided opportunities for firms to enhance management, revenue generation, and operating processes. Similarly, the recent emergence of the digital economy brought relevant enterprise technologies, including BI&A, at significantly lower costs (McLuhan, 2020). Modern BI&A systems are now available as Software-as-a-Service (SaaS) or On-Demand BI&A, Mobile BI&A, self-service BI&A, and desktop and browser-based BI authoring tools (Cristescu, 2016). The modular software design of BI&A also enables small organizations to choose software packages suitable for their current needs. These changes created opportunities for

organizations with limited resources to equip themselves with the same technologies as large enterprises do (Boonsiritomachai *et al.*, 2016).

The utilization of the technology encompasses three main phases based on different levels of complexity (Lepenioti, Bousdekis, Apostolou, & Mentzas, 2020): descriptive, predictive, and prescriptive analytics. BI&A is commonly perceived as too complex for SMEs because it is associated with data science, big data, and machine learning. In contrast, SMEs can start with a set of transactional data using basic descriptive methods as a starting point for examining the changes that have occurred to their businesses. The approach is also called the reporting layer of analytics that focuses on “What happened?” (McLuhan, 2020). Adoption and organizational learning is a continuous process that could eventually move them to the next level of BI&A applications, such as analysis and monitoring layers that focus on questions “Why did it happen?” and “What is happening now?”, respectively (Lepenioti *et al.*, 2020). Thus, the utilization of BI&A in smaller businesses does not necessarily mean they need to be at the same level as large organizations. They can start with any basic methods to develop internal knowledge and skills. Table 1 shows examples of the applications of BI&A in SMEs.

Table 1: Application of BI&A in small businesses

Major types of BI opportunity	Analysis	Application
BI for management process	Merchandise planning and allocation	Retailers can examine the patterns in stores or regions with similar demographic characteristics for merchandise planning and allocation for market expansion.
	Sales forecasting	Examining time-based and location-based sales patterns help retailers to understand buying seasonality for supply optimization and stocking decisions.
BI revenue-generating process	Market basket analysis	Understanding customers’ buying behaviors and the products they purchase to improve stocking, store layout strategies, and marketing promotions.
	Predictive life-cycle value	Data mining can help operators predict each customer’s lifetime value and behavior patterns to service segments and individuals (e.g., time-based offers of special deals and discounts).
BI for operating process	Distribution logistics	Distribution companies can apply visualization of routes based on GPS data to enhance the delivery of services to customers and route optimization to save fuel costs.
	Credit decision analysis	Micro-finance operators can optimize and reduce the transaction costs from previous credit decisions by examining transactions that were known to be fraudulent or to default.

Source: (McLuhan, 2020; Williams & Williams, 2007)

Philippine MSMEs and IT capabilities

Each country has different criteria for classifying small business organizations. The IS literature presented in Table 2 reveals that SMEs or MSMEs are classified based on the size of employment, capital assets, and turnover levels (Maduku, Mpinganjira, & Duh, 2016). For example, Alshamaila, Papagiannidis, & Li (2013) define SMEs as

those businesses in northeast England with less than 250 employees. The study of Kumar *et al.* (2017) describes MSMEs in India based on their investment in plants and machinery. Also, the definition of South African SMEs presented in the study of Maduku *et al.* (2016) is based on employment size and annual turnover.

Hence, it is evident from the literature that there is no universal definition or method in defining small businesses. For this reason, MSMEs in this study are defined based on Philippine Republic Act No. 6977 (Magna Carta for Micro, Small, and Medium Enterprises (MSMEs)). An MSME in the Philippines is defined as any business involved in the industry, agri-business, or services and is classified based on its asset and employment size, regardless of whether they are single proprietorship, cooperative, partnership, or corporation (Gov Ph, 2008). Micro enterprises are businesses with an investment size of up to Php3 million and an employment size of fewer than 10 employees. Small enterprises are categorized as businesses with an investment size of up to Php15 million and an employment size of fewer than 100 employees. Medium enterprises are firms with an investment size of up to Php100 million and an employment size of fewer than 200 employees (MSMED Council, 2017).

Philippine MSMEs play an essential role in the economic development of the country. The current statistics show that 99.52% of the businesses in the country are classified as MSMEs. The MSME sector contributes around 62.4% to the total employment (DTI, 2018) and 35.7% share to GPD (MSMED Council, 2017). The Survey on Information and Communications Technology (SICT) in 2017 reported that an average of 98.9% of business enterprises (core and non-core ICT industries) own computers and communication equipment, and 98.6 have access to the internet used for business transactions. However, their use of these technologies is limited to simple activities, such as obtaining information or forms from government organizations and using spreadsheet and document processing applications (DICT, 2017).

Previous literature (see Table 2) also suggests that limited financial and human resources are some of the prevailing problems of SMEs that compel them to be cautious in investing in innovations (Thong, 1999) and slow in adopting technologies (Alshamaila *et al.*, 2013; Ramdani, Chevers, & Williams, 2013). Moreover, despite that technologies are becoming inexpensive and more relevant for SMEs nowadays, they still have limited capability in management techniques such as financial analysis and forecasting (Ghobakhloo *et al.*, 2011; Ramdani *et al.*, 2013). One of the reasons is that chief executive officers (CEO) make most of the decisions related to IS adoption as SMEs tend to have a highly centralized organizational structure (Thong, 1999). Another difficulty is recruiting and retaining IS staff because of limited career opportunities in SMEs (Ghobakhloo *et al.*, 2011; Thong, 1999). It is, therefore, reasonable to consider that lacking internal IS knowledge in SMEs causes a lack of understanding of the benefits and low adoption rate of technological innovations.

Theoretical background

The literature in technological innovation adoption currently has two separate areas: the technology adoption of individuals and the technology adoption of organizations. The studies focusing on technology adoption of individuals apply

intention-based models, such as the Theory of Reasoned Action (Fishbein & Ajzen, 1975), Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003), Technology Acceptance Model (TAM) (Davis, 1986), Theory of Planned Behavior (Ajzen, 1991), and Task-Technology Fit (Goodhue, 1995). On the other hand, organizational technology adoption studies are based on multi-perspective theories, such as the Diffusion of innovations (DOI) (Rogers, 1962) and the Technology-Organization-Environment framework (DePietro *et al.*, 1990).

The adoption of different types of technologies in SMEs has been part of these streams of literature. Previous studies have successfully examined this area of research using TOE, DOI, or a combination of both theories (Alshamaila *et al.*, 2013; Ghobakhloo *et al.*, 2011; Puklavec, Oliveira, & Popovic, 2017). The advantage of the TOE is that it considers an environmental context that is not included in DOI, whereas DOI's innovation attributes are commonly integrated as constructs to broaden the technological context of the TOE (Alshamaila *et al.*, 2013; Ramdani *et al.*, 2013). Theoretical and empirical evidence suggests that the TOE has substantial support and is a well-grounded theoretical foundation suitable for examining intra-firm adoption of innovations (Alshamaila *et al.*, 2013; Maduku *et al.*, 2016). Previous literature in technology adoption shows that the TOE framework is a dominant theory used in examining the technology adoption of SMEs, including e-commerce (Ghobakhloo *et al.*, 2011), mobile marketing (Maduku *et al.*, 2016), website (Ramayah *et al.*, 2016), enterprise resource planning (Ramdani *et al.*, 2013), cloud computing (Alshamaila *et al.*, 2013; Kumar *et al.*, 2017), and general information systems (Thong, 1999).

The IS literature also reveals that innovativeness is also associated with technology adoption in small businesses (Boonsiritomachai *et al.*, 2016; Ghobakhloo *et al.*, 2011; Ramayah *et al.*, 2016; Thong, 1999). Rogers's (1962) prominent work in innovation diffusion suggests that individuals with a high level of innovativeness tend to seek information from new ideas and can cope with a high degree of uncertainty about adoption. In the same view, Agarwal & Prasa (1998) describe innovativeness as the willingness of an individual to test any emergent IT. Innovativeness is a personality trait independent from the subjective evaluation of other system members. Advanced technologies, like BI&A, often involve a stringent evaluation process in determining their significance to an organization. Thus, only innovative individuals are more likely to spend their time examining the potential benefits of technological innovations for their organization. For this reason, the study will also test the relationship between PIIT and adoption intention based on the previous work of Agarwal & Prasa (1998).

Table 2 summarizes some of the previous technology adoption studies in SMEs. The discussion of selected variables and proposed research hypotheses are presented in the following sections.

Table 2: Summary of prior technology adoption studies in SMEs using TOE framework

Author and Technology	Theory and Dependent Variable	Technological context	Organizational and Individual contexts	Environmental context	Sample and method
Ghobakhloo <i>et al.</i> (2011) E-Commerce	TOE framework Initial ¹ and Post ² adoption	Relative advantage ^{1*} 2*, Compatibility ^{1*} 2*, Cost	Information intensity ^{2*} , CEO's IS knowledge, CEO's innovativeness ^{1*} , Business Size	Competition, Buyer/supplier pressure ^{1*} 2*, Support from technology vendors ^{1*} 2*	235 SME CEO Adopters and non-adopters (<i>Multiple Regression</i>)
Maduku <i>et al.</i> (2016) Mobile marketing	TOE framework Intention to adopt ¹	Relative advantage ^{1*} , Perceived complexity, Cost ^{1*}	Top management support ^{1*} , Availability of financial resource, Employee IT capability ^{1*}	Vendor support, Competitive pressure, Customer pressure ^{1*}	511 SME Owners/ decision-makers Non-adopters only (<i>CB-SEM</i>)
Puklavec <i>et al.</i> , (2017) Business intelligence	TOE Framework Evaluation ¹ , Adoption ² , Use ³	Relative advantage Cost ^{2*} 3*, BIS as part of ERP ^{1*} 2* 3*	Management support ^{1*} 3*, Rational decision-making culture ^{1*} , Project champion ^{1*} 2* 3*, Organizational data environment ^{3*} , Organizational readiness ^{1*} 2*	External support	181 SMEs CIOs, management, senior IS personnel Adopter and non-adopters (<i>PLS-SEM</i>)
Ramayah <i>et al.</i> , (2015) Website	TOE Framework Continuance intention ¹	Relative advantage ^{1*} , Compatibility, Cost ^{1*} , Security	Size Employee IS knowledge Innovativeness ^{1*} , IT knowledge, IT adoption attitude ^{1*}	External pressure, External support	108 SMEs Owners or key executives ICT, manufacturing Adopters only (<i>PLS-SEM</i>)
Boonsiritomachai <i>et al.</i> (2016) Business intelligence	TOE framework Maturity level ¹	Relative advantage ^{1*} , Complexity ^{1*} , Compatibility ^{1*}	Absorptive capacity, Organizational resource availability ^{1*} , Owner-managers' innovativeness ^{1*} , Owner-managers' IT knowledge	Competitive pressure ^{1*} Vendor selection ^{1*}	427 SMEs Adopters only <i>MN logistic regression</i>
Kumar <i>et al.</i> (2017) Cloud computing	TEO and DOI Intention to adopt ¹	Cost benefit ^{1*} , <i>Relative advantage, reliability</i>	Top management support ^{1*} , Security and privacy	Competitive pressure ^{1*} , Perceived concerns ^{1*}	121 SMEs Owners, director, manager Adopter and non-adopters (<i>Multiple Regression</i>)
Awa (2016) Enterprise Resource Planning	TOE framework Adoption decision ¹	ICT infrastructure ^{1*} , Technical know-how ^{1*} , Compatibility ^{1*} , Values ^{1*} , Security ^{1*}	Subjective norms ^{1*} , Size ^{1*} , Demographic composition ^{1*} , Scope of business operations ^{1*}	External support ^{1*} , Competitive pressure ^{1*} , Trading partners' readiness ^{1*}	373 SMEs Owners and executives Adopter and non-adopters (<i>Logistic regression</i>)
Yoon (2020) Smart farm	TEO framework Adoption decision ¹	Relative advantage Compatibility ^{1*} , Complexity,	Financial cost ^{1*} , Lack of skills, Human resource vulnerability, CEO innovativeness, CEO IT knowledge	Government support, Digital environment change ^{1*}	232 SMEs Farmers (<i>PLS-SEM</i>)
Ramdani <i>et al.</i> (2013) Enterprise systems	TOE framework Adoption decision ¹	Relative advantage ^{1*} Compatibility ^{1*} , Complexity ^{1*} , Trailability ^{1*} , Observability ^{1*}	Top management support ^{1*} , Organizational readiness, ICT experience, Size ^{1*}	Industry ^{1*} , Market scope ^{1*} , Competitive pressure ^{1*} , External ICT support	300 SMEs Owners (<i>PLS-SEM</i>)

Note Numbers 1, 2, and 3 represent the dependent variable/s (DV); * indicates a significant independent variable (IV); (ex. IV^{2*} implies that the IV is a significant predictor of DV²)

Theoretical framework and hypotheses

Built on the seminal work of DePietro *et al.* (1990), the TOE framework is an organizational-level theory that explains the three contexts that drive organizations' adoption decisions. The theory posits that technological, organizational, and environmental conditions influence the innovation adoption of an organization. The research framework in this study also incorporates the concept of innovativeness in an individual context based on the empirical findings indicating that the construct is associated with SMEs at the pre-adoption (Ghobakhloo *et al.*, 2011; Thong, 1999) and adoption (Alshamaila *et al.*, 2013; Boonsiritomachai *et al.*, 2016; Ramayah *et al.*, 2016) innovation stages. Figure 1 shows the proposed research framework of this study.

The technological condition represents the essential technologies for an organization. These include internal technologies currently utilized in the organization and available external technologies available but not currently in use (DePietro *et al.*, 1990). The organizational condition denotes the characteristics and resources of the organization, including the link between its members, the methods of communication, their size, and slack resource (DePietro *et al.*, 1990). The environmental condition refers to the arena in which the organization conducts its business, which involves industry structure, competition, technology providers, and regulatory setting (DePietro *et al.*, 1990).

Technological context

Relative advantages are defined in this study as the expected benefits of MSMEs from BI&A. Rogers (1962), from his seminal work in innovation diffusion theory, emphasized that an individual's understanding of the relative advantages of innovation is a factor for his/her decision of adoption. In the same way, the construct corresponds to perceived usefulness in TAM (Davis, 1989) as one of the antecedents of the adoption and usage of new technologies. Previous studies suggest that the relative advantage is a significant and positive determinant of SMEs' adoption of IS (Ghobakhloo *et al.*, 2011; Maduku *et al.*, 2016; Ramayah *et al.*, 2016; Ramdani *et al.*, 2013). BI&A systems offer various potential benefits for MSMEs to enhance existing processes at the different organizational levels (Boonsiritomachai *et al.*, 2016; McLuhan, 2020). However, technology adoption is also a trade-off between the overall benefits and the factors they need to sacrifice. It also implies that small firms are more likely to invest in BI&A if they have an assurance that these potential benefits are viable and relevant for business growth (Ramayah *et al.*, 2016; Ramdani *et al.*, 2013). Hence, the relative advantage of BI&A is much crucial for small businesses, because unlike other technologies such as e-commerce or online marketing, BI&A is composed of broad functionalities, methodologies, and processes that need careful evaluation to determine the appropriateness of its use (Llave, 2017). For example, using BI&A for sales forecasting is relevant in wholesale and retail businesses but not in the financial service industry. Based on these perspectives, the relative advantage of BI&A is

applied as one of the determinants of Philippine MSMEs' intention to adopt. Thus, the study hypothesizes that:

H1: Perceived relative advantage is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

Complexity in this study refers to the degree of MSME's perception of how difficult it is to understand and use BI&A. The DOI of Rogers (1962) emphasized that the complexity of new technology is a barrier to adoption. This construct is the opposite view of perceived ease of use from the concepts of TAM of Davis (1989). While these views are defined differently, both suggest that technology is more likely to be adopted if it is easy to learn and understand. This view has support from prior studies suggesting that technologies involving a steep learning curve negatively affect the adoption decisions of SMEs as it raises uncertainty and risk (Alshamaila *et al.*, 2013; Boonsiritomachai *et al.*, 2016; Ramdani *et al.*, 2013). Although the user interface of BI&A applications is much easier to use nowadays, potential adopters still need to have knowledge and skills in other areas to generate reliable results (Olszak & Ziemia, 2012). For example, BI&A requires expertise in data preparation and basic statistics. Such requirement is a problem for small firms because they lack internal knowledge and in-house IS experts (Ghobakhloo *et al.*, 2011; Thong, 1999). Thus, the complexity of BI&A is a concern for small businesses because of their limited technological capability. For these reasons, complexity is applied in this study as a factor affecting the intention of Philippine MSMEs to adopt BI&A. Accordingly, the study proposes the following hypothesis:

H2: Perceived complexity is negatively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

Perceived cost in this study refers to the financial resources involved in the adoption and implementation of BI&A. The lack of resources and technical capability are some of the prevailing problems of most SMEs worldwide that compel them to be cautious in investing in technological innovation (Maduku *et al.*, 2016; Thong, 1999). IS literature in technology adoption of SMEs (Kumar *et al.*, 2017; Maduku *et al.*, 2016; Puklavec *et al.*, 2017; Ramayah *et al.*, 2016) has identified this construct as negatively associated with adoption intention. In their study, Maduku *et al.* (2016) and (Ramayah *et al.*, 2016) identified cost as one of the main factors affecting mobile marketing adoption and website continuance of SMEs. Considering that BI&A involves a much complex implementation process, therefore, it is practical to expect that cost is a factor that affects MSMEs' decision to adopt the technology as they need to invest in upgrades of computer hardware, software, employee training, and IS consulting services (Cristescu, 2016). Consequently, the overall implementation cost needed for BI&A adoption will also depend on the current technological capabilities of MSMEs instead of mainly on the cost of software alone. Thus, the perceived cost of BI&A implementation was applied in this study as it is a potential determinant of MSMEs' intention to adopt due to their limited financial resources for innovations. Similarly, the study hypothesizes that:

H3: Perceived cost is negatively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

Organizational context

Resource-based view theory (Barney, 1991) defines top management support as an essential relationship resource of an organization. Thong (1999) stressed that a supportive environment is necessary to maintain organizational climate and boost employee motivation towards successful innovation adoption. Prior studies have identified top management as a positive driver of technology adoption in SMEs (Kumar *et al.*, 2017; Maduku *et al.*, 2016; Puklavec *et al.*, 2017; Ramdani *et al.*, 2013). One of the reasons is that the adoption of enterprise technology heavily relies on the commitment of top management to provide sufficient resources throughout its implementation (Alshamaila *et al.*, 2013). Organizations are commonly confronted with difficulties when adopting technological innovations as it impacts organizational processes and their ways of doing business. Kulkarni *et al.* (2017) emphasized that maintaining top management commitment is an enabling factor in innovation adoption of organizations as it helps facilitate changes and reduce user resistance. This factor is more crucial for small firms because of their highly centralized structure wherein the owner makes most decisions to align IT utilization to organizational objectives and strategies (Thong, Yap, & Raman, 1996). Based on these perspectives, top management commitment is applied in this study as a determinant of MSMEs' adoption intention towards BI&A. Accordingly, the study proposes the following hypothesis:

H4: Top management support is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

Cohen & Levinthal (1990) define absorptive capacity as "the ability of an organization to recognize the value of new, external information, assimilate it, and apply it to commercial ends." This capability develops based on the previous involvement of an organization in activities that will enhance the individual absorptive capacity of its members (Bozic & Dimovski, 2019). Organizations with a high absorptive capacity tend to recognize innovations and opportunities more than those with a moderate absorptive capacity (W. Cohen & Levinthal, 1990). However, most MSMEs have limited resources that impede them from adopting advanced technological innovations. Unlike large enterprises, small firms have low internal IS knowledge because of their inability to hire IT staff, which causes a lower level of awareness of the benefits of technological innovations. Moreover, small firms can only provide a limited career path that constrains them from retaining IS professionals (Thong, 1999). Following this viewpoint, this study includes the level of absorptive capacity as a positive driver of MSMEs' intention to adopt BI&A (Boonsiritomachai *et al.*, 2016; Maduku *et al.*, 2016; Ramayah *et al.*, 2016). Therefore, MSMEs are more likely to adopt the technology if they have sufficient organizational absorptive capacity. In the same way, this study hypothesized that:

H5: Absorptive capacity is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

The availability of organizational resources is defined in this study as the level of technological and financial readiness of MSMEs to adopt BI&A. Technological capability refers to the current IT usage and level of sophistication of an organization. On the other hand, financial capacity denotes the availability of resources for acquiring computer hardware, software, and other relevant IT consulting services (Iacovou, Benbasat, & Dexter, 2013). Both are considered necessary resources for an organization to adopt and implement technological innovations. In addition, Boonsiritomachai *et al.* (2016) suggest that time is also an essential organizational resource needed for technology adoption. However, small firms have very limited technological, financial, and human resources compared to large enterprises. In his study, Thong (1999) refers to this condition as resource poverty caused by severe constraints on financial resources and internal IS expertise (Ghobakhloo *et al.*, 2011; Maduku *et al.*, 2016). For these reasons, small firms face significant challenges and barriers to innovation, which compels them to be cautious in investing in modern IS. In a previous study by Maduku *et al.* (2016), the availability of financial resources was identified as a non-significant factor in the adoption of mobile marketing of SMEs in South Africa. In contrast, this study involves a much more complex enterprise technology compared to mobile marketing. Hence, previous findings may not be applicable in the context of BI&A in MSMEs. This study addresses this gap by examining the availability of organizational resources in the context of BI&A and MSMEs' adoption intention. Thus, this study proposes the following hypothesis:

H6: Organizational resource availability is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

The concept of information intensity denotes the volume of information present in an organization's commodity, services, and value chain (Ghobakhloo *et al.*, 2011). Businesses have different needs for information processing depending on the industry sector. For example, SMEs in the retail industry are information-intensive because of the volume of information in every product they sell. Also, the manufacturing value chain is information-intensive due to the interdependent activities involved in their production process. The intensity of information in an organization's products or services was identified in previous literature as a positive determinant of SMEs' decision to use IS (Ghobakhloo *et al.*, 2011; Thong, 1999). BI&A is a form of technology designed for transforming data into critical information for decision making and is, therefore, a competitive tool for information-intensive business organizations. On the other hand, firms from less information-intensive industries may find the technology unsuitable for their current needs. Thus, MSMEs are more likely to adopt BI&A if they are part of an information-intensive industry and are familiar with the uses of information for developing strategic and competitive advantages. Thus, information intensity was applied in this study as a decision factor for MSMEs to adopt BI&A. In the same way, the study hypothesized that:

H7: Information intensity is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

Environmental context

Business organizations adopt technological innovation to enhance existing processes and maintain a competitive position within their external environment (Ramdani *et al.*, 2013). In this study, competitive pressure refers to the degree of competition from the external environment experienced by business organizations. Competitive pressure was found as a positive determinant of technology adoption in SMEs (Boonsiritomachai *et al.*, 2016; Ghobakhloo *et al.*, 2011; Iacovou *et al.*, 2013). This internal pressure forms in an organization when the technology used by the industry, trading partners, and competitors is more advanced than what they are currently using. It causes firms to seek strategic advantage through technology upgrades and innovations (Paydar, Endut, Yahya, & Rahman, 2014). Competitive pressure can also emerge from the spread of technology adoption in other industries that are not considered competitors or trading partners (Alshamaila *et al.*, 2013). For example, as the number of BI users in a specific industry increases, non-adopters will start to appreciate the benefits of the technology. This condition also causes internal pressure and a tendency to adopt the same technology into their existing system to achieve the same level of capability. Thus, firms are more likely to adopt technology if they are operating in a highly competitive business environment. For these reasons, competitive pressure is included as an essential factor for MSMEs' intention towards BI&A adoption. Similarly, the study proposes that:

H8: Competitive pressure is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

This study defines vendor support as the external IS expertise and assistance from software companies to their respective customers (Ifinedo, 2011). This aids firms, irrespective of their size, during IS implementation process as software vendors generally provide computer hardware, software, maintenance, user training, and other technical support (Ramayah *et al.*, 2016; Thong, 1999). Previous empirical evidence shows that support from software vendors positively affects SMEs' decision towards innovation adoption as they are restrained by their limited IS expertise (Awa, 2016; Kumar *et al.*, 2017; Ramdani *et al.*, 2013). Thus, SMEs would greatly rely on external support as it helps reduce risk and uncertainty to ensure successful implementation, particularly on complex forms of IS. Furthermore, according to Ifinedo (2011), technology vendors serve as change agents in the planning and implementation stage, especially for organizations with insufficient internal IS capability, to bridge knowledge gaps and reduce user resistance (Alshamaila *et al.*, 2013). Based on these concepts, vendor support was applied in this study as a driver of MSMEs' intention to adopt BI&A. Accordingly, the following hypothesis is proposed:

H9: Vendor support is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

Individual context

The marketing and consumer behavior literature describes innovativeness as “the degree to which an individual makes decisions independent from the communicated experience of others” (Flynn & Goldsmith, 1993). The study of Agarwal & Prasa (1998) introduced the concept of PIIT as a personality trait associated with a person’s willingness to test emerging computer-based technologies. According to Rogers’s (1962) work in innovation diffusion theory, innovative individuals are novelty-seekers and can handle high levels of risk and uncertainty. Furthermore, it has been identified in the previous study by Thong (1999) that CEOs’ innovativeness influences organizational change because of their willingness to evaluate the potential advantages of IS. Empirical evidence also shows that the level of innovativeness positively affects the decision of SMEs to adopt technologies that involve relatively simple implementation such as websites (Ramayah *et al.*, 2016) and e-commerce (Ghobakhloo *et al.*, 2011). Hence, innovativeness is a critical factor for MSMEs’ decision to adopt because BI&A is an intricate technology that requires cautious assessment to determine its potential value to their organization. For instance, using BI&A for market-basket analysis is appropriate for the retail sector but may not be perfectly suitable for the accommodation and food services industry. For these reasons, personal innovativeness was applied in this study as a determinant of MSMEs’ intention to adopt BI&A. In turn, the study proposes the following hypothesis:

H10: Innovativeness is positively associated with the intention of MSMEs in the Philippines to adopt BI&A applications.

The proposed research framework and the hypothesized relationships are illustrated in Figure 1.

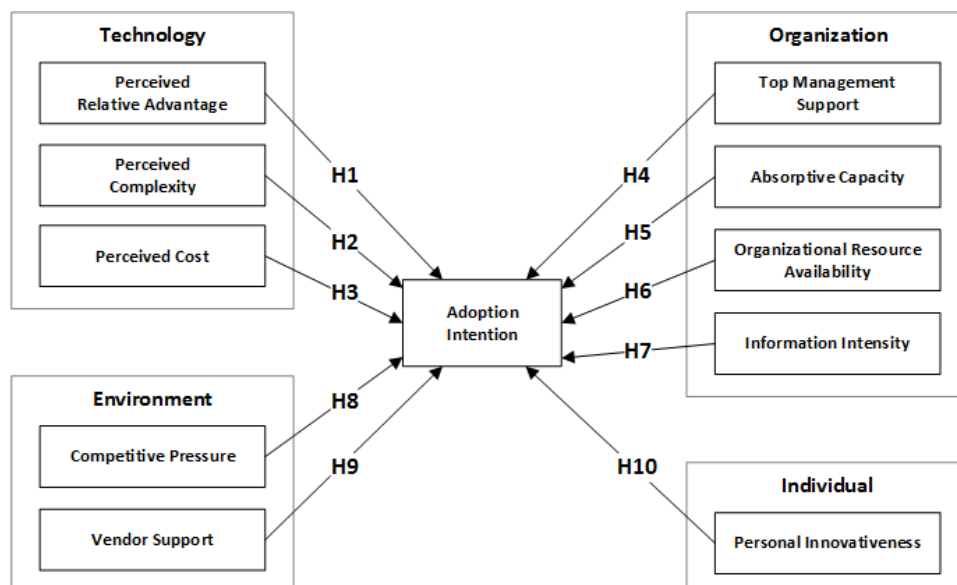


Figure 1: The research model

Methodology

The following section outlines the research methodology applied in this study to test the hypotheses, including measurement, sampling, data collection, and the examination of data for non-response bias and common method bias.

Measures

Ten independent variables were hypothesized as determinants of intention to adopt BI&A. All constructs have a minimum of three items to ensure that the results will yield adequate reliability. All constructs were measured using a 5-point Likert-type scale with values ranging from 1 (strongly disagree) to 5 (strongly agree). The measurement items were adopted from previously validated scales and aligned to the context of this study. The preliminary version of the survey instrument was administered to ten participants from the target population to gather some suggestions regarding the clarity of the instructions and questions. Enhancement of the questionnaire was applied based on the recommendations of the respondents. Before data collection, a pilot test with 40 MSMEs was conducted for preliminary examination of the measures. All measurement items of the questionnaire were above the recommended threshold of 0.70, indicating an adequate level of internal consistency and reliability based on Cronbach's Alpha coefficient.

Sampling and data collection

The study gathered the data from the National Capital Region (NCR) and Region 4A because the regions are two of the main contributors to the country's economy and the home of more than 35% of the total MSME population in the Philippines. NCR is the major contributor to the Philippine economy, concentrating on the production of industry-related goods and services with 36% GDP (DTI, 2018). Similarly, Region 4A is the second-largest contributing region hosting the highest concentration in the manufacturing of semi-processed industrial raw materials and components with around 17% GDP (DTI, 2018). Lists of registered MSMEs were requested from the Department of Trade and Industry (DTI) provincial office and were used to gather initial details. Four hundred MSMEs were randomly selected from the three largest industries, including manufacturing, wholesale and retail, and accommodation and food services sectors. Selected respondents are owner-managers or managers who are responsible for or have significant involvement in IT adoption decisions.

The survey was administered in government-sponsored training and seminars for MSMEs within the regions through collaboration with Negosyo Centers and SME-Roving Academy program coordinators. These are programs spearheaded by the DTI to facilitate access to services, training, and development programs for MSMEs. The data gathering processes collected a total of 244 survey responses, and all of them

indicated that they are not currently using BI&A. Survey questionnaires from unqualified respondents based on the stated criteria or with more than 15% incomplete answers were, therefore, dropped for further analysis (Hair, Hult, Ringle, & Sarstedt, 2017). This data filtering process yields 202 valid responses, indicating a 51% response rate.

Non-Response Bias & Common method bias

A test for potential non-response bias was conducted by comparing the distribution of early and late respondents using the Kolmogorov-Smirnov test. The results indicate a significant dissimilarity among early and late respondents (p-value > .10 for all variables), indicating that potential non-response bias is not present in the model (Ryans, 1974). Considering that the data in the study were from self-contained questionnaires, a test for possible common method bias was also performed using Herman's single factor test method (Podsakoff, Mackenzie, Lee, & Podsakoff, 2003). The result shows that the first factor accounted for approximately 14% of the variation present in the model, indicating the absence of common method bias (Harman, 1976). A further test was conducted using the full collinearity assessment approach (Kock & Lynn, 2010). The findings show that the variance inflation factors (VIFs) of all latent variables are below the recommended threshold (3.3), which further indicates that the model is free from common method bias.

Results

The descriptive analysis was performed using SPSS v.22 to examine the profile of the respondents. The dataset for the research framework was examined using partial least squares structural equation modeling (PLS-SEM) with SmartPLS v.3 to test the hypothesized causal relationship between latent variables. PLS-SEM is the most suitable method for this research because it works efficiently for relatively sample size and non-normal data distribution (Hair *et al.*, 2017). The subsequent sections present the data analysis, including descriptive statistics, the assessment of measurement, and structural models to test the proposed hypotheses.

Descriptive Statistics

The profile of research participants is composed of owners and managers with 70.3% and 29.7%, respectively. The majority of the respondent are between 31 to 50 years old and are mostly are females (72.3%). Their highest level of education shows that 75.2% of them are college graduates, 14.9% have completed a vocational or diploma course, and the rest have master's and doctoral degrees. The results also show that most of the respondents are from the manufacturing (43.6%), wholesale and retail industries (33.2%), and accommodation and food services (23.3%).

The descriptive statistics of measurement items have a mean above the midpoint with standard deviations between 0.792 to 1.268. Data distribution was also assessed based on the values of skewness and kurtosis. The recommended threshold

for examining normality is that indices should be within +1 and -1 (Hair *et al.*, 2017). The skewness values are between -1.400 and 0.501, and kurtosis values are between -0.770 and 1.460. The skewness and kurtosis values of ACAP4, PRAV1 PRAV2, and PRAV3 are higher than the recommended threshold, indicating a slight non-normality. Thus, the result of the normality test further suggests the appropriateness of a non-parametric method for analysis.

Measurement Model Evaluation

The measurement model was assessed for internal consistency reliability, indicator reliability, convergent validity, and discriminant validity (Hair *et al.*, 2017). Internal consistency reliability was evaluated using Cronbach's alpha (CA) and composite reliability (CR) values of all dependent and independent variables (Benitez, Henseler, Castillo, & Schuberth, 2020). The values presented in Table 3 indicate that the CA and CR coefficients of constructs are above the 0.70 threshold (Chin, 2010), which implies that all measurement items have a substantial level of internal consistency.

In Table 3, indicator loadings of measures are mostly higher than the threshold value of 0.70 and significance levels less than 0.001. The outer loadings of IINT4 (0.6965) and INNO2 (0.6708), which were slightly below the critical value and items, should be dropped from the model to increase composite reliability (CR) or average variance extracted (AVE) values. The CR of IINT4 and INNO2 are 0.8585 and 0.8427 and are above the critical value of 0.70. Furthermore, the average variance extracted (AVE) values of IINT4 (0.5491) and INNO2 (0.5736) are also higher than the recommended threshold of 0.50, which therefore suggests that there is no need to drop the measures from the model.

Table 3: Results of measurement validity

Construct	Item	Factor loading	CA	CR	AVE	VIF
Perceived relative advantage	PRAV1	0.8635	0.9042	0.9329	0.7766	1.1642
	PRAV2	0.8878				
	PRAV3	0.8862				
	PRAV4	0.8874				
Perceived complexity	PCMP1	0.7155	0.8222	0.8809	0.6503	1.1443
	PCMP2	0.7781				
	PCMP3	0.8677				
	PCMP4	0.8550				
Perceived cost	PCST1	0.8560	0.8868	0.9209	0.7443	1.1252
	PCST2	0.8622				
	PCST3	0.8824				
	PCST4	0.8501				
Top management support	TMSP1	0.7914	0.8138	0.8750	0.6370	1.0984
	TMSP2	0.8278				
	TMSP3	0.8378				

	TMSP4	0.7312				
Absorptive capacity	ACAP1	0.8473	0.8832	0.9142	0.7273	1.0829
	ACAP2	0.8806				
	ACAP3	0.8680				
	ACAP4	0.8138				
Organizational resource availability	ORAV1	0.9144	0.8953	0.9233	0.7507	1.1241
	ORAV2	0.8484				
	ORAV3	0.8392				
	ORAV4	0.8617				
Information intensity	IINT1	0.7105	0.8096	0.8585	0.5491	1.0833
	IINT2	0.7933				
	IINT3	0.7108				
	IINT4	<u>0.6965</u>				
	IINT5	0.7880				
Competitive pressure	CPRE1	0.7641	0.7862	0.8610	0.6079	1.1686
	CPRE2	0.7828				
	CPRE3	0.8141				
	CPRE4	0.7564				
Vendor support	VNSP1	0.8507	0.8792	0.9146	0.7284	1.1266
	VNSP2	0.9022				
	VNSP3	0.8468				
	VNSP4	0.8116				
Innovativeness	INNO1	0.7995	0.7523	0.8427	0.5736	1.2002
	INNO2	<u>0.6708</u>				
	INNO3	0.7520				
	INNO4	0.7999				
Intention to adopt	IADP1	0.9019	0.8606	0.9150	0.7820	
	IADP2	0.8711				
	IADP3	0.8798				

The convergent validity of variables was examined based on the AVE coefficients. The AVE values of latent variables should be higher than the recommended threshold of 0.50 (Chin, 2010; Hair *et al.*, 2017). As presented in Table 3, the results indicate that all constructs explain more than half of the variance of its indicators, which also implies that convergent validity of the measurement model was achieved (Hair *et al.*, 2017; Sarstedt, Ringle, Smith, Reams, & Hair, 2014).

The discriminant validity was examined based on the cross-loadings, Fornell-Larcker criterion, and the heterotrait-monotrait ratio of correlation (HTMT). All indicator loadings of constructs are greater than the loadings on other constructs. Furthermore, factor loadings of primary constructs are 0.2 higher than the loadings with other constructs, indicating the absence of major cross-loadings between latent variables. Fornell-Larcker's criterion requires that the square root of AVE of a construct should be greater than its correlation with other constructs (Fornell &

Larcker, 1981). Table 4 shows that each construct's square root of AVE (on-diagonal) is greater than its correlation with any other latent variable (off-diagonal), thus providing additional support for the model's discriminant validity.

HTMT is also a recommended measure of discriminant validity in PLS-SEM (Henseler, Ringle, & Sarstedt, 2015). Examining a model using this criterion requires values to be lower than the threshold of 0.90 (HTMT_{.90}) or a more conservative threshold of 0.85 (HTMT_{.85}) to be considered acceptable (Henseler *et al.*, 2015). As shown in Table 5, HTMT values of all constructs are less than 0.85, indicating that the measurement model has substantial support for discriminant validity.

Table 4
Square root of AVE and correlation of constructs

	ACAP	CPRE	IINT	INNO	IADP	ORAV	PCMP	PCST	PRAV	TMSP	VNSP
ACAP	0.8528										
CPRE	0.1392	0.7797									
IINT	0.0153	0.0039	0.7410								
INNO	0.1159	0.2391	0.0506	0.7574							
IADP	0.2036	0.4339	0.1078	0.5344	0.8843						
ORAV	0.1364	0.0445	0.1570	0.2086	0.1853	0.8664					
PCMP	-0.1251	-0.2526	-0.0035	-0.2277	-0.3979	-0.1300	0.8064				
PCST	-0.1011	-0.1898	-0.0795	-0.2042	-0.2957	-0.1163	0.1758	0.8628			
PRAV	0.1693	0.2008	0.1076	0.2440	0.5136	0.1328	-0.1749	-0.1971	0.8813		
TMSP	0.0838	0.1409	0.1537	0.1182	0.3392	0.0214	-0.0043	-0.1803	0.1828	0.7981	
VNSP	0.1829	0.1555	-0.1111	0.1877	0.1170	0.1779	-0.1302	-0.0558	0.1271	0.0561	0.8534

Note: on-diagonal values are the square root of AVE; off-diagonal values are inter-construct correlations

Table 5
Heterotrait-monotrait ratio of correlation

	ACAP	CPRE	IINT	INNO	IADP	ORAV	PCMP	PCST	PRAV	TMSP	VNSP
ACAP											
CPRE	0.1441										
IINT	0.0665	0.0994									
INNO	0.1478	0.2985	0.1148								
IADP	0.2072	0.5200	0.1146	0.6565							
ORAV	0.1411	0.0832	0.2037	0.2249	0.1835						
PCMP	0.1453	0.3043	0.1231	0.2725	0.4587	0.1405					
PCST	0.1069	0.2364	0.1151	0.2542	0.3299	0.1215	0.2060				
PRAV	0.1858	0.2400	0.1501	0.2830	0.5797	0.1345	0.1942	0.2190			
TMSP	0.0997	0.1811	0.2322	0.1545	0.3900	0.0703	0.0745	0.2015	0.2114		
VNSP	0.2086	0.1738	0.1245	0.2265	0.1267	0.2092	0.1570	0.0730	0.1361	0.0935	

Structural Model Evaluation

The structural model was examined for potential collinearity, path coefficient and significance, predictive accuracy, effect size, and predictive relevance (Chin, 2010; Hair *et al.*, 2017). The collinearity between latent variables was examined based on each construct's variance inflation factors (VIF). High levels of collinearity (or multicollinearity) can lead to insignificant estimates that can also change the signs of weaker constructs (Benitez *et al.*, 2020; Hair *et al.*, 2017; Kock & Lynn, 2010). A construct VIF value greater than the threshold of 5.0 (Hair *et al.*, 2017) or 3.3 (Kock & Lynn, 2010) indicates a presence of collinearity. As presented in Table 3, VIF values of constructs are all below the recommended 3.3 threshold value, indicating support for the absence of collinearity between latent variables (Hair *et al.*, 2017; Kock & Lynn, 2010).

The path coefficients of each hypothesized causal relationship and their corresponding *p*-values are presented in Table 6. The results of hypothesis test and path coefficients show significant positive relationships of PRAV (H1) ($\beta = 0.3042$, *p*-value < 0.001), TMSP (H4) ($\beta = 0.2038$, *p*-value < 0.001), CPRE (H8) ($\beta = 0.2065$, *p*-value < 0.001), and INNO (H10) ($\beta = 0.3296$, *p*-value < 0.001) on IADP. Moreover, the test also indicates a significant negative relationship between PCMP and IADP (H2) ($\beta = -0.2066$, *p*-value < 0.001). The *p*-values of path relationships from PRAV, TMSP, CPRE, INNO, and PCMP to IADP are significant at a 0.1% error probability (Hair *et al.*, 2017). Therefore, the structural model evaluation supports H1, H2, H4, H8, and H10.

In contrast, the findings also reveal that the path relationships from PCST (H3), ACAP (H5), ORAV (H6), IINT (H7), and VNSP (H9) to IADP are non-significant. The associated *p*-values of these path relationships are higher than the significance level of 0.05; therefore, these relationships are insignificant and are not supported. Furthermore, the H9 was hypothesized to have a positive relationship, but the results reveal it was negative. Thus, H9 is still unsupported even if the path relationship is significant.

Table 6
Results of hypothesis testing

Path coefficient and significance						Effect size	
Hypothesis	Hypothesis path	Path coefficient	T-value	<i>p</i> -value	Decision	<i>f</i> ²	Interpretation
H1	PRAV->IADP	0.3042***	5.5178	<0.001	Supported	0.1971	Medium
H2	PCMP->IADP	-0.2066***	3.5827	<0.001	Supported	0.0925	Small
H3	PCST->IADP	-0.0509	1.0705	0.2845	Not Supported	0.0057	No Effect
H4	TMSP->IADP	0.2038***	4.3362	<0.001	Supported	0.0937	Small
H5	ACAP->IADP	0.0451	0.8844	0.3765	Not Supported	0.0047	No Effect
H6	ORAV->IADP	0.0350	0.6166	0.5375	Not Supported	0.0027	No Effect
H7	IINT->IADP	0.0075	0.1204	0.9041	Not Supported	0.0001	No Effect
H8	CPRE->IADP	0.2065***	3.7375	<0.001	Supported	0.0905	Small
H9	VNSP->IADP	-0.0704	1.2520	0.2106	Not Supported	0.0109	No Effect
H10	INNO->IADP	0.3296***	6.4075	<0.001	Supported	0.2243	Medium

Note: f^2 0.02=small effect; 0.15=medium effect; 0.35=large effect; *** $p < 0.001$

Aside from the values of path coefficients and significance level, R^2 was also examined using a bootstrap process with 5000 iterations to test the model's level of predictive accuracy. Hair *et al.* (2017) suggested that values of 0.25, 0.50, and 0.75 of an endogenous variable can be interpreted respectively as weak, moderate, and substantial moderate. Based on the result, the IADP R^2 value of 0.5966 suggests that the model had gained a moderate level of predictive accuracy.

Effect size (f^2) is another path coefficient measure that indicates the impact of a specific independent construct when omitted from the model. Chin (2010) suggests that f^2 values of 0.02, 0.15, 0.35 are equivalent to small, medium, and large effect sizes, respectively (J. Cohen, 1988). Based on this criteria, the effect sizes of PRAV ($f^2 = 0.1971$) and INNO ($f^2 = 0.2243$) indicates a medium effect, while PCMP ($f^2 = 0.0925$), TMSV ($f^2 = 0.0937$), and CPRE ($f^2 = 0.0905$) represents small effect (J. Cohen, 1988).

The predictive relevance of the model was examined based on Stone-Geisser's Q^2 and blindfolding procedure. Q^2 values of 0.02, 0.15, and 0.35, represent small, medium, and large predictive relevance. The result shows that the IADP Q^2 value of 0.4417 is substantially large, indicating strong support for the predictive relevance of the model (Hair *et al.*, 2017).

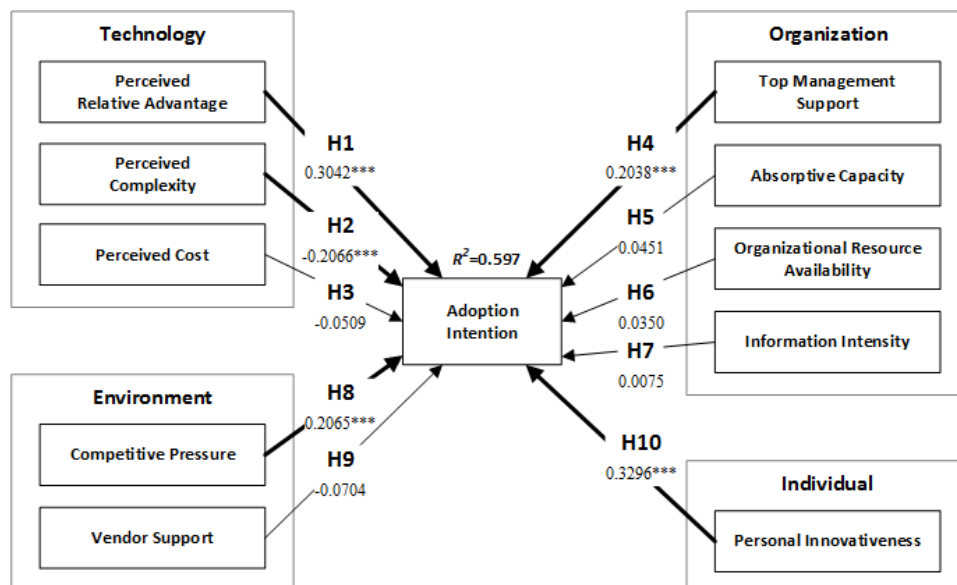


Figure 2: Results of the research model

Additionally, model fit was also evaluated to determine the model's exploratory power based on standardized root mean square residuals (SRMR), RMSttheta, and exact model fit measure (Hair *et al.*, 2017). The results indicate that the model has a good fit with an SRMR value of 0.0591 below the cut-off value of 0.08. Moreover, the model's RMSttheta value of 0.1197 is also lower than the recommended threshold of 0.12. (Benitez *et al.*, 2020). Lastly, the exact model fit criterion test reveals

that the model's SRMR (0.0591) is lower than the HI95 of SRMR (0.0753), d_ULS (3.4586) is lower than the HI95 of d_ULS (5.6280), and d_G (1.2595) is lower than the HI95 of d_G (.17378), which also indicates that the model has an acceptable overall fit.

Discussion and implications

Technological Context

The hypothesis test shows a positive relationship between the relative advantage of BI&A and behavioral intention. This relationship implies that MSMEs which are knowledgeable about the advantages and benefits of BI&A are more likely to have a higher propensity towards adoption. This result supports previous findings on the influence of relative advantage on the level of BI&A adoption (Boonsiritomachai *et al.*, 2016). Thus, the assessment of the construct further confirms this relationship in the context of MSMEs in the Philippines. A negative influence of perceived complexity on intention towards BI&A adoption also emerged from the findings. This relationship implies that MSMEs which believe that the technology is hard to incorporate into their existing tasks because their limited IS knowledge are less likely to have the propensity towards its adoption (Maduku *et al.*, 2016). In contrast with previous findings, the results also reveal that perceived cost is not associated with the adoption intention of MSMEs (Kumar *et al.*, 2017; Ramayah *et al.*, 2016). A plausible explanation for this is the availability of free and trial versions of basic BI&A software packages for learning its fundamental applications.

Organizational Context

Among the factors of organizational context, the support of top management exhibits a positive impact on the intention of MSMEs to adopt BI&A. This result implies that critical decisions related to management and investment are all part of the responsibilities of top managers (Puklavec *et al.*, 2017; Ramdani *et al.*, 2013). Thus, this finding further revalidates this relationship in the context of non-adopters of BI&A. On the other hand, the test of hypotheses indicates no significant link between absorptive capacity and intention to adopt BI&A, which means that organizational absorptive capacity does not influence the adoption intention of MSMEs toward BI&A. A possible explanation for this is that Philippine MSMEs tend to be reactive and develop internal capacity only when needed because of their limited resources. (W. Cohen & Levinthal, 1990).

Similarly, this study found that organizational resource availability has no significant relationship with adoption intention. The result is potentially affected by the availability of relevant BI&A desktop applications that Philippine MSMEs can use for initial learning and testing. These software products provide basic functionalities sufficient for planning and technology evaluation. Hence, the availability of their resources for adoption is initially less significant during the technology evaluation stage. This result also indicates that their need for more advanced capabilities in the future would lead organizations to consider the availability of their resources.

Information intensity also reveals no relationship with intention to adopt BI&A. This result implies that MSMEs' decision to adopt BI&A is not affected by the volume of information from their goods, services, or processes. While this result contradicts Ghobakhloo *et al.* (2011) and Paydar *et al.* (2014), it reveals the difference between potential and existing adopters of technology. A plausible explanation for this result is that potential adopters of BI&A are still in the early stages of the innovation-decision process (Rogers, 1962). Potential adopters are currently more concerned about the functionalities, relevance, and benefits of the technology to their business. Thus, MSMEs would consider the intensity of their information resources if they already understand the usefulness of BI&A to improve their existing processes.

Environmental Context

Competitive pressure shows a positive relationship with adoption intention in the environmental context. This finding suggests that MSMEs' intention of adopting BI&A is affected by the level of competitiveness from their external business environment. Consistent with previous findings, this study further revalidates that competitive pressure is an enabling factor for Philippine MSMEs to adopt BI&A (Ghobakhloo *et al.*, 2011; Kumar *et al.*, 2017). In contrast, vendor support is not associated with the intention of MSMEs to adopt BI&A. This finding suggests that the availability of support from vendors is not a factor for MSMEs to adopt BI&A. A possible reason for this finding is that potential adopters are still examining the capabilities of the technology and its appropriateness to their existing practices. Hence, MSMEs may rely on vendor support as they progress to a more complex implementation of BI&A, for example, integration to their database system to develop a real-time analytics dashboard.

Individual Context

Personal innovativeness shows a positive influence on MSMEs' adoption intention. This finding suggests that their willingness to evaluate new technologies significantly affects their decision to adopt BI&A. This result is consistent with Puklavec *et al.* (2017), who identified rational decision-making culture as a driver of the early stage of BI&A adoption. Thus, the study further confirms that personal innovativeness determines the propensity to adopt advanced technology in Philippine MSMEs.

Practical Implications

This study has several implications for organizational decision-makers, technology vendors, and government agencies regarding the growth of MSMEs. BI&A vendors should offer their products to innovative business owners for testing and evaluation to help increase awareness of the potential benefits and relevance of the technology to their business operations. Technology vendors and online learning websites for analytics could provide specifically designed courses in basic analytics for small businesses. Government agencies and BI&A consultants may also promote

and regard attitude and innovativeness as crucial psychological components of technology decisions that drive innovation adoption aside from technical knowledge and skills. Furthermore, it is also necessary to enlighten small business owners and managers on the importance of top management involvement in innovation adoption. Capability-building programs of the government should be in line with the advantages and perspectives of using the technology as it aids in developing a positive behavioral attitude of top management towards adoption. The knowledge of top management is essential in adopting advanced technologies, particularly when the benefits of an innovation outweigh its costs. For example, the utilization of BI&A for predicting and monitoring the spread of a global pandemic could greatly help different MSME sectors to devise appropriate business strategies that will help increase their capability to survive an economic downturn.

Research contribution

The study contributes to both business and IS literature as it supports the TOE framework and PIIT in the context of BI&A. Previous studies have focused on existing adopters, whereas non-adopters have received less attention. The findings of this study reveal that PIIT plays a very significant role in the innovation adoption decision of non-adopters. Moreover, the study underscores the unique characteristic of non-adopters of technology, which implies that strategies and support for existing adopters are not entirely suitable for non-adopters. Finally, the work also contributes to the extensive literature on technology adoption in SMEs and information system models. It verifies the uniqueness of factors affecting non-adopters in the context of advanced IS and MSMEs in the Philippines. Thus, the results presented in the study would serve as a basis in developing models for future research on the adoption of innovations in small businesses.

Limitation and future research

This work also has several limitations to be considered for future investigations. First of all, this research covered modern business intelligence that refers to desktop and cloud-based BI&A applications. Therefore, it is recommended for future studies to assess the adoption of traditional BI&A in MSMEs. Further, the unit of analysis of this study only includes MSMEs from the three largest industry sectors. A study focusing on technology adoption of a specific business industry sector could yield different findings. Comparing the BI&A adoption of MSMEs from urban and rural areas is also a relevant research subject for future studies. It is also recommended for future studies to examine other related constructs. For example, government support and perceived risk are also potential variables associated with MSMEs' adoption intention. Future research may also consider examining the mediating role of perceived risk. Previous literature in business shows that the relationship of personal innovativeness on individuals' adoption intention is associated with risk and uncertainty. Lastly, the moderating effect of perceived risk on the relationship between top management support and adoption intention is also a factor to be considered in future studies.

Conclusion

The study examined the factors affecting the intention of Philippines MSMEs to adopt BI&A systems through the development and examination of the conceptual framework. The overall findings revealed that the determinants of Philippine MSMEs' intention to adopt BI&A are the advantages and complexity of the technology, support from top management, intensity of competition, and level of innovativeness of the members of an organization.

Among these five significant factors, personal innovativeness and relative advantage of technology are the most influential drivers of behavioral intention. In contrast, the remaining constructs (perceived cost, absorptive capacity, organizational resources availability, information intensity, and vendor support) indicate no direct impact on the intention of MSMEs. Thus, the study suggests that the adoption of advanced technology in Philippine MSMEs is highly associated with technology and individual factors than internal organizational knowledge and capability, which further confirms the significant difference between adopters and non-adopters of innovations. The study contributes to the literature on technology adoption by centering on understanding the differences among potential users of innovations. These findings also contribute valuable insights for government agencies in charge of developing strategies and programs for the MSMEs in the country.

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Appendix A Measurement items

Construct	Item ID
Relative Advantage (Ghobakhloo <i>et al.</i> , 2011; Maduku <i>et al.</i> , 2016)	
Business intelligence and analytics would enable our employees to save time in preparing reports.	PRAV1
Business intelligence and analytics would help our company access business information quickly.	PRAV2
Business intelligence and analytics would help our company access business information efficiently.	PRAV3
Business intelligence and analytics can aid top management in decision-making.	PRAV4
Complexity (Ghobakhloo <i>et al.</i> , 2011; Maduku <i>et al.</i> , 2016)	
Learning to use business intelligence and analytics would require much time.	PCMP1
Learning to use business intelligence and analytics is difficult.	PCMP2
Business intelligence and analytics would be difficult to implement in our company.	PCMP3
Business intelligence and analytics would be difficult to integrate into our current work.	PCMP4
Cost (Ghobakhloo <i>et al.</i> , 2011; Maduku <i>et al.</i> , 2016)	
The cost of business intelligence and analytics would be greater than the expected benefits.	PCST1
The cost of maintaining business intelligence and analytics would be very high for the company.	PCST2
The cost involved in providing a support system for business intelligence and analytics would be too high for the company.	PCST3
The amount of money to be invested in the training of employees for business intelligence and analytics would be too high.	PCST4
Top management support (Lai, Lin, & Tseng, 2014; Maduku <i>et al.</i> , 2016)	
Top management would be enthusiastic about adopting business intelligence and analytics.	TMSP1
Top management would provide training opportunities to employees in using business intelligence and analytics.	TMSP2
Top management would provide the necessary tools for exploring the capabilities of business intelligence and analytics.	TMSP3

Top management would encourage employees to explore the TMSP4 capabilities of business intelligence and analytics.

Absorptive Capacity (Liang, Saraf, Hu, & Xue, 2014; Teo, Wan, Wang, & Wei, 2003)

Our employees have extensive training in using computer-based ACAP1 applications in their work.

Our company can provide adequate technical support in using ACAP2 business intelligence and analytics.

Our company knows who can help solve business intelligence and ACAP3 analytics problems.

Our company can provide training for business intelligence and ACAP4 analytics to employees regularly.

Organizational Resource Availability (Boonsiritomachai *et al.*, 2016)

Our company has sufficient technological resources for adopting ORAV1 business intelligence and analytics.

Our company has sufficient financial resources for adopting ORAV2 business intelligence and analytics.

Our company can provide training and IS support for adopting ORAV3 business intelligence and analytics.

Our company has sufficient time for learning business intelligence ORAV4 and analytics.

Information intensity (Ghobakhloo *et al.*, 2011; Thong & Yap, 1995)

Our company needs to have access to reliable information for IINT1 decision making.

The company's daily operations rely on accurate information. IINT2

Our company needs to have access to relevant information for IINT3 decision making.

The company's daily operations rely on up-to-date information. IINT4

Our company needs to have quick access to information when IINT5 needed.

Competitive pressure (Maduku *et al.*, 2016; Thong & Yap, 1995)

Our decision to adopt business intelligence software would be CPRE1 strongly influenced by our competitors in the industry.

I am aware that our competitors were already using business CPRE2 intelligence and analytics.

Our company needs business intelligence and analytics to gain CPRE3 competitiveness in the market.

Adopting business intelligence is a strategic necessity for the CPRE4 company.

Vendor support (Al-Qirim, 2005; Ifinedo, 2011)

Vendors of business intelligence and analytics should provide VN-SP1 appropriate technical support.

Vendors of business intelligence and analytics help SMEs must VN-SP2 understand the benefits and risks of adopting the technology.

Vendors of business intelligence and analytics should provide free VN-SP3 training for our employees.

Vendors of business intelligence and analytics should actively VN-SP4 promote the technology for SMEs.

Innovativeness (Agarwal & Prasa, 1998; Thong & Yap, 1995)

If I heard about new information systems for business, I would look INNO1 for ways to experiment with them.

I am one of those who first tried out new information systems for INNO2 business.

In general, I am hesitant to try out new information systems for INNO3- business. (Reverse code)

I like to experiment with new information systems for business. INNO4

Intention to use (Venkatesh *et al.*, 2003)

I intend to use business intelligence and analytics in the next 6 IADP1 months.

I predict that I will use business intelligence and analytics in the next IADP2 6 months.

I plan to use business intelligence and analytics in the next 6 months. IADP3

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Author Credits Declaration

RBS: Conceptualization, methodology, software, model solution, data curation, writing- original draft preparation.

MTS: Supervision, writing-reviewing, formatting, and editing.

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What Drives High Penetration Rates Of Social Media? A Qualitative Comparative Analysis Across Countries

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Abstract

Purpose – This study examines the drivers of high social media penetration rates (SMP) across countries by considering the concurrent causation of cultural and socio-economic conditions.

Method – Ninety-four countries across continents were analyzed using the set-theoretic configurational approach fuzzy set Qualitative Comparative Analysis (fsQCA 3.0).

Findings – The results reveal that adult literacy rate is necessary, and four causal combinations for high social media penetration rates were identified.

Limitations – This study uses secondary data at a single point, including only two socio-economic conditions in the design.

Implications – This study is among the first to test and provide evidence of SMP as an outcome of cultural and social-economic conditions using QCA. It contributes to theory by advancing our knowledge of what combination of cultural and social-economic factors would result in high or low SMP. This study provides implications for digital marketers and social media technology designers and suppliers. It provides greater insights into what combination of cultural and social-economic conditions may facilitate or inhibit the adoption of social media platforms. Our findings can also help social media managers in their global targeting initiatives (practical implications). Our study offers insights for social policymakers by identifying multiple paths which enhance social media's penetration as decision-makers increasingly realize its potential and long-term benefits (social implications).

Originality – This study is among the first to test and provide evidence of SMP as an outcome of cultural and social-economic conditions using QCA. It identifies four complex antecedent paths that contribute to high SMP, allowing for a more comprehensive explanation of our outcome of interest.

Keywords: Social media penetration, cultural dimensions, social-economic conditions, qualitative comparative analysis

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Introduction

Fueled by the ubiquity of smartphones, the digitization of user-generated content, and the phenomenal growth of e-commerce, the world has witnessed the explosive evolution of social media and its potential influence on how people interact and make decisions. Digital marketers who capitalize on such trends invest more in social media to make their brands more accessible, engaging, and shoppable.

With its overwhelming global reach, more social media research is needed since the extent to which it has been embraced varies considerably from country to country. For example, while Facebook is indisputably the most popular (Statista, 2020), its global user base is by no means universal or equally distributed. Moreover, Facebook has a relatively low penetration in countries where domestic social media platforms generate more traffic, such as Line in Japan (Society, 2019), WeChat in China (Dick, 2017; Gupta *et al.*, 2018), Kakao Talk in South Korea (Chadha, 2017), VKontakte in Russia and a handful of its neighbors (E-commerce Nation, 2019; Zinovieva, 2014). The success of these home-grown social media can be at least partially accredited to their cultural appropriateness (Goodrich and De Mooij, 2014). Echoing these observations, an increasing body of literature reveals direct or indirect associations between adoption and use of Internet-mediated technology and underlying cultural values and social interaction patterns of a country (e.g., Dinev & Hart, 2006; Yoon, 2009; Udo & Bacghi, 2011; Hoehle *et al.*, 2015; Huang, 2017; Lin & Ho, 2018). There is a pronounced need to investigate why the social media adoption rates in many countries are higher.

The present study addresses the gap in the extant literature by incorporating multiple cultural dimensions and social-economic variables. Most existing research uses cultural dimensions to shape social media penetration (SMP) by following the traditional linear approach. For example, Goodrich and De Mooij (2014) argued that Hofstede's cultural dimensions could explain cross-cultural differences in online and offline purchase decisions. However, there remains some ambiguity. For instance, Chile and

Finland have high SMP rates - while Chile scored 63 in the power distance dimension and 23 in the individualism dimension, Finland scored 33 and 63 on these two dimensions. Could we infer that power distance and/or individualism could explain the high SMP rate of these two countries? The findings of several other studies could be questioned similarly (e.g., Alsaleh *et al.*, 2019; Dadgar *et al.*, 2017; Kim *et al.*, 2011). Hence, there is a scope to believe that these causations should be a combination leading to high SMP; and a configurational approach is in need. This research intends to view SMP as a concurrent outcome of cultural and socio-economic conditions. Specifically, we use QCA (Ragin, 2000) to test and provide evidence of SMP as an outcome of cultural and social-economic conditions. We aim to further the theory of social media adoption at the country level by examining whether different cultural dimensions combined with other social-economic conditions would account for significant variations in social media adoption. Thus, the current research contributes to theory by advancing our knowledge of what combination of cultural and social-economic factors would result in high or low SMP.

The remainder of the paper is structured as follows. The literature review in Section 2 explains relevant factors influencing social media adoption. Section 3 describes our research design, data set and respective sources, and analytical methods. Section 4 presents our empirical results. Finally, section 5 concludes with a discussion of the findings, implications, limitations, and directions for future research.

Literature Review

Extensive literature has been developed to address new product adoption behaviors. The seminal conceptualizations of Everett Rogers (1962) have been at the forefront of this literature. Over the ensuing decades, the adoption and diffusion of innovation literature have spawned considerable theoretical development and extensive empirical evidence. Moreover, this literature has bifurcated into two prevalent approaches: the individual level (such as studies that measure the effects of adopters' demographic traits or perceptions of an innovation's characteristics on adoption patterns or compare the adoption rates of different innovations) and the system level (such as those that consider the nature of a social system and the relative extent to which an innovation is adopted within communities, countries, or other social units having different economic, demographic and cultural characteristics).

At the individual level, from the early empirical literature and on which the conceptualizations (e.g., Eastin, 2002; Kiiski & Pohjola, 2002; Murdock & Franz 1983; Stoneman, 1983) are based, we know that new product adoption among individuals is affected by consumer demographics (e.g., age, income, education, mobility), personal characteristics/psychological factors (e.g., general and domain-specific innovativeness, involvement, social interaction, attitudes toward risks, and opinion leadership), and perceived product attributes (e.g., perceived usefulness and ease of use). These factors

are important constructs found in the Technology Acceptance Model (TAM) (e.g., Bagozzi *et al.*, 1992; Davis, 1985, 1989; Venkatesh & Davis, 2000; Alarcón-del-Amo *et al.*, 2014) and human-computer interaction (HCI) literature (e.g., Helander, 1988; Shackel, 2009). While the findings related to demographic traits have not always been consistent, substantial evidence suggests that consumer innovators/early adopters tend to be younger, have higher income levels, and are more educated (Dee Dickerson & Gentry, 1983; Gatignon & Robertson, 1991; Rogers, 2003). For example, in their meta-analysis of the effects of socio-demographic factors, Feng *et al.* (2019) found that individuals who were female, younger, well-educated, well-paid, and urban residents were more likely to use social media.

At higher social levels, diffusion can be viewed as a prolonged social process through which new cultural elements, such as technological innovations, are presented to society. If accepted by its people, these elements are further integrated into a preexisting culture (Dearing, 2009). Country adoption rates and how the populace of different nations engages with social media vary considerably, even within the same global region (Kemp, 2020). There is a nascent body of literature whose findings have linked various aspects of Internet-mediated technology adoption and use implicitly or explicitly to a nation's underlying cultural values and social interaction patterns (e.g., Dinev & Hart, 2006; Sia *et al.*, 2009; Yoon, 2009; Udo & Bacghi, 2011; Hoehle *et al.*, 2015; Huang, 2017; Lin and Ho, 2018). Unlike other commercial technologies, social media is a communication technology that people may use for both personal and commercial purposes. Moreover, personal use may involve social or asocial activities or some combination of both (Zhao, 2006). Thus, cultural factors may play a significant role in influencing consumers' social media behaviors.

National Culture

People's behaviors are both a component and a reflection of the culture they are embedded in (Baligh, 1994). Hofstede (1991, p. 5) defines national culture as "the collective programming of the mind which distinguishes the members of one group or category of people from another." His original framework included four dimensions: individualism (vs. collectivism), femininity (vs. masculinity), power distance, and uncertainty avoidance (Hofstede, 1980, 2001), and has been expanded with two more: long-term (vs. short-term) orientation and indulgence (vs. restraint). Ratings on these dimensions for many countries are provided on his website (Hofstede Insights, 2020).

Hofstede's framework has been employed by numerous studies on social media adoption both at the country (e.g., Desmarchelier & Fang, 2016; Dwyer *et al.*, 2005; Ganesh *et al.*, 1997; Kumar and Krishnan, 2002; La Ferle *et al.*, 2002) and individual levels (e.g., Faqih & Jaradat, 2015; Hoehle *et al.*, 2015; Van Everdingen & Waarts, 2003; Yoon, 2009), and robust relationships have been reported between cultural dimensions and the penetration of high-tech products such as the Internet, cellular phones, and PCs. As such,

it has been an acceptable and frequently used means to capture cultural values for several decades.

Individualism-Collectivism (IDV) This dimension describes the relationship between the group and the individual. It reflects how people view themselves as independent or identify themselves within groups (Triandis & Gelfand, 2012). There is growing evidence suggesting that IDV values serve as indicators of how people form their social networks, use strong/weak ties as behavioral references, and engage in collective actions (Beugelsdijk, 2019; Granovetter, 1973, 1978, 1983; Hu *et al.*, 2014; Triandis, 1995; Triandis *et al.*, 1988). This dimension has further implications for the social media adoption, as revealed in the structures of online social networks (i.e., size and relative presence of strong versus weak ties) and the underlying bridging or bonding role of the structures (Choi *et al.*, 2011; Hu *et al.*, 2014; Rosen *et al.*, 2010).

Because of their prioritization and emphasis on personal needs, social media users from individualist cultures tend to prize autonomy, differentiation, and uniqueness (Aaker & Maheswaran, 1997), and their roles in various social relationships broadly define their identities. In this respect, social networking can be seen as a manifestation of one's identity and a means of self-expression. For instance, Rosen *et al.* (2010) found that people have a proclivity to engage in more attention-seeking behaviors via social media in individualistic cultures. Specifically, social media users from such cultural backgrounds have more extensive networks of friends, and a greater proportion of them have not met face-to-face, as opposed to users who identify with more collectivist cultural backgrounds.

In contrast, members from collectivistic societies are more likely to join and participate in social media activities to enhance their sense of belonging, fulfill group duties, and achieve interpersonal harmony. Gangadharbatla (2008) found that the need for belonging positively affects a person's attitude toward social media and willingness to use them. Kim and Yun (2007) reported that most Koreans use social media to keep close ties with a small number of friends instead of befriending new people.

Masculinity-Femininity (MAS) This cultural dimension focuses on how a society stresses achievement or nurture and is closely related to societal expectations of gender roles (Hofstede, 2011). Masculine cultures value achievement and material success more and have more apparent role distinctions between males and females. In contrast, feminine cultures value caring and nurturing behaviors, are concerned with the quality of life, and have more fluid gender roles (Hofstede, 1980, 2001). Individuals from feminine cultures tend to pay more attention to the availability of technologies that are expected to influence the quality of their lives (Tarhini *et al.*, 2017). In addition, the social aspects of social media seem to be more germane in feminine cultures where the nurturing of personal relationships is more appreciated (Hoehle *et al.*, 2015; Magnusson *et al.*, 2014; Ribi  re *et al.*, 2010; Singh, 2006).

Power Distance Index (PDI) This cultural dimension is designed to measure the acceptance of power established in relationships within institutions and organizations of a society (Hofstede, 1991) and is related to conservatism and the status quo (Steenkamp, 2001). Countries with high PDI tend to be less innovative because people in such cultures are more likely to adopt a hierarchy where everyone has a place, follow directions, and avoid standing out through original thinking (Herbig and Miller, 1993), prefer to be told what to do, and rely more on opinions from reference groups. These attributes may influence their adoption decision-making (Hofstede, 2011; Daniels & Greguras, 2014; Zhang *et al.*, 2018). In lower PDI cultures characterized by more democratic or consultative relations, individuals have more autonomy and are less worried about status; thus, more innovative behaviors can be expected, and new ideas may be adopted more freely (Hofstede, 2011; Im *et al.*, 2011; Capece *et al.*, 2013; Zhang *et al.*, 2018). A greater degree of empirical evidence indicates a negative relationship between PDI and innovation adoption (La Ferle *et al.*, 2002; Yenyurt & Townsend, 2003; Van Everdingen & Waarts, 2003). Social media use is considered democratic and creates a sense of leveling the equality of participants (Cook, 2008), therefore more in line with low power distance (Jacobs *et al.*, 2021).

Uncertainty Avoidance Index (UAI) This cultural dimension depicts how societies differ on the degree of tolerance of unpredictability. In cross-cultural studies, it has been used to understand why some ideas and business practices work better in some countries. Cultures with high UAI exhibit value stability, established rules, and a formality to life structure. Their citizens are generally more averse to change, tend to avoid the unconventional way of thinking and behaving, and are more likely to be concerned that widespread dissemination of information might lead to intentional or unintentional information distortion (Bettis-Outland, 1999). Therefore, the cultural environment in these societies is less conducive to innovativeness. Research has found a negative impact of uncertainty avoidance on the SMP (Schlagwein & Prasarnphanich, 2011) and other technological innovations (e.g., La Ferle *et al.*, 2002; Lynn & Gelb, 1996; Yenyurt & Townsend, 2003).

Long-term Orientation (LTO) This cultural dimension captures the notion of Confucian dynamism, i.e., how societies view time and whether they focus on present or past, or the future (Ford *et al.*, 2009). People with long-term orientation subscribe to the values of persistence, perseverance, saving, adapting, and a strong work ethic; thus, long-term rewards are expected because of the hard work. Trust and reciprocity are encouraged to build and maintain relationships, reducing future risks and possible opportunistic behaviors (Hallikainen & Laukkanen, 2018; Wang *et al.*, 2015). Short-term-oriented societies consider that the present or past is more important than the future. People in these societies are apt to emphasize achieving quick results and be more sensitive to social trends (Hofstede, 2011; Yoon, 2009; Zhang *et al.*, 2018). Shen and Liu (2019) found that concern for future consequences was negatively associated with the

motivation of using social media for both entertainment and relaxation and for information to solve problems.

Indulgence-Restraint (IND) The last dimension is the culture's tendency regarding the fulfillment of desires. It has, to date, not yet been widely applied to academic research nor for intercultural training. The scores for this dimension are available from fewer countries than the previous dimensions. Countries on the indulgence end allow or encourage relatively free gratification of basic and natural human desires related to enjoying life and having fun. Their populations consider freedom of speech important, perceive themselves to have control over their personal lives, and declare themselves happy. Conversely, populations from countries toward the restraint end tend to suppress gratification of needs, are regulated by strict social norms, are more pessimistic, and carry perceptions of helplessness (Lu *et al.*, 2018; Hofstede Insights, 2020).

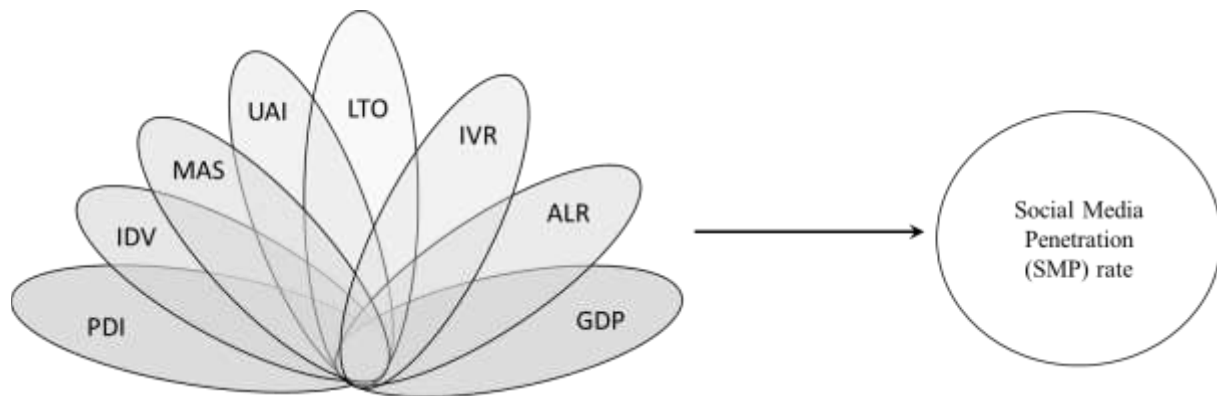
Social-economic conditions

Education (Literacy Rate) In a literature review, Rogers (1983) reported that 73 percent of past studies support a positive relationship between education and innovativeness. From a causal perspective, education and socio-economic development are mutually related. In other words, each fosters the other, and a compelling body of research links education to economic development and growth (Schweke, 2004). Education facilitates socio-economic development by lubricating workers' movement between sectors, providing necessary skills and attitudes, and encouraging rapid rural-to-urban migration as literate agricultural workers seek better lives in cities. An educated workforce reduces training costs while allowing an accelerated pace of technological change in the workplace. By the same token, more affluent nations have higher levels of literacy, considerable public and private support for education, and extensive arrays of educational institutions. Thus, it is logical to expect that the demand for technological innovations and related skills will be driven, at least in part, by the degree of education in a population (Robison & Crenshaw, 2002). Despite the inherent logic to this rationale, Techatassanasoontorn and Kauffman (2005) note that the effect of education on technology growth is mixed, which may be affected by whether special skills are required to use the innovation. As an intuitive communications platform, social media no longer require more skills than one would need to use a smartphone. Thus, education may not be a determining factor.

Wealth (GDP per Capita) According to Rogers (1995), innovation diffusion studies also revealed that early adopters tend to have greater wealth. Individuals with higher income have the financial resources to invest in new technologies even before the advantages of the innovation are recognized by other adopters. In addition, they can better afford the risk associated with early adoption because of their financial strength (Maitland & Bauer, 2001). At the country level, one measure of a nation's wealth is its GDP per capita, which is frequently used in empirical studies. Such a measure is in part

an aggregation of individuals' wealth and should predict adoption just as the individual-level measure (i.e., annual personal or household income) would. According to Beise (2005), countries with high income per capita command a demand advantage for innovation. In addition, Jha and Majumdar (1999) argue that greater GDP per capita signifies the greater affordability of a country's population.

To summarize the literature review in this section, the following configural model is proposed.



Note: PDI = Power distance, IDV= Individualism, MAS = Masculinity, UAI = Uncertainty avoidance, LTO = Long term orientation, IVR = Indulgence, ALR = Adult literacy rate, GDP = GDP per capita in USD

Figure 1: Foundational complex configural model

Research Methodology

Due to the difficulty in collecting country-level data on a global scale, we utilized secondary data from several reputable sources, namely Hofstede's cultural dimension scores (Hofstede Insights, 2020), We Are Social's 'Digital in 2020 Yearbook' (Kemp, 2020) for SMP level, and World Bank Group (2019) and World Population Review (2019) for literacy rates. Data were compiled for 94 countries.

We used the set-theoretic configurational approach fuzzy set Qualitative Comparative Analysis (fsQCA 3.0) (Ragin, 2000, 2009), which is an emerging methodological choice for data analyses in social science, such as marketing and social media related studies (e.g., Capatina *et al.*, 2018; Johansson-Berg and Kask, 2017, Mikalef *et al.*, 2016). QCA is an analysis technique that combines both qualitative and quantitative methodologies to compare cases and establish causal relationships and helps researchers determine which conditions cause an outcome of interest. Despite its applicability for large-scale studies, it is especially pertinent in social science research that requires substantial knowledge from a small number of comparable cases (Roig-Tierno *et al.*, 2017). Another advantage of QCA is its ease and effectiveness in dealing with complex

configurations and antecedents that are often investigated in the social sciences (e.g., access to the Internet, income level, and other demographic factors). Fainshmidt *et al.* (2020) summarized some major benefits of using QCA, including handling smaller sample sizes, identifying multiple configurations of casual condition (conjunctural causation and equifinality), and asymmetric solutions for a given outcome, and paving the way for additional qualitative exploration. In addition, in a recent study, Lin (2017) utilized multiple regression analysis (MRA) and fsQCA to examine the causal complexity of passengers' intentions to re-ride. The MRA revealed that satisfaction with facilities and service, ride convenience, and service range are all accountable for the strong intentions of passengers to re-ride. Furthermore, fsQCA identified seven complex antecedent paths that account for strong intentions to re-ride, demonstrating that QCA has more explanatory power than MRA.

Analysis and Results

Calibration of the causal conditions and the outcome

We first transformed the raw data into fuzzy sets by assigning degrees of membership in the interval from 0 to 1 through the calibration process (Ragin, 2009). We then followed the calibration process by using the calibration function built in the fsQCA 3.0 software. Finally, to calibrate the data, we specified three qualitative break-points [full non-membership (0), cross-over (0.50), and full membership (1)] as depicted in Table-1.

Table 1: Break-points for calibrating fuzzy sets

Conditions	Type of fuzzy set	Construction rules
Power distance	3- values	1.0 = Most high-power distant countries that score 100 (ex. Malaysia)
		0.5 = Middle power distant countries that score 50 (ex. Italy scores =50, South Africa=49)
		0.0 = Least power distant countries that score 11 (ex. Austria)
Individualism	3- values	1.0 = Most individualistic countries that score 91 (ex. USA)
		0.5 = Middle individualistic (or collectivist) countries that score 45 (ex. Argentina=46)
		0.0 = Least individualistic countries that score 10 (ex. Bolivia)
Masculinity	3- values	1.0 = Most masculine countries that score 100 (ex. Slovakia)
		0.5 = Middle masculine (or feminine) countries that score 50 (ex. Pakistan)
		0.0 = Least masculine countries that score 5 (ex. Sweden)
Uncertainty avoidance	3- values	1.0 = Highest uncertainty avoidance countries that score 100 (ex. Uruguay)

		0.5 = Countries at the middle of the uncertainty avoidance that score 45 (ex. Dominican Republic)
		0.0 = Least uncertainty avoidance countries that score 8 (ex. Singapore)
Long term orientation	3- values	1.0 = The highest in the long-term orientation (most pragmatic countries) that score 100 (ex. South Korea)
		0.5 = Countries at the middle of the long-term orientation that score 47 (ex. Bangladesh)
		0.0 = Least long-term oriented (normative culture) countries that score 0 (ex. Puerto Rico)
Indulgence	3- values	1.0 = The highest in the indulgence (most pragmatic countries) that score 100 (ex. Venezuela)
		0.5 = Countries at the middle of the indulgence that score 45 (ex. Bolivia score 46)
		0.0 = Least the indulgent (Restrained) countries that score 0 (ex. Pakistan)
Adult literacy rate	3- values	1.0 = Highest adult literacy rate 1.00 (ex. Finland /Estonia)
		0.5 = Middle adult literacy rate 0.90 (ex. Since more and more countries are heading towards complete literacy, we choose 0.90 as the cross-over for the adult literacy rate. Lebanon, Brazil, and the Dominican Republic are examples of countries.)
		0.0 = Lowest adult literacy rate 0.29 (Burkina Faso)
GDP per capita in USD ¹	3- values	1.0 = 105,000 USD (Luxembourg)
		0.5 = 25,000 USD (ex. Chile - 24600, Turkey -27000)
		0.0 = 1,300 USD (ex. Mozambique)
Social Media Penetration ²	3- values	1.0 = 75th percentile
		0.5 = 50th percentile
		0.0 = 25th percentile

¹ As the definition for middle-income countries is too broad (on the one hand, we have Tanzania USD 3200 GDP/capita; on the other hand, we have Malaysia 29,100 USD GDP/Capita). As such, we set 28,000 USD as the cross-over point.

² With the lack of a theoretical justification of defining “high” and “low” social media penetration rates, we followed the previous research (Orlandi *et al.*, 2022).

Analysis of the necessary conditions

Second, we performed the test of necessity to identify whether a causal condition was necessary for an outcome, where the consistency threshold was set at 0.90 (Ragin, 2009). We found that the adult literacy rate was a necessary condition for having a high SMP rate, while low GDP per capita was a necessary condition for medium/low SMP rate, as shown in Table-2.

Table 2: Analysis of Necessary Conditions

Conditions	High SMP		Medium/Low SMP (~)	
	Consistency	Coverage	Consistency	Coverage
Power distance	0.72	0.71	0.89	0.47
~Power distance	0.47	0.89	0.45	0.46
Individualism	0.52	0.87	0.49	0.44
~Individualism	0.67	0.71	0.86	0.49
Masculinity	0.58	0.81	0.69	0.51
~Masculinity	0.65	0.80	0.74	0.49
Uncertainty avoidance	0.80	0.73	0.88	0.42
~Uncertainty avoidance	0.37	0.85	0.44	0.54
Long term orientation	0.57	0.79	0.65	0.48
~Long term orientation	0.62	0.77	0.72	0.47
Indulgence	0.63	0.86	0.60	0.43
~Indulgence	0.58	0.73	0.80	0.53
Adult literacy rate	0.91	0.78	0.73	0.33
~Adult literacy rate	0.23	0.61	0.52	0.74
GDP per capita	0.61	0.95	0.49	0.41
~GDP per capita	0.62	0.70	0.94	0.56

Analysis of sufficient conditions

The third step was to reconstruct the fuzzy-set data matrix as a truth table (Ragin, 2009). The truth table looks for the sufficient configurations for a given outcome by listing all logically possible 2^k combinations of causal conditions, where k is the number of causal conditions (Paykani *et al.*, 2018; Ragin, 2009) (please see appendix-3 for the truth tables). As such, our eight causal conditions would lead to 256 combinations of causal conditions. The following procedure minimized the initial truth table to only relevant combinations to the outcome. For minimization, we chose the frequency threshold at three and the Consistency cutoff at 0.90 (Ragin, 2009). Then, we selected the standard analysis to derive the three different sets of solutions: complex, intermediate, and parsimonious solutions (Ragin, 2008) (see appendix 1 and 2 for the complex and parsimonious solutions). Among the three sets of solutions, the intermediate solution is considered the optimal solution as it offers a balance between the parsimonious and complex solutions (Ragin, 2008, 2009). Table 3 provides the configurations for high SMP derived from the intermediate solution. Coverage refers to how much the outcome is covered or explained by a particular configuration/solution, while consistency denotes the degree to which the membership in the configuration/solution is a subset of the outcome (Ragin, 2009). The solutions coverage is 0.46, while the solution consistency is 0.94 for the high SMP.

Besides the presence and absence of a causal condition, we also signify the core and complementary conditions using larger and smaller circles. Core conditions are part

of both parsimonious and intermediate solutions, while complimentary conditions are only part of the intermediate solutions.

Table 3: Intermediate Solution (Social Media Penetration)

Model: $SMP = f(pdi, idv, mas, uai, lto, ivr, alr, \text{ and } GDP)$

Algorithm: Quine-McCluskey, Frequency cutoff: 3, Consistency cutoff: 0.92598,

Solution coverage: 0.464981, Solution consistency: 0.946175

Sl#	PDI	IDV	MAS	UAI	LTO	IVR	ALR	GDP	Coverage		Consistency	examples of countries
									Raw	Unique		
1	○	●		●	○	●	●	●	0.26	0.05	0.97	Finland (0.64,0.77), Australia (0.58,0.93), Iceland (0.57,0.98), Norway (0.57,0.92), New Zealand (0.55,0.95), Canada (0.54,0.88)
2	●	○	○	●	○	●	●	○	0.31	0.12	0.93	Paraguay (0.65,0.67), Uruguay (0.58,0.97), Bolivia (0.51,0.86), Chile (0.51,0.97), Peru (0.51,0.94)
3	○	●	○	●	●	○	●	●	0.23	0.02	0.97	Lithuania (0.57,0.87), Estonia (0.56,0.7), Latvia (0.53,0.59)
4	●	●	●	●	●	○	●	●	0.24	0.03	0.97	Czechia (0.60,0.59), Slovakia (0.58,0.53), Japan (0.52,0.86)

Note: PDI = Power distance, IDV= Individualism, MAS = Masculinity, UAI=Uncertainty avoidance, LTO = Long-term orientation, IVR = Indulgence, ALR = Adult literacy rate, GDP = GDP per capita in USD.

● = Core causal condition present; ○ = Core causal condition absent

● = Complementary causal condition present; ○ = Complementary causal condition absent

Conclusions

This research analyzes eight factors (Power distance, Individualism, Masculinity, Uncertainty avoidance, Long-term orientation, Indulgence, Adult literacy rate, and GDP per capita) that might contribute to the high SMP rate. FsQCA (Ragin, 2008) is used to determine the necessary conditions that may cause a high SMP rate and combinations of sufficient conditions for high SMP. Previous research exerts that QCA is a data analysis technique that aims to facilitate a dialogue between ideas and evidence (Charles, 2008; Kort *et al.*, 2016). To do so, QCA explores two sets of conditions of a given outcome – necessary conditions and sufficient conditions.

The necessary conditions must be present for an outcome to occur (Beynon *et al.*, 2018). The finding that the adult literacy rate is a necessary condition for high SMP reemphasizes the connection between education and innovation. (Rogers, 2010). For instance, as of January 2021, SMP rates for India, Ghana, Kenya, and Nigeria are 32.3%, 26.1%, 20.2%, and 15.8%, respectively; while the adult literacy rates of those countries are 69.3%, 79%, 81.53%, and 62.02% respectively. Therefore, based on our research findings, Ghana and Kenya have the potential to witness a high SMP rate in the coming days (since they have a higher adult literacy rate). The relationship between adult literacy and social media is not static; instead, it is reciprocal. Rogers (2003) noted that the innovation-decision process is an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation. In this process, an individual learns about the existence of the innovation, seeks information about the innovation, and develops either a negative or positive attitude toward the innovation. The literacy level will undoubtedly impact or even determine an individual's ability to learn and process the new information and shape one's attitude toward innovation. Feldman (2015) argued that social media could foster adult learners' knowledge construction. As such, a high adult literacy rate may increase the SMP rate, which could further promote adult skills development and training to ensure economic prosperity and poverty elimination. As the adult literacy rate is a necessary condition for achieving a high SMP rate, this study urges further investment in adult education in developing countries that could have a ripple effect on their socio-economic development. Pew research center (Poushter *et al.*, 2018) found that Internet use is more common in wealthier countries while India and sub-Saharan African countries are lagging behind. The finding that a low GDP is a necessary condition for having a low/medium SMP aligns with previous research. If we consider these two necessary conditions together, it can be inferred that causation of high/low SMP is more complex than it is usually thought to be as it is highly linked with socio-demographic factors, such as the literacy rate and the GDP per capita.

Further, we identified a sufficient combination of national cultural and social-demographic conditions for achieving a high SMP rate through intermediate solutions, consistent with theoretical and empirical knowledge. Four sets of casual conditions (configurations) for having a high SMP rate are identified, and the causal combinations explain approximately 46% of the outcome.

The first configuration ($\sim PDI * IDV * UAI * \sim LTO * IVR * ALR * GDP$) found high individualism (IDV) being a core causal condition. In contrast, the absence of power distance (PDI), presence of uncertainty avoidance (UAI), absence of long-term orientation (LTO), high indulgence (IVR), high adult literacy (ALR), and high GDP per capita are the complementary causal conditions for high SMP. The regions included in this configuration are countries in Oceania, Scandinavia, and North America. In these countries, the medium/low UAI indicates high trust in people and institutions (Goodrich & De Mooij, 2014), while high indulgence signifies positive emotions and enjoyment from

freedom of speech (Hofstede, 2011). Hence these two conditions coupled with high adult literacy and favorable economic conditions foster a higher SMP rate. This combination is interesting, as the effect of uncertainty avoidance on social media usage is mixed in the literature. Some argue (Campisi *et al.*, 2015; Dadgar *et al.*, 2017) about the positive effect of high UAI on social media usage based on users' behaviors of information seeking and posting on social media, while others (Gong *et al.*, 2014) suggest more social media usage resulted from the high trust nature of countries with low UAI. Cultural dimensions, such as UAI, should not be considered as a standalone factor for SMP; instead, other factors should also be taken into account.

The second configuration ($PDI^* \sim IDV^* \sim MAS^* UAI^* \sim LTO^* IVR^* ALR^* \sim GDP$) did not find any core causal condition. However, high power distance (PDI), low individualism (IDV), low masculinity (MAS), high uncertainty avoidance (UAI), low long-term orientation (LTO), high indulgence (IVR), in combination with high adult literacy (ALR) and low comparative GDP can also lead to a high SMP rate. The Latin American countries typify this configuration. Social network usage has been on the rise, with 82% of the population in the region accessing social networks since 2020. Goodrich and De Mooij (2014) mentioned that Hispanic students use social media to maintain contact with friends and family. The region's high power distance and low individualism manifest this trait. Nonetheless, the region's high SMP rates should be understood as a combination of conditions prescribed in this research.

The third configuration ($\sim PDI^* IDV^* \sim MAS^* UAI^* LTO^* \sim IVR^* ALR^* GDP$) reflects the Baltic region countries. Low masculinity turns out to be a core causal condition, while low power distance (PDI), high individualism (IDV), moderate uncertainty avoidance (UAI), high long-term orientation (LTO), low indulgence (IVR) combining with high adult literacy (ALR) and high GDP per capita can also lead to high SMP. Previous research (Dadgar *et al.*, 2017) found that high power distance and uncertainty avoidance infer high social media usage. However, even in the Baltic countries with low power distance (Lithonia, Estonia, and Latvia), high SMP is still attainable with the other dimensions indicated above.

The fourth configuration ($PDI^* IDV^* MAS^* UAI^* LTO^* \sim IVR^* ALR^* GDP$) exemplifies western Slavic countries and Japan. It identifies high adult literacy (ALR) as the core condition for high SMP, while high power distance (PDI), moderate individualism (IDV), high masculinity (MAS), high uncertainty avoidance (UAI), high long-term orientation (LTO), low indulgence (IVR), together with high adult literacy (ALR), and high GDP per capita can also lead to high SMP. Interestingly, most of the conditions within this mixed configuration show moderate to high indexes (e.g., power distance, individualism (note: Japan is not as a collectivist culture as its Asian neighbors), and uncertainty avoidance). Dadgar *et al.* (2017) found that these three dimensions would result in high SMP. This configuration advances their findings by suggesting a combined effect from other cultural dimensions and social-economic factors.

Our study reveals different configurations of conditions for high SMP in different world regions. Previous studies (Dadgar *et al.*, 2017; Stump & Gong, 2020) have regarded individual cultural dimensions as the significant cause(s) for social media penetration/adoption across all regions. Results of this study allow us to look at social media adoption/penetration from a more holistic view, i.e., as a result of a combination of the causal conditions. As discussed above, fsQCA identifies four complex antecedent paths that account for high SMP, allowing for a more comprehensive explanation of our outcome of interest.

Discussions

This study provides managerial implications for digital marketers and social media technology designers and suppliers. For the former, understanding the relationship between the adoption of social media and cultural orientations can be conducive to generating more effective social media marketing strategies. With the increasing connectedness in this digital age, global marketers should be more mindful and respectful of the expectations of their customers around the world and adjust their decision-making processes accordingly. Social media can be an effective tool to help global marketers learn about other cultures, overcome adjustment challenges, and establish and maintain relationships. All these accomplishments can accelerate the integration into the host culture during their adaptation (Sawyer & Chen, 2012). For the latter, this study provides greater insights on what combination of cultural and social-economic conditions may facilitate or inhibit the adoption of social media platforms. For example, digital marketers, when formulating their social media strategies targeting high UAI cultures, should provide simplified layouts and clear presentation of relevant information (such as prices, quality standards, straightforward visual content) to create a sense of confidence and comfort and reduce ambiguity for the users who prefer to make informed decisions based on all available data.

In contrast, digital marketers and web designers should indulge creativity when targeting societies with low UAI as users in these cultures would be more likely to explore fresh and trendy layouts, appreciate the fun and engaging user experiences, and enjoy more novel challenges (Klement, 2018a). When marketing to people in high PDI cultures, an orderly web layout, endorsements from celebrities and authority figures (regarded as more trustworthy and dependable), official certificates and approvals, or even national symbols and iconography would garner stronger responses from users. Meanwhile, customer reviews, testimonials, and user-generated content would work better in low-PDI countries where transparency is particularly important (Klement, 2018b). Our findings can also help social media managers in their global targeting initiatives. Customized social media programs can be designed to target a specific cluster of countries according to usage patterns, technological capability, and social norms. For instance, if a social media company wishes to increase its penetration in countries like

Brazil or El Salvador, it must consider the adult literacy rate. According to the third configuration of this research, all sufficient conditions are present in these two countries except high adult literacy rates.

More and more reports attest to social media's economic and social impact. For example, as reported by the National Bureau of Economic Research in a series of papers regarding the economic effects of social networks, social interactions enabled by the networking platforms such as Facebook can shape not only individual beliefs and behaviors (e.g., product adoption decisions such as cell phone purchase, investment in the housing market) but also many aspects of social and economic activities, including migration, international trade and social mobility (Stroebe & Kuchlur, 2021). For example, Bailey *et al.* (2020) find that social connectedness between two regions in Europe speaking the same language is about 4.5 times higher than two regions without a common language. Furthermore, a 10% increase in social connectedness between two regions is associated with a 12% to 17% travel increase between the regions by train. In Asia, particularly China, the effects of social networks on the national economy are perhaps much more prominent. WeChat, as the largest social media platform in China (Long, 2017), had a penetration rate (calculated by using active social media users as a proxy for WeChat users) of 65% in 2017 and 72% in 2019 (We Are Social, 2018, 2020). According to CAICT (2017, 2020), in 2019, WeChat-driven information consumption reached RMB 323.8 billion (compared to RMB 209.7 billion in 2017), representing 6% (compared to 4.7% in 2017) of China's total information consumption.

Moreover, it drove RMB 596.6 billion (compared to RMB 333.9 billion in 2017) in traditional consumption, covering travel, food, shopping, hotel, tourism, etc., by integrating the Internet, artificial intelligence, and big data technologies with the real economy. In addition, it contributed to the employment of 29.63 million (compared to 20.3 million in 2017) people. However, despite the rapid-growing influence on our societies, social media remains a relatively untapped source of information to catalyze policy action and social change (Yeung, 2018). Our study offers insight for social policy making by identifying multiple paths to enhance social media's penetration. In addition, decision-makers increasingly realize the potential and long-term benefits resulting from the continued use of social media analytics.

Limitations & Future Research

Several limitations of the study should be mentioned. First, using secondary country-level data from different sources may be criticized for being inconsistent and unreliable (Yeniyurt & Townsend, 2003). Second, the aggregated country-level data at a single point may not fully capture the variations in behaviors of individuals or ethnic subgroups within a country (Srite & Karahanna, 2006; Khastar *et al.*, 2011). Third, we only

included two social-economic conditions in this study. Hence, the results should be read with caution and interpreted in light of the limitations outlined here.

Future research could incorporate more socio-economic conditions, and more results regarding SMP may come to light. Future research could also explore the effects of the Internet, mobile and broadband penetration, changes in consumers' online behaviors, and the evolving competitive landscape in social media to enhance the predictive power of the proposed model. In addition, a larger sample with diverse nations and regions and a broader range of income and education levels would be desirable. Knowledge in this regard will help marketers understand the different effects resulting from combinations of these factors and form their expectations on customer satisfaction and retention. Finally, insights about the potential of social media in converting users into customers based on empathy and appreciation for social-cultural differences should help marketers design more effective viral and WOM marketing strategies that would allow for the most meaningful connection with customers.

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Appendix A: Measurement items

Model: $SMP = f(PDI, IDV, MAS, UAI, LTO, IVR, ALR, GDP)$

Frequency cutoff: 3; consistency cutoff: 0.92598

Configurations	Coverage		Consistency	Solution Coverage	Solution Consistency
	Raw	Unique			
~PDI*IDV*UAI*~LTO*IVR*ALR*GDP	0.26	0.05	0.97	0.46	0.95
PDI*~IDV*~MAS*UAI*~LTO*IVR*ALR*~GDP	0.31	0.12	0.93		
~PDI*IDV*~MAS*UAI*LTO*~IVR*ALR*GDP	0.23	0.02	0.97		
PDI*IDV*MAS*UAI*LTO*~IVR*ALR*GDP	0.24	0.03	0.97		

Appendix B: Parsimonious solution

Model: $SMP = f(PDI, IDV, MAS, UAI, LTO, IVR, ALR, GDP)$

Frequency cutoff: 3; consistency cutoff: 0.92598

Configurations	Coverage		Consistency	Solution Coverage	Solution Consistency
	Raw	Unique			
IDV	0.52	0.04	0.87	0.77	0.86
GDP	0.61	0.07	0.95		
~MAS*IVR	0.48	0.01	0.89		
~MAS*~LTO*ALR	0.46	0.02	0.93		

Appendix C: Truth table: High social media penetration

fs_pd i	fs_id v	fs_ma s	fs_ua i	fs_lto v	fs_iv r	fs_Literac y	fs_GD P	numbe r	fs_SM P	raw consist.	PRI consist.	SYM consist
0	1	0	1	1	0	1	1	3	1	0.969286	0.906927	0.906927
1	1	1	1	1	0	1	1	3	1	0.966959	0.894169	0.905909
0	1	0	1	0	1	1	1	3	1	0.963734	0.911909	0.911909
0	1	1	1	0	1	1	1	3	1	0.961346	0.895552	0.895551
1	0	0	1	0	1	1	0	5	1	0.92598	0.831661	0.831661
1	0	1	1	0	1	1	0	3	0	0.898322	0.772985	0.780069
1	0	0	1	1	0	1	0	11	0	0.847637	0.649789	0.65812
1	0	0	1	0	0	0	0	5	0	0.715297	0.388128	0.398438

Appendix D: Truth table: (~) Low / medium social media penetration

fs_pd i	fs_id v	fs_ma s	fs_ua i	fs_ltowv s	fs_iv r	fs_Literac y	fs_GD P	numbe r	~fs_SM P	raw consist.	PRI consist.	SYM consist
1	0	0	1	0	0	0	0	5	1	0.807365	0.585997	0.601563
1	1	1	1	1	0	1	1	3	0	0.71679	0.092872	0.0940914
1	0	0	1	1	0	1	0	11	0	0.711795	0.337553	0.34188
0	1	0	1	1	0	1	1	3	0	0.700714	0.0930736	0.0930735
0	1	1	1	0	1	1	1	3	0	0.668576	0.104449	0.104449
1	0	1	1	0	1	1	0	3	0	0.64972	0.217934	0.219931
1	0	0	1	0	1	1	0	5	0	0.634314	0.168339	0.168339
0	1	0	1	0	1	1	1	3	0	0.62458	0.0880914	0.0880914

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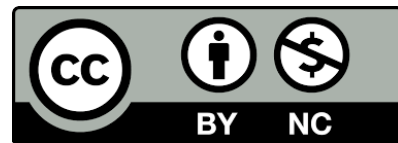
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