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A PRELIMINARY REPORT ON GREEN IT ATTITUDE AND ACTIONS AMONG AUSTRALIAN IT PROFESSIONALS

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with

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2009

Abstract

This paper provides a preliminary analysis on Green IT awareness among Australian IT professionals based on a survey of 322 members of The Australian Computer Society. Overall, the study indicates that there is a discrepancy between IT professionals' awareness and concern for Green IT and the actions that they and their organisations have actually taken. Specifically,

- *The study shows that most IT professionals are concerned about climate change and recognise the dual role of IT in causing and resolving environmental sustainability problems.*
- *More than 70% of all respondents believe that they can play significant roles in leading Green IT changes. An equal percentage believe that Green IT should be a core part of an organisation's overall environmental sustainability strategy and IT management should take the responsibility for reducing IT's environmental footprint*
- *The study, however, also indicates that while IT professionals are practicing simple behaviours to support Green IT initiatives, more complex behaviours at organisational levels are practiced to a more limited extent.*
- *Only about 30% of respondents are aware of Australian Computer Society's policy paper on Green IT.*
- *IT professionals are either sceptical or unaware of their organisation's commitment to Green IT. However, a minority of organisations are taking initial steps in terms of putting green IT on their radar, allocating budget and implementing Green IT projects.*
- *Despite the initial steps taken by organisations, the enforcement of quick win Green IT practice such as switching off computers when not in use has only been fully implemented in less than one third of cases.*
- *Respondents' age, gender, education, occupation and industry differences do not seem to significantly influence the above findings.*

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1. INTRODUCTION

There has been an unprecedented increase on the level of concern regarding climate change and environmental sustainability issues. Additionally, businesses are under increasing pressure from customers, shareholders and proposed legislative changes to improve their environmental credentials. Likewise, the environmental impact of Information Technology (IT) under the banner of "Green IT" has started being discussed by academia, media and government. IT professionals are expected to play significant roles in bringing Green IT to organisations - provided that they are prepared, have developed and/or are developing the necessary capabilities to lead and support sustainability initiatives.

The purpose of this paper is to report on an investigation of IT professionals' opinions on the environmental impact of IT. The research questions to be addressed are (1) to what extent are IT professionals concerned about climate change (2) what are the perceptions of IT professionals in terms of IT's contribution to environmental footprint and in IT's role in tackling a business's environmental footprint (3) what are some of the processes IT professionals follow to increase their awareness of Green IT (4) to what extent they are tacking actions towards Green IT in their professional and personal lives and (5) how do they perceive their working environments' preparedness for Green IT.

2. BACKGROUND TO GREEN IT

Green or eco-sustainability is "the ability of one or more entities, either individually or collectively, to exist and thrive (either unchanged or in evolved forms) for lengthy timeframes, in such a manner that the existence and flourishing of other collectivities of entities is permitted at related levels and in related systems" (Starik and Rands, 1995). It often refers to meeting the needs of present generations without compromising the ability of future generations to meet their needs and involves pollution prevention at the end of a product's use, product stewardship to minimize the environmental footprint during use and use of clean technologies to reduce the use of polluting materials and develop environmentally friendly competencies (Hart, 1997).

The construct of IT is equally broad and can best be approached from an IT infrastructure perspective. Previous IT research distinguishes between the IT technical infrastructure and the IT human and managerial capability infrastructure. The IT technical infrastructure refers to "choices pertaining to applications, data and technology configurations" (Broadbent and Weill, 1997). The human infrastructure pertains to "the experiences, competencies, commitments, values and norms of the IT personnel delivering the IT products and services" (Byrd and Turner, 2000). The managerial capability comprises the management of all IT activities including strategic foresight concerning changes in the business, IT and wider environment.

The combination of the IT infrastructure and the eco-sustainability perspectives can led to the following definition of Green IT

> *Green IT is an organisation'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.*

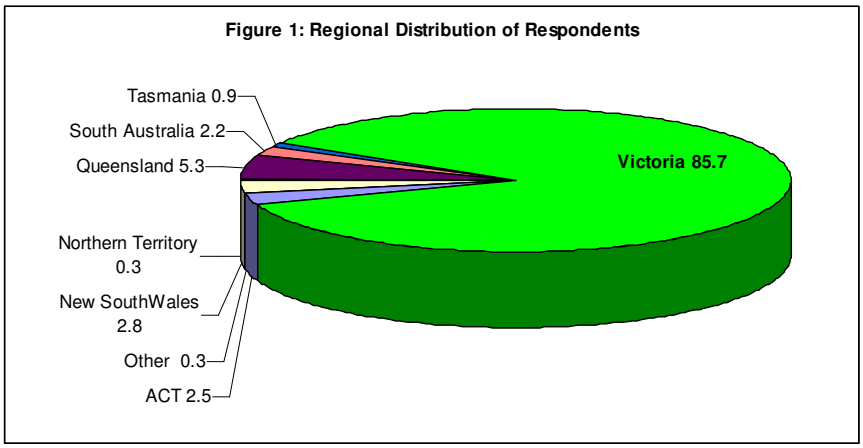
Thus defined, Green IT can include hard technologies as well as soft systems and business policies and practices spanning the IT lifecycle from production, through sourcing, building and use to disposal. Environmental considerations can be embedded in policy frameworks, in operational routines, in IT design features and information systems as well as in the values and norms of the IT human infrastructure and managerial considerations and practices. Greening IT can be undertaken in order to address two overarching and interrelated goals. On the one hand Green IT can help businesses to mitigate IT's direct contribution to emission, that is solving IT's

contribution to environmental problem. On the other hand, Green IT can be pursued in order to help businesses tackle their overall footprint, that is using IT as part of the solution to reduce a business's environmental footprint. Of course within these two objectives are the needs to satisfy the business case for reducing cost and/or increasing revenue.

3. DATA COLLECTION

Data for this study were collected through a survey of Australian Computer Society members between December 2008 and January 2009. Invitation to participate in the survey was disseminated through ACS Regional Branches' e-newsletters. While The Victorian Branch of ACS has cooperated by broadcasting invitation to the survey, such cooperation was not possible from other branches. As a result, 85% of respondents were from Victoria as shown in Figure 1. Data analysis follows a descriptive approach. In order to explore whether there are significant differences in participants' responses due to gender, age, occupation, and educational qualification differences, both ANOVA and Kruskal-Wallis tests are used.

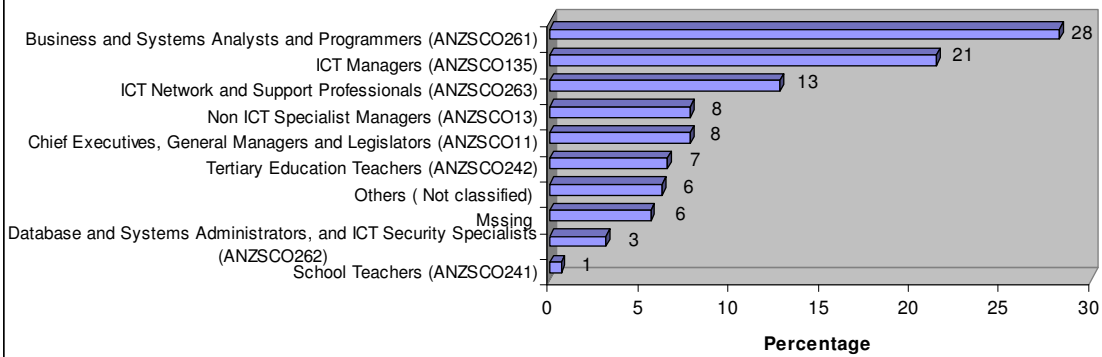
Figure 1: Regional Distribution of Respondents



4. PROFILE OF SURVEY PARTICIPANTS

Respondents held a variety of IT job titles. In order to identify the common occupation lists, the Australian and New Zealand Standard Industry Occupational Classification (ANZSOC) is used. Two researchers have coded the data using a combination of three and two digits ANZSOC codes. The result shows that almost 50% of respondents are either analysts or IT managers as depicted in Figure 2.

Figure 2: Respondents' Occupation

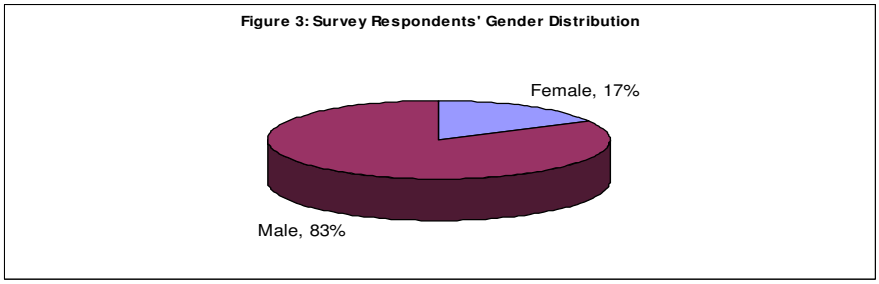


The respondents come from a number of industries. However, more than 50% are from the ICT and education and research sectors (See Table 1).

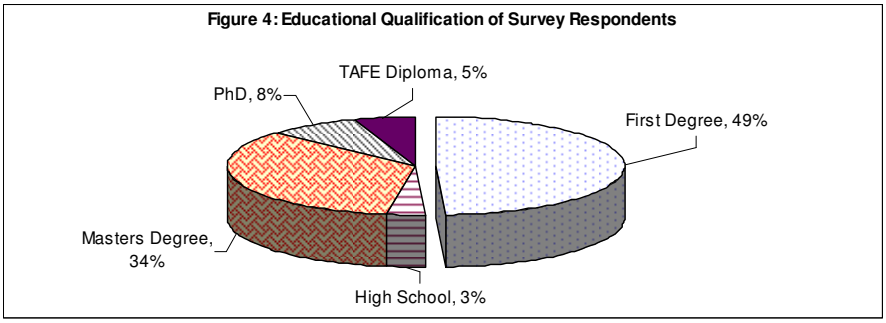
Table 1: Survey Respondents' Industry Distribution

	Frequency	Percent
ICT	127	39%
Education and research	45	14%
Finance and insurance	29	9%
Government	25	8%
Other	22	7%
Manufacturing	17	5%
Trade (Retail and Wholesale)	14	4%
Communication services	10	3%
Health and Pharmaceuticals	9	3%
Transport (Air, Rail Road and Water)	9	3%
Electricity gas and water supply	7	2%
Consulting	6	2%
Mining	2	1%

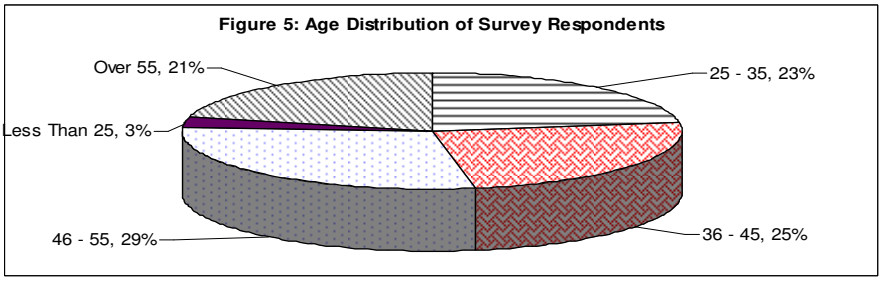
In terms of gender (Figure 3), more than 80% of the respondents are male.



The majority of respondents held tertiary qualification (Figure 4). Of all the respondents 49 and 34 percent have bachelor and master degree qualifications respectively.



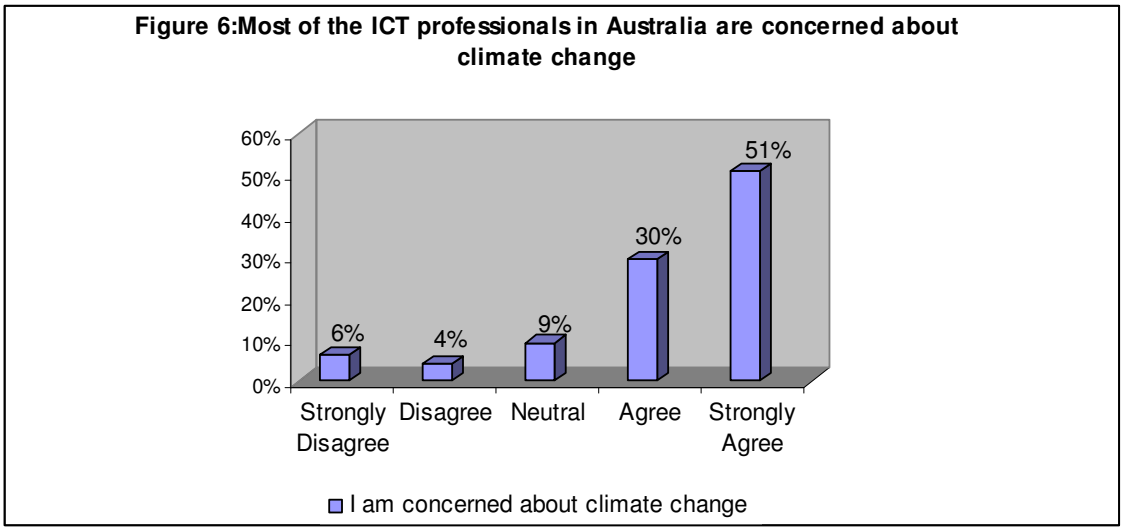
The age distribution of respondents (Figure 5) indicates that more than half are within the age brackets of 36- 55.



5. OPINION ABOUT CLIMATE CHANGE

The concern towards climate change is always one of the critical issues in Green IT. The survey results show that at least 80% of participants are concerned about climate change. This result is similar to Info~Tech's (2008) international survey of Asia, Europe, USA and the Rest of the world. The Info~Tech's (2008) finding shows that more than 50% of the survey respondents were strongly concerned about climate change which is the same as the current finding. Excepting participants' industry, the other demographic variables have no statistically significant impact (α=0.05) on respondents' concern towards climate change. Participants from the consulting, manufacturing and education and research sectors appear to be more concerned than for example those working in the finance and insurance, trade and transport sectors.

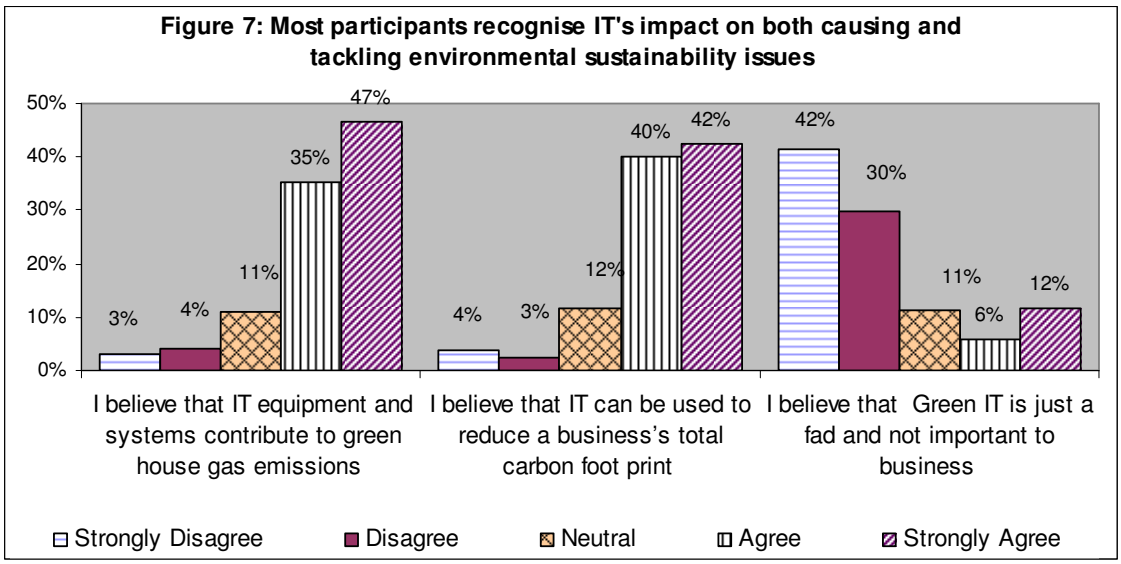
Figure 6:Most of the ICT professionals in Australia are concerned about climate change



6. IT's IMPACT ON THE ENVIRONMENT

The survey also gauged participants' beliefs regarding the position of IT as causing and/or resolving environmental sustainability problems. The result shows that an almost equal number of participants believe the dual role of IT in environmental sustainability as shown in Figure 7. In addition, more than 80% of the respondents believe that Green IT is more than a fad and important for business sustainability. These views are not sensitive to differences in participants' age, gender, occupation, education or industry. However, ICT professionals working in high schools (1% of respondents) tend to view Green IT as a fad.

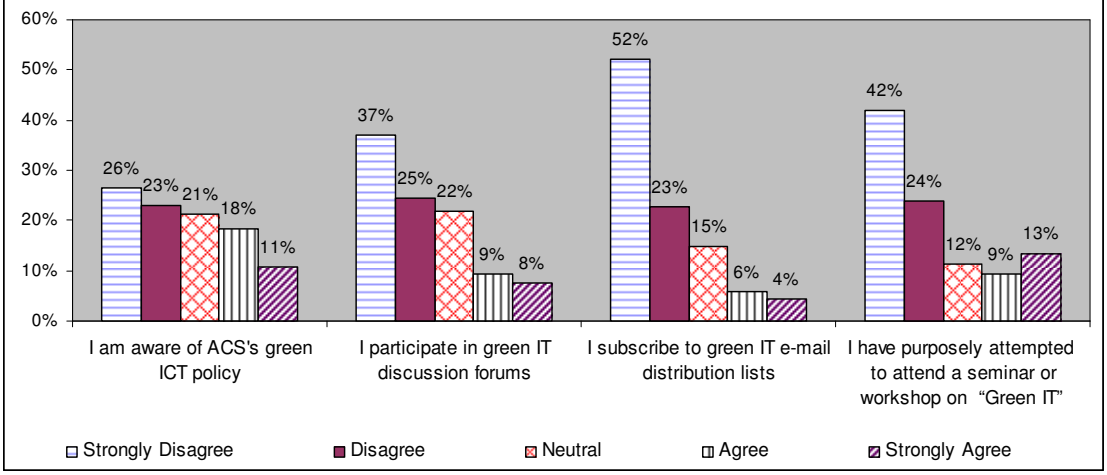
Figure 7: Most participants recognise IT's impact on both causing and tackling environmental sustainability issues



7. GREEN IT KNOWLEDGE

After examining general opinions about climate change and Green IT, participants were asked to identify how they seek to develop their Green IT knowledge (Figure 8).

Figure 8: Green IT knowledge seeking behavior among Australian IT professionals is limited

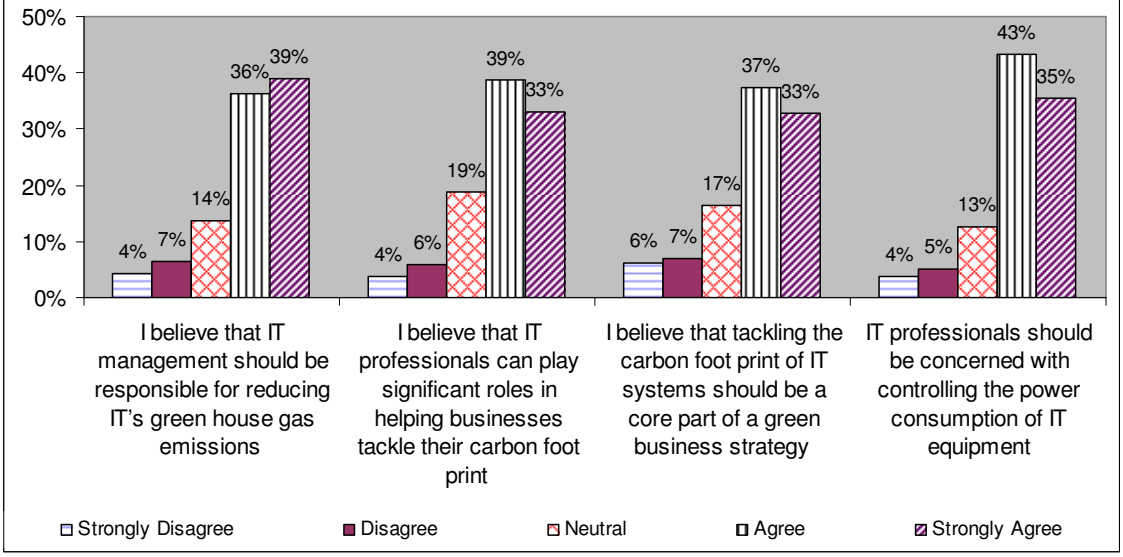


As can be seen from Figure 8, only less than 30% of respondents are aware of ACS's Green ICT policy; less than 20% of respondents neither participate on Green IT discussion forums nor subscribe to distribution lists. Only about 20% have sought to attend either a seminar or a workshop on Green IT. Respondents with a PhD are less likely to participate in Green IT discussion forums and subscribe to e-mail distribution lists. This finding can be interpreted in at least two ways- either the indicated sources are not primary means of acquiring Green IT knowledge or participants, despite their concern for Green IT, have yet to actively seek Green IT knowledge.

8. IT PROFESSIONALS' ROLE IN GREEN IT

Participants were asked four questions regarding the IT human infrastructure and management's role in Greening IT. The results in Figure 9 indicate that most respondents believe that not only IT professionals and management should take on the responsibility of reducing the IT technical infrastructure's carbon footprint, but also that Green IT should be seen as an integral and core part of a business's overall Green Strategy. Younger respondents (less than 25 years) perceive a limited role of IT management compared to those in other age brackets.

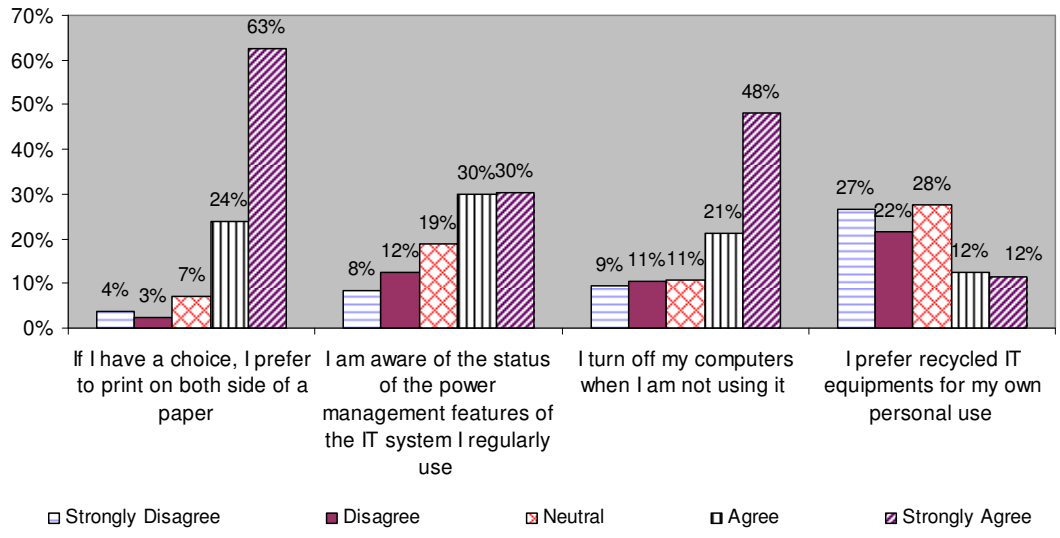
Figure 9: Most IT professionals recognise their role in leading changes to Green IT



9. GREEN IT PRACTICE

The participants were asked to what extent they are undertaking some rudimentary Green IT actions. More than 85% are taking actions to reduce papers but only 24% are willing to use recycled IT equipments. 60% are aware of the power management features of the systems they use and about 30% do not turn off their computers even when not in use. While respondents in the age bracket 36-45 and from the utility sector tend to be more concerned about paper consumption and younger respondents and school IT teachers are more likely to buy recycled IT equipment, male respondents and respondents from the consulting sector are relatively more aware of the status of the power management systems they use.

Figure 10: Basic Green IT practices among IT professioanls

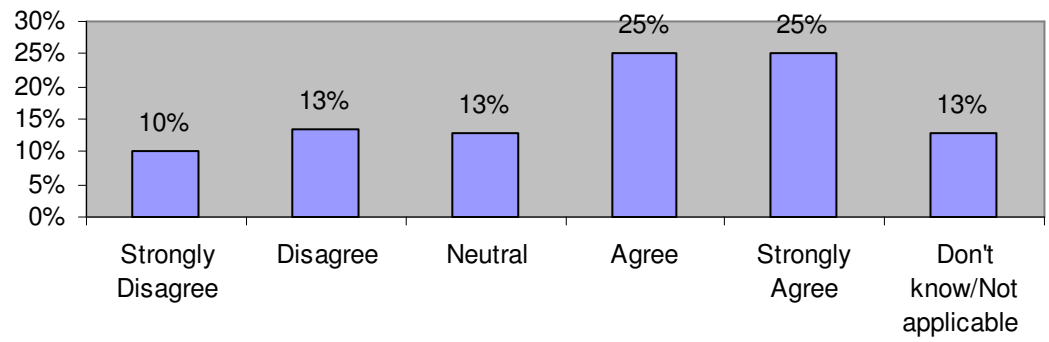


10. GREEN IT COMMITMENT AND GOVERNANCE AMONG AUSTRALIAN ORGANISATIONS

After gauging the Green IT awareness, knowledge and practice of the IT professionals, the survey examined to gauge opinions about the Green IT commitment and governance of the organisations where the respondents work.

One of the questions asked how engaged Australian organisations are with environmental issues. About 50% of respondents believe that their employers have taken some steps in tackling their carbon emission as shown in Figure 11. Although industry difference does not significantly affect this finding, organisations in the utility, government, finance and insurance sectors appear to lead the rest.

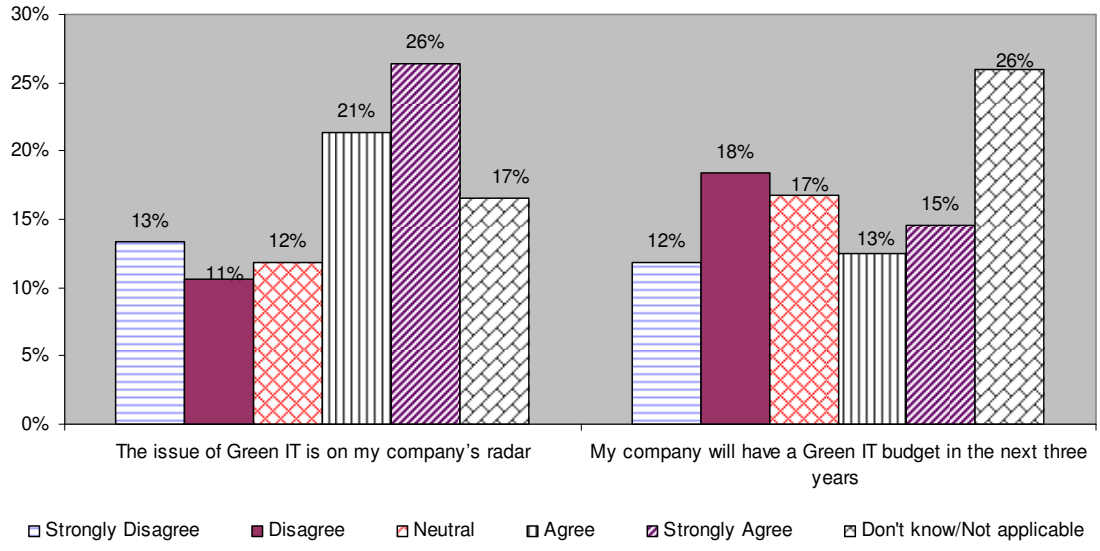
Figure 11: "My company has taken steps to reduce its carbon footprint"



The commitment of organisations to Green IT was gauged by asking respondents about top managements' attention to Green IT and resource allocation for Green IT. The findings as depicted in Figure 12 show that while under 50% of respondents' enterprises are putting Green IT on the radar, in close to a quarter of the enterprises, Green IT has yet to emerge on their company's radar. Likewise, less than 20% of respondents strongly believe that their enterprise will allocate budget to Green IT in the next three years. About 30% are less optimistic about their organisation's budget allocation for Green IT. Some respondents are unaware of their organisation's commitment to Green IT.

Although Green IT issues appear to be more on the radar of organisations in the utility and ICT sectors than the health and trade sectors, the difference is not statistically significant. Likewise, there is no statistically significant difference in the adoption of Green IT budget among organisations in different sectors.

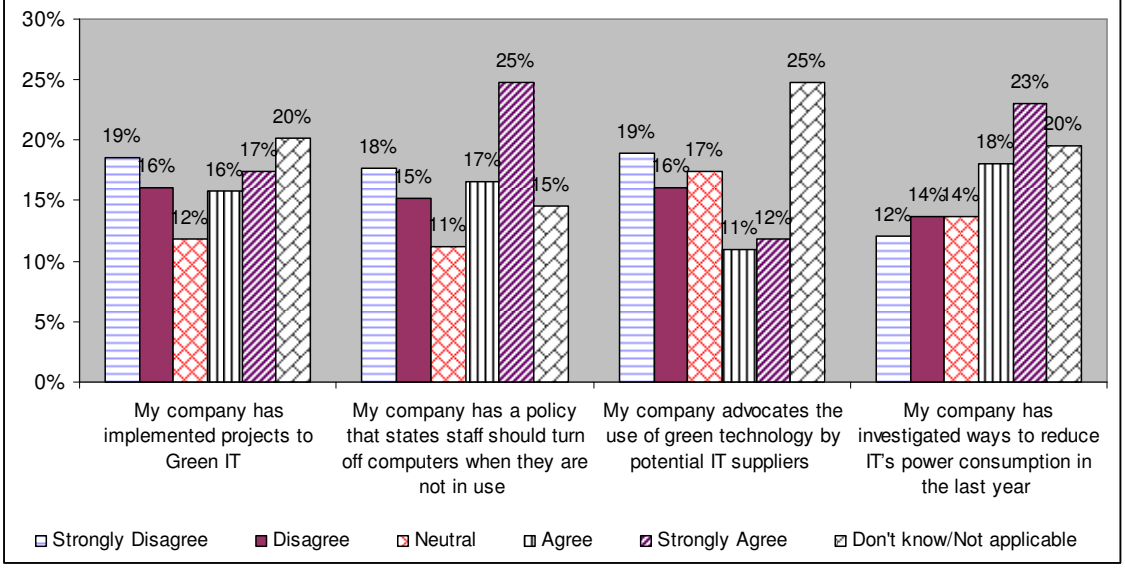
Figure 12: Enterprises' commitment to Green IT



When it comes to specific actions taken by organisations and IT departments (Figure 13), about 30% believe that their organisation has implemented Green IT Projects. This percentage is slightly less than the percentage of respondents who believe that Green IT is on their company's radar. However, even the enforcement of a quick win Green IT action, such as turning off computers when not in use, has only been strongly practiced in a quarter of organisations. In addition, most organisations do not seem to track the Green credentials of their IT suppliers. However, more than 40% of organisations have explored ways to reduce IT's power consumption.

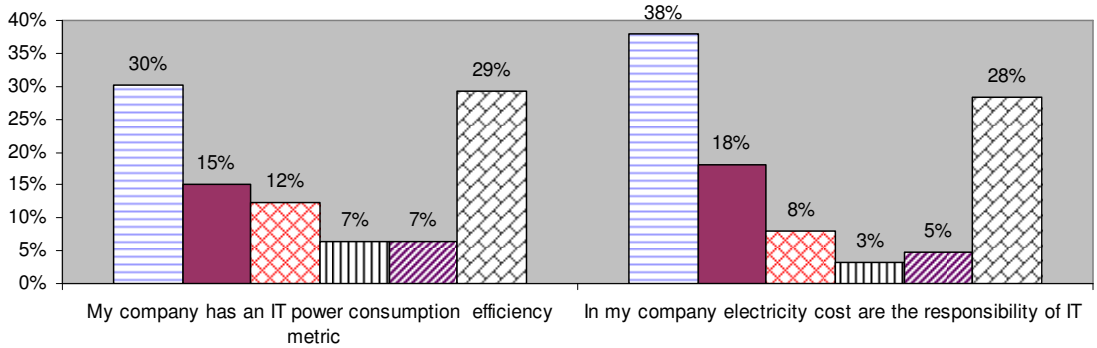
The only statistically significant difference in actions relates to enterprises' tracking of the Green credential of their IT suppliers. Such practices are more applied in the communication services, ICT and utility sectors and less applied in the finance and insurance, transport and consulting sectors. Overall, respondents are less positive about actions taken by their respective organisations to Green IT.

Figure 13: Actions to Green IT

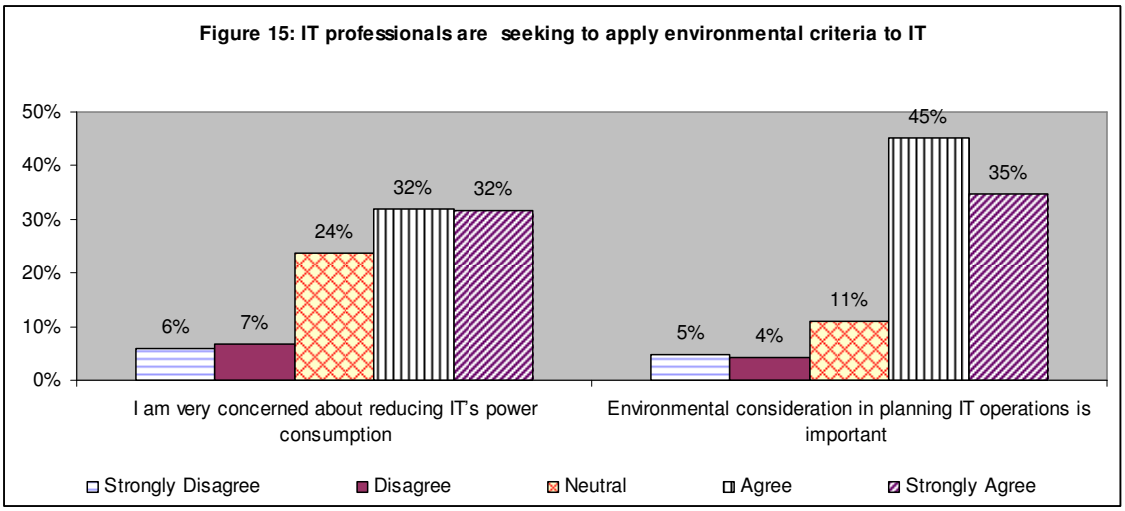


The survey further explored Green IT governance related practices that organisations might have put in place (Figure 14).The majority of respondents have yet to put in place proper metric to audit the power efficiency of IT systems. Auditing IT's power consumption is one of the early preparatory steps businesses need to undertake in the path to a Greener IT. Only less than 15 % of respondents believe that such a metric exists in their organisation. Further, in the majority of cases, IT is not responsible for its own power consumption. In terms of variations due to industry differences, the ICT industry appears to significantly lead in power consumption efficiency metric followed by communication services and education and research sectors. On the other hand, the consulting and transport industries appear to lag from the rest of the sectors.

Figure 14: Green IT governance



Although most of the IT professionals are sceptical about their enterprise's commitment to Green IT and rank low existing company wide Green IT governance regimes, 64% are personally concerned to reduce IT's power consumption and 80% believe that environmental consideration in planning IT operations is important (Figure 15).



11. SUMMARY

This study was set out to address the following four questions:

1. To what extent are IT professionals concerned about climate change?
2. What are the perceptions of IT professionals in terms of IT's contribution to environmental footprint and in IT's role in tackling a business's environmental footprint?
3. What are some of the processes IT professionals follow to increase their awareness of Green IT?
4. To what extent they are practicing Green IT in their professional and personal lives?
5. How do they perceive their working environments' preparedness for Green IT.

The findings indicate that the majority of IT professionals are concerned about climate change and the overwhelming majority believes that IT has a dual role in causing and mitigating environmental problems. However, the way in which IT professionals seek to increase their knowledge of Green IT issues remains unclear as few respondents indicated that they participate in Green IT workshops, discussion forums or seminars. This implies that either IT professionals are using alternative means to increase their knowledge, or that there is a need to promote Green IT education to IT professionals. Importantly, the study has identified that currently there seems to be a discrepancy between the concern for Green IT issues and the actual practice of Green IT in organisations. While IT professionals are taking simple actions towards Green IT such as printing on both sides of paper, more complex behaviours are practiced to a less commonly. Further, IT professionals are largely sceptical of their organisation's awareness, policy and practices of Green IT which warrants further investigation.

To present a comparative view of the practices of Australian companies with companies worldwide, some of the above findings are benchmarked against the findings of a global Green IT Attitude and Action Survey (Info~Tech, 2008). Info~Tech (2008) conducted the Global Green IT Attitude and Action survey covering 1260 respondents at the end of 2007. Ten of the questions in the current survey were taken from Info~Tech's report. The comparison of those ten questions against Info~Tech's published report is summarised in Table 2.

Table 2: A comparative overview of the perception and practices of green IT between Australian companies and worldwide companies

Items	Australia* (own survey)	Source: Info~Tech (2008)**			
		Europe	North America	Asia	Rest of world***
Concern about climate change (Figure 6)	81%	94%	83%	90%	95%
Company action for reducing carbon footprint (Figure 11)	50%	45%	35%	47%	41%
Green IT on company's radar (Figure 12)	47%	72%	71%	71%	72%
Budget for green IT in the next three years (Figure 12)	28%	65%	55%	68%	65%
Company's steps to reduce IT's power consumption (Figure 13)	41%	48%	48%	54%	47%
Company policy on computers use (Figure 13)	42%	56%	36%	74%	56%
Company advocating use of Green technology in sourcing (Figure 13)	23%	30%	25%	41%	31%
Adoption of IT Power consumption efficiency metric (Figure 14)	14%	21%	16%	40%	25%
IT"s responsibility for power consumption (Figure 14)	8%	25%	20%	45%	22%
Personal concern for reducing IT's power consumption (Figure 15)	64%	85%	85%	85%	88%

** Percentage are exact figures*
*** Percentages are approximate estimates*
**** Rest of the world includes Africa, S. America and Oceania*
All percentages refer to those that either "agree" or "strongly agree" or answer "yes"

The result in Table 2 shows that, overall Australian respondents are less positive about their company's Green IT commitment compared to their peers in Asia, Europe, North America and the rest of world. Nevertheless, Australian companies appear to have taken more action for reducing their carbon footprint. This result might be interpreted as either that Australian organisations are becoming more environmentally friendly or it could just be the outcome of the time differences between the current and Info~Tech's (2008) survey.

Despite an almost one year difference in the data collection time frame between the current and Info~Tech's survey, Green IT has yet to capture the attention of more than half of Australian respondent organisation's attention. This lack of attention is further reflected in budget allocation. While more than 55 % of Info~Tech's European, Asian, North Americana and the Rest of World respondents believed that their employer will allocate a budget for Green IT, only less than 30% of Australian respondents expect to see that level of Green IT commitment from their enterprise. Further, even in terms of respondents' personal concern for reducing IT's power consumption, Australian respondents lag the rest of the world by about 20%.

In summary, the current findings suggest that Australia underperforms in many of the Green IT attitude and action dimensions. However, this result should be considered as preliminary and more studies are needed to understand the shift in opinions and actions towards Green IT.

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About the Authors

Alemayehu Molla is an Associate Professor at the School of Business Information Technology, RMIT University. He researches in the areas of Green IT, e-business, enterprise systems and development informatics. He has published more than sixty refereed papers. His publications appeared in top-tier international journals including the *European Journal of Information Systems, International Journal of E-commerce, Journal of E-commerce Research, Information & Management, Internet Research, The Information Society Journal, Journal of Information Technology for Development and IT and International Development*.

Dr Vanessa Cooper is a Lecturer in the School of Business Information Technology. Vanessa has worked as a systems engineer in the IT services industry in both Australia and the UK, which prompted her research interest in IT services, and in particular, the role of knowledge management in the provision of IT services. Vanessa's research has involved working closely with numerous medium and large multi-national organisations, where she investigated the transfer of after-sales IT support-oriented knowledge to enterprise customers via web-based self-service systems for her PhD. Her other key research interests include e-relationship management, and more recently, Green IT. Vanessa has published and reviewed in both Australian and international information systems conferences and journals.

Hepu Deng is a professor in information systems at the School of Business Information Technology, RMIT University. He researches in the areas of green IT, digital business, decision analysis and intelligent systems. He has published more than ninety refereed papers in international journals and conferences, some of them appeared in top-tier international journals and conferences including *European Journal of Operational Research, IEEE Transactions on Systems, Man and Cybernetics (Part A), The Operational Research Society, International Journal of Approximate Reasoning*.

Stas Lukaitis is a Senior Lecturer at the School of Business Information Technology, RMIT University. He has been an academic at RMIT Business for over 20 years and is actively lecturing students and preparing them for the world of 21st century ICT. Stas's current teaching interest includes Open Source Environments, Computer Networking and Enterprise Systems Security. Stas is pursuing a doctorate by research in the area of the alignment between the business and its IT function, trying to understand what makes the business and its ICT function work for the benefit of the business and occasionally not work so well.