Association for Information Systems
AIS Electronic Library (AISeL)

AMCIS 2012 Proceedings | Proceedings

Green IS Assimilation: A Theoretical Framework and Research Agenda

Chun Fong Lei
The Department of Management and Marketing, The Hong Kong Polytechnic University, Kowloon, Hong Kong.,
10900544r@connect.polyu.hk

Eric Wai Ting Ngai
The Department of Management and Marketing, The Hong Kong Polytechnic University, Kowloon, Hong Kong.,
mswtngai@inet.polyu.edu.hk

Green IS Assimilation: A Theoretical Framework and Research Agenda

Chun Fong Lei
The Hong Kong Polytechnic University
10900544r@connect.polyu.hk

Eric W. T. Ngai
The Hong Kong Polytechnic University
mswtngai@polyu.edu.hk

ABSTRACT

The current paper presents a theoretical framework on the assimilation of Green IS in organizations. The assimilation of Green IS comprises three stages, namely, Green IS initiation, adoption, and routinization. The different stages of assimilation are proposed to be affected by different groups of factors. Based on institutional theory, organizational information processing theory and organization theory, environmental uncertainty, organizational slack, and institutional pressure are employed to explain Green IS assimilation, and the importance of each of these factors will vary in different stages of assimilation. Institutional factors and environmental uncertainty will affect the initiation of adoption of Green IS, while organizational resources will affect the adoption and rountinization of Green IS. Organizational resources will moderate the relationship between environmental uncertainty and Green IS adoption. The proposed framework is planned to be tested in the future empirical study. Finally, theoretical and managerial implications of the proposed conceptual model are presented.

Keywords

Green IS assimilation, research agenda, theoretical framework.

INTRODUCTION

The over-exploitation of the environment by human beings has resulted in the deterioration of the natural environment (Elliot, 2011). With the deterioration of the environment, many problems are emerging, including skyrocketing energy price because of the nonrenewable fossil energy source and global warming because of the consumption of fossil fuels.

The information systems (IS) field should play a role in dealing with environmental issues for two reasons. The first reason is that the IS field is responsible for the deterioration of the environment. Information technology (IT) and IS are two contributors to the deterioration. The IS field is notorious for its pollution released. The usage of IT equipment in the United States has produced 4 million tons of carbon dioxide emissions (Ranganathan, 2010), and is likely to increase in the foreseeable future (Elliot & Binney, 2008). Aside from the greenhouse gases emissions contributed, the energy consumption of this field is also growing exponentially (Brown & Reams, 2010). As the lifecycle of IT equipments have become increasingly shorter because of rapid technological development, an increasing number of IT equipments containing toxic materials are disposed into landfills (Karin, 2009). To reduce pollution, as well as the amount of energy consumed by the IS field, a number of Green IS measures should be implemented, including the virtualization of servers data center reconfiguration, and extension of desktop and laptop lifecycles.

The second reason is that Green IS can help organizations reduce pollution and achieve environmental sustainability. It can be used to optimize energy consumption and distribution, which, in turn, can reduce GHG emission, so Green IS is believed to have the capability to achieve environmental sustainability (Watson, Boudreau & Chen, 2010). Moreover, Green IS can help guide organizations to handle toxic and hazardous materials and waste, design green products, re-engineer business processes to be more environmental friendly, and manage energy consuming facilities (Butler, 2011). The assimilation of Green IS is proposed to result in a number of positive outcomes, such as cost reduction, risk reduction (Thambusamy & Salam, 2010), new customers attraction, and image promotion (Rusinko, 2007).

Green IS is predicted to transform business and become one of the main research themes in the near future (Baker, Avital, Davis, Land & Morgan, 2011). Several research studies on the adoption of Green IS have been published in IS journals (For example, Bose & Luo, 2011; Butler, 2011; Dao, Langella & Carbo, 2011). However, most of them are not empirical. To contribute to the knowledge on Green IS assimilation, we plan to conduct an empirical study on this topic. We have three objectives:

1. To identify some of the drivers of assimilation and investigate the effects of these drivers on the consequent assimilation of Green IS.

2. To understand whether some of the existing theoretical perspectives can explain and describe the assimilation of Green IS.

3. To investigate the assimilation of Green IS, and the change in the importance of its drivers throughout the assimilation process.

The current study is expected to contribute in the accumulation of knowledge on the drivers of Green IS assimilation at different stages. The next section will provide a brief literature review and the development of the theoretical model on Green IS assimilation. The proposed methodology for future validation of the model, discussions, theoretical and practical implications will be presented in the following sections. In the last section, limitations of the current study will discussed.

LITERATURE REVIEW AND THEORETICAL DEVELOPMENT

Definition of Green IS

In IS literature, no universal definition of Green IS is available (see Bose & Luo, 2011; Ijab, Molla, Kassahun & Teoh, 2010; Bulter, 2011). In this research study, Green IS is defined as the IS or IT used to achieve environmental sustainability (Jenkin, Webster & McShane, 2011).

Green IS Assimilation

According to the diffusion of innovation theory (DIT), an organization will go through a process of assimilation when it accepts an innovation (Rogers, 1985). Assimilation refers to the degree to which a particular innovation becomes widely deployed and routinized within an organization (see Balas & Venkatesh, 2007). Through the process of assimilation, an organization passes through a lifecycle from an initial awareness to the routinization of a particular innovation. The assimilation of Green IS as an innovation is not an one-off action, but a continuous process that passes through several stages (Bose & Luo, 2011). Therefore, the current study is not limited to the decision to adopt Green IS, but also covers the pre- and post-adoption stages.

The assimilation of Green IS has three stages, namely, the initiation, adoption, and routinization stages (Zhu, Kraemer & Xu, 2006). In the initiation stage, the organization conducts a formal evaluation of the system. In the adoption stage, the organization formally decides on adopting the Green IS. In the routinization stage, the Green IS is implemented throughout the organization, with the users accepting it (Rajagopal, 2002). The drivers' effects may be varied in different stages of assimilation (Laudon, 1985). For example, the study conducted by Zhu et al. (2006) found that the effects of the same set of factors vary in different stages of IT assimilation. In the present study, we also argue that different antecedents exist in the different stages of Green IS assimilation.

Environmental Uncertainty

The perception of environmental uncertainty can drive organizational change and innovation. Environmental uncertainty is defined as information shortage on the environment that surrounds an organization, resulting in difficulties in predicting external changes and evaluating organizational actions (López–Gamero, Molina–Azorín & Claver–Cortés, 2011). According to the organizational information processing theory, uncertainty in the environment faced by an organization triggers its information processing needs, such as investing in IT (Lu & Ramamurthy, 2010), adapting to the environment (Karimi, Somers & Gupta, 2004).

Environmental uncertainty is positively related to the initiation and adoption of IS (Grover & Goslar, 1993). Moreover, the number of environmental innovations adopted by an organization to achieve environmental sustainability is positively related to the environmental uncertainty faced by the organization (Rothenberg & Zyglidopoulos, 2007). Organizations that perceive more environmental uncertainty are more likely to develop proactive environmental strategies (Aragón-Correa & Sharma, 2003). Environmental uncertainty is also positively related to the initiation and adoption of Green IS because Green IS allows an organization to reduce the uncertainty confronted, such as risks (Thambusamy & Salam, 2010) and pollution (Bengtsson & Agerfalk, 2011) generated by the organization. The effect of environmental uncertainty is not long lasting (Laudon, 1985), so this concept is not positively related to the routinization of Green IS.

H1: Perceived environmental uncertainty is positively related to Green IS initiation.

H2: Perceived environmental uncertainty is positively related to Green IS adoption.

Organizational Slack

Although environmental uncertainty is positively related to Green IS adoption, contradictory evidence was found in the literature. The two empirical studies conducted by Lin and Ho (2010; 2011) show that the perceived environmental uncertainty is negatively related to the adoption of green practices, which is contrary to the prediction made. The possible

reason is that the samples of these empirical studies are the small and medium-sized enterprises (SMEs), and they usually have limited resources. Considering that the adoption of Green practices may require the sacrifice of initial benefit for future benefit and that SMEs do not have adequate resources to sacrifice, SMEs may decide to retain strategies and practices that are less risky and that require less immediate costs. This type of organizational resource is called organizational slack.

Organizational slack refers to the available resources of an organization that are beyond the minimum requirement to maintain daily operations during a certain period (Damanpour, 1991; Voss, Sirdeshmukh & Voss, 2008). Organizational slack can be referred to as the capability of an organization to tolerate the sacrifice of instant profit for future gains (Dao et al., 2011). The existence of organization slack facilitates the adoption of new practices and results in positive performance (Goldstein & Iossifova, in press). In the present study, organizational slack is divided into three groups, namely, operational, human resource and financial slack (Damanpour, 1991). Operational slack refers to the operational resources of an organization that are unused or under-utilized. Human resource slack refers to human resources that are skilled and specialized. Financial slack refers to excess financial resources for the maintenance of the operations of an organization (Voss et al., 2008).

Organizational slack can facilitate the adoption of Green IS because it helps the organization exchanges current benefits for long-term benefits and facilitates a long-term mindset. Environmental uncertainty is negatively correlated with Green IS adoption when organizational slack is low. This prediction is made because when resources are very limited, an organization tends to allocate less resources for short-term projects that produce quick results in an uncertain environment (Del Brio & Junquera, 2003).

H3: When the level of operational slack is high, environmental uncertainty is positively related to Green IS adoption, whereas when the level of operational slack is low, environmental uncertainty is negatively related to Green IS adoption.

H4: When the level of human resource slack is high, environmental uncertainty is positively related to Green IS adoption, whereas when the level of human resource slack is low, environmental uncertainty is negatively related to Green IS adoption.

H5: When the level of financial slack is high, environmental uncertainty is positively related to Green IS adoption, whereas when the level of financial slack is low, environmental uncertainty is negatively related to Green IS adoption.

Organizational slack is an important factor facilitating organizational change and innovation (Damanpour, 1991). In the IS literature, internal resources, including financial (Kim & Ko, 2010), HRM (Dao et al., 2011) are widely proposed as the antecedents of Green IS assimilation. Considering that organizational slack can be regarded as an organizational resource, organizational slack is believed to be the antecedents of Green IS assimilation.

The routinization of Green IS requires organizational slack to provide training (Sherif & Vinze, 2003). Therefore, organizational slack is also positively related to the routinization of Green IS. Organization slack must not be a driver of Green IS initiation because this initiation is merely a formal evaluation of Green IS, and it must not require a large amount of resources. In the present study, only unabsorbed slack, which can improve organizational performance according to organization theory is examined (Tan & Peng, 2003).

H6: Operational slack is positively related to the adoption of Green IS.

H7: Operational slack is positively related to the routinization of Green IS.

H8: Human resource slack is positively related to the adoption of Green IS.

H9: Human resource slack is positively related to the routinization of Green IS.

H10: Financial slack is positively related to the adoption of Green IS.

H11: Financial slack is positively related to the routinization of Green IS.

Institutional Theory

The institutional theory is often employed in Green IS adoption literature (Butler, 2011; Chen, Watson, Boudreau & Karahanna, 2009). According to that theory, the reason behind why organizations initiate change is to seek legitimacy and political power (DiMaggio & Powell, 1983). Seeking legitimacy is considered as one of the reasons that organizations respond to environmental issues (Bansal & Roth, 2000). Three factors drive organizations to initiate changes, namely, mimetic, coercive, and normative pressures. Mimetic pressure refers to pressure that drives an organization to imitate the actions and practices of others perceived to be similar to the organization (Teo, Wei & Benbasat, 2003). Coercive pressure is the force that subjects an organization to comply with law and regulations (Chen, Boudreau & Watson, 2008). Normative

pressure refers to the expectations from the stakeholders in the same social network forcing the organization to take legitimate actions (Chen et al., 2008).

In the study conducted by Chen et al. (2009), mimetic and coercive pressures are found to be positively related to the adoption of Green IS. Mimetic, coercive, and normative pressures are also considered the drivers of Green IS adoption (Chen et al., 2008). Moreover, the extent of Green IS adoption is positively related to the coercive pressures an organization is facing (Chen et al., 2009). The institutional theory is selected because we are interested in studying the effects of external pressures on the adoption of Green IS.

Normative pressure drives the initiation and adoption of Green IS because organizations tend to follow the norm in their social networks (Teo et al., 2003). Coercive pressure drives the initiation and adoption of Green IS because organizations want to avoid the potential costs and legal liabilities related to environmental issues (Thambusamy & Salam, 2010). From the traditional point of view, the adoption of sustainable development is largely driven by governments' regulations and policies (El-Gayar & Fritz, 2006). Mimetic pressure also drives the initiation and adoption of Green IS because an organization aims to follow the successful examples of others that have also adopted Green IS (Teo *et al*., 2003). Institutional pressures are only important in the early stage of green practice adoption. However, the effects of these pressures do not persist overtime (Bansal, 2005). Therefore, normative, coercive, and mimetic pressures are not positively related to the routinization of Green IS.

H12: Normative pressure is positively related to the initiation of Green IS.

H13: Normative pressure is positively related to the adoption of Green IS.

H14: Coercive pressure is positively related to the initiation of Green IS.

H15: Coercive pressure is positively related to the adoption of Green IS.

H16: Mimetic pressure is positively related to the initiation of Green IS.

H17: Mimetic pressure is positively related to the adoption of Green IS.

This theoretical model is different from the theoretical framework of Jenkin et al. (2011), which has proposed four types of Green IS strategies: image-oriented only (Type 0), prevent, control, eco-efficiency (Type 1), product stewardship, eco-equity (Type 2), sustainable development, eco-effectiveness (Type 3). Each of them represents different level of Green IS adoption, the lowest level is type 0, while the highest level is type 3. In other words, the framework developed by Jenkin et al. (2011) focuses on the how organizations are different in adopting different level of Green IS strategies, while our theoretical framework focuses on how organization are going through the Green IS assimilation process, regardless the level of Green IS strategies.

The theoretical model proposed in this research study is also different from the strategic framework for the organizational implementation of Green IT (SFOIGIT) developed by Mann, Grant and Mann (2009). The SFOIGIT provides guideline for the organization to determine the extent of investment in Green IT in order to get the optimized benefits, while our framework focuses on explaining and predicting the assimilation of Green IS.

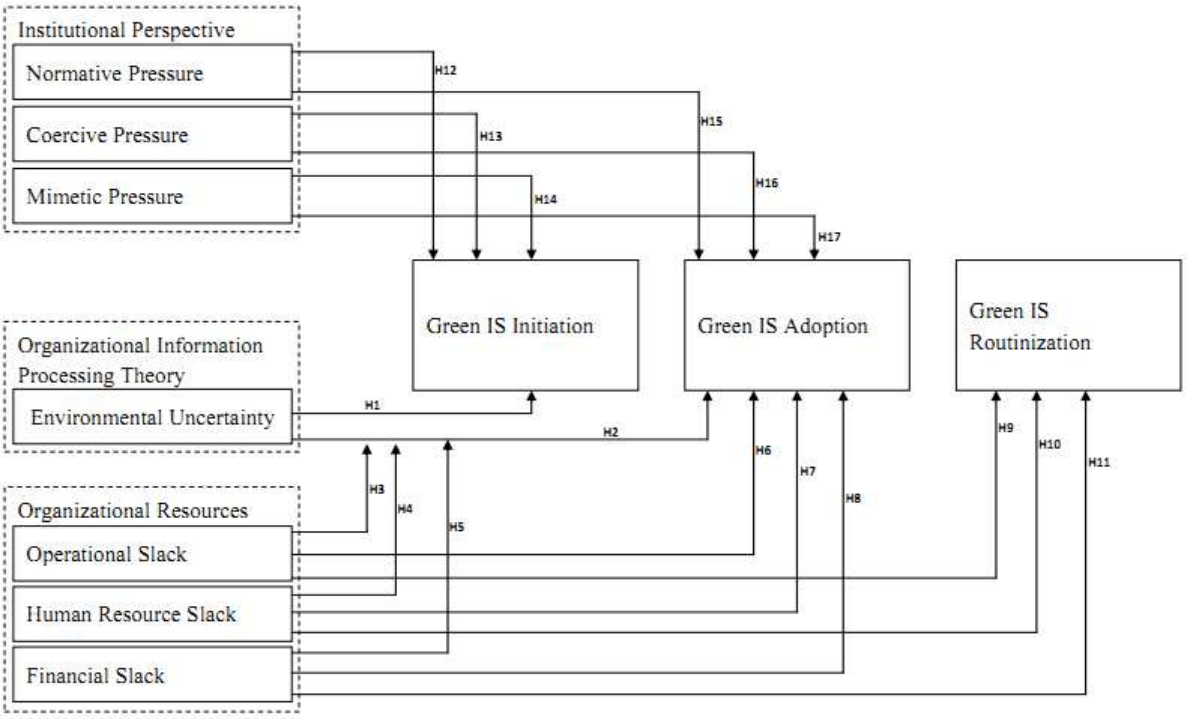

Figure 1. Schematic diagram of the proposed model

FUTURE RESEARCH

Model Validation

The proposed conceptual model is planned to be tested using empirical data. The results and findings will be reported in future publications. A survey will be conducted to collect the data that will be used to test the model. The target participants are IS managers of organizations in different industries. Data are expected to be collected from 200 organizations.

Proposed Measurement - Dependent Variables

(1) Measurements of the three stages of IS assimilation employed by Grover and Goslar (1993) will be used to measure the three dependent variables of the future study. The measurements to be adopted are Green IS initiation, adoption, and routinization. Green IS initiation will be measured by asking respondents whether a formal evaluation is conducted for each type of Green IS. (2) Green IS adoption will be measured by asking respondents whether a formal decision on the adoption of each type of Green IS has been made. (3) Green IS routinization will be measured by a set of seven-point Likert scale questions. The answers to these questions will determine the extent of the routinization of each technology in the organization. The Green IS selected to be studies are those that have been investigated by Molla (2009), including green is policy, sourcing practice, energy efficiency practice, end of life practice, network critical physical infrastructure, and technical infrastructure.

Proposed Measurement - Independent Variables

(1) *Perceived environmental uncertainty* is measured using the scale developed by Lewis and Harvey (2001). A number of seven-point Likert scale questions concerning seven dimensions will be asked. The Likert scale is selected because it can capture the aspects of natural environment, and is suitable for the context of Green IS. (2) *Mimetic*, *coercive,* and *normative pressures* are all measured using seven-point scale questions. For each question on *mimetic* and *coercive pressures*, respondents select answers from strongly disagree to strongly agree, respectively. *Mimetic pressure* will be measured using three items. One of the items states that "Our main competitors who have adopted Green IS are favorably perceived by others in the same industry". (3) *Coercive Pressure* will also be measured using three items. One of the items states that "The competitive conditions require our firm to use Green IS". (4) Similarly, *normative pressure* will be measured using three items. One of questions instructs the respondents to "Please indicate the extent of Green IS adoption by your firm's suppliers". Respondents select answers from very low to very high, respectively. Similar measurements have been adopted by Liang, Saraf, Hu, and Xue (2007). (5)

Operational slack. All three types of organizational slack will be measured using objective data. Operational slack is measured as an unutilized production capacity using the following equation: days of inventory + days of accounts receivables + days of account payables. This measurement has also been adopted by Hendricks, Singhal, and Zhang (2009). (6) *Human resource slack* is measured using the following equation: firm employees over firm sales minus industry employees over industry sales. This measurement has been adopted by Mishina, Pollock, and Porac (2004). (7) *Financial slack* is measured by obtaining the quotient of current assets over current liabilities. A similar measurement has been adopted by Bansal (2005).

DISCUSSION

A conceptual model on Green IS assimilation is proposed based on both the literature on Green IS and on theories from organizational innovations, and planned to be tested with empirical data. Moreover, considering that the assimilation of Green IS is more important than the decision to adopt it in terms of determining its effects, the proposed theoretical model goes beyond the decision to adopt Green IS. The current study investigates the process of Green IS assimilation. The conceptual model can provide a better understanding of both the antecedents and theoretical frameworks on Green IS adoption.

The theoretical model has also attempted to solve the paradox wherein environmental uncertainty is positively related to green practice adoption based on organizational theories, but is negatively related to green practices in empirical studies. The paradox is tackled by employing a new moderator, organization slack, between environmental uncertainty and Green IS adoption.

THEORETICAL IMPLICATIONS

Green IS is a relatively nascent research topic in IS literature, and only a few theoretical frameworks are solely designed for Green IS adoption. The proposed model is important to Green IS research because its operationalization may potentially produce empirical evidence, which is scarce in the existing literature. These empirical evidence may be used to investigate the effect of environmental uncertainty, organizational slack, and institutional pressure on Green IS assimilation. The model is hoped to be capable of providing testable hypotheses that can be used to develop the knowledge on Green IS assimilation further.

PRACTICAL IMPLICATIONS

The proposed conceptual model can provide insights and further understanding on the establishment of proper interventions for the assimilation of Green IS. For the government, establishing regulations on environmental issues is necessary. Moreover, the government should provide resources to support SMEs that intend to adopt Green IS because the lack of resources is a hindrance to Green IS assimilation. For the society and different industries, establishing environmentally friendly norms and practices is necessary. Finally, for suppliers and consumers, imposing pressure on organizations to adopt Green IS is needed.

LIMITATIONS

The current study has several limitations. First, the proposed conceptual model is not validated by empirical evidence. Therefore, further research is required to support the validity of the conceptual model. Second, based on the proposed measurement method, a number of exogenous and endogenous constructs rely on data from the same respondents. Therefore, doubts on whether the conceptual model has been subjected to common method bias exist. To address this issue, a single-method-factor approach will be adopted to assess whether common method bias is significant or not (Podsakoff, MacKenzie, Lee & Podsakoff, 2003). The third limitation of the present study is that cross-sectional data are bases for validating the conceptual model. The fourth limitation is that the measurements of the initiation, adoption, and routinization of Green IS rely on the memory of the managers and hence, may not be accurate. Therefore, to deal with these limitations, a longitudinal research will be conducted to validate the conceptual model after the use of cross-sectional data.

REFERENCES

1. Aragón-Correa, J. A., and Sharma, S. (2003). A contingent resource-based view of proactive corporate environmental strategy. *Academy of Management Review*, 28, 71-88.

2. Baker, J., Avital, M., Davis, G., Land, F., and Morgan, H. (2011). ICIS 2010 Panel Report: Technologies that transform business and research: Lessons from the past as we look to the future. *Communications of the Association for Information Systems*, 28, 497-508.

3. Balas, H., and Venkatesh, V. (2007). Assimilation of interorganizational business process standards. *Information Systems Research*, 18, 340-362.

4. Bansal, P. (2005). Evolving sustainability: A longitudinal study of corporate sustainable development. *Strategic Management Journal*, 26, 197-218.

5. Bansal, P., and Roth, K. (2000). Why companies go green: A model of ecological responsiveness. *Academy of Management Journal*, 43, 717-736

6. Bengtsson, F., and Agerfalk, J. (2011). Information technology as a change actant in sustainability innovation: Insights from Uppsala. *Journal of Strategic Information Systems*, 20, 96-112.

7. Bose, R., and Luo, X. (2011). Integrative framework for assessing firm's potential to undertake Green IT initiatives via virtualization - A theoretical perspective. *Journal of Strategic Information Systems*, 20, 38-54.

8. Brown, D. J., and Reams, C. (2010). Toward Energy-Efficient Computing. *Communication of the ACM*, 53, 50-58.

9. Butler, T. (2011). Compliance with institutional imperatives on environmental sustainability: Building theory on the role of Green IS. *Journal of Strategic Information Systems*, 20, 6-26.

10. Chen, A. J., W., Boudreau, M., and Watson, R. T. (2008). Information systems and ecological sustainability. *Journal of Systems and Information Technology*, 10, 186-201.

11. Chen, A. J., Watson, R. T., Boudreau, M., Karahanna, E. (2009). Organizational adoption of green IS and IT: An institutional perspective. *Association for Information Systems: Proceedings of the 13th International Conference on Information Systems*, Phoenix (pp. 142).

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

13. Dao, V., Langella, I., and Carbo, J. (2011). From green to sustainability: Information Technology and an integrated sustainability framework. *Journal of Strategic Information Systems*, 20, 63-79.

14. Del Brío, J. A., and Junquera, B. (2003). A review of the literature on environmental innovation management in SMEs: Implications for public policies. *Technovation*, 23, 939-348.

15. DiMaggio, P. J., and Powell, W. W. (1983).The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, 48,147–160.

16. El-Gayar, O., and Fritz, B. D. (2006). Environmental Management Information Systems (EMIS) for sustainable development: A conceptual overview. *Communications of the Association for Information Systems*, 17, 756-784.

17. Elliot, S. (2011). Transdisciplinary perspectives on environmental sustainability: A resource base and framework for IT-enabled business transformation. *MIS Quarterly*, 35, 197-236.

18. Elliot, S., and Binney, D. (2008). Environmentally sustainable ICT: Developing corporate capabilities and an industry-relevant IS research agenda. *Association for Information Systems: Proceedings of the 12th Pacific Asia Conference on Information Systems*, Suzhou, PRC (pp. 209).

19. Goldstein, S. M., and Iossifova, A. R. (In Press). Ten years after: Interference of hospital slack in process performance. *Journal of Operations Management*.

20. Grover, V., and Goslar, M. D. (1993). The initiation, adoption, and implementation of telecommunications technologies in U.S. organizations. *Journal of Management Information Systems*, 10, 141-163.

21. Hendrick, K. B., Singhal, V. R., and Zhang, R. (2009). The effect of operational slack, diversification, and vertical relatedness on the stock market reaction to supply chain disruptions. *Journal of Operations Management*, 27, 233-246.

22. Ijab, M. T., Molla, A., Kassahun, A. E., and Teoh, S. Y. (2010). Seeking the "green" in "Green IS": A spirit, practice and impact perspective. *Association for Information Systems: Proceedings of the 14th Pacific Asia Conference on Information Systems*, Taipei, Taiwan (pp. 46).

23. Jenkin, T. A., Webster, J., and McShane, L. (2011). An agenda for 'Green' information technology and

24. Karimi, J., Somers, T. M., and Gupta, Y. P. (2004). Impact of environmental uncertainty and task characteristics on user satisfaction with data. *Information Systems Research*, 15, 175-193.

25. Karin, B. (2009, September 16). Scavenging Hazardous 'E-Waste' for a Few Redeemables. *Washington Post, The*. Retrieved from EBSCOhost..

26. Kim, Y. S., and Ko, M. (2010). Identifying green IT leaders with financial and environmental performance indicators. *Association for Information Systems: Proceedings of the 16th Americas Conference on Information Systems*, Lima, Peru (pp. 54).

27. Laudon, K. C. (1985). Environmental and institutional models of system development: A national criminal history system. *Communications of the ACM*, 28, 728-740.

28. Lewis, G. J., and Harvey, B. (2001). Perceived environmental uncertainty: The extension of Miller's scale to the natural environment. *Journal of Management Studies*, 38, 201-233.

29. Liang, H., Saraf, N., Hu, Q., and Xue, Y. (2007). Assimilation of enterprise systems: The effect of institutional pressures and the mediating role of top management. *MIS Quarterly*, 31, 59-87.

30. Lin, C., and Ho, Y. (2010). The influences of environmental uncertainty on corporate green behavior: An empirical study with small and medium-size enterprises. *Social Behavior and Personality*, 38, 691-696.

31. Lin, C., and Ho, Y. (2011). Determinants of green practice adoption of logistics companies in China. *Journal of Business Ethics*, 98, 67-83.

32. López-Gamero, M. D., Molina-Azorín, J. F., and Claver-Cortés E. (2011). Environmental uncertainty and environmental management perception: A multiple case study. *Journal of Business Research*, 64, 427-435.

33. Lu, Y., and Ramamurthy, K. (2010). Proactive or reactive IT leaders? A test of two competing hypotheses of IT innovation and environment alignment. *European Journal of Information Systems*, 19, 607-618.

34. Mann, H., Grant, G., and Mann, I. J. S. (2009). Green IT: An implementation framework. *Association for Information Systems: Proceedings of the 15th Americas Conference on Information Systems*, San Francisco (pp. 121).

35. Mishina, Y., Pollock, T. G., and Porac, J. F. (2004). Are more resources always better for growth? Resource stickness in market and product expansion. *Strategic Management Journal*, 25, 1179-1197.

36. Molla, A. (2009). Organizational motivations for Green IT: Exploring Green IT matrix and motivation models. *Association for Information Systems: Proceedings of the 13th Pacific Asia Conference on Information Systems*, Hyderabad, India (pp. 13).

37. Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88, 879-903.

38. Rajagopal, P. (2002). An innovation - diffusion view of implementation of enterprise resource planning (ERP) systems and development of a research model. *Information and Management*, 40, 87-114.

39. Ranganathan, P. (2010). Recipe for Efficiency: Principles of Power-Aware Computing. *Communication of the ACM*, 53, 60-67.

40. Roger, E. M. (1985). *Diffusion of innovations* (3rd ed.). New York, NY: The Free Press.

41. Rothenberg, S., and Zyglidopoulos, S. C. (2007). Determinants of environmental innovation adoption in the printing industry: The importance of task environment. *Business Strategy and the Environment*, 16, 39-49.

42. Rusinko, C. A. (2007). Green manufacturing: An evaluation of environmentally sustainable manufacturing practices and their impact on competitive outcomes. *IEEE Transactions on Engineering Management*, 54, 445-454.

43. Sherif, K., and Vinze, A. (2003). Barriers to adoption of software reuse: A qualitative study. *Information and Management*, 41, 159-175.

44. Tan, J., and Peng, M. W. (2003). Organizational slack and firm performance during economic transitions: Two studies from an emerging economy. *Strategic Management Journal*, 24, 1249-1263.

45. Teo, H. H., Wei, K. K., Benbasat, I. (2003). Predicting intention to adopt interorganizational linkages: An institutional perspective. *MIS Quarterly*, 27, 1, 19-49.

46. Thambusamy, R., and Salam, A. F. (2010). Corporate ecological responsiveness, environmental ambidexterity and IT-enabled environmental sustainability strategy. Association for Information Systems: Proceedings of the 31th *International Conference on Information Systems*, St. Louis (pp. 191).

47. Voss, G. B., Sirdeshmukh, D., Voss, Z. G. (2008). The effects of slack resources and environmental threat on product exploration and exploitation. *Academy of Management Journal*, 51, 147-164.

48. Watson, R. T., Boudreau, M., and Chen, A. J. (2010). Information systems and environmentally sustainable development: Energy informatics and new directions for the IS community. *MIS Quarterly*, 34, 23-38.

49. Zhu, K., Kraemer, K. L., and Xu, S. (2006). The process of innovation assimilation by firms in different countries: A technology diffusion perspective on E-business. *Management Science*, 52, 1557-1576.