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Why Organizations Adopt Green IT: A Comprehensive Review

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Abstract
Recently, Green IT has become one of the hottest topics in IS field. Among questions related to Green IT, the first one is "Why organizations adopt Green IT". Just like there is no consensus on what Green IT is, no consistent answer has been proposed for this question. Beginning with a clarification of the definition of Green IT, this paper reviewed and summarized the predictors of organizational adoption of Green IT identified by previous studies. Based on the TOE framework, a taxonomy was provided in this paper. Several critical observations were discussed as well.

Keywords:
Green IT, Green IT adoption, taxonomy, TOE framework

1. Introduction
As one of the triple bottom line, i.e., social, environmental and financial (Elkington, 1994), environmental sustainability has been identified as one of chief executive officers' major issues of concern in global surveys (IBM 2008; McKinsey 2009). With potential power to address energy and environmental issues, Green IT has become an emerging topic, gaining increasing attention from both practitioners and scholars (Elliot, 2007). According to a report surveying 426 companies in North America and a total of 1052 worldwide, 86 percent of companies stated that it is important to implement Green IT initiatives (Symantec, 2009).

Despite its widely use, Green IT has been conceptualized in a number of ways, with wider or narrower scope, and with a variety of terminologies and concepts (Dedrick, 2010), such as Green IS (Jenkin, Webster & McShane, 2011; Watson, Boudreau & Chen, 2010), IT for Green (Cai, Chen & Bose, 2013; Faucheux & Nicolaï, 2011), Green IS & IT (Chen, Watson, Boudreau & Karahanna, 2009), environmentally sustainable ICT (Elliot, 2007). A summary of related terminologies and their definitions is presented in Appendix 1. To be associated with other

studies addressing Green IT adoption, we adopt the definition of Green IT proposed by Cai et al. (2013). *Green IT refers to the practice of designing, manufacturing, using and disposing of computer, servers and associated subsystems efficiently and effectively with minimal or no impact on the environment.*

Although many organizations are actively pursuing Green IT for a number of reasons, e.g., reducing power consumption and carbon emissions, improving systems performance and use, saving space, the main determinants for Green IT adoption are not clear. As suggested by Brooks, Wang and Sarker (2010), to understand Green IT adoption, one needs to know the motives for a company to adopt Green IT. In IS academic community, many studies, both conceptual and empirical, have addressed Green IT adoption from different perspectives (e.g., Bose & Luo, 2011; Butler, 2011; Chen et al., 2009; Gholami, Sulaiman, Ramayah & Molla, 2013; Kuo, 2010; Molla, 2009; Molla & Abareshi, 2011; Sarkar & Young, 2009; Sayeed & Gill, 2009). While these studies have identified several predictors, few of them are holistic. Since adoption of Green IT involves so many aspects of organization, it is crucial to take the holistic view to explain such behavior exhaustively. Furthermore, while the topic of Green IT is still in its infancy, more studies are needed for further examinations.

Embracing a holistic view, this paper has two objectives: 1) to review and categorize the extant predictors of organizational adoption of Green IT in research area. A comprehensive review could help to assess the current state of knowledge with respect to understanding organizational adoption of Green IT; 2) to propose several directions for future research based on the review. The rest of this paper is organized as follows. Section two introduces the research method used in this study. Section three presents a comprehensive review of extant predictors of organizational adoption of Green IT based on a proposed taxonomy. Section four provides several observations and discussions based on the review findings.

2. Research Method

Given that research in Green IT is still emerging and there are relatively few publications (Lei & Ngai, 2013; Brooks et al., 2010), we included relevant papers included in both IS academic journals and IS conferences in the literature search. First, we conducted title search, using key words "Green IT/IS" and "green information system/technology" without published date limitation, in eight top academic IS journals (i.e., *MIS Quarterly, Information Systems Research, Information Systems Journal, Journal of the Association for Information Systems, Journal of Management Information Systems, Journal of Strategic Information Systems, European Journal of Information Systems, Decision Support Systems*). The search resulted in only 5 papers (1 from MISQ and 4 from JSIS). The result confirmed our expectation of the scarcity of journal paper on this topic. To include more samples, we searched the eLibrary of *Association for Information Systems* site (www.aisnet.org), because it's considered as the most comprehensive portal for IS field, and followed the same procedure as that of journal paper search. The search resulted in 97 papers included in various conference proceedings such as ICIS, AMCIS, and PACIS. In total, a total of 102 papers on Green IT/IS were identified based on initial search criteria. Next, we eliminated unrelated papers by examining their title and abstracts and then reviewed the remaining papers one by one to determine their qualifications. Overall, 14 papers were identified and included in the final analysis on Green IT adoption.

3. Why Organizations Adopt Green IT

3.1 Extant Predictors of Organizational Adoption of Green IT

Several researches have studied why organizations adopt Green IT. While each of these studies makes important and unique contributions to the knowledge on organizational adoption of Green IT, different dependent variables have been used, such as Green IT adoption (Chen et al., 2009; Lei & Ngai, 2013; Molla, 2008; Molla & Abareshi, 2011), Green IS adoption (Gholami et al., 2013; Lei & Ngai, 2012), Green IT initiative/initialization (Bose & Luo, 2011; Simmonds & Bhattacherjee, 2014), extent of Green IT (Kuo, 2010; Schmidt, Erek, Kolbe & Zarnekow, 2010), Intention to Green IT adoption (Lei & Ngai, 2014; Molla, 2008). Some studies employed the process view and differentiated between Green IT initiation and Green IT adoption; while others, taking the view of manager, discriminated between intention to Green IT adoption and Green IT adoption. Although different terminologies have been used in different studies, the predictors (independent variables) identified in these studies can be viewed as antecedents of Green IT adoption. Since the goal for this study is to take a holistic review and to understand the reasons why Green IT is adopted in organizations, we treated all predictors identified in these studies equally and examined them thoroughly based on their research contexts. Table 1 describes the studies identified. For each of the studies, the theoretical foundations, type (i.e., empirical vs. conceptual), core constructs, components/predictors and definitions have been examined.

Citation	Theoretical Foundations	Type[1]	Core Constructs	Components and Definitions[2]
Cai, Chen & Bose (2013)	Porter's concept of competitive advantage; Diffusion of Innovation (DOI) Theory	E	Political	**Public concerns (+, NS)**: "interests of the community stakeholders and the public." *(p. 4)* **Regulatory Forces (+, NS)**: "influences from government and laws/regulations." *(p. 4)*
			Economic	**Cost reduction (+, S)**: "a firm can obtain competitive advantage by selling products or services with the lowest cost in its industry." *(p. 5)* **Differentiation (+, S)**: "a firm can use differentiation strategies to create unique features for its products or its services." *(p. 5)*
			Perceived Complexity	Or **perceived innovation complexity (-, NS)**, "refers to the degree to which as innovation is perceived as relatively difficult to understand and use." *(p. 5)*
Chen et al. (2009)	Institutional Theory; Natural Resource Based View (NRBV)	E	Mimetic Pressures **(+)**	**Frequency-based imitation (+, NS)**: "mimetic pressure arises from the number of other organizations that have adopted a certain practice." *(p. 5)* **Outcome-based imitation (+, S)**: "organizations are motivated to adopt a given practice because of the favorable results achieved by other adopters." *(p. 5)*
			Coercive Pressures **(+)**	**Imposition-Based Coercion (+, PS)**: regulations (e.g., public policy, industrial regulation). **Inducement-Based Coercion (+, PS)**: "important supply chain partners often possess the power to create strong inducements for a focal organization to comply with their demands." *(p. 7)*
			Mimetic × Coercive **(+, PS)**	"Between coercive and mimetic pressures, the presence of one is very likely to add to the institutional legitimacy suggested by the other. … Therefore, the presence of one pressure reinforces the effect of the other." *(p. 7-8)*
Gholami et al. (2013)	Belief-Action-Outcome Framework; Institutional Theory	E	Macro Factors (antecedents of Attitude)	**Coercive pressure (+, S)**: "pressure from regulatory bodies, suppliers, and customers." *(p. 432)* **Mimetic pressure (+, NS)**: "mimetic isomorphism suggests that firms will follow leading firms who have realized benefits from being the first movers in the industry." *(p. 433)*
			Micro (Belief	**Attitude (+, S)**: "an affective characteristic of senior managers; it measures the extent to

[1] For type of study, "E" means empirical study and "C" means conceptual study.

[2] "+/-": (in the column of "Components and Definitions") the component is hypothesized to be positively/negatively related to the construct it belongs; (in the column of "Core Construct") the construct is hypothesized to be positively/negatively related to Green IT adoption; "S": The hypothesis is supported; "NS": The hypothesis is not Supported; "PS": The hypothesis is partially Supported.

			Factors)	which they are aware of and interested in Green IS." *(p. 432)* **Consideration of Future Consequences (CFC) (+, S)**: "Individuals low in CFC, attach a high degree of importance to the immediate consequences of behavior; whereas those high in CFC attach a high degree of importance to the future consequences of behavior." *(p.432)*
Kuo (2010)		E	Motivational Factors	**Competitive pressures**: "initiatives that reduce costs, generate revenues or improve efficiencies." *(p. 2)* • External competitive pressures **(NS)**: "arise from external market forces in the form of mimetic institutional pressures." *(p. 2)* • Bottom line considerations **(S)**: "comprised solely of economic drivers such as tangible cost savings from IT operations." *(p. 2)* **Legitimation pressures**: "initiatives are based on satisfying government, local community and stakeholders and complying with norms and regulations in order to avoid penalties and lessen risks." *(p. 2)* • Normative legitimation pressures **(S)**: "when cultural expectations press organizations to act in a legitimate way." *(p. 2)* • Coercive legitimation pressures **(NS)**: "when organizations are driven to act alike because of governmental laws and regulations." *(p. 2)* **Social responsibility pressures (NS)**: "organizations act from 'a sense of obligation, responsibility or philanthropy rather than out of self-interest'." *(p. 2)*
			Organizational Factors	**Organizational capabilities (NS)**: "such as ongoing operational costs, the complexity of processes, the availability of resources and the capability of the organization to adapt." *(p. 3)* **Management influences (S)**: support from senior management champion. *(p. 3)*
			Technological Constraints **(NS)**	Including technological context, technology facilitation, the complexity of initiatives and the limitations posed by software, hardware and technological infrastructure.
Molla (2009); Molla & Abareshi (2011)	Theories of organizational motivation; Eco-sustainability	E; E	Eco-efficiency **(+, S)**	"Desire to improve eco-sustainability while at the same time pursuing economic objectives." *(p. 8)*
			Eco-effectiveness **(+, S)**	"Eco-sustainability motives associated with beliefs and value system of the organization out of deep concern for the natural environment and to achieve sociopolitical outcomes." *(p. 8)*
			Eco-responsive **(+, NS)**	"Desire to improve eco-sustainability either due to green opportunities or in response to actions and/or demands of competitors, customers, suppliers and market forces." *(p. 8)*
			Eco-legitimacy **(+, PS)**	"Desire to improve eco-sustainability due to political and social pressures facing a company." *(p. 8)*
Sarkar & Young (2009)	Institutional Theory; Theory of Reasoned Action (TRA)	E	Managerial Attitudes	**Effective cost model (+, S)**: "cost reduction… need for such a comprehensive model establishing an explicit link between green IT initiatives and resultant cost savings." *(p. 8)* **Awareness programs (+, S)**: "educate their colleagues in the organisation about the benefits of Green IT, and de-mystify misconceptions surrounding the issue." *(p. 8)*
			External Influences	**Customer requirements (+, S)**: "customers were keen on Green-enabled IT services as this allowed them to report on their carbon footprint in accordance with the government regulations." *(p. 8)* **Government regulations (+, S)**: "Australian environmental regulatory agencies were close to mandating carbon footprint reporting schemes." *(p. 7)*
Schmidt et al. (2010)	Technology Acceptance Model (TAM); DOI	E	Importance (+)	**Corporate management (+, S)**: The IT department is approached frequently by the corporate management with the topic of Green IT. **Environmental engagement (+, S)**: How would you rate the environmental engagement of your enterprise? **Experience (+, S)**: Our enterprise possesses a lot of experience with Green IT.
			Uncertainty (-)	**Experience (-, S)**: Our enterprise possesses a lot of experience with Green IT. **Measurement (-, S)**: The success of Green IT is difficult/easy to measure. **Standards (-, S)**: There are defined and generally accepted standards for Green IT. **Hype (+, S)**: Green IT is a hyped topic and is overrated. **Initiative from IT staff (-, S)**: Did IT staff instigates the Green IT initiative?
Bose & Luo (2011)	TOE Framework; DOI; Process Virtualization	C	Technological Context	**Sensory readiness**: "the degree to which virtualization process participants are able to enjoy a full sensory experience of the process." *(p.47)* **Relationship readiness**: "the need for process participants to interact with one another in a professional context." *(p.47)*

	Theory (PVT)			**Synchronism readiness**: "the degree to which the activities that make up a process need to occur quickly with minimum delay." *(p.47)* **Identification and control readiness**: "the degree to which the process requires unique identification of process participants and the ability to exert control over/influence their behavior." *(p.47)*
			Organizational Context	**Champion Support**: "a management-level person (e.g., CEO) who recognizes the usefulness of an idea to the organization and leads authority and resources for innovation throughout its development and implementation." *(p.48)* **Resource Commitment**: "the commitment of financial resources to Green IT as a proportion of total organizational resources." *(p.48)* **Firm Size**: "the number of employees in the organization." *(p.48)*
			Environmental Context	**Regulatory support**: "supportive government or state policies and/or legislation on the state-wide or national level can help organizations achieve their Green IT aims." *(p. 49)* **Competition intensity**: "the degree that the company is affected by competitors in the market." *(p.49)*
Lei & Ngai (2012)	Institutional Theory; Organizational Information Processing Theory;	C	Institutional Perspective	"**Mimetic pressure** refers to pressure that drives an organization to imitate the actions and practices of others perceived to be similar to the organization." *(p. 3)* "**Coercive pressure** is the force that subjects an organization to comply with law and regulations." *(p .3)* "**Normative pressure** refers to the expectations from the stakeholders in the same social network forcing the organization to take legitimate actions." *(p. 4)*
			Information Processing Theory	**Environmental Uncertainty**: "information shortage on the environment that surrounds an organization, resulting in difficulties in predicting external changes and evaluating organizational actions." *(p. 2)*
			Organizational Resources	"**Operational slack** refers to the operational resources of an organization that are unused or under-utilized." *(p. 3)* "**Human resource slack** refers to human resources that are skilled and specialized." (p. 3) "**Financial slack** refers to excess financial resources for the maintenance of the operations of an organization." *(p. 3)*
Lei & Ngai (2014)	Norm Activation Model	C	Personal Norm	"Refers to an organizational decision maker's self-set standard on the relationship between business and natural environment." *(p. 4)*
			Competitive Advantage	"The expected level of economic and environmental benefits of Green IT adoption." *(p. 5)*
			Managerial Interpretation (moderator)	"Managerial interpretation may serve as norm activator/de-activator. Decision makers' managerial interpretation on environmental preservation can either be interpreted as a threat or an opportunity." *(p. 5)*
Molla (2008)	TOE Framework; Perceived E-readiness Model (PERM)	C	Green IT Context	**Technological context**: "Green IT is likely to flourish in organisations that have large installed IT assets." *(p. 663)* **Organisational context**: "refers to the descriptive properties of a business such as sector, size and corporate citizenship." *(p. 663)* **Environmental context**: "the regulatory environment is a critical factor in creating the conducive and permissive environment for encouraging the use of some Green IT technologies." *(p. 664)*
			Green IT Drivers	"**Economic driver** refers to the need for greater IT efficiency and the pursuit of tangible cost savings from IT operations." *(p. 662)* "**Regulatory driver** refers to the pursuit of legitimacy within the wider social context." *(p. 663)* "**Ethical driver** refers to the pursuit of socially responsible business practices and good corporate citizenship." *(p. 663)*
			Green IT Readiness	**Perceived organisational Green IT readiness**: describes the awareness, commitment and resources of a firm relevant to Green IT. **Perceived value network Green IT readiness**: refers to the readiness of a firm's suppliers, competitors, investors, partners and customers for Green IT. **Perceived Institutional Green IT Readiness**: refers to business's assessment of the readiness of these institutional forces, which refer to both formal entities such as government and professional associations and informal norms and practices.
Nedbal, Wetzlin	TOE Framework;	C	Technological Context	**Technical compatibility**: "an innovation's compatibility with existing systems [...], including hardware and software". *(p. 5)*

ger, Auinger & Wagner (2011)	DOI; Process Virtualization Theory (PVT)			**Perceived complexity**: perceived difficult to use outsourcing solution. *(p. 5)*
			Organizational Context	**Top management support**: same as *champion support* in Bose & Luo (2011). **Transaction costs**: "organizations weigh the internal transaction costs against the external transaction costs before they decide whether or not to keep certain business processes in-house, or to outsource the processes." *(p. 6)* **Size**: same as *firm size* in Bose & Luo (2011).
			Environmental Context	**Regulatory support**: same as *regulatory support* in Bose & Luo (2011). **Competition intensity**: same as *competition intensity* in Bose & Luo (2011).
Simmonds & Bhattacherjee (2014)	RBV; Advanced Model of Corporate Ecological Responsiveness	C	Environmental	"The concern that a firm has for its social obligations and values" *(p. 7)*, such as Green IT properties (energy usage; material toxicity and recyclability), social responsibility pressures (from employees), eco-effectiveness, eco-efficiency.
			Economic/ Competitiveness	"Potential for ecological responsiveness to improve long-term profitability" *(p. 7)*, such as cost reduction, differentiation, adaptability to changing contexts, eco-efficiency.
			Legitimation	"The desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values, or beliefs" *(p. 7)*

Table 1: Extant Studies of Organizational adoption of Green IT

3.2 Taxonomy of Predictors of Green IT Adoption

Technology-Organization-Environment (TOE) framework was developed by Depietro, Wiarda and Fleischer (1990). Based on this framework, three dimensions (technological, organizational and environmental contexts) affect the adoption of technological innovations. Technological context focuses on both the internal and external technologies relevant to the firm. It includes current practices and equipment internal to the firm, as well as the available technologies external to the firm (Hage, 1980). Organizational context describes common organizational attributes which facilitate/constrain innovation adoption. Environmental context, differing from natural environment (Angeles, 2013), refers to the arena where a firm conducts its business. It reflects that the firm is surrounded by multiple stakeholders (such as competitors, suppliers, customers, the government, etc.) who determine the firm's need for innovation, ability to acquire resources for pursuing innovation, and capability for actually deploying it.

In this paper, we adopt TOE framework to categorize the predictors identified in previous studies for two reasons. First, TOE framework has been validated in the past for its theoretical strength and empirical support in investigating the adoptions of various forms of innovations (Aboelmaged, 2014; Oliveira & Martins, 2011) and technologies such as E-commerce (Zhu & Kraemer, 2005); CRM (Ramdani, Chevers, & Williams, 2013); knowledge management systems (KMS) (Lee, Wang, Lim, & Peng, 2009); enterprise resource planning (ERP) (Pan & Jang, 2008); open systems (Chau & Tam, 1997). Second, and more importantly, instead of offering concrete set of factors that affect technology adoption, TOE framework provides taxonomy for classifying adoption predictors (Ven & Verelst, 2011), which is consistent with the purpose of this paper.

Study	Technology	Organization	Environment
Bose & Luo (2011)	Sensory Readiness; Relationship Readiness; Synchronism Readiness; Identification and Control Readiness	Champion Support; Resource Commitment; Firm Size	Regulatory Support; Competition Intensity
Cai et al. (2013)	Perceived Complexity	Cost Reduction; Differentiation	Public Concerns; Regulatory Forces
Nedbal et al. (2011)	Technical Compatibility;	Top Management Support; Transaction	Regulatory Support; Competition Intensity

	Perceived Complexity	Costs; Size	
Kuo (2010)	Technological Constraints	Organizational Capabilities; Management Influences	Competitive Pressures (External competitive pressures; Bottom line considerations); Legitimation Pressures (Normative legitimation pressures; Coercive legitimation pressures; Social responsibility pressures)
Gholami et al. (2013)		Attitude; Consideration of Future Consequences	Coercive Pressure; Mimetic Pressure
Lei & Ngai (2012)		Organizational Resources (Operational slack; Human resource slack; Financial slack)	Institutional Perspective (Normative pressure; Coercive pressure; Mimetic pressure); Environmental Uncertainty
Molla (2008)		Technological Context; Organisational Context; Economic Driver; Perceived Organisational Green IT readiness	Regulatory Driver; Environmental Context Ethical Driver; Perceived Value Network Green IT Readiness; Perceived Institutional Green IT Readiness
Molla (2009); Molla & Abareshi (2011)		Eco-efficiency; Eco-effectiveness	Eco-responsive; Eco-legitimacy
Sarkar & Young (2009)		Managerial Attitudes (Effective cost model; Awareness programs)	External Influences (Customer requirements; Government regulations)
Schmidt et al. (2010)		Corporate Management; Environmental Engagement; Experience; Initiative from IT Staff	Measurement; Standards; Hype
Simmonds & Bhattacherjee (2014)		Environmental; Economic	Legitimation
Chen et al. (2009)			Frequency-Based Imitation; Outcome-Based Imitation; Imposition-Based Coercion; Inducement-Based Coercion
Lei & Ngai (2014)		Personal Norm; Competitive Advantage of Green IT; Managerial Interpretation (Moderator)	

Table 2: Taxonomy of extant predictors based on TOE framework

4. Discussion and Recommendation

Predictors of Green IT adoption: a broad list with emphases

For organizational adoption of Green IT, although a broad list of predictors has been proposed by researchers, no consensus has reached. In spite of this, several predictors have received more attention. Among them, top management support (or champion support, management influence, managerial attitude, managerial interpretation) has been identified to be positively related with Green IT adoption by approximately half of the studies identified (see Table 1). Economic benefit (or cost reduction, eco-efficiency, bottom line considerations) has been consistently confirmed to be positively related with Green IT adoption as well. Regulatory force (or imposition-based coercion, coercive pressure, government regulations) has been included by 12 (out of 14) studies as a positive predictor of Green IT adoption. Among extant predictors, although some have been tested empirically while others have not, there seems to be that no one is intrinsically better than others. For specific research, the choice of predictors should be made based on research objective, research context and the characteristics of green information technology addressed in the research.

The "T" of T-O-E needs more attention

While organizational and environmental contexts received much attention, technological context seemed to be overlooked. Of the 14 studies identified, only 4 included technological context in their research model. As such researchers should pay more attention on technological context. Green IT is a broad concept, within which there are numerous technologies, such as e-commerce, virtualization, smart grid and cloud computing. From practical perspective, specific characteristics of different technologies should be considered as potential predictors of Green IT adoption so that the research results could be more informative and meaningful. From research perspective, including such characteristics could provide us with a broader theoretical foundation for studying Green IT adoption. For example, in Bose & Luo's (2011) study of Green IT initiatives via virtualization, the process-virtualization-theory (PVT) was used as one of the theoretical foundation. Based on PVT and characteristics of virtualization, they proposed four technological predictors (see table 1). These four predictors may not be appropriate for adoption of other Green IT but they are important for predicting adoption of virtualization. Future research should pay more attention to the effect of technological characteristics on Green IT adoption.

Adapting TOE framework for future research

Although TOE framework has provided an appropriate taxonomy for categorizing the predictors of Green IT adoption, not all predictors can be embedded in TOE framework. In this paper, we treated natural environmental concern as the eco-responsive of organization and categorized it in organization context of TOE framework, however, such dispose would possibly raise some questions such as "where are the 'green' motivations of Green IT adoption?" Thus, it may be more useful and clear to adopt an adaptive TOE framework (TOEE: technology, organization, environment and ecological environment) in future research.

T-O-E: From independent to interdependent

In past IT adoption studies, three contexts of TOE framework have been treated independently. The assumption needs to be challenged. For example, top management support (organizational context) could be negatively impacted by technological constraint (technological context) and positively impacted by coercive and mimetic pressure (environmental context) (Gholami et al., 2013). Firms with sophisticated IS infrastructure and available IS expertise are more likely to implement technological innovation (Zhu & Kraemer, 2005) because such organizations have low perceived technological complexity. In-depth discussion would be beyond the scope of this study. In future, researchers should consider the interdependent relationships in TOE framework.

Broaden theoretical foundation through the lens of decision making

Although, in this paper, we only introduced the TOE Framework which is at organizational level, it does not mean that theories at individual level cannot be used to explain organizational adoption of Green IT. Inherently, whether to adopt Green IT is a decision to be made. Therefore, the decision makers' acceptance of Green IT would be a crucial predictor of organizational adoption of Green IT. As shown above, top management support is one of the important predictors of Green It adoption. In decision making context, top management support could be viewed as decision makers' acceptance of Green IT. Furthermore, the "perceived complexity" and "technological benefits" are consistent with "the ease of use" and "the usefulness" in TAM, respectively. Although previous studies tended to employ theories at organizational level, in future, researchers could make use of theories at individual level to explain Green IT adoption.

5. Conclusion

Green IT is becoming one of popular research areas in IS field. Among the related questions, understanding why organizations adopt Green IT is critical. This study contributes to Green IT research by providing a comprehensive review and categorization of publications in IS journals and conference proceedings and by suggesting several important areas and directions for future researches. Specifically, the study reviewed predictors identified in 14 papers on Green IT adoption and categorized them based on the TOE framework. As stated above, we made several observations and discoveries based on data collected. The paper is, however, limited by the small sample size and the inadequate organizational information due to the limitation of the research scope. Future studies could address these limitations.

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Appendix 1: Definitions of Green IT and Related Terminologies

Citation	Definition	Terminology
Bose & Luo (2011)	"**Green IT** refers to the using of IT resources in an energy-efficient and cost-effective manner." *(p. 38)*	Green IT
Cai et al. (2013)	"**Green IT** is the practice of designing, manufacturing, using and disposing of computer, servers and associated subsystems efficiently and effectively with minimal or no impact on the environment, with a strong focus on improving energy efficiency and equipment utilization through steps such as designing energy efficient chips, virtualization, reducing data center energy consumption, using renewable energy to power data centers, and reducing electronic waste. **IT for green** is the use of information systems to enhance sustainability across the economy, with a focus on IT as a solution." *(p. 3)*	Green IT IT for Green
Chen et al. (2009)	"**Green IS & IT** refers to IS & IT products (e.g., software that manages an organization's overall emissions) and practices (e.g., disposal of IT equipment in an environmentally friendly way) that aims to achieve pollution prevention, product stewardship, or sustainable development." *(p. 4)*	Green IS & IT
Dedrick (2010)	"**Green IS** refers to the use of information systems to achieve environmental objectives, while **Green IT** emphasizes reducing the environmental impacts of IT production and use." *(p. 173)*	Green IS Green IT
Elliot (2007)	"The design, production, operation and disposal of ICT and ICT-enabled products and services in a manner that is not harmful and may be positively beneficial to the environment during the course of its whole-of-life." *(p. 107)*	Environmentally sustainable ICT
Elliot (2011)	"Activities to minimize the negative impacts and maximize the positive impacts of human behavior on the environment through the design, production, application, operation, and disposal of IT and IT-	Environmental sustainability of

	enabled products and services throughout their life cycle." *(p. 208)*	IT
Erek et al. (2011)	"**Green IT** is the systematic application of practices that enable the minimization of the environmental impact of IT, maximise efficiency and allow for company-wide emission reductions based on technology innovations." *(p. 3)*	Green IT
Faucheux & Nicolaï (2011)	"**Green IT** defined as IT sector's own activity and its impact on environmental efficiency. Green applications of IT or **IT for green** defined as the impact of IT on other sectors' environmental productivity, particularly in terms of energy efficiency and carbon footprint." *(p. 2021)*	Green IT IT for Green
Jenkin et al. (2011);	"**Green IT** is mainly focused on energy efficiency and equipment utilization." *(p. 2)* "**Green IS**, in contrast, refers to the design and implementation of information systems that contribute to sustainable business processes." *(p. 2)*	Green IT/S
Lei & Ngai (2012)	"**Green IS** is defined as the IS or IT used to achieve environmental sustainability." *(p. 3)*	Green IS
Lei & Ngai (2013)	"**Green IT** refers to the practices and process enabled by information systems (IS) that can enhance the economic and environmental performance of an organization." *(p. 96)*	Green IT
Murugesan (2008)	"**Green IT** refers to environmentally sound IT. It's the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems… efficiently and effectively with minimal or no impact on the environment." *(p. 25-26)*	Green IT
Molla (2009)	"**Green IT** is an organization's ability to systematically apply environmental sustainability criteria (such as pollution prevention, product stewardship, use of clean technologies) to the design, production, sourcing, use and disposal of the IT technical infrastructure as well as within the human and managerial components of the IT infrastructure." *(p. 3)*	Green IT
Molla & Abareshi (2011)	"Therefore, both IT hardware manufacturers and firms using IT need to apply principles of environmental sustainability, which include pollution prevention, product stewardship and sustainable development in managing IT. **Green IT** refers to such practices." *(p. 3)*	Green IT
Molla, Cooper & Pittayachawan (2011)	"**Green IT** is a systematic application of ecological-sustainability criteria (such as pollution prevention, product stewardship, use of clean technologies) to the creation, sourcing, use, and disposal of the IT technical infrastructure as well as within the IT human and managerial practices." *(p. 73)*	Green IT
Watson et al. (2010)	"In the practitioner literature, much of the current attention is devoted to '**Green IT**.' We argue that this exclusive focus on information technologies is too narrow and should be extended to information systems, which we define as an integrated and cooperating set of people, processes, software, and information technologies to support individual, organizational, or societal goals. To the commonly used Green IT expression, we thus prefer the more encompassing **Green IS** one, as it incorporates a greater variety of possible initiatives to support sustainable business processes. Clearly, Green IS is inclusive of Green IT." *(p.24)*	Green IT Green IS