Industrial Marketing Management xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

Industrial Marketing Management

journal homepage: www.elsevier.com/locate/indmarman

Review paper

The adoption of technological innovations in a B2B context and its impact on firm performance: An ethical leadership perspective

Woon Leong Lin[a,1], Nick Yip[b,2], Jo Ann Ho[a,*,3], Murali Sambasivan[c,4]

[a] Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia
[b] Norwich Business School, University of East Anglia, United Kingdom
[c] Taylor's Business School, Malaysia, Thiagarajar School of Management, Madurai, India

ARTICLE INFO

Keywords:
Technological innovation
Corporate financial performance
B2B
Ethical leadership
System GMM

ABSTRACT

The introduction of the digital economy has opened much discussion on the various business models that challenge traditional thinking in B2B marketing. This includes technological innovation in the digital space which has brought about theoretical changes in the way marketing is applied, more so in the B2B environment where communication is essential in the alignment with various stakeholders. Several discussions on ethical leadership in the digital economy have provided some insights into addressing increased complexity in a society where markets are connected (physically) yet disconnected (proximity) and this has led marketing practices going astray. Our paper proposes the relevance of ethical leadership and its role in the application of technological innovation by arguing that technological innovation has a positive impact on firm performance and that ethical leadership plays a critical role in moderating this effect. We use a dynamic panel data system Generalized Method of Moment (GMM) approach to examine secondary data from 465 IT service companies and demonstrate that ethical leadership plays a critical role as it enables innovation through technology, and this has an impact on the firm's performance.

1. Introduction

When it comes to digital transformation within businesses, much has been discussed on the ways with which firms manage this ever-changing economic landscape. From social media strategies to mobile applications (Jussila, Kärkkäinen, & Aramo-Immonen, 2014), and from the digitisation of processes to the use of artificial intelligence (Zeng, Chen, Lusch, & Li, 2010), there is an abundance of research examining the impact of technological advancement in the digital sphere. These different researches have been given an additional boost from new technological innovation in the form of disruptive technology and novel digital thinking. For example, the introduction of the "sharing economy" (or as Harvard Business Review calls it the "access economy") and "collaborative consumption" in the marketplace has opened much discussion on the various business models that challenge traditional thinking in marketing. It is clear then that technological innovation in the digital space has brought about theoretical changes in the way marketing is applied, more so in the business-to-business (B2B) environment where communication is essential in the alignment of the various stakeholders. Gunasekaran, Marri, McGaughey, and Nebhwani (2002) define "B2B from an applications viewpoint as a form of information technology that electronically enables enterprise transactions among a variety of entities in order to satisfy organizational or individual objectives". For example, the understanding of the influence of social media within the sales process and its customers' satisfaction (Agnihotri, Dingus, Hu, & Krush, 2016; Itani, Agnihotri, & Dingus, 2017; Nunan, Sibai, Schivinski, & Christodoulides, 2018), social media usage and acceptance (Keinänen & Kuivalainen, 2015; Lacka & Chong, 2016), stakeholder relationships and interactions (Wang, Pauleen, & Zhang, 2016) brand innovation (Nguyen, Yu, Melewar, & Chen, 2015) and content marketing (Holliman & Rowley, 2014). Tandoc Jr, Lim, and Ling (2018) suggest that popular social media websites and mobile applications have morphed into perfect platforms to "produce, consume, and exchange different types of information" (p. 139) aimed at

* Corresponding author.
E-mail addresses: linwoonleong@gmail.com (W.L. Lin), N.Yip@uea.ac.uk (N. Yip), ann_hj@upm.edu.my (J.A. Ho), director@tsm.ac.in (M. Sambasivan).
[1] First author.
[2] Second author.
[3] Third author.
[4] Forth author.

https://doi.org/10.1016/j.indmarman.2019.12.009
Received 28 December 2018; Received in revised form 5 May 2019; Accepted 24 December 2019
0019-8501/

marketing to a very wide audience. From a branding perspective, it has been argued that such misinformation (sometimes referred to as fake news) impedes the firms' ability to connect with its consumers as "facts and fiction" can often be tied to one another. Under these circumstances, it can be argued that the information economy has also given rise to the misinformation age; and this problematic situation has grown over the last decade and is expected to escalate exponentially in the coming decades, unless some form of arrest is put in place.

In the wake of these pressing issues, discussions on leadership and specifically "ethical leadership" in the digital economy has paved the way for some insights into how this misinformation might be addressed. For example, it is often understood that ethical leadership is based on several constructs including behaviour, honesty, trust and fairness (Brown & Trevino, 2006). According to this study, ethical leadership is defined as "the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making" (Brown, Treviño, & Harrison, 2005, p. 120). These attributes are important in order to "predict outcomes" such as the perceived effectiveness of leaders, job satisfaction, dedication, overall management stability and performance (Brown et al., 2005). However, in the digital and knowledge economy, it is imperative to note that the rules of engagement have changed dramatically as leaders are now frequently and repeatedly asked about their roles in managing ethical issues such as greed, dishonesty and unscrupulous behaviour. In this regard, we argue that the role of ethical leadership is not only important as "agents of movers and shakers of collective action" (Morris & Staggenborg, 2004, p. 178) but is also duty-bound to ensure that organisations use digital technologies to communicate effectively, build stronger relationships and, develop effective strategies; all of which would have a positive impact on its trade performance.

These prominent emerging questions of ethical leadership (Bennett & Segerberg, 2013) in the technology-driven economy in recent years have raised several challenges including the notion that the increasing complexity of society where markets are connected (physically) yet disconnected (proximity) has lead marketing practices going astray. Strategies such as "paid social" and "pay per click" (Hanna, Rohm, & Crittenden, 2011) have encouraged a multitude of the consumer's privacy invasion on the B2C platform. However, little research has explored the role of ethical leadership in managing digital technologies within the B2B platform.

As such, this paper aims to explore the relationship between the adoption of B2B technological innovation, ethical leadership and its impact on firm performance (as indicated financially, and we use it interchangeably). In order to develop our study, we apply a dynamic panel data modelling approach by using the system Generalized Method of Moment (GMM) estimator to demonstrate that there is a positive relationship between technological innovation and firm performance and that ethical leadership moderates this relationship. We use this methodology as GMM is not usually applied in the B2B marketing domain, and this study might afford a starting point as to how industrial marketing and management researchers can utilize such datasets to provide insights for business practitioners (Ullah, Akhtar, & Zaefarian, 2018). Our paper commences with an examination of literature in B2B marketing technology, followed by ethical leadership. We then present our methodology and findings before concluding with a discussion on theoretical and practical implications.

2. Literature review and hypotheses development

2.1. Adoption of B2B marketing technology

Literature suggests that business-to-business (B2B) marketing is heavily reliant on managing relationships between stakeholders (Kim & Kumar, 2018). With technological advancement, efforts in marketing communications have been made easier with more frequent interactions between buyers and sellers. These interactions on the B2B platform are commonly used to build stronger relationships with the aim of influencing the buying behaviour of its customers through a comprehensive communication strategy (Agnihotri et al., 2016). These strategies are usually equipped with value propositions from the firm to the customer and its success depends on several factors including the evaluation of its messages, quality and consistency. In that respect, the significance of technological innovation to enhance competitive advantage and firm performance of B2B firms cannot be underestimated. For example, some research has shown that the disruptive power of technology can make existing B2B processes obsolete (Wiersema, 2013). This has encouraged increasing number of B2B firms to look towards technological innovation for enhancing efficiency, effectiveness and business growth. Reportedly though, not many new B2B technological innovations can lead to a better outcome (Nunan et al., 2018).

The marketing literature suggests that although there is much research examining B2B marketing, there remain gaps in our understanding of its nature (Lilien, 2016) and there is still much to learn (Cortez & Johnston, 2017). Ironically, Gummesson (2014) alleges that B2B firms appeared to have flourished without the assistance of academic input and this has further widened the gaps in B2B marketing literature. Several critical aspects of B2B marketing research that appears to be lacking is the role of technological innovation, its ethical adoption on the B2B platform and how it impacts the firm. Given the speed at which digitisation currently impacts the economy, and also with the rampant use of misinformation, it is surprising that not much has been done to address these different issues. Furthermore, while there is research to demonstrate the diversity of technologically innovative prospects that companies can potentially select from, it is also crucial to understand the suitability of the newly selected technological innovation that would impact on the firm's competitiveness and profitability, yet not much has been said about it.

Theoretically, the acceptance of B2B technological innovation, such as IT in Social Media Apps is widely used to facilitate multiple functions of the firm (Agnihotri et al., 2016). This can be observed as an enabler of development innovations from the standpoint of the adopter. If the application succeeds, it changes the practices of the firm and the new system is then adopted more widely throughout its firm's practices. In this respect, the adopted technology could enable the innovation to the extent that it proposes a new service to consumers in a way that is new to the business. For example, the development of new online inventory B2B software might typically switch from an old tedious method on how received orders are treated (Pagani & Pardo, 2017). This adoption not only assists the firm's operations but can extend throughout the supply chain. According to research, technological adoption including the use of social media can improve several aspects of the firm's business operations including successful innovation, distribution speed, revenues and partner relationships (McKinsey, 2013).

However, the benefits obtained through the adoption of B2B technological innovation in organisations are often confronted with challenges that contain not only the actions of the adopters but also the reactions of its customers, consumers and rivals. Therefore, the economic returns for stakeholders in a market are interconnected and this is important for the adoption of technological adoptions on the B2B platform (Pagani & Pardo, 2017). In that respect, the economic theory proposes that both the generation of a new supply action and the outward shift of an existing supply action could bring a better outcome and thus higher profit, even though these are achieved through diverse mechanisms (Hart & Sharma, 2004) such as the adoption of technology. This then implies that technological innovation is an important factor in B2B interaction as it can lead to better sales performance (Agnihotri et al., 2016; Li, Guo, Cao, & Li, 2018). The aim of this research is to investigate the role of ethical leadership in the relationship between technological innovation and firm performance.

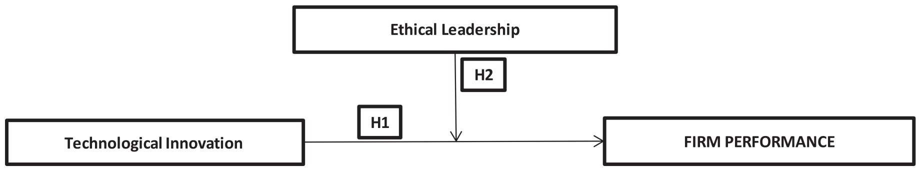

Fig. 1. Theoretical Framework.

2.2. Conceptual framework

The conceptual framework is developed from the literature review and shown in Fig. 1. It demonstrates the relationship between the dependent (ROA, ROE, ROIC) and independent (Technological Innovation) variables. It also determines the moderating effect of ethical leadership.

2.3. The relationship between technological innovation and firm performance

Innovation as a management term is ubiquitous as it relates to several concepts. Often, it can be described as an "iterative process" initiated by the perception of a new market opportunity for an invention which leads to the development, production, and marketing (OECD, 1991). These opportunities can include developing new ideas on products, methods of production, sources of supply, exploitation of new markets, new ways to organize business (Schumpeter, 1934), processes of improving capabilities and increased utility (Drucker, 1985; Farr & Ford, 1990). Recently, with more business processes engaging on the digital platform, research in innovation has increasingly focused on "technical innovation" including areas of management, marketing, economics and production engineering (Eurostat, 2005).

Conceptually, technological innovation refers to any incremental or radical change in technology embodied in product and process, including changes in value activities such as service and administration (Teece, 1986). From a resource-based view, this innovative capability, among other capabilities, is seen as critical to a firm achieving strategic competitiveness (Conner, 1991). Specifically, innovations enable a firm to offer a greater variety of valuable, rare, inimitable and differentiated products, and therefore lead firms to higher financial performance (Barney, 1991; Hitt, Hoskisson, & Ireland, 1994; Zahra, Ireland, & Hitt, 2000). In that respect, technological innovation can embody inventions from the industrial arts, engineering and the applied sciences. As a result, technological innovation is crucial to a firm acquiring and sustaining competitive advantage and improving its performance in a dynamic environment (Hannan & McDowell, 1990; Koellinger, 2008). Hence, research has shown that investments in R&D have been on the increase (Koellinger, 2008) as this may lead to increasing the competitive advantage of the firm.

Yet, an investment in technological innovation needs to be justified in terms of long-term economic gains and shareholder value (Srivastava, Fahey, & Christensen, 2001). This is especially true for firms considering investments in the adoption of specific technologies, such as IT which plays an important role for innovation through the improvement of processes or enabling firms to offer new products or services to its customers. Conversely, technology investments that do not result in innovations are considered as sunk costs since these investments will not result in improved firm performance (Levin et al., 1987; Teece, 1986).

Therefore, the relationship between technological innovation and firm performance is dependent on several factors. First, the ability of firms to transfer technology investments into innovation which tends to be influenced by firm-specific resources (Sampson, 2007). Second, the type and suitability of innovation that emerges from the firms' R & D investments to complement its business activities. Third, the intensity of the markets' competition which relates to the stage of the firm's technology adoption (i.e. whether the firm is an innovator, early adopter, late majority, or a laggard), the price-elasticity of demand of the firm's products or services, the firm's market share, and the negotiation power the firm possesses with its suppliers and customers. Fourth, choosing an appropriate strategy such as new products if the underlying design was unique, functionally elegant, and difficult to imitate can help the firm obtain supernormal profits from innovations, suggesting that the success of these tactics is likely to vary across industries and with the type of innovation carried out.

Alternatively, the literature mentions that if companies are unable to gain competitive advantages from its innovation, then competitors can gain through open competition (Levin et al., 1987; Teece, 1986). To evade the issue, companies normally seek out earnings through innovation by employing various strategies which include confidentiality, lead time, patents as well as the use of complementary capabilities (Cohen, Goto, Nagata, Nelson, & Walsh, 2002). However, the effect on a firm's performance will depend on the strategy chosen. With regards to the empirical and theoretical findings in the literature mentioned above, a significant relationship between a firm's performance and technological innovation was found (Hitt et al., 1994; McWilliams & Siegel, 2000; Teece, 1986). Thus, we put forth the following hypothesis:

Hypothesis 1. Technological innovation is positively related to firm performance.

2.4. Ethical leadership in the digital economy

In the digital economy, two important issues that are currently being examined are enterprise ethics and corporate social responsibility as it is believed that leaders need to establish ethical behaviour to continue operating accountable businesses by implementing more sophisticated technologies (Gerbaudo, 2017; Tu & Lu, 2016). Baker and Craig (2006) have highlighted that some understanding has been gained by the study of leadership and ethics in the past decade because of increased concerns pertaining to ethical issues in business, particularly due to increased activities of misinformation. For sustainable businesses, a critical driver is the presence of ethical leadership, which mostly results in profitability for organisations. A study by the Ethics Research Centre (ERC) in Washington found that the highest quality recruits are attracted to firms that maintain ethical business practices and management (Fulmer, 2004). Similarly, Mo and Shi (2018) also confirmed the significant role played by ethical leadership in maintaining positive employee performance resulting in higher revenues for the company (Mo & Shi, 2018).

With all the recent scandals to hit the tech business (such as the Facebook's Cambridge Analytica Scandal or Yahoo's massive data breach on its users), digital businesses need to establish practices that can balance stakeholder's wealth and organizational profitability in an ethical and socially responsible way. Thus, a better understanding of ethical leadership needs to be gained by organisations when managing technological innovation.

Ethical leadership can be described as 'the showcasing of normatively appropriate conduct with the help of interpersonal relationships and personal actions, and employing two-way communication, reinforcement and decision making to promote such conduct to followers' (Brown et al., 2005, p. 120). Fundamentally, normatively appropriate conduct shows ethical leaders' moral component along with desirable traits like honesty, fairness and trustworthiness to oversee their own actions, as well as to utilize punishments and rewards on subordinates and making them responsible for their activities (Piccolo, Greenbaum, Hartog, & Folger, 2010). Punishments are employed to discourage unethical behaviour, while the reward systems are for motivating normatively appropriate behaviour in the firm (Brown et al., 2005).

Both in theory and practice, ethical leadership is said to be capable enough to actively manage morality, sometimes also known as moral identity (Mayer, Aquino, Greenbaum, & Kuenzi, 2012). The key aim for moral identity is to encourage leaders to have a moral schema that guides these leaders in their daily behaviour. It often shows receptiveness to others' expectations and welfares since insincerity could create dissonance and self-condemnation. For instance, moral identity can be considered as a predictor of pro-social behaviours like donations and charity (Reed, Aquino, & Levy, 2007), which can be negatively associated with unethical behaviours like cheating (Reynolds & Ceranic, 2007). Because ethical leaders understand their responsibility well and live by principles and values, they are more likely to contribute to the betterment of society (Maak & Pless, 2006).

From the viewpoint of stakeholders, ethical leaders know how to maintain and build good relations with all key stakeholders as they can create incentives to motivate, foster respectful collaboration, and offer a commitment to establish responsible and sustainable change both outside and inside the organisation (e.g. Maak & Pless, 2006). For instance, ethical leaders tend to offer a healthy, safe and fair working environment for their workers as well as morally obligated to provide safe products and services for their customers. Ethical leaders also ensure transparent communication regarding the possible risks of products and services, if there are any, keeping in mind customers' safety. With regards to communities and societies, it is expected that ethical leaders would be conscious towards the region where they run the business and where they are more likely to evaluate the effects cast by their organisation decisions on the society and its natural environments. This is because the ethical leadership's final goal is to accomplish a mutual good like organizational legitimacy that affords business sustainability (Bass & Steidlmeier, 1999).

2.5. Moderating role of ethical leadership

As explained in the previous sections, the technological innovation of firms is fostered through ethical leadership, which further improves and adds to the performance of the firm. Ethical leaders generally set well-defined and consistent ethical standards for their followers, communicate ethical values, define reward for ethical behaviour, and render punishment for unethical behaviour (Brown & Trevino, 2006). Moreover, ethical leadership could uphold a firm's credibility and reputation by giving importance to ethical decision-making specifically to strengthen stakeholder relations and to make a new technology investment. The firms that are involved in technological innovation practices and procedures under strong ethical leadership are inclined towards building trust-based relationships with their stakeholders. The level to which leaders exhibit their trustworthiness towards new technological innovations becomes the decisive factor in ascertaining whether the technological innovation pursuits are effective or not. That is, the strong ethical leaders of firms need to have a personal contribution and involvement in the firms' long-term commitment to technological innovation pursuits (Damanpour, 1991; Jung, Chow, & Wu, 2003; Jung, Wu, & Chow, 2008).

Studies by Eisenbeiss, Van Knippenberg, and Fahrbach (2015) and Chen and Hou (2016) have found a positive relationship between the firm's performance and technological innovation as soon as leaders exhibit ethical leadership (Chen & Hou, 2016; Eisenbeiss et al., 2015). This is because ethical leaders not only encourage their followers to voice their opinions and suggestions on ethical matters but also on work-related processes (Walumbwa & Schaubroeck, 2009). Giving the followers the opportunity to voice their opinions and ideas will foster creativity on the job since such voices would prompt employees to think of new methods of thinking (Chen & Hou, 2016). On the other hand, the existence of a weak ethical leadership alongside technological innovation in an organisation can prove to be destructive and limiting for the organisation's growth (Jung et al., 2008).

According to Zhu, Sun, and Leung (2014), ethical leaders pursue and implement technological innovation with determination and committed action, which will eventually lead to the creation of a sustainable value to the stakeholders. Hence, this study then posits:

Hypothesis 2. The relationship between firm performance and technological innovation is moderated by ethical leadership in a way that perceived technological innovation positively impacts performance when the leaders exhibit high ethical leadership.

3. Data collection

We chose the IT B2B service industry due to its intensely competitive and turbulent environment and companies in this industry must respond quickly to market demands, establish agile organizational mechanisms and offer excellent innovative services to uphold their competitive advantage (Chen, Tsou, & Ching, 2011). Hence, the IT B2B service industry is a suitable context for this study. Our data is represented by two secondary sources which are CSRHub database and Thomson Reuters. The CSRHub database is a web-based tool that offers access to firm's corporate social responsibility ratings particularly in environmental, social and governance on companies in the world. CSRHub brings together all data from nine of the leading socially responsible investment (SRI) analysis firms and over 265 NGOs, government agencies, CSR networking groups, smaller for-profit organisations and publishers around the issues of environment, social and governance. The CSRHub rating has been widely used in sustainability research (e.g., Ekawiguna & Darmansyah, 2017; Hynds et al., 2014; Thanetsunthorn, 2015).

To establish the link between technological innovation and firm performance, our study also uses the secondary data provided by Thomson Reuters for innovation and financial variables. Return on asset (ROA), return on equity (ROE) and return on invested capital (ROIC) were the three dependent variables that represented the financial performance of the firm while we employed research and development (R&D) intensity as a proxy for technological innovation and with several firm characteristics as control variables. The sample for this study consisted of 3132 firm-year observations between 2011 and 2017, representing 465 individual firms.

3.1. Measurement of technological innovation

In general, two most common indicators of the technological innovation used in previous studies are firm's patent (Du & Ai, 2008; Pakes & Griliches, 1980) and R&D expenditures (Keller, 2004). De Rassenfosse and de la Potterie (2009) found that the number of patents was affected by numerous factors and comprised of education and intellectual property rights. Therefore, often the patents filed were unable to represent and reflect the true value of technological innovation. Alternatively, R&D expenditure is one of the most widely utilised and accepted constructs to explore technological innovation as it is considered to reflect accurately the level of technological innovation investment of a firm (Beneito, 2003; Chen, 2008; Keller, 1998; Unger, Gallagher, & White III, 2004). As such, we argue that R&D investment directly reflects technological innovation and innovation output, and as such is a more suitable proxy than using the number of patents for computing technological innovation performance (Keller, 2004).

In this study, we apply R&D intensity as our proxy for technological innovation which is calculated as research and development expenditures in year ‘t’ deflated by the total of sales (Chudnovsky, López, & Pupato, 2006; Klomp & Van Leeuwen, 2001). We adopted R&D intensity as the valuation of technological innovation measure. R&D expenses of a firm are any expenses related with the R&D of a firm's products or services. R&D expenses are a form of operational expenditure and can be subtracted per se on a corporate tax return. This kind of expenditure is occurred in the process of developing and producing novel products or services. R&D is a kind of systematic action led by a firm, that intergrades both fundamental and advance research to look for solutions to problems, or to produce or update products and services.

$$\text{Technological innovation} = (\text{Total } R\&D \text{ expenditures})/(\text{Total Revenue})$$

3.2. Measurement of firm performance

As in most management studies, measuring firm performance can be multi-faceted. In our study, we adopt the accounting-based performance as a proxy to firm performance (FP). There is not much agreement about which measurement tool is most suitable. Even though some employ marketing-based measurements (Alexander & Buchholz, 1978; Vance, 1975) others suggest accounting-based measurements (Cochran & Wood, 1984; Waddock & Graves, 1997) and in some studies, both are adopted (McGuire, Sundgren, & Schneeweis, 1988). For this study, we employed return on assets (ROA), return on equity (ROE) and return on invested capital (ROIC) as a proxy for firm performance and these measures have been utilised in previous studies (Aral & Weill, 2007; Sher & Yang, 2005; Zhang et al., 2018).

It ought to be mentioned that ROA is a measurement of CFP and management competence as it represents in what way competent the management is in making revenues from assets and how effective in handling assets to create income. It is defined as the percentage for determining the profitable nature of the company, related to the total assets. ROA has been recognised in the finance literature as an important and commonly used ratio of a firm's performance (Dietrich & Wanzenried, 2011).

Return on Assets (ROA) = (Income before Extra- Ordinary Items in year t) / (Total Assets in year t).

Another measure of CFP includes the Return on Equity (ROE). This parameter is expressed as a percentage and defined as the net income which is returned as the percentage of the shareholder's equity. Regardless of being extensively used in financial researches, ROE is at times not regarded as the most suitable measure of firm performance because firms with a lower debt ratio or higher equity have a tendency to have a greater ROA yet a lower ROE (Dietrich & Wanzenried, 2011). This is due to the fact that ROE disregards the higher risk related to high leverage and the effects legislations have on leverage. Consequently, we used ROA as the main dependent variable. It should be noted that there is a strong relationship between ROA and ROE, but it is beneficial to use ROE as an alternative measure of CFP to increase insight into the implicit opinion of investors and owners regarding the common stock of companies (Pava and Krausz, 1996). Therefore, the outcomes for ROE are presented too.

$$\text{Return on Equity (ROE)} = (\text{Income before Extra} - \text{Ordinary Items in year } t)/(\text{Total Equity in year } t)$$

The third economic-based financial performance measure was returned on invested capital (ROIC), as suggested by Copeland, Koller, and Murrin (1996). This measure calculates firm earnings before interest, minus depreciation, and gain or loss from non-operating investments. A meritorious aspect of using ROIC as a performance measure considers net income and all invested capital (Lee, Lee, & Pennings, 2001). Both ROA and ROE contain non-business activities, for example, non-operating return or loss, selling assets, share buy-back scheme case and others, thus the profitability that is measured by the ROA may be inaccurate. For instance, a business can increase ROA by selling assets and then increasing net revenue. Less likely, ROIC shows operating profit for the assets that are invested in real business activities only and is measured by profits made from sales, which is divided by assets used for sales. Therefore, it calculates the true value of profitability that a firm makes from the business. Hence, ROIC is employed to compute the relationship between technological innovation and CFP.

$$\text{Return on Invested Capital (ROIC)} = (\text{Income before Extra} - \text{Ordinary Items in } year\ t)/(\text{Total Equity} + \text{Debt in } year\ t)$$

3.3. Measurement of ethical leadership

For measuring ethical leadership, we used the score provided by CSRHub. CSRHub measures “ethical leadership” by scoring how well the company manages its relationships with its primary and secondary stakeholders, including stockholders, suppliers, clients, societies, and governments. In addition, the ethical leadership rating by CSRHub also considers the firm's overall effectiveness of incorporating its social and environmental activities into the firm's strategy. The ethical leadership score was on a scale of 0 to 100 where 100 indicated excellent ethical leadership.

3.4. Control variables

This study employed three different firm-level control variables to regulate for firm size, slack resources and risks which were proxied by total assets, free cash flow, and leverage. Firm size was computed as a natural logarithm of a firm's total assets and was controlled to avoid any compounding effect of firm size on firm performance. Firm size controls for any systematic, size-related effects on the dependent variable; it can influence its decision-making competences, profitability, and structure (Simerly & Li, 2000). For instance, big companies performed better and more effectively than small companies since these companies enjoy economies of scale in the form of costs reduction in operation and greater purchasing power (Riordan & Williamson, 1985). On the contrary, big companies can suffer from higher costs due to their larger and more complex operations and systems (Canback, Samouel, & Price, 2006).

Correspondingly, leverage was used to control for firm risk as it measured a firm's financial risk which is a total debt to total equity ratio. The need for managers of highly leveraged firms to generate and retain cash to service the debt might reduce their ability to fund technological innovation (Barnea & Rubin, 2010; Reverte, 2009). We, therefore, controlled for firm leverage. Finally, the slack resource provides a firm opportunity to innovate and make an investment in the operation. The higher the slack, the more resources are accessible for developing future investment choices. We measure free cash flow as slack resources since it is vital to control for slack in our empirical model. These data on total assets and leverage and free cash flow are collected from DataStream.

4. Methodology

For this study, a quantitative methodology was used to test the hypotheses developed for this study. We used the dynamic panel data (DPD) “System Generalized Method of Moments (SYS-GMM)” as proposed by Arellano and Bover (1995) and Blundell and Bond (1998). SYS-GMM can eliminate/mitigate the issues of dynamic panel bias and potential endogeneity due to any independent variable correlating with the error term (Zaefarian, Kadile, Henneberg, & Leischnig, 2017). The main objective of utilising SYS-GMM instead of Pooled OLS or Fixed Effect estimates was that both the Pooled OLS and Fixed effect estimates could lead to biased and inconsistent outcomes since these two approaches were not capable in controlling for dynamic biases and endogeneity concerns (Arellano & Bover, 1995; Blundell & Bond, 1998). This was due to two reasons: First, Pooled OLS neglects unobserved

Table 1
Descriptive summary statistics.

Variable	Observation	Mean	Std. Dev.	Min	Max
ROA	3132	0.0948	0.8349	−3.3552	1.3243
ROE	3132	9.9499	118.9906	−98.1621	3169.0000
ROIC	3132	0.2276	2.4029	−40.0000	63.0869
RD Intensity	3132	0.2409	0.4914	0.0000	16.1429
Leadership	3132	3.8969	0.2177	2.2711	4.5247
Size	3132	7.5561	1.9522	0.0000	13.5226
Free cash flow	3132	0.0360	0.1929	−5.7143	0.8492
Leverage	3132	0.2139	0.2264	0.0000	3.0000

Notes: All statistics are based on original data values.

time-invariant firm effects. Second, Fixed Effect considers for the unobserved time-invariant firm-specific effects in the DPD model (Hsiao, 2014).

In addition, the SYS-GMM is seen to yield efficient and consistent estimates in the regression model, wherein the independent variables were not strictly exogenous, i.e., these variables correlated with past and current realizations of the error, and/or in which heteroscedasticity and autocorrelation within individuals existed (Roodman, 2009a). Furthermore, this estimator controls the endogeneity problems by instrumenting all lagged dependent and other endogenous variables with the variables that are believed to be unrelated to the fixed effects (Nickell, 1981; Roodman, 2009a). The SYS-GMM was more efficient with an extra postulation that the first differences of instruments were not correlated with the firm special effects, which then allowed for the addition of instruments (Roodman, 2009a).

This study assessed the relationship between FP, represented as Y_{it} (ROA/ ROE/ROIC), its lagged value, Y_{it-1}, technological innovation, represented as technological_innovation$_{it}$, and the group of firm-level control variables (ln total assets, leverage, free cash flow, and the yearly dummies), represented as X_{it}. These were considered to be predetermined rather than as endogenous covariates, which were expressed as:

$$Y_{it} = \alpha + \beta\, Y_{it-1} + \gamma\, \text{Technological\_Innovation}_{it} + \delta X_{it} + \mu_i + \phi_t + \varepsilon_{it} \tag{1}$$

where,

- Y_{it} = CFP of firm i at time t as proxied by ROA, ROE, ROIC.
- α = intercept.
- β, γ and δ are coefficients parameters
- Technological innovation$_{it}$ = total amount of R&D intensity of firm i at time t.
- X_{it} = Control variable (free cash, firm size and leverage) of firm i at time t.
- μ_i and measures firm-specific (fixed)
- ε_{it} = signifies the disturbances, and differs across firms i and time periods t.
- ϕ_t, = time dummies.

The disturbances, i.e., μ_i and ε_{it}, were not cross-correlated and displayed the following properties:

$$E(\mu_i) = 0;\ E(\varepsilon_{it}) = 0;\ E(\mu_i \varepsilon_{it}) = 0 \tag{2}$$

On the other hand, the time-varying errors were assumed to be uncorrelated:

$$E(\varepsilon_{it}\varepsilon_{is}) = 0 \text{ with } t \neq s \tag{3}$$

Where $i = 1…465$ and $t, s = 2008…2017$.

With the purpose of ensuring the consistency of the SYS-GMM estimations, this study presents four main diagnostics tests. First, to ensure no serial correlation in the error term, we used Arellano and Bond's (1991) test that addresses the 1st and 2nd order serial correlations in the first-difference residuals. AR (2) shows the *p*-values for the null hypothesis of no second-order serial correlation in the first-difference residuals.

Second, the instruments must be uncorrelated with the error term. This study uses Hansen's (1982) test of over-identifying limitations that presents the p-values for the null hypothesis of instrument validity. Third, the additional moment limitations should be valid (Blundell & Bond, 1998). This study uses the Difference-in-Hansen test, which presents the p-values for the null hypothesis of the validity of additional moment conditions. And finally, the amount of instruments should be lesser than the amount of groups in a regression to avoid finite sample bias caused by overfitting (Roodman, 2009b).

For estimating the hypothesis that ethical leadership (EL) acts as a moderator (i.e. H2), between technological innovation and FP, Eq. (1) was extended by integrating the interaction between ethical leadership (EL) and technological innovation. This interaction term (EL*Technological_Innovation) was included in the model specifications as follows:

$$Y_{it} = \alpha + \beta Y_{it-1} + \gamma_1 \text{Technological\_Innovation}_{it} + \gamma_2 \text{Ethical\_Leadership}_{it} + \lambda(\text{EL} * \text{Technological\_Innovation})_{it} + \delta X_{it} + \mu_i + \phi_t + \varepsilon_{it} \tag{5}$$

Where,

- ethical leadership = total CSRHub' score of firm i at time t.
- EL*Technological_Innovation = interaction effect of technological innovation and ethical leadership scores.

5. Empirical results

5.1. Descriptive statistics and correlation matrix of the variables

The finding of descriptive statistics and correlation matrix are depicted in Table 1 and Table 2. In Table 1, all the variables had positive mean values and standard deviations. For example, five variables had a median value smaller than 1.00, while, three of the variables had a median value > 1.00. The bivariate correlation matrix is reported in Table 2 which revealed that R&D, leverage, firm size and free cash flow were positively correlated with ROA (assets), ROE (equity) and ROIC (invested capital) which is signified as FP. All four of these variables were significant in explaining the relationship with the formation of FP.

Table 2
Pearson correlation coefficients.

	ROA	ROE	ROIC	RD Intensity	Leadership	Size	Free cash flow	Leverage
ROA	1							
ROE	0.0775***	1						
ROIC	0.1623***	0.0333*	1					
RD Intensity	−0.0051***	−0.0118	−0.0564***	1				
Leadership	0.1198***	0.0138	0.0463***	−0.1181***	1			
Size	0.1510***	0.0865***	0.0602***	−0.3431***	0.2874***	1		
Free cash flow	0.4647***	0.0289	0.0695***	−0.6490***	0.0721***	0.1108***	1	
Leverage	0.0754***	0.0462***	−0.0239	−0.1053***	0.0355**	0.2189***	−0.0141	1

Notes: All statistics are based on original data values. ** Correlation is statistically significant at the 95% level of confidence (two-tailed).

Table 3
The impact of technological innovation on corporate financial performance.

Variables	System GMM		
	(Model 1)	(Model 2)	(Model 3)
	ROA	ROE	ROIC
ROA_{t-1}	0.354*** (0.0295)		
ROE_{t-1}		0.290*** (0.00528)	
$ROIC_{t-1}$			−0.0609*** (0.00940)
RD Intensity	0.0516* (0.0294)	13.23*** (14.56)	9.284*** (1.355)
Size	0.0243** (0.0116)	14.28*** (2.164)	1.024*** (0.345)
Free Cash Flow	0.438*** (0.0411)	35.63*** (40.77)	23.61*** (3.265)
Leverage	−0.101*** (0.0386)	−27.58* (19.37)	−5.422*** (1.998)
Constant	−0.129 (0.0902)	−14.43*** (14.11)	−9.488*** (2.938)
Year Dummy	Yes	Yes	Yes
No of Instruments	19	19	19
Observations	2673	2673	2673
Number of Firms	459	459	459
AR (1)	−3.03(0.002)	−1.91(0.056)	−2.72(0.007)
AR (2)	−0.71(0.477)	−1.31(0.189)	0.70(0.482)
Hansen Test	19.90(0.819)	11.66(0.555)	12.13(0.517)
Different in Hansen Test	9.22(0.056)	9.62(0.382)	8.40(0.495)

Notes: The standard errors are reported in parentheses, except for Hansen test, AR1, AR2 and Difference-in-Hansen test which p-values, ***, ** and * indicate significant at 1%, 5% and 10% levels, respectively. Time dummies are included in the model specification, but the results are not reported to save space. System GMM model is estimated by using the Blundell and Bond (1998) dynamic panel system GMM estimations and Roodman (2009a, 2009b) – Stata xtabond2 command.

Moreover, the result revealed that the firm's R&D intensity which was a proxy for technological innovation of companies was negative and significantly associated with the firm performance. These results indicated that the variables were significant in explaining FP. The overall bivariate correlation matrix results displayed that all the correlation coefficients were < 0.6, indicating that none of the variables showed serious multi-collinearity. Furthermore, correlation of explanatory variable could be examined to guarantee the explanatory variable had no relationship. This can be observed from the tolerance and variance inflation factor (VIF) values; a tolerance value near to zero or VIF values over 10.0 would indicate that one of the explanatory variables was related to other variables. We obtained the VIF value of 1.33 which implied that there was no multicollinearity problem in this study.

5.2. Relationship between technological innovation and FP

We used the System GMM estimator to test our hypotheses. The estimate outcomes of the relationship between Technological innovation and FP are shown in Table 3. The three dependent variables used to compute FP were ROA, ROE and ROIC. We used R&D intensity as a proxy to technological innovation to check the influence of disregarding heterogeneity and dynamic technological innovation–FP relationship. The misspecification tests were validated (the second- order serial correlation test (the AR (2) test) and the Hansen test of other-identifying restrictions), permitting us to accomplish that the SYS-GMM was a proper model specification.

The significant coefficient of the lagged dependent variable affirmed that FP was persistent, that depended significantly on its own prior realizations. Furthermore, in whichever regression methodology, either in Model 1, 2 or 3, the control variables had the subsequent effect on FP. Both total asset and free cash flow had a positive impact on FP. The finding also showed a negative effect of leverage on FP. This ambivalent outcome might be explained by the fact that, in different circumstances, higher debt ratio was predicted to have a negative effect on FP, because of increased interest expenses which results in an increase in costs related to financing the firm's strategy. Nevertheless, the debt ratio might also play a positive role in easing agency costs by serving to discourage over-investment of free cash flow by self-serving managers.

The relationship between technological innovation and ROA, which is the firm performance variable, was significantly positive. Hypothesis 1 was supported, and this finding was consistent with Aboody and Lev (2000) and Zahra et al. (2000). Additionally, the analysis showed that the relationship between technological innovation and ROE and ROIC, the other two firm performance variables, were significantly positive. In comparison to the size of the coefficient and significance of technological innovation on ROA with those of ROE and ROIC, the effect of technological innovation on ROE and ROIC (13.23 at 1% and 9.284 at 1% respectively) was much stronger than that of ROA (0.0516 at 1%). In other words, the technological innovation term in the ROE and ROIC equation dominated the technological innovation term in the ROA equation.

5.3. The moderating effect of ethical leadership on the relationship between technological innovation and firm performance

System GMM estimate was also used to scrutinize the interaction effect of the moderator (ethical leadership). This study explicitly used Brambor, Clark, and Golder's (2006) interaction approach to evaluate the moderating effects of ethical leadership. Hypothesis 2 postulated that ethical leadership would strengthen the positive association between technological innovation and FP. The coefficient associated with the interaction term in Model 1, 2 and 3 in Table 4 were positive and significant for Hypothesis 2 (0.000727, $p < .01$, 0.394, $p < .01$ and 0.000333, $p < .01$). Thus, the three models supported Hypothesis 2: Ethical leadership strengthens the positive relationship between technological innovation and FP.

To obtain a stronger interpretation of the nature of the interactions, we plotted the interaction terms utilising the necessary procedures recommended by Aiken, West, and Reno (1991) (Figs. 2, 3 and 4). We employed the unstandardized coefficients to plot the three-way interactions and conducted simple regression tests to gain further insight into these relationships. The simple regression test involved splitting the ethical leadership into a high group and a low group and re-estimating the square effects of technological innovation and FP. Figs. 2, 3 and 4 display the graph of the moderating effect of ethical leadership on the relationship between technological innovation and firm' performance which show the same form. Confirming the hypothesized moderating effects, the slopes of the regression lines in these three graphs varied significantly as the *Z*-values varied (mean plus/minus one standard deviation). Simple slope analyses further indicated that technological innovation had a strong positive association with a firm's performance when the CEO of the firm displayed a strong ethical leadership.

6. Discussion and conclusion

A better understanding of technological innovation in the B2B environment is critical for modern leadership in the digital economy. Organisations are now facing a myriad of internal and external pressures from all aspects of its business operations including social responsibility that covers the environment, markets and its employees. Their ability and capacity to adapt, adopt and regenerate have become interesting conversations for academics and business communities alike. As a result, there has been rising interest in research on the various ethical kinds of governance involved with the application of technological advancement including the utilisation of artificial

Table 4
The contingency effect of ethical leadership on technological innovation – firm performance link.

Variables	System GMM		
	(Model 1)	(Model 2)	(Model 3)
	ROA	ROE	ROIC
ROA_{t-1}	0.332***		
	(0.0289)		
ROE_{t-1}		0.195***	
		(0.0219)	
$ROIC_{t-1}$			−0.0178***
			(0.00501)
RD Intensity	−0.0690*	−50.84***	−0.603*
	(0.0380)	(107.8)	(0.526)
Ethical Leadership	−0.00787	48.90	0.490***
	(0.0189)	(58.88)	(0.140)
Moderator (RD*Leadership)	0.000727***	0.394***	0.000333*
	(0.000122)	(0.0570)	(0.000185)
Size	0.00422	19.14	−0.0598
	(0.0103)	(19.23)	(0.0868)
Free Cash Flow	0.490***	3538***	0.843**
	(0.0523)	(213.6)	(0.376)
Leverage	−0.0535	−88.19	0.945
	(0.0384)	(160.1)	(1.212)
Constant	0.0706	−57.76**	−1.422**
	(0.108)	(281.4)	(0.592)
Year Dummy	Yes	Yes	Yes
No of Instrument s	20	20	20
Observations	2673	2673	2673
Number of Firms	459	459	459
AR (1)	−3.04(0.002)	−5.09(0.000)	−2.13(0.033)
AR (2)	−0.71(0.477)	−0.51(0.611)	1.20(0.229)
Hansen Test	2.66(0.752)	7.94(0.790)	13.87(0.309)
Different in Hansen Test	10.88(0.092)	2.75(0.739)	8.14(0.149)

Notes: The standard errors are reported in parentheses, except for Hansen test, AR1, AR2 and Difference-in-Hansen test which p-values, ***, ** and * indicate significant at 1%, 5% and 10% levels, respectively. Time dummies are included in the model specification, but the results are not reported to save space. System GMM model is estimated by using the Blundell and Bond (1998) dynamic panel system GMM estimations and Roodman (2009a, 2009b) – Stata xtabond2 command.

intelligence, big data, and social media.

Much of these issues on modern leadership surround the notion of ethical leadership and how firms conduct their marketing activities. In the B2B platform, much of these are generated through direct and relational marketing that is often considered one of the most controversial methods of advertising channels, especially when the approaches included are unsolicited with some pushing the limits of ethical standards and legality in a strong manner. A survey by the Ethics Resource Centre (2013) found that 43% of respondents believed that their supervisors lacked ethical integrity. Furthermore, with disruptive innovation, it not only challenges traditional business models but often disrupts the ethics and moral standards by using dubious practices. For example, the use of dynamic pricing to fill capacity and the "bait and switch" where customers are "baited" through the advertisements for some products or services that have a low price is a classic case. In the long term, these unscrupulous practices are considered as non-sustainable business models and are known to "step over the line". This implies then that managing innovative technology requires some form of ethical leadership as there is much at stake when it comes to enabling a company to optimize its returns to various stakeholders including employees, customers, business partners, local communities and the environment. Hence, organisations should encourage their managers to develop ethical leadership by emphasizing morality, two-way communication, respecting employees' dignity while empowering subordinates to come up with new ideas.

It is recommended that managers should develop ethical leadership style by emphasizing morality in workplace, respecting their followers' nature and dignity, empowering and enriching the job significance to encourage their followers to come up with new ideas and put them into practice. Our study explores this relationship and the findings confirm several of the research aims. First, it demonstrates that technological innovation plays an important part in the firm's performance. This is almost intuitive as we find increasing numbers of organisations investing heavily into the digital aspects of their operations, from processes to services. Second, we show that ethical leadership has a moderating role in the relationship between technological innovation and firm performance. This suggests that firms that practice good governance and are morally and ethically high in its CSR score tend to have a positive effect on firm performance. It is important to draw these observations as the study empirically indicates that ethical leadership is critical for firms wanting to compete in the digital economy.

A benefit seen with the implementation of new technologies that enable innovation is recognising the firm and market-specific mechanisms that could result in various consequences affecting the firm that is investing in the same technologies. Moreover, two kinds of technology-induced changes (process vs. product innovation) can be recognised regarding rather diverse economic implications. For instance, a key difference between both innovations is how these could cast an effect on employment. The expansion because of both types of innovations results in generating an extra request for the labour and capital production aspects, suggesting that innovating companies would likely generate additional employment. This is also known as the compensation effect (Pasinetti, 1981). Though, innovations could lead to a labour decreasing effect too. In the case of process innovations, this could happen once productivity growing effects start to materialise. Increase in productivity suggests that a lower production input could induce a given level of output. Thus, should output and demand to continue to remain constant, a reduction of labour would result due to process innovation. This is also known as the replacement effect (Edquist, Hommen, & McKelvey, 2001). For product innovations, this consequence is less possible, regardless of these being IT-enabled or not.

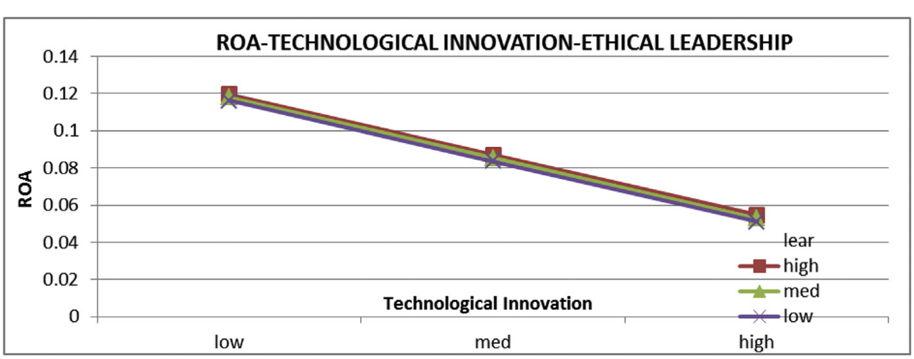

Fig. 2. Effects of Technological Innovation on ROA: Contingent on Ethical Leadership.

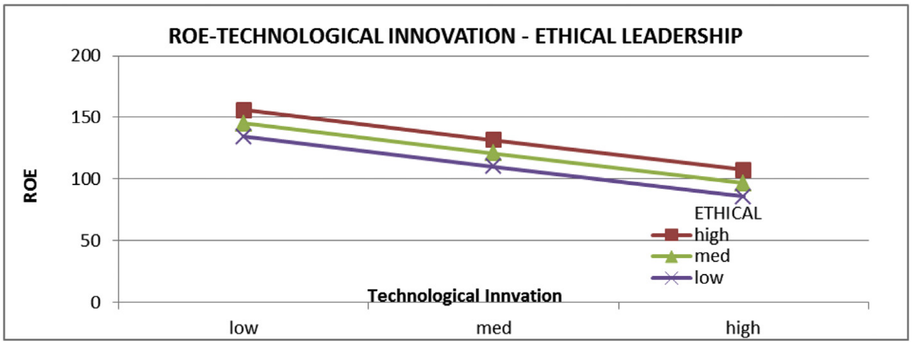

Fig. 3. Effects of Technological Innovation on ROE: Contingent on Ethical Leadership.

Therefore, our study has two theoretical implications. First, it extends our understanding of technological innovation and B2B studies. It is insufficient for firms to invest in B2B technological innovation if it ignores how these technologies are to be used. Literature suggests that as digital technologies become increasingly sophisticated (Li et al., 2018), so will the wide use of misinformation to gain a strategic advantage. In this respect, B2B firms would have to look to ethical leadership in managing how these technologies to not only benefit itself but to look beyond in the interest of society and the environment. For example, a recent article suggested that firms are too fixated on statistics to the extent that writing "fake online reviews" have now become an occupation (Hu, Bose, Koh, & Liu, 2012). Although some online firms have committed to weed out these practices, sceptics are not entirely convinced that it is easy to challenge £23 billion spent annually on online reviews (BBC, 2018).

In this regard, it appears that ethical leadership is needed to ensure that their organisations are using digital technologies not merely effectively but also to safeguard its use from a marketing perspective. Theoretically speaking, marketing ethics is one of the most complicated and contentious subjects in management theory (Lilien, 2016). The relationship between commercialism, profitability and ethics has been studied by both academics and business leaders for years with little consensus reached, and still, not much insight has been offered on how ethical leadership may affect firm performance. However, our study found that the relationship between technological innovation and firm performance was stronger with the presence of an ethical leader. Ethical leaders are defined as leaders who demonstrate normatively appropriate conduct through personal actions, interpersonal relationships and by encouraging two-way communication, reinforcement and decision-making (Brown et al., 2005). Hence, followers of ethical leaders are more likely to experience higher levels of job significance and would be more willing to generate new ideas to contribute to organizational goals (Yidong & Xinxin, 2013), thereby encouraging an innovative work behaviour which leads to higher technological innovation.

Second, our study adds to a better understanding of ethical leadership with regards to marketing practices on the B2B platform. In the wake of the technology-driven economy, several challenges including the notion that the increasing complexity of society where markets are connected (physically) yet disconnected (proximity) has lead marketing practices astray. For example, data sharing between large corporations on the B2B platform have purportedly infringed on privacy laws (Arqué-Castells, 2012; Bennett & Segerberg, 2013). Such sharing has led to millions and millions of unsolicited marketing messages and furthered compromised the security of individuals as well as businesses. Our research has extended the discussion on the importance of further theoretical research into this area.

Finally, our methodology proposes the use of the GMM which has been rarely used in marketing studies. We believe that this is an innovative way to examine marketing performance by demonstrating the relationships between marketing investments and the firm's performance. It also presents an alternative to studying the moderating effects of other important variables in marketing activities.

7. Limitations and recommendations for future studies

Although our research model explains the relationships between technological innovation, firm performance and ethical leadership on the B2B platform, there are limitations to the study and additional opportunities for further development. First, other potential factors may change the relative impacts of ethical leadership on firm performance such as firm size, structure and culture. Future research needs to consider controlling other types of variables including other firm performance measures such as firm risk or reputation. Second, this study employed secondary date to operationalize the various dimensions of performance; but future research could use primary and objective measures such as data in relation to production cost, market share, and total revenues. From a quantitative perspective, historical data may not always be a good predictor of forwarding trends and future studies but nonetheless, this research provides opportunities for possible further

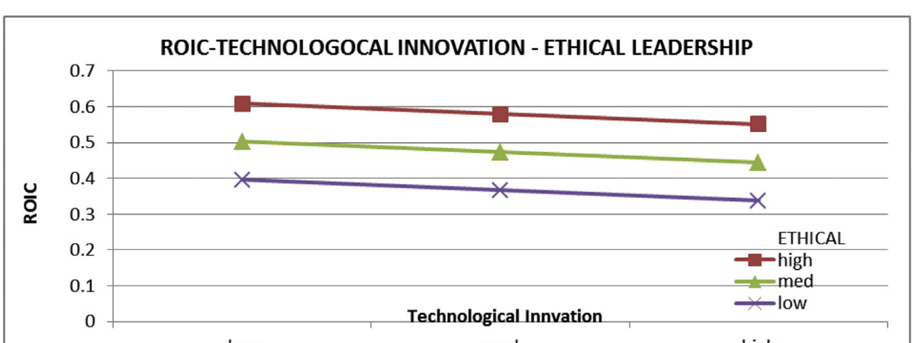

Fig. 4. Effects of Technological Innovation on ROIC: Contingent on Ethical Leadership.

research in more cross-disciplinary research from a marketing and leadership perspective. Critically, from a theoretical perspective is the development of leadership qualities that are required to develop more strategic, sustainable and ethical practices. This may lead to further studies on ethical marketing promotional campaigns and how these might be relevant in correcting misinformation in marketing communications.

References

Aboody, D., & Lev, B. (2000). Information asymmetry, R&D, and insider gains. *The Journal of Finance, 55*(6), 2747–2766.

Agnihotri, R., Dingus, R., Hu, M. Y., & Krush, M. T. (2016). Social media: Influencing customer satisfaction in B2B sales. *Industrial Marketing Management, 53*, 172–180.

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions.* United States, California: Sage.

Alexander, G. J., & Buchholz, R. A. (1978). Corporate social responsibility and stock market performance. *Academy of Management Journal, 21*(3), 479–486.

Aral, S., & Weill, P. (2007). IT assets, organizational capabilities, and firm performance: How resource allocations and organizational differences explain performance variation. *Organization Science, 18*(5), 763–780.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277–297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics, 68*(1), 29–51.

Arqué-Castells, P. (2012). How venture capitalists spur invention in Spain: Evidence from patent trajectories. *Research Policy, 41*(5), 897–912.

Baker, B., & Craig, B. (2006). When actions speak louder than words: The relative importance of leader behaviors in predicting global impressions of integrity. Chair In M. Hargis (Ed.). *Leadership, It's all relative: Applying relative importance statistics to leadership. Symposium conducted at the annual conference of the Academy of Management in Atlanta, Georgia* August.

Barnea, A., & Rubin, A. (2010). Corporate social responsibility as a conflict between shareholders. *Journal of Business Ethics, 97*(1), 71–86.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

Bass, B. M., & Steidlmeier, P. (1999). Ethics, character, and authentic transformational leadership behavior. *The Leadership Quarterly, 10*(2), 181–217.

BBC (2018, April). Fake five-star reviews being bought and sold online. Retrieved from https://www.bbc.com/news/technology-43907695.

Beneito, P. (2003). Choosing among alternative technological strategies: An empirical analysis of formal sources of innovation. *Research Policy, 32*(4), 693–713.

Bennett, W. L., & Segerberg, A. (2013). *The logic of connective action: Digital media and the personalization of contentious politics.* UK, Cambridge: Cambridge University Press.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115–143.

Brambor, T., Clark, W. R., & Golder, M. (2006). Understanding interaction models: Improving empirical analyses. *Political Analysis, 14*(1), 63–82.

Brown, M. E., & Trevino, L. K. (2006). Socialized charismatic leadership, values congruence, and deviance in work groups. *Journal of Applied Psychology, 91*(4), 954.

Brown, M. E., Treviño, L. K., & Harrison, D. A. (2005). Ethical leadership: A social learning perspective for construct development and testing. *Organizational Behavior and Human Decision Processes, 97*(2), 117–134.

Canback, S., Samouel, P., & Price, D. (2006). Do diseconomies of scale impact firm size and performance? A theoretical and empirical overview. *ICFAI Journal of Managerial Economics, 4*(1), 27–70.

Chen, A. S. Y., & Hou, Y. H. (2016). The effects of ethical leadership, voice behavior and climates for innovation on creativity: A moderated mediation examination. *The Leadership Quarterly, 27*(1), 1–13.

Chen, J. S., Tsou, H. T., & Ching, R. K. (2011). Co-production and its effects on service innovation. *Industrial Marketing Management, 40*(8), 1331–1346.

Chen, Y. S. (2008). The driver of green innovation and green image–green core competence. *Journal of Business Ethics, 81*(3), 531–543.

Chudnovsky, D., López, A., & Pupato, G. (2006). Innovation and productivity in developing countries: A study of argentine manufacturing firms' behavior (1992–2001). *Research Policy, 35*(2), 266–288.

Cochran, P. L., & Wood, R. A. (1984). Corporate social responsibility and financial performance. *Academy of Management Journal, 27*(1), 42–56.

Cohen, W. M., Goto, A., Nagata, A., Nelson, R. R., & Walsh, J. P. (2002). R&D spillovers, patents and the incentives to innovate in Japan and the United States. *Research Policy, 31*(8–9), 1349–1367.

Conner, K. R. (1991). A historical comparison of resource-based theory and five schools of thought within industrial organization economics: Do we have a new theory of the firm? *Journal of Management, 17*(1), 121–154.

Copeland, T., Koller, T., & Murrin, J. (1996). *Valuation.* US, New York: Wiley.

Cortez, R. M., & Johnston, W. J. (2017). The future of B2B marketing theory: A historical and prospective analysis. *Industrial Marketing Management, 66*, 90–102.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal, 34*(3), 555–590.

De Rassenfosse, G., & de la Potterie, B. V. P. (2009). A policy insight into the R&D–patent relationship. *Research Policy, 38*(5), 779–792.

Dietrich, A., & Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International Financial Markets Institutions and Money, 21*(3), 307–327.

Drucker, P. (1985). *Entrepreneurship and Innovation: Practice and Principles.* US, New York: Harper Business.

Du, R., & Ai, S. (2008). Cross-organizational knowledge acquisition through flexible hiring and joint R&D: Insights from a survey in China. *Expert Systems with Applications, 35*(1–2), 434–441.

Edquist, C., Hommen, L., & McKelvey, M. D. (2001). *Innovation and employment: Process versus product innovation.* UK, Cheltenham: Edward Elgar Publishing.

Eisenbeiss, S. A., Van Knippenberg, D., & Fahrbach, C. M. (2015). Doing well by doing good? Analyzing the relationship between CEO ethical leadership and firm performance. *Journal of Business Ethics, 128*(3), 635–651.

Ekawiguna, S. M., & Darmansyah, A. (2017). Effect of corporate social responsibility, corporate governance and earnings management on firm performance at publicly listed Indonesian companies in Indonesia stock exchange. *Australian Academy of Accounting and Finance Review, 1*(1), 1–28.

Workforce Retrieved fromEthics Resource Centre (2013). *National Business Ethics Survey (NBES) of the U.S.* https://www.ibe.org.uk/userassets/surveys/nbes2013.pdf.

Eurostat, O. E. C. D. (2005). *Oslo Manual. The Measurement of Scientific and Technological Activities. Guidelines for Collecting and Interpreting Innovation Data*.

Farr, J. L., & Ford, C. M. (1990). *Innovation and Creativity at Work: Psychological and Organizational Strategies.* UK, Chichester: John Wiley & Sons.

Fulmer, R. M. (2004). The challenge of ethical leadership. *Organizational Dynamics, 33*(3), 307–317.

Gerbaudo, P. (2017). Social media teams as digital vanguards: The question of leadership in the management of key Facebook and twitter accounts of Occupy Wall Street, Indignados and UK Uncut. *Information, Communication & Society, 20*(2), 185–202.

Gummesson, E. (2014). The theory/practice gap in B2B marketing: Reflections and search for solutions. *The Journal of Business and Industrial Marketing, 29*(7/8), 619–625.

Gunasekaran, A., Marri, H., McGaughey, R., & Nebhwani, M. (2002). Business-to-business electronic commerce. *International Journal of Production Economics, 74*, 185–197.

Hanna, R., Rohm, A., & Crittenden, V. L. (2011). We're all connected: The power of the social media ecosystem. *Business Horizons, 54*(3), 265–273.

Hannan, T. H., & McDowell, J. M. (1990). The impact of technology adoption on market structure. *The Review of Economics and Statistics,* 164–168.

Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the Econometric Society,* 1029–1054.

Hart, S. L., & Sharma, S. (2004). Engaging fringe stakeholders for competitive imagination. *Academy of Management Perspectives, 18*(1), 7–18.

Hitt, M. A., Hoskisson, R. E., & Ireland, R. D. (1994). A mid-range theory of the interactive effects of international and product diversification on innovation and performance. *Journal of Management, 20*(2), 297–326.

Holliman, G., & Rowley, J. (2014). Business to business digital content marketing: marketers' perceptions of best practice. *Journal of Research in Interactive Marketing, 8*(4), 269–293.

Hsiao, C. (2014). *Analysis of panel data (No. 54).* UK, Cambridge: Cambridge university press.

Hu, N., Bose, I., Koh, N. S., & Liu, L. (2012). Manipulation of online reviews: An analysis of ratings, readability, and sentiments. *Decision Support Systems, 52*(3), 674–684.

Hynds, E. J., Brandt, V., Burek, S., Jager, W., Knox, P., Parker, J. P., & Zietlow, M. (2014). A maturity model for sustainability in new product development. *Research-Technology Management, 57*(1), 50–57.

Itani, O. S., Agnihotri, R., & Dingus, R. (2017). Social media use in B2B sales and its impact on competitive intelligence collection and adaptive selling: Examining the role of learning orientation as an enabler. *Industrial Marketing Management, 66*, 64–79.

Jung, D., Chow, C., & Wu, A. (2003). The role of transformational leadership in enhancing organizational innovation: Hypotheses and some preliminary findings. *The Leadership Quarterly, 14*, 525–544.

Jung, D., Wu, A., & Chow, C. (2008). Towards understanding the direct and indirect effects of CEO's transformational leadership on firm innovation. *The Leadership Quarterly, 19*, 582–594.

Jussila, J. J., Kärkkäinen, H., & Aramo-Immonen, H. (2014). Social media utilization in business-to-business relationships of technology industry firms. *Computers in Human Behaviour, 30*, 606–613.

Keinänen, H., & Kuivalainen, O. (2015). Antecedents of social media B2B use in industrial marketing context: customers' view. *Journal of Business & Industrial Marketing, 30*(6), 711–722.

Keller, W. (1998). Are international R&D spillovers trade-related?: Analyzing spillovers among randomly matched trade partners. *European Economic Review, 42*(8), 1469–1481.

Keller, W. (2004). International technology diffusion. *Journal of Economic Literature, 42*(3), 752–782.

Kim, K. H., & Kumar, V. (2018). The relative influence of economic and relational direct marketing communications on buying behavior in business-to-business markets. *Journal of Marketing Research, 55*(1), 48–68.

Klomp, L., & Van Leeuwen, G. (2001). Linking innovation and firm performance: A new approach. *International Journal of the Economics of Business, 8*(3), 343–364.

Koellinger, P. (2008). The relationship between technology, innovation, and firm performance—Empirical evidence from e-business in Europe. *Research Policy, 37*(8), 1317–1328.

Lacka, E., & Chong, A. (2016). Usability perspective on social media sites' adoption in the B2B context. *Industrial Marketing Management, 54*, 80–91.

Lee, C., Lee, K., & Pennings, J. M. (2001). Internal capabilities, external networks, and performance: A study on technology-based ventures. *Strategic Management Journal, 22*(6–7), 615–640.

Levin, R. C., Klevorick, A. K., Nelson, R. R., Winter, S. G., Gilbert, R., & Griliches, Z. (1987). Appropriating the returns from industrial research and development. *Brookings Papers on Economic Activity, 1987*(3), 783–831.

Li, C., Guo, S., Cao, L., & Li, J. (2018). Digital enablement and its role in internal branding: A case study of HUANYI travel agency. *Industrial Marketing Management, 72*, 152–160.

Lilien, G. L. (2016). The B2B knowledge gap. *International Journal of Research in Marketing, 33*(3), 543–556.

Maak, T., & Pless, N. M. (2006). Responsible leadership in a stakeholder society–a relational perspective. *Journal of Business Ethics, 66*(1), 99–115.

Mayer, D. M., Aquino, K., Greenbaum, R. L., & Kuenzi, M. (2012). Who displays ethical leadership, and why does it matter? An examination of antecedents and consequences of ethical leadership. *Academy of Management Journal, 55*(1), 151–171.

McGuire, J. B., Sundgren, A., & Schneeweis, T. (1988). Corporate social responsibility and firm financial performance. *Academy of Management Journal, 31*(4), 854–872.

McKinsey (2013). *Business and web 2.0: An interactive feature. Explore, track, and customize six years of survey results on how businesses use new web technologies and tools.* Retrieved from http://www.mckinsey.com/insights/business_technology/business_and_web_20_an_interactive_feature.

McWilliams, A., & Siegel, D. (2000). Corporate social responsibility and financial performance: Correlation or misspecification? *Strategic Management Journal, 21*(5), 603–609.

Mo, S., & Shi, J. (2018). The voice link: A moderated mediation model of how ethical leadership affects individual task performance. *Journal of Business Ethics, 152*(1), 91–101.

Morris, A. D., & Staggenborg, S. (2004). Leadership in social movements. In D. A. Snow, S. A. Soule, & H. Kriesi (Eds.). *The Blackwell companion to social movements* (pp. 171–196). Australia: Blackwell Publishing.

Nguyen, B., Yu, X., Melewar, T. C., & Chen, J. (2015). Brand innovation and social media: Knowledge acquisition from social media, market orientation, and the moderating role of social media strategic capability. *Industrial Marketing Management, 51*, 11–25.

Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica,* 1417–1426.

Nunan, D., Sibai, O., Schivinski, B., & Christodoulides, G. (2018). Reflections on "social media: Influencing customer satisfaction in B2B sales" and a research agenda. *Industrial Marketing Management, 75*, 31–36.

OECD (1991). *Basic science and technology statistics.* Paris.

Pagani, M., & Pardo, C. (2017). The impact of digital technology on relationships in a business network. *Industrial Marketing Management, 67*, 185–192.

Pakes, A., & Griliches, Z. (1980). Patents and R&D at the firm level: A first report. *Economics Letters, 5*(4), 377–381.

Pasinetti, L. (1981). *Structural change and economic growth.* Cambridge: Cambridge University Press. UK.

Pava, M. L., & Krausz, J. (1996). The association between corporate social-responsibility and financial performance: The paradox of social cost. *Journal of Business Ethics, 15*(3), 321–357.

Piccolo, R. F., Greenbaum, R., Hartog, D. N. D., & Folger, R. (2010). The relationship between ethical leadership and core job characteristics. *Journal of Organizational Behavior, 31*(23), 259–278.

Reed, A., Aquino, K., & Levy, E. (2007). Moral identity and judgments of charitable behaviors. *Journal of Marketing, 71*(1), 178–193.

Reverte, C. (2009). Determinants of corporate social responsibility disclosure ratings by Spanish listed firms. *Journal of Business Ethics, 88*(2), 351–366.

Reynolds, S. J., & Ceranic, T. L. (2007). The effects of moral judgment and moral identity on moral behavior: An empirical examination of the moral individual. *Journal of Applied Psychology, 92*(6), 1610.

Riordan, M. H., & Williamson, O. E. (1985). Asset specificity and economic organization. *International Journal of Industrial Organization, 3*(4), 365–378.

Roodman, D. (2009a). How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal, 9*(1), 86–136.

Roodman, D. (2009b). A note on the theme of too many instruments. *Oxford Bulletin of Economics and Statistics, 71*(1), 135–158.

Sampson, R. C. (2007). R&D alliances and firm performance: The impact of technological diversity and alliance organization on innovation. *Academy of Management Journal, 50*(2), 364–386.

Schumpeter, J. (1934). *Capitalism, socialism, and democracy.* US, New York: Harper & Row.

Sher, P. J., & Yang, P. Y. (2005). The effects of innovative capabilities and R&D clustering on firm performance: The evidence of Taiwan's semiconductor industry. *Technovation, 25*(1), 33–43.

Simerly, R. L., & Li, M. (2000). Environmental dynamism, capital structure and performance: A theoretical integration and an empirical test. *Strategic Management Journal, 21*(1), 31–49.

Srivastava, R. K., Fahey, L., & Christensen, H. K. (2001). The resource-based view and marketing: The role of market-based assets in gaining competitive advantage. *Journal of Management, 27*(6), 777–802.

Tandoc, E. C., Jr., Lim, Z. W., & Ling, R. (2018). Defining "fake news" a typology of scholarly definitions. *Digital Journalism, 6*(2), 137–153.

Teece, D. J. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy, 15*(6), 285–305.

Thanetsunthorn, N. (2015). The impact of national culture on corporate social responsibility: Evidence from cross-regional comparison. *Asian Journal of Business Ethics, 4*(1), 35–56.

Tu, Y., & Lu, X. (2016). Do ethical leaders give followers the confidence to go the extra mile? The moderating role of intrinsic motivation. *Journal of Business Ethics, 135*(1), 129–144.

Ullah, S., Akhtar, P., & Zaefarian, G. (2018). Dealing with endogeneity bias: The generalized method of moments (GMM) for panel data. *Industrial Marketing Management, 71*, 69–78.

Unger, E. J., Gallagher, M. A., & White, E. D., III (2004). R&D budget-driven cost and schedule overruns. *The Journal of Cost Analysis & Management, 6*(1), 80–97.

Vance, S. C. (1975). Are socially responsible corporations good investment risks. *Management Review, 64*(8), 19–24.

Waddock, S. A., & Graves, S. B. (1997). The corporate social performance–financial performance link. *Strategic Management Journal, 18*(4), 303–319.

Walumbwa, F. O., & Schaubroeck, J. (2009). Leader personality traits and employee voice behavior: Mediating roles of ethical leadership and work group psychological safety. *Journal of Applied Psychology, 94*(5), 1275.

Wang, W. Y., Pauleen, D. J., & Zhang, T. (2016). How social media applications affect B2B communication and improve business performance in SMEs. *Industrial Marketing Management, 54*, 4–14.

Wiersema, F. (2013). The B2B agenda: The current state of B2B marketing and a look ahead. *Industrial Marketing Management, 42*, 470–488.

Yidong, T., & Xinxin, L. (2013). How ethical leadership influence employees' innovative work behavior: A perspective of intrinsic motivation. *Journal of Business Ethics, 116*(2), 441–455.

Zaefarian, G., Kadile, V., Henneberg, S. C., & Leischnig, A. (2017). Endogeneity bias in marketing research: Problem, causes and remedies. *Industrial Marketing Management, 65*, 39–46.

Zahra, S. A., Ireland, R. D., & Hitt, M. A. (2000). International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. *Academy of Management Journal, 43*(5), 925–950.

Zeng, D., Chen, H., Lusch, R., & Li, S. H. (2010). Social media analytics and intelligence. *IEEE Intelligent Systems, 25*(6), 13–16.

Zhang, Y., Li, J., Hu, Y., Song, W., Jiang, W., & Ding, W. (2018). The effects of slack resource of R&D professionals on firm performance: Evidence from traditional manufacturing firms in an emerging economy. *The International Journal of Human Resource Management,* 1–23.

Zhu, Y., Sun, L. Y., & Leung, A. S. (2014). Corporate social responsibility, firm reputation, and firm performance: The role of ethical leadership. *Asia Pacific Journal of Management, 31*(4), 925–947.