

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/366185940>

Sustainability and Green Technology Innovation

Article in REMITTANCES REVIEW · December 2022

DOI: 10.47059/rr.v7i2.2410

CITATION

1

READS

897

4 authors, including:



Vasantha Shanmugam
Vels University

201 PUBLICATIONS 775 CITATIONS

SEE PROFILE



Ruby Evangelin
Vels University

10 PUBLICATIONS 15 CITATIONS

SEE PROFILE



Vimala Dharmasivam
Vels University

2 PUBLICATIONS 2 CITATIONS

SEE PROFILE

Received: 12 June 2022; Accepted: 06 September 2022

DOI: 10.47059/rr.v7i2.2408

Sustainability and Green Technology Innovation

D. Vimala¹, M. Ruby Evangelin² and Dr.S. Vasantha^{3*}

Abstract

This study investigates the relationships between investments in green technology and involvement in sustainability. Small firms' interest in investing in green technology is influenced by how involved they are with sustainability. Investments in green technologies, however, do not seem to be primarily motivated by participation in environmental sustainability. The study's findings demonstrate that businesses using green technologies do not prioritise environmental sustainability over other goals like creating economic and social value. Supposedly, the triple bottom line, which operates in this space, aims to assess corporate performance in terms of its effects on the environment and interested parties in addition to concerns about profitability. The study of sustainability in management information systems has thus far been constrained by the field of green IT, which largely focuses on reducing the energy consumption of corporate IT systems. It shows how to integrate human, supply chain, and IT resources to help businesses develop sustainability capabilities that enable them to deliver sustainable values to relevant stakeholders and maintain competitive advantage. In particular, the development of sustainability capabilities is addressed in relation to the role of automate, inform, transform, and infrastructure IT resources. The project calls for IT to play a daring new role in sustainability that goes beyond lowering energy usage. The ramifications for future IT and sustainability research and management practise are also discussed.

Index Terms: *Economic Sustainability; Environmental Sustainability; Green Technology Innovation; Sustainability.*

Introduction

Sustainability has acquired relevance in business study and practise over the past few decades as a result of worries about economic imbalance, and corporate social responsibility. The "triple bottom line" approach in this field aims to assess a company's performance in terms of its effects on the environment and other stakeholders in addition to concerns about profitability. The study

¹PhD Scholar, School of Management Studies, Vels Institute of Science, Technology & Advanced Studies (VISTAS).
E-mail: vimala.sivam1987@gmail.com

²Assistant Professor and Research Scholar, School of Management Studies, Vels Institute of Science Technology and Advanced Studies (VISTAS), Chennai. E-mail: rubyevangelin.sms@velsuniv.ac.in

³Professor, School of Management Studies, Vels Institute of Science, Technology & Advanced Studies (VISTAS).
E-mail: vasantha.sms@velsuniv.ac.in

of sustainability in management information systems has thus far been constrained by the field of green IT, which largely focuses on reducing the energy consumption of corporate IT systems. The creation of the overall sustainability framework in the document is theoretically underpinned by the resource-based view. The development of sustainability skills in particular is explored in relation to the function of IT resources in automating, informing, transforming, and infrastructure. Beyond reducing energy use, the proposal calls on IT to take on a daring new role in sustainability. The ramifications for future IT and sustainability research and management practise are also discussed.

Businesses must be more adaptable in the dynamic and rapidly evolving global business environment in order to promptly react to market changes. Changes are being prompted by a number of issues, some of which are becoming more urgent, such as demands for corporate responsibility and sustainability. To survive in a time as trying as this economic crisis, businesses must make challenging decisions. Studies show that tackling sustainability challenges is crucial for an organization's existence and expansion (Porter and Kramer, 2006). For academics and professionals in management, sustainability has become more important.

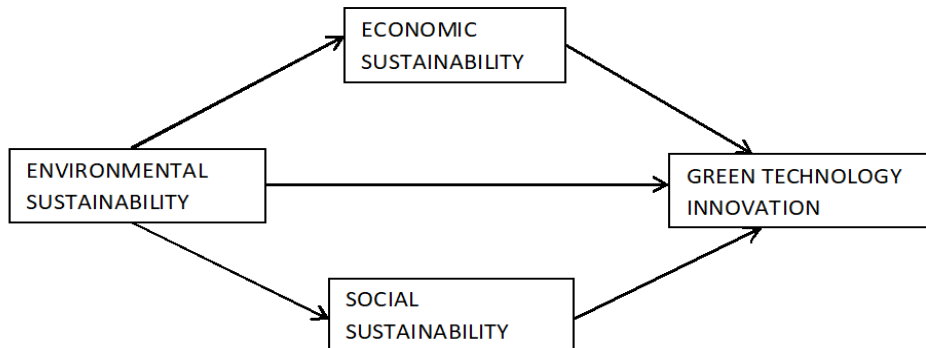
Even though the economy has expanded significantly over the past two decades, there is currently a lot of concern about wealth disparity and the depletion of natural resources. These facts can be linked to the most recent drive. This has led to the emergence of a more contemporary perspective on sustainability, which views the natural environment, society, and economic performance as its three key components. (2004, Elkington, 1994).

Objectives

- To review the level of awareness on the environmental sustainability for the successful implementation of green technology innovation.
- To find the mediating effect of economic sustainability on environmental sustainability and green technology innovation.
- To also find the effect of social sustainability on green technology innovation.

Conceptual Framework

The study has been shortly depicted by a conceptual framework that the sustainability leads to Green Technology Innovation. Economic stability and social sustainability also acts as mediators for environmental stability and green technology innovation.



Literature Review

Human Resource Management and Sustainability

Fenwick and Bierma conducted a study on the topic of research on HRM and sustainability is new, however it is developing. According to Wirttenberg et al. from 2007, they "identified seven essential characteristics of sustainable organisations and drew up specific HR-related techniques to assist increase these qualities." According to studies by Fenwick and Bierma, more HR involvement is needed to achieve social responsibility and ecological balance. (2008). However, a comprehensive plan that would include HRM and other organisational resources in order to produce lasting capacities is currently inadequate, according to our research of the HR literature. IT will be responsible for ensuring that these are applied and understood throughout the entire company.

Supply Chain Management and Sustainability

Cavinato, 1992; Lee and Billington, 1993, conducted a study to show that it is virtually always necessary for multiple businesses to work together to satisfy a demand for a specific commodity or service (Operations management (OM), which aims to satisfy customer demand through effective production and logistical procedures, includes supply chain management as a subfield. In order for organisations to most effectively meet customer demand, information sharing and enhanced collaboration are necessary, according to the core notion of supply chain management (in terms of cost).

Li and Wang, 2007; Sarmah et al., 2006 studied in detail and proved that it has been clearly demonstrated that the revenues can be maximised if each partner operates as though they are a single profit-maximizing corporation. The following is what supply chain coordination entails, it is debatable whether or not entire supply chains, rather than simply individual actors, must

operate in a remarkable manner for sustainability to be genuinely effective. If one partner in the supply chain has a stringent environmental policy, but its distributor or supplier makes decisions without taking the environment into consideration, it doesn't make sense.

Shrivastava, Angell and Klassen, Klassen and Whybark, (1995 and 1999) showed that a company that views sustainability highly will look for partners who share those principles. The supply chain of the partners will be sustainable as a result, and managerial choices will take into account both the environment and people.

Environmental Sustainability

Galdeano-Gómez et al 2013 conducted a study to show that green technology and innovations aimed at resource efficiency at the heart of environmental sustainability. According to several studies, these technologies emphasise reducing negative environmental consequences, utilising natural processes, such as nutrient recycling, and raising support for sustainable solutions. Negative environmental effects include those caused by waste management.

Enhancing shared social capital through, for example, community involvement and a strong civil society is referred to as social sustainability (Goodland and Daly 1996). The business must strike a balance between the needs of people (both individually and collectively), the health of the economy, and the potential of the environment in order to practise social sustainability.

In addition to promoting productivity and competitiveness, social sustainability engagement protects the environment and promotes human development. Employee education can spur behaviour changes and environmental consciousness in people (Huang et al. 2016). The adoption of sustainable solutions is influenced by the internal information flow inside an organisation.

Zsidisin and Siferd, 2001 et al conducted a study to prove that only a small number of papers have looked at several companies using the triple bottom line's three components. The role of CSR in purchasing decisions is examined by Carter and Jennings (2004). Similar to this, Strand (2008) looks at a company's sustainability, including its suppliers. Of course, not even these wonderful contributions focus on the downstream supply chain participants, such as distributors, merchants, and the like.

When considering the triple bottom line, we can look at how operations and human resources contribute to sustainability. The HR department takes decisions that have an effect on people (employee satisfaction) and profit through employee remuneration and perks (labor and benefit cost). Decisions that have an influence on both profit (via operational costs) and the environment are often made by the operations department.

Vachon and Klassen (2008) showed that these competencies include the following in the context of a supply chain: (1) the capacity to collaborate with other partners for improved

performance and productivity, and (2) the capacity for cooperation with other partners, which promotes inter-organizational learning and has the particularly potent effect of facilitating the development of capacities in other partners.

Information Technology and Sustainability

As was previously mentioned, for businesses to develop sustainability skills, close cooperation and information sharing between and within organisations, made possible by information systems, are essential. Combining IT resources with their complementary people and managerial resources has been proved to provide capabilities that give businesses a competitive advantage (e.g. Bharadwaj et al., 2007; Klein et al., 2007; Rai et al., 2006).

However, the majority of this research is concerned with the economic effects of IT. It might be argued that from a sustainability perspective, integrating IT technical and human resources with HR and SCM resources is essential for businesses to achieve sustainable capabilities. These justifications lead to our first hypothesis, which we use as a starting point for our investigation into the contribution of various IT resource types to business strategies aimed at enhancing sustainability capabilities.

Economic Sustainability as a Mediator

Two components can be used to identify the financial incentives for making investments in green technology. One is related to the financial success of the companies themselves, and the other is related to the financial interests of stakeholders in the companies (for example, offering cheaper services or products. Cost savings are the primary forces behind green innovation in terms of the financial aspects of sustainability, according to recent studies.

Del Ro, Romero-Jordán et al furthered the idea that cost-cutting strategies appear to be driving many eco-innovations and expenditures in environmental R & D. Cost-savings are a driving force behind cutting back on energy and material consumption. They also emphasised the significance of taxes as eco-innovation drivers. According to Hottenrott, Rexhäuser, and Veugelers (2016), enhanced productivity may be a factor in green technology investment in addition to possible cost savings. Hottenrott, Rexhäuser, and Veugelers (2016) claim that using green technology to boost productivity will help firms become more profitable.

Bloom et al. (2010) discovered a link between improved environmental management and greater productivity. According to the previous debate, a person's interest in economic sustainability increases their interest in environmental sustainability, which then increases their desire to invest in green technology. The impact of economic sustainability on environmental sustainability affects investments in green technologies.

Social Sustainability

Baumann, Boons, and Bragd (2002) showed that while using sustainable technology to achieve a variety of goals, organisations must compromise between positive and negative impacts. In conclusion, a variety of incentives spur businesses to invest in green technologies. Depending on the criteria that are prioritised in a company's operations, different factors (such as management concern and environmental requirements) also influence the strategies of different organisations. According to this study, "sustainable engagement" refers to how much businesses value the three facets of sustainability; this concept is regarded as a driving force behind businesses' investments in green technology. According to the research model investments in green technologies and sustainability participation (in terms of environmental sustainability) have a favourable association. Social and economic variables mediate the link between investments in green technology and environmental sustainability.

Social Progress as Mediator

Investment in green technologies has also been proven to be motivated by managerial concerns. According to Qi et al. (2010), managerial concerns appear to be the main motivation for the implementation of green practises. Technology innovation is included in Chen's definition of "green innovation" (Chen, Lai, and Wen, 2006). Chen (2008) also found that collaborative learning and capacities linked to environmental management and green innovation can improve the performance of organisations' green process and green product innovation. Huang et al. (2016) contend that managerial commitment to staff training and the flow of information both play a key role in driving green innovation.

Furthermore, green innovation is essential to business management since it enables organisations to enhance performance, capitalise on competitive advantages, and create value, according to Chang and Chen (2013). Implementing green technologies, according to Hottenrott, Rexhäuser, and Veugelers (2016), can be expensive and potentially harm a company's productivity. But the impact of adopting green technologies on productivity may be reduced or even reversed if organisational changes can be made to enable a more complete and effective use of the technology. The business environment is fast changing in terms of societal expectations from a number of stakeholders, in addition to management concerns and the development of human capital. (Dangelico and Pujari 2010).

The management of sustainability challenges by businesses is becoming more challenging in order to attract, please, and retain customers, according to Dangelico and Pujari (2010). Customers' needs are thus considered as a driving force behind green technology. According to Kesidou and Demirel (2012), meeting the bare minimum of social criteria serves as the driving force behind

the adoption of eco-innovations. Additionally, studies have demonstrated that consumers want businesses to provide goods, services, and procedures that strive to cut down on energy use, waste, and inefficient use of materials. (Horbach, Rammer, and Rennings 2012).

Green innovations have also been identified as a strategic need for businesses, providing a great potential to satisfy customers' needs without endangering the environment. The following can be used to summarise the points made above: An intention to invest in green technology follows involvement in environmental sustainability, which increases involvement in social sustainability. The second premise is so as follows: M. Saunila et al., Investments in green technologies are influenced by environmental sustainability through its impact on social sustainability.

In general, small enterprises' commitment to sustainability appears to have an effect on their interest in making investments in green technologies. Regardless of the firm size, sustainability participation impacts investments in green technologies. Even though it doesn't seem to be the primary driver of green technology expenditures, involvement generally seems to have a favourable impact on those investments. According to the results of M. Saunila et al, businesses that invest in green technologies do not prioritise environmental sustainability over goals like winning over the public, cutting costs, and starting new businesses.

Sustainability Engagement

Brundtland et al showed that the three well-known sustainability pillars of environmental, social, and economic sustainability can be used to approach sustainable participation. The assumption that humans must coexist with their environment, which serves as both a source of life and a place to dispose of waste, forms the basis for environmental sustainability participation. (Goodland and Daly 1996; Morelli 2011).

"The upkeep of capital" is what makes an economy sustainable. It focuses on how much money something is worth. Although it is challenging to integrate environmental value in such measurements, environmental externality costs are also taken into account (Goodland and Daly 1996). Resources (both finite and renewable) that are used in manufacturing processes are included in economic sustainability efforts, among other things, by revenue, expenses, and starting a new business.

Investment in Green Technology

Hojnik and Ruzzier (2016) argued that both terms can be used interchangeably, whereas Sustainable innovation, according to Schiederig, Tietze, and Herstatt (2012), includes both social and ecological considerations. Despite the parallels between the concepts of eco-innovation and environmental innovation that Franceschini, Faria, and Jurowetzki (2016) demonstrated, Charter

and Clark (2007) and their study both distinguished between the two terms. Sustainable innovation takes ethical and social considerations into account in addition to economic and environmental sustainability, according to Franceschini, Faria, and Jurowetzki (2016).

Competitive objectives, green innovation, and management are all tightly intertwined. Green innovation presents businesses with a significant opportunity to satisfy client wants without endangering the environment.

Chang and Chen (2013) concluded that green innovation might give an advantage over rivals. In order to gain a competitive edge, innovation is the process of developing new goods, services, procedures, and business models. The innovation method in this study is technology-focused, despite the fact that innovation in relation to sustainable development places more emphasis on societal concerns. (Berkhout 2006; Schot and Geels 2008).

Green innovation refers to the creation of novel goods, services, procedures, or management techniques that help address environmental issues (Li et al. 2017). Our definition of "green innovation" is "innovation in technology linked to waste recycling, energy conservation, green product designs, pollution avoidance, or environmental management," which is similar to Chen, Lai, and Wen's (2006) definition. According to our analysis, "green innovation" refers to machinery or software connected to products or practices. Investment describes the use of resources, such as cash or knowledge, to purchase and implement green technologies.

Investment in green technologies and environmental protection Investments in green technologies, which include those that aid in trash recycling, pollution avoidance, and energy conservation, are driven by a commitment to the environment (Chen, Lai, and Wen 2006). These technologies emphasise minimising harmful environmental effects, such as those brought on by waste management, and utilising natural processes Delai, Takahashi, and Galdeano Gómez (2011); Pretty, Toulmin, and Williams (2011); Aznar-Sánchez, Pérez-Mesa, and Aznar-Gómez (2013). In response to the current environmental issues, investing in green technology is one way that businesses may work toward their environmental goals with a commitment to the environment. (Chang and Chen 2013).

Significant environmental change presents obstacles, but environmental rules have also encouraged businesses to invest in green technology. Community-based policies, essential legislation, and political development support are examples of government actions that promote sustainable development. (Mamede and Gomes 2014; Lozano 2015). According to the prior study cited above, an interest in investing in green technologies is likely to come after involvement in environmental sustainability.

Contribution to Theory

This study looked into potential connections between spending on green technology and involvement in sustainability. From a triple bottom-line standpoint, the sustainability factors that influence businesses to invest in green technologies were outlined. According to the report, businesses are more inclined to invest in green technology the more committed they are to environmental sustainability.

The analysis's findings suggest that making a conscious effort to safeguard the environment can be beneficial. When incentives are based on a physical resource, such as capital, the goal of investing in green technology may be seen as significant. The survey also revealed that the inclination to invest in green technologies is not greatly influenced by the firm's size or method of operation.

Green Technology Innovation

Two aspects of green technology investments served as the catalyst for this study, which examined the impact of sustainability engagement in such investments. First of all, there hasn't been much research that concurrently examines sustainability from the view point of small enterprises in its environmental, social, and economic dimensions. Despite the fact that earlier studies have typically explored green innovation, the variables that influence small enterprises' investments in green technology, which is one component of green innovation, have not been the subject of much in-depth empirical research.

In contrast to earlier studies, this one examined how investments in green technology and social and economic sustainability may help to promote environmental sustainability. As we saw, involvement in environmental sustainability affected investments in green technologies. Prior studies have shown that environmental commitment is necessary for using ecological processes and for minimising a company's negative environmental effects (such as in waste management), or instance, recycling of nutrients.

Conclusion

Our results are consistent with the results of this study. Less is known about the connection between actual investments in green technologies and environmental sustainability participation. Our data also show how environmental sustainability affects investments in green technology, with social and economic sustainability serving as a mediating element. According to the study's findings, small firms prioritise gaining social and economic benefit over minimising environmental damage when investing in green technologies. Examples of this include growing social acceptance, lowering costs, and the creation of new businesses.

The current study's findings show that if green technologies also have economic and social benefits in addition to environmental benefits, corporations are more likely to invest in them. The results of earlier investigations are supported by the recently revealed mediation effect of social sustainability. Staff training, in the opinion of Huang et al. (2016), can encourage workers to develop more environmentally friendly practises. Additionally, Del Ro, Romero-Jordán, and Peasco (2015) suggested that the adoption of sustainable solutions is influenced by the flow of knowledge inside an organisation. According to the study's findings, investments in green technology and environmental sustainability are mediated by these social dimensions of sustainability in addition to having direct benefits.

The study's findings also demonstrate that investments in green technology are unaffected by the size of the organisation. The size of the company does not appear to have an impact on small enterprises' intentions to engage in green technologies, despite the widespread belief that small businesses have limited resources, including cash and human resources (Wolff and Pett 2006, for example). Academics and business professionals have become more interested in sustainability during the past few years.

Implications for Future Research

First, little inter-disciplinary research has looked at how organisations might integrate resources across different functional areas to meet the TBL. More specifically, little research has looked at how IT resources, beyond lowering energy usage of corporate IT infrastructure, contribute to sustainability. Research has revealed that IT resources have broad, meaningful effects on a variety of organisational performance and competitiveness factors. Our research demonstrates that, it is possible to translate such broad effect potentials to the deployment of IT resources to help businesses establish sustainable capabilities. The development of organisations' sustainable capacities must therefore be examined through the lens of multiple disciplines in sustainability research.

Our research also establishes the theoretical groundwork for further investigation into the sustainability value of IT in many contexts. First off, our study has demonstrated that IT can contribute to sustainability in ways other than just through conserving energy through green IT activities. Future research on IT and sustainability needs to take a more integrated approach, looking at IT resources and strategies that are integrated with complementary business resources and strategies and aligned with the situational context to enable firms to develop sustainability capabilities for specific sustainability objectives. IT is arguably an integral part of firms' sustainability strategy.

Future study can look at how other resources, such as accounting, finance, and marketing, might be connected with IT resources to help businesses enhance their sustainability performance. Our research focuses on the integration of IT resources with HRM and SCM resources. Cross-disciplinary studies in finance and accounting, for instance, may provide performance evaluation and quantification of sustainability effects.

Future studies could build on these insights by studying how different IT resource combinations with particular complementary resources affect how well businesses are able to solve particular sustainability framework concerns.

Managerial Implications

According to the report, each sustainability component influences organisations' actual investments in green technology from the standpoint of the triple bottom line. Based on this knowledge, companies that develop and market green technologies must take into account all three sustainability dimensions. Moreover, when deciding to engage in green technology like biogas plants or services that address manure-handling issues, businesses can strike a compromise between several sustainability characteristics.

Limitations and Avenues for Future Research

Further research is necessary in order to generalise the findings to other industries because the data were taken from a particular industry. However, the horse business is a part of a wider urbanisation trend. The results apply to a wide range of companies outside the horse industry because this change is a reality in many different areas. The results were only collected from one country in Northern Europe, which presents another constraint; when using the results in practice or for more research, particular country features must be taken into account. However, the conclusions can be extrapolated to other Western economies because horse industries in Western nations are similar.

This study's cross-sectional design and reliance on perceptual data are further potential drawbacks. Although perceptual data are frequently used in business research, using a key informant strategy can lead to inaccuracies. These restrictions were further mitigated by taking into account theoretical justifications for the correlations under study.

These limitations might be addressed in further investigations. To further understand the variables influencing small enterprises' investments in green technology, more empirical study is needed. First off, various technologies are included in the broad definition of investments in green technologies. Therefore, it would be advantageous to investigate the motivations behind

various green technology investment. Second, it would be intriguing to examine investment intentions in green technology in relation to particular firm traits like maturity or internationality.

References

- Aguilera, R., Rupp, D., Williams, C., & Ganapathi, J. (2007). Putting the S back in corporate social responsibility: a multilevel theory of social change in organizations. *Academy of Management Review*, 32(3), 836–863.
- Angell, L.C., & Klassen, R.D. (1999). Integrating environmental issues into the mainstream: an agenda for research in operations management. *Journal of Operations Management*, 17, 575–598.
- Baird, L., & Meshoulam, I. (1988). Managing two fits of strategic human resource management. *Academy of Management Review*, 13(1), 116–128.
- Banker, R.D., Bardhan, I.R., Chang, H., & Lin, S. (2006a). Plant information systems, manufacturing capabilities, and plant performance. *MIS Quarterly*, 30(2), 315–337.
- Brundtland, G.H. (1987). *Our common future*. In: *Report of the World Commission on Environment and Development*. Oxford: Oxford University Press.
- Carroll, A.B. (1991). The pyramid of corporate social responsibility: toward the more management of organizational stakeholders. *Business Horizons*, 34(4), 39–49.
- Chen, A., Boudreau, M., & Watson, R. (2008). Information systems and ecological sustainability. *Journal of Systems and Information Technology*, 10(3), 186–201.
- Dewett, T., & Jones, G.R. (2001). The role of information technology in the organization: a review, model, and assessment. *Journal of Management*, 27, 313–346.
- Duncan, N. (1995). Capturing flexibility of information technology infrastructure: a study of resource characteristics and their measure. *Journal of Management Information Systems*, 12(2), 37–57.
- Environmental, U.S. (2007). Protection Agency. Report to congress on server and data center energy efficiency. *Public Law*, 109-431.
- Fenwick, T., & Bierma, L. (2008). Corporate social responsibility: issues for human resource development professionals. *International Journal of Training and Development*, 12(1), 24–35.
- Klein, R., Rai, A., & Straub, D. (2007). Competitive and cooperative positioning in supply chain logistics relationships. *Decision Sciences*, 38(4), 611–646.
- Kleindorfer, P.R., Singhal, K., & Van Wassenhove, L.N. (2005). Sustainable operations management. *Production and Operations Management*, 14, 482–492.
- Lado, A.A., & Wilson, M.C. (1994). Human resource systems and sustained competitive advantage: A competency based perspective. *Academy of Management Review*, 19(4), 699–727.
- Porter, M., & Kramer, M. (2006). Strategy and society: the link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84(12), 78–92.
- Powell, C., & Dent-Micallef, A. (1997). Information technology as competitive advantage: the role of human, business, and technology resources. *Strategic Management Journal*, 85(3), 375–405.
- Prahalad, C.K., & Hart, S. (2002). The fortune at the bottom of the pyramid. *Strategy+Business*, 26, 54–67.
- Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS Quarterly*, 30, 225–246.



- Ray, G., Muhanna, W., & Barney, J. (2005). Information technology and the performance of the customer service process: a resource-based analysis. *MIS Quarterly*, 29(4), 625–652.
- Watson, R., Boudreau, M., & Chen, A. (2010). Information systems and environmentally sustainable development: energy informatics and new directions for the IS community. *MIS Quarterly*, 34(1), 23–38.
- Wagner, S., Hespeneide, E., & Pavlovsky, K. (2009). The responsible and sustainable board. *Deloitte Review*, 4(4), 59-71.
- Zsidisin, G.A., & Siferd, S.P. (2001). Environmental purchasing: a framework for theory development. *European Journal of Purchasing & Supply Management*, 7, 61–73.
- Zuboff, S. (1988). *In the Age of the Smart Machine: The Future of Work and Power*. Basic Books, New York.
- Zmud, R., Shaft, T., Zheng, W., & Croes, H. (2010). Systematic differences in firm's information technology signaling: implications for research design. *Journal of the Association for Information Systems*, 11(3), 149–181.
- Zhu, Q., & Sarkis, J. (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management*, 22, 265–289.