ICT for Eco-Sustainability

An assessment of the capability of the Australian ICT Sector

A study commissioned by the Australian Information Industry Association

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OUTLINE

EXECUTIVE SUMMARY

As eco-sustainability issues become increasingly important to most, if not all, Australian organisations, the Information and Communication Technology (ICT) industry is expected to provide solutions that reduce material consumption (dematerialise), emissions (decarbonise), and energy use and waste production (demobilise) in both the ICT infrastructure and the business processes and practices of industries. The term 'Green ICT' represents this eco-sustainability enabling role of the ICT industry.

The School of Business Information Technology and Logistics, RMIT University in collaboration with the Australian Information Industries Association (AIIA) surveyed all members and affiliates of the AIIA at the beginning of 2010 to understand Australian ICT firms' capability to enhance the eco-sustainability of other industries. Based on data collected from 133 ICT firms, this report constitutes the first comprehensive study that exclusively focuses on the Australian ICT industry.

Green ICT Capability (GITCAP) represents an ICT firm's ability and performance to articulate an eco-sustainability vision; to apply eco-sustainability criteria to acquire and manage its tangible and intangible resources; to deploy those resources to create products and services that promote the sustainability of industries; and to generate green economic value. In our study, we identified five components of GITCAP – *Eco-Innovativeness, Eco-process, Eco-portfolio, Eco-marketing* and *Eco-value*. Based on the capability maturity lens, we explain the differences in the performance of the ICT firms in terms of the overall GITCAP and along its five components as *Very Low, Basic, Average, Advanced,* or *Optimising*. In addition, indices for the overall GITCAP maturity of the Australian ICT sector as well as the maturity of the GITCAP components were computed.

Our findings (Figure A) indicate that at the time of the survey (early 2010), Australian ICT firms demonstrated a GICTCAP maturity index of ***46.5*** and ***Basic Level of Maturity***. The leaders (ICT firms with an *Optimising* maturity level) have a GITCAP maturity index of 94, and the fast followers (*Advanced* maturity level) have a maturity index of 79. Those that either lack or assign no priority to Green ICT perform at a maturity index of 25. The rest of the respondents have a maturity index of 61 (*Average* maturity level) or 41 (*Basic* maturity level).

Figure A: The Green ICT Capability Maturity Distribution of ICT Firms in Australia
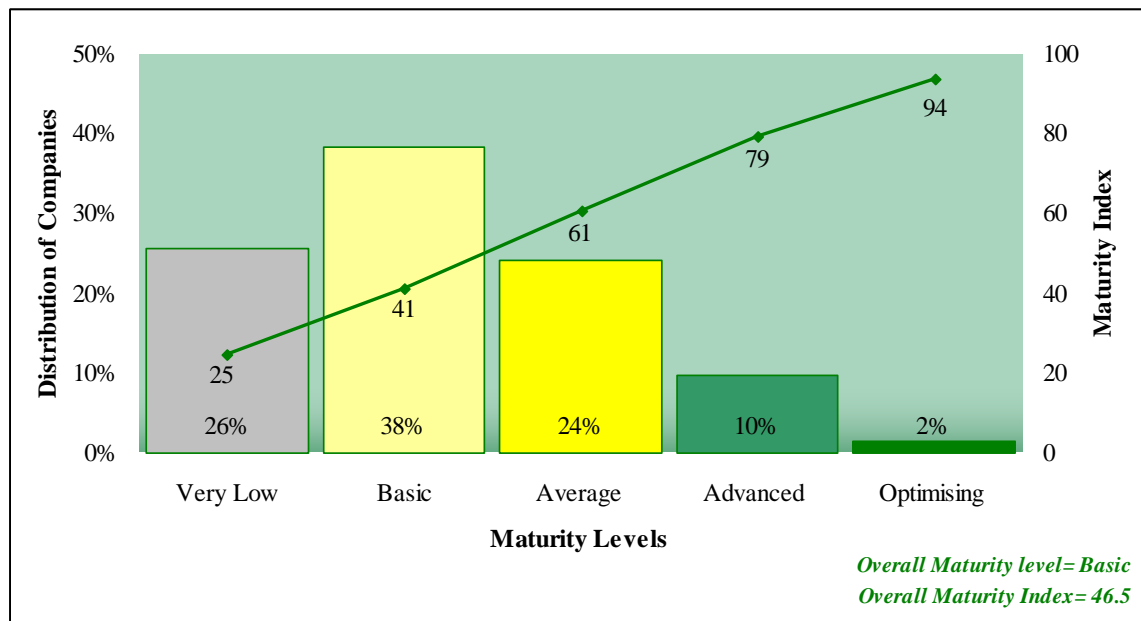
As of the beginning of 2010, Australian ICT firms appeared to have done relatively well in developing the GITCAP components *Eco-marketing* (with an index value of 51.8) and *Eco-innovativeness* (index value 50.5) (Figure B). *Eco-value* was the least-developed capability (index value 43.2).

Figure B: GITCAP Component Maturity Indices
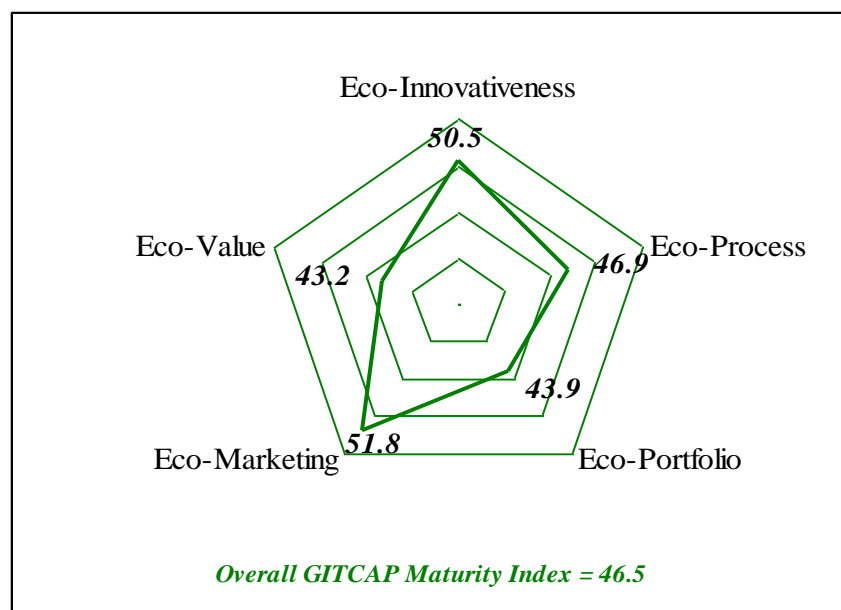
Key Findings

- The Very Large organisations (> 500 employees) in the sample (15%) had relatively well developed capability in all the GITCAP components (GITCAP Index 63.4). Those that are engaged in hardware manufacture, maintenance, and wholesaling tended to perform better (GITCAP Index 58.7) than the other ICT sub-sectors.

- Most ICT firms are developing clearer strategic direction about the opportunities associated with climate change. Thirty-nine per cent of firms stated they had a very clear strategy for enabling the eco-sustainability of other industries. In another 38% such clarity was described as emerging, and only 23% of the respondents were either unconvinced or inactive about the need for developing a sustainability vision.

- The surveyed firms claimed to have relatively well developed processes for the utilisation and optimisation of ICT resources such as servers, storage, applications, networks, telephony, office systems and other materials. In addition, in 29% of the firms, the practice of disposing of electronic and non electronic waste in an eco-friendly manner was mature. In some of the firms, eco-sustainability design principles such as lower energy use, less waste, less use of toxic chemicals, and greater use of recyclable, reusable and renewable systems and materials are being enforced at the time of product design.

- 75% of the firms have yet to acquire any third party certification for their environmental performance.

- ICT solutions that enable workers to work remotely, such as video conferencing, telepresence and telecommuting are the most matured offerings in the Australian ICT sector. Such products are well established in 32% of the companies surveyed and these companies are working to maintain and improve the value contribution from their offerings. For another 32% of the companies, the product category has market visibility and is a source of revenue; 21% of the respondents reported no plans to offer such products.

- The surveyed firms described a promising portfolio of development and initial offering product categories. For example, more than a third of the companies have either allocated resources for development of – or have started offering solutions for – energy use monitoring and reporting, energy efficiency, remote power management and pollution control and treatment. An equal proportion of firms is also developing capability in Green ICT strategic consulting and Green ICT training, education and research.

- 40% of the companies have recognised the brand value of Greenness and are at an advanced or optimising level in using it in their marketing strategy. Using Greenness in a marketing strategy shouldn't always be interpreted as "Green-washing"; most of the companies that use Greenness in marketing strategy use it to complement their other value propositions such as price, quality and service. These companies are not simply re-branding existing products for Greenness, but are providing either initial or mature solutions that can improve the environmental performance of their customers.

- Companies perform relatively better in indicators of value realisation than of value measurement. For example, 35% of respondents believe that their Green ICT products provide them with great competitive edge, and another 9% believe Green ICT products help them achieve a moderate increase in competitive performance. Thirty-two per cent of surveyed firms obtain high or very high cost and environmental footprint reduction out of their Green ICT initiatives. Some 40% of respondents claimed that their Green ICT products enhance their revenue, and 29% stated that the enhancement is substantial.

- 69% of the respondents identified the need to be legitimised as a concerned member of global and local communities and vision from senior management as the two major drivers for investing in Green ICT products and service development.

- The factor most frequently considered to inhibit the uptake of Green ICT was that it is not a priority, followed by lack of demand and money.

1. INTRODUCTION

The School of Business Information Technology and Logistics at RMIT University was engaged by the Australian Information Industries Association (AIIA) to carry out a survey of AIIA members' Green Information and Communications Technology (ICT) capability. The study was undertaken to promote the development of sustainable ICT responses to climate change and facilitate the uptake of sustainable ICT by Australian enterprises.

This report is based on a survey of the Australian ICT industry conducted in the first quarter of 2010. AIIA provided useful input by reviewing the survey instrument and inviting its members to participate in the survey.

The study supports AIIA's Green ICT work which aims to promote the benefits of the ICT industry – technology as an enabler in the area of environmental and business sustainability.

1. 1 Context

The future of the global ecosystem is dependent on humanity's collective ability to reverse or limit the effects of global climate change. In this regard, firms are expected to act in a sustainable manner by addressing commercial and environmental goals simultaneously rather than viewing them as trade-offs. This expectation raises challenges and opportunities for the ICT industry. The challenges include the minimisation of ICT-related emissions, energy, waste and water. Opportunities exist because the ICT industry is expected to enable eco-sustainability by reducing material consumption (dematerialise), emissions (decarbonise), and energy use and waste generation (demobilise) within business and supply chain processes. Green ICT represents these roles of ICT in environmental sustainability.

Green ICT has emerged as a key platform in the sustainable development strategies of firms and in the policies of the European Union, the OECD and Australian state and federal governments. It is also a focus of many companies working to ensure that their operations are both economically and environmentally sustainable. Nevertheless, Green ICT development practice is not easy to implement. ICT firms vary in their performance in applying environmental sustainability criteria to their own operations and in their ability to provide products and services to promote the eco-sustainability of other industries. A better understanding of the variation and gaps in the capacity of the Australian ICT industry to provide sustainable services is necessary before the sector can be assisted to fulfil its potential. The study described in this report was conducted to generate the first comprehensive picture of the Green ICT capability of the Australian ICT industry.

1.2 Objectives

The project's objectives were to assess the Australian ICT industry's capability to provide ICT solutions and services that can enable businesses and other organisations to:

- reduce their IT related energy use, emissions and waste, and

- measure, monitor, report and reduce their core enterprise and value chain processes' energy use, greenhouse gas emissions and waste.

The following questions about Australian ICT firms were explored to achieve the objectives of the project.

- To what extent are Australian ICT firms cultivating a sustainability mindset and vision for Green ICT product and service innovation?

- How Green are their business processes?

- What Green ICT products and solutions are they offering?

- How are they developing and marketing their Green brands?

- What are the tangible and intangible benefits of Green ICT?

2. METHODOLOGY

The study was guided by academic and industry best practices in organisational capability assessment[1], in balanced performance measurement[2], and the Carnegie Mellon's Capability Maturity Model (CMM)[3].

2.1 Key Definitions

The ICT Industry: The ICT industry includes firms that produce and market ICT hardware, software and services. In order to classify firms by meaningful product groups, we used the Australian New Zealand Standard Industry Classification scheme (ANZSIC) with two additions, as detailed below.

- 2421 Computer and electronic office equipment manufacturing

- 2422 Communication equipment manufacturing

- 2429 Other electronic equipment manufacturing

- 3492 Computer and computer peripheral wholesaling

- 3493 Telecommunication goods wholesaling

- 3494 Other electrical and electronic goods wholesaling

- 5420 Software publishing

- 5801 Wired telecommunications network operation

- 5802 Other telecommunications network operation

- 5809 Other telecommunications services

- 5910 Internet service providers and web search portals

- 5921 Data processing and web hosting services

- 5922 Electronic information storage services

- 7000 Computer system design and related services

- 9422 Electronic (except domestic appliance) and precision equipment repair and maintenance

- ICT consulting services

- ICT managed services

Green ICT is defined here as:

> *a systematic application of ecological-sustainability criteria (such as pollution prevention, product stewardship, use of clean technologies) to the design, production, sourcing, use and disposal of ICT products and services in order to reduce IT, business process and supply chain related emissions, waste and water use, improve energy efficiency and generate tangible and intangible green economic rent.* [4]

Capability: Organisational capability can be tangible or intangible firm-specific processes and assets that represent firms' ability to coordinate and deploy resources[5]. It includes functional skills and cultural perceptions that influence management of change and innovation. An organisation's capability differentiates it from its competitors and can affect its operational and market performance. Capabilities emerge over time through complex interactions among tangible and intangible resources. Overall, capabilities can be classified as managerial, input, transformational, output and market based[6]. Managerial capabilities refer to the ability of leaders to articulate a strategic vision, communicate it and empower employees to realise it. Input capabilities refer to firms' physical, capital and human resources. Transformational capabilities transform inputs into outputs, and include innovation to generate new processes, products and services as well as organisational culture, learning and adaptation. Output capabilities refer to firms' tangible products and services and intangible outputs. Market based capabilities refer to a firm's ability to capture and maintain market advantage and sense change in the market environment.

Green ICT Capability (GITCAP): Extending the organisational capability concept to Green ICT, GITCAP is defined as an ICT firm's ability to: articulate and implement an eco-sustainability vision (managerial); apply eco-sustainability criteria to acquiring and managing its tangible and intangible resources (input); deploy those resources (transformational) to create products and services (output) that promote the sustainability of other industries and generate green economic value (market). Thus defined, and based on the tenets of the balanced performance measurement, the GITCAP of an organisation can be decomposed into the following five interrelated components:

- *Eco-innovativeness*: an ICT firm's ability to take advantage of the opportunities associated with climate change, to cultivate an eco-sustainability mindset and vision for product and service innovation, and create a pool of talent and other resources to realise the vision.

- *Eco-process*: the existence of coherent processes for applying environmental criteria in the design, creation, and delivery of a product or service. This includes the extent to which green principles (less energy, less waste, less toxic material, more recyclables, less water, less emission) have permeated the architecture, processes and operation of the firm as well as its products and services.

- *Eco-portfolio*: refers to the diversity and maturity of the Green ICT products and services that a firm offers to the market.

- *Eco-marketing:* refers to the ability of an ICT firm to create, manage, monitor and reinforce its Green brand at both organisational and product levels.

- *Eco-value:* refers to the ability of an ICT firm to measure, release or seize tangible and intangible Green ICT benefits.

The GITCAP concept is illustrated in Figure 1.

Figure 1: Components of Green ICT Capability
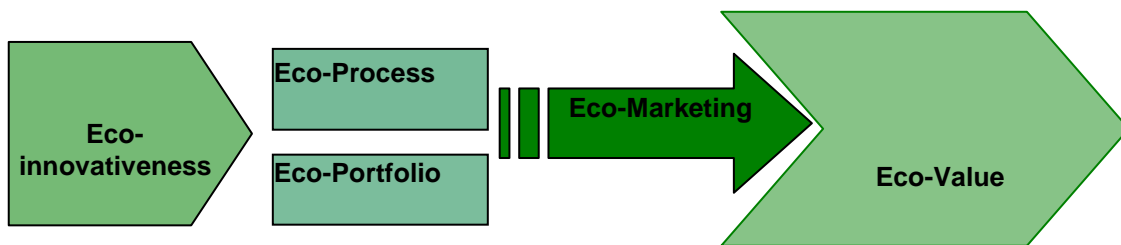
2.2 The GITCAP Assessment Tool

Although there are many references to Green ICT capability in the practitioner literature and in the ICT industry and beyond, there is no conceptually sound and rigorous assessment tool that provides a comprehensive evaluation of the GITCAP of an ICT firm covering both lagging (past performance) and leading (future potential) indicators. Thus, in consultation with AIIA's Green IT and Sustainability Task Force, we developed a GITCAP assessment tool based on (a) our definition of GITCAP (b) our previous G-readiness framework, (c) a review of relevant literature and (d) interviews with a sample of AIIA members.

The GITCAP assessment tool covers the five dimensions of GITCAP. We initially generated a questionnaire containing 65 items; this was pilot tested with a sample of 30 AIIA member ICT firms, and peer-reviewed by Australian and international academics who actively research Green ICT. Based on the pilot study results, the GITCAP assessment tool was reduced to 52 items. In the final questionnaire, seven questions measure each of *Eco-innovativeness* and *Eco-process. Eco-portfolio* is measured by 21 questions about Green ICT products and services. Nine and eight questions are used to measure the *Eco-marketing* and the *Eco-value*

components of GITCAP respectively. Participants were asked to give responses to each question on a five point performance-oriented Likert scale ranging from 1 = low performance (low maturity) to 5 = high performance (high maturity).

Note that our GITCAP assessment tool was developed specifically for this project and requires more rigorous validity tests, so the results presented here should be considered preliminary rather than definitive indicators.

2.3 Modelling GITCAP

The development and distribution of GITCAP and its constituent components are not uniform across firms and are highly firm-specific. GITCAP requires constant building, re-building and upgrading, hence it can be modelled using the Capability Maturity Model (CMM)[7]. We adopted the CMM to understand the variation in the GITCAP (both aggregate and in terms of the five individual components) of firms. The CMM approach is an internationally recognised framework that has been applied in Software Engineering, IT management, IT business alignment, outsourcing vendors and e-business and e-government to reveal and map achievements in key performance areas. The CMM framework can also be used as a roadmap to identify strategies for monitoring, developing and continuously improving an organisation's capability.

Using the maturity framework, five levels of GITCAP maturity can be defined as follows.

- Level 5 - *Optimising*: evidence of ongoing improvements in Green ICT product, process and market innovation to maintain and improve value contribution from Green ICT offerings.

- Level 4 - *Advanced*: Green ICT has become an established offering and a source of revenue.

- Level 3 - *Average*: the organisation has a Green ICT product, Green ICT expertise and efficiency has begun to emerge.

- Level 2 - *Basic*: the organisation has just started to consider offering Green ICT and has allocated a budget (investment).

- Level 1 - *Very Low*: there is no strategy, no budget, no clear operating plan for a Green ICT and Green ICT is not a priority for the firm.

The levels of maturity listed above can apply to the ICT industry as a whole, to individual firms or to the five components of the GITCAP. The five levels of GITCAP maturity correspond to ranges of index values as indicated in Table 1. Thus, firms' maturity levels can be converted

into an index of the overall GITCAP maturity of the Australian ICT sector as well as maturity indices for the GITCAP components and the questions that measure each of the components. In addition, GITCAP indices were computed for different firm sizes and industry sub-categories.

Table 1: Index Values for Levels of GITCAP Maturity

MATURITY LEVEL	INDEX VALUE
Level 5 - *Optimising*	>= 90
Level 4 - *Advanced*	70-89
Level 3 - *Average*	50-69
Level 2 - *Basic*	30-49
Level 1 - *Very Low*	< 30

2.4 Data Collection

The data for this report were collected using an online survey of the members and affiliates of the AIIA. The survey instrument and the GITCAP Assessment Tool included questions about the sector, market, ICT, size and financial performance profile of the firms and about the motivating and inhibiting factors that influence investment and action on Green ICT.

AIIA invited all of its 550 members and affiliates to participate in the online survey. After two rounds of reminding e-mails and 350 follow-up telephone calls, 135 responses were received. Two responses were excluded because of insufficient data; thus, this report is based on analysis of 133 responses (a response rate of 24%).

3. PROFILE OF SURVEY PARTICIPANTS

3.1 General Profile

Most of the respondents (68%) were AIIA members and the rest were AIIA affiliates. As indicated in Figure 2, while 59% of the respondents were chief executive officers or their equivalent, 5% of the responses came from chief information officers and 5% from sustainability directors. The remaining respondents (26%) nominated their job title or role as business development manager, product development, sales and marketing manager, principal consultant, or operations manager.

Figure 2: Respondent Job Title
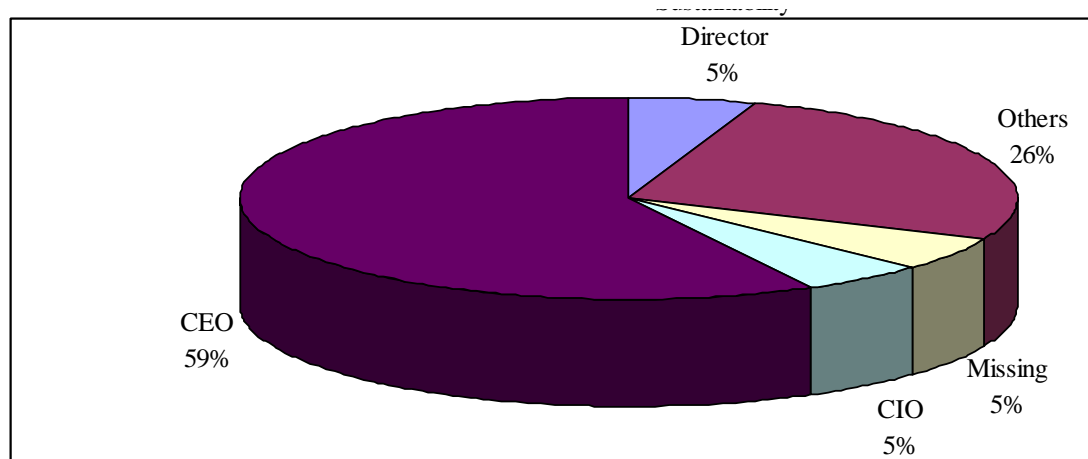
Table 2 shows that:

- the majority of respondents (74%) classified their organisation's size as either Small (59%) or Micro (15%). However, based on the Australian Bureau of Statistics classification using Full Time Equivalent (FTE) employee numbers, 52% are either Small (31%) or Micro (21%);

- most respondents (63%) had been in business for less than 15 years;

- while many respondents (37%) opted not to disclose their location, 24% of the respondents were located in Victoria or maintain an office in Victoria.

Table 2: Respondent Profile

Category	Classification	Frequency	Percentage
Self reported organisational size	Small	79	59%
	Micro	20	15%
	Medium	20	15%
	Large	12	9%
	Missing	2	2%
Organisational size based on FTE employee number	Small (6-20)	41	31%
	Medium (21-100)	35	27%
	Micro (<=5)	27	21%
	Very Large (> 500)	20	15%
	Large (101-500)	9	7%
Age	<=5 year	32	24%
	6 to 15	50	38%
	16 to25	21	16%
	26 to 35	15	11%
	>=36	13	10%
	Missing	2	2%
Regional Distribution	VIC or office in VIC	32	24%
	NSW	21	16%
	ACT	11	8%
	QLD	9	7%
	WA	7	5%
	NT	2	2%
	SA	2	2%
	Missing	49	37%

3.2 Industry Profile

Two categories of industry profiling classifications were used – ANZSIC and CeBIT. While ANZSIC describes the ICT industry economic sub-sectors, CeBIT describes the market segment in which a firm competes. Respondents were asked to choose only one of the ANZSIC classifications that best describes their company, but they were given the option to choose as many of the market segments (CeBIT classification) within which they operate as applicable.

The findings with respect to industry profile are presented in Figures 3 and 4. In terms of industry sub-sector distribution (that is, ANZSIC classification), most respondents were from the Software publishing (ANZSIC category 5420 – 20%) and ICT consulting (19%) sub-

sectors. The other major sub-sector in the sample was Computer systems design and related services (ANZSIC category 7000 – 11%). The rest of the respondents were from a cross-section of the ICT industry sub-sector. It is worth noting that 18% of the respondents did not identify their business with any of the 17 ANZSIC classifications.

Figure 3: Respondent Classification by ICT Industry Sub-sector (ANZSIC)
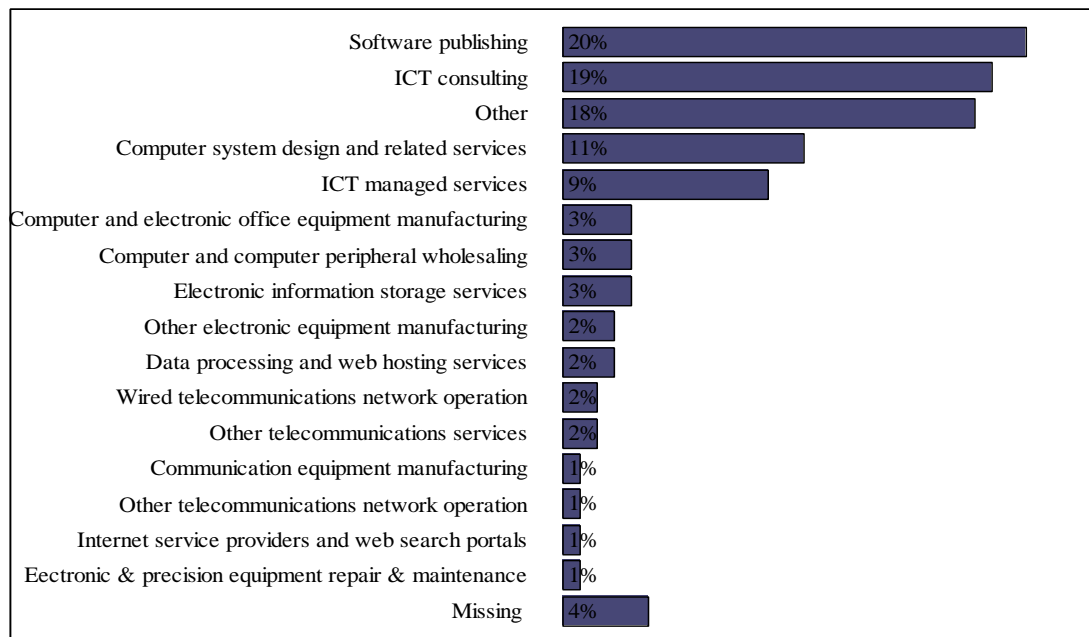
For further analysis, the ICT industry sub-sectors were grouped into four major categories.

- *ICT Hardware Manufacture and Wholesaling*: Computer and electronic office equipment manufacturing (ANZSIC 2421), Communication equipment manufacturing (2422), Other electronic equipment manufacturing (2429), Computer and computer peripheral wholesaling (3492), Other electrical and electronic goods wholesaling (3494), Electronic (except domestic appliance) and precision equipment repair and maintenance (9422).

- *Software Publishing and System Design:* Software publishing (5420); Computer system design and related services (7000).

- *IT Services*: Data processing and web hosting services (5921), Electronic information storage services (5922), ICT Consulting and ICT managed services

- *Telecoms*: Telecommunication goods wholesaling (3493), Wired telecommunications network operation (5801), Other telecommunications network operation (5802), Other

telecommunications services (5809), Internet service providers and web search portals (5910).

Fifty-six per cent of the respondent organisations compete in the IT services market segment (a CeBIT classification – see Figure 4). The Banking, Finance and Insurance IT and Enterprise Applications market segments account for 38% each. While about one in ten of the surveyed firms produce software, close to one-fifth of the respondents operate in the Environmental Technologies IT market segment.

Figure 4: Respondent Classification by ICT Market Segment (CeBIT)
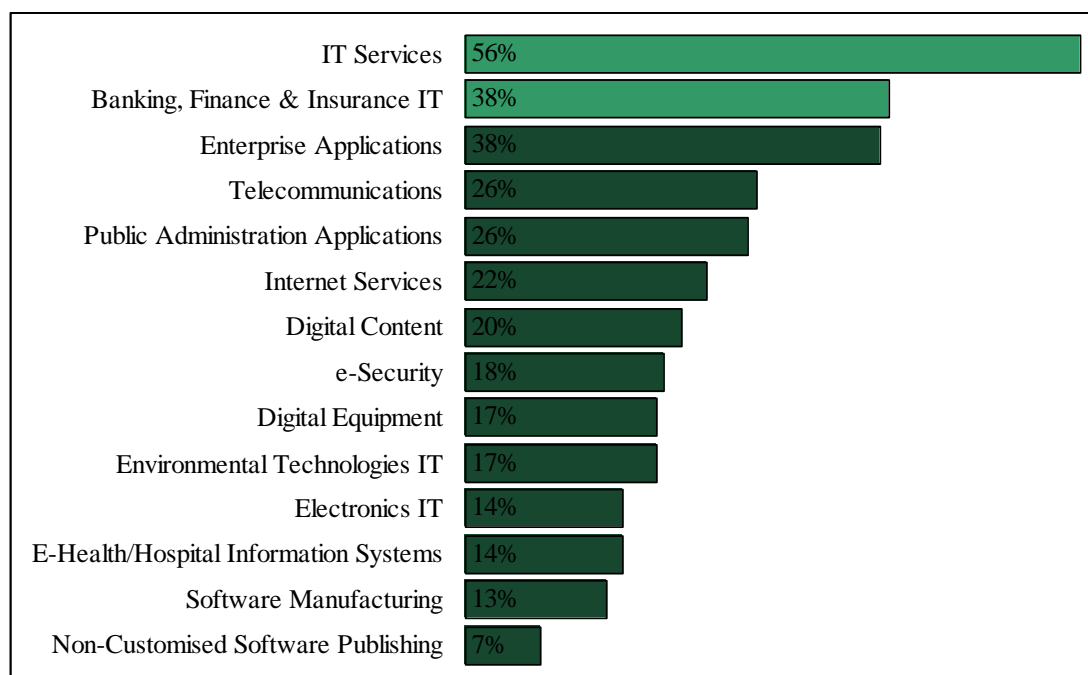
3.3 ICT Profile

Participating firms differ in terms of their IT profiles (Table 3). A little over half of all respondents operate IT businesses with fewer than 5 servers, 19% between 6 and 20 servers and 8% more than 100. Most of the respondents do not outsource any IT work.

Table 3: ICT Profile of Participants

ICT				Percenatge of Outsourced IT Work		
	Servers	PC	Laptop		Frequency	Percenatge
<=5	53%	31%	36%	None	70	53%
6 -20	19%	23%	35%	1-20%	27	20%
21-100	12%	28%	11%	21-50%	12	9%
101-500	4%	3%	5%	51-75%	3	2%
>500	4%	6%	8%	76-100	9	7%
Missing	9%	9%	6%	Missing	12	9%

3.4 Financial Status

Over half of the respondents did not disclose their revenue figures and their marketing and product development budgets (See Table 4). Based on the responses to financial related questions, it appears that most of the surveyed ICT firms have revenues of less than AUD$10 million and annually allocate less than AUD$50,000 to their product development and marketing budgets.

Table 4: Financial Profile of Participants

Revenue (in '000,000 AUD)	2009		Last 5 Years Average	
	Percentge	Frequency	Percentge	Frequency
<1	13%	17	16%	21
1- 10	25%	33	21%	28
11-20	3%	4	4%	5
21-100	3%	4	2%	2
>100	7%	9	7%	9
Missing	50%	66	51%	68

Budget (in'000 AUD)	Product Development		Marketing	
	Percentge	Frequency	Percentge	Frequency
0	12%	16	9%	12
<=50	7%	9	17%	22
51-100	4%	5	5%	7
101-500	12%	16	7%	9
>500	9%	12	4%	5
Missing	56%	75	59%	78

The profile data indicate that most Australian ICT firms are Small.

4. GREEN ICT CAPABILITY (GITCAP)

Although the ICT industry is uniquely placed to contribute to the solutions that enable ecologically sustainable organisational and societal practices, the ability of individual firms to go beyond the rhetoric and take actions can differentiate the first movers from the fast followers and everyone else.

We proposed five components of GITCAP for ICT firms – *Eco-Innovativeness, Eco-process, Eco-portfolio, Eco-marketing and Eco-value*. Using the capability maturity lens, the differences in the performance of the ICT firms in terms of the overall GITCAP and along the five individual components can be explained by a company's stage of GITCAP maturity - *Very Low, Basic, Average, Advanced, Optimising*. Each of the maturity levels is associated with a range of index values (Table 1). The following sections present the results of the survey.

4.1 Overall GITCAP Maturity and Index

Using the GITCAP Maturity Model as a framework, the GITCAP performance of the 133 survey respondents were placed on a maturity chart (Figure 5). In addition, a GITCAP maturity index was calculated.

Figure 5: GITCAP Maturity Levels and Index of Australian ICT Firms
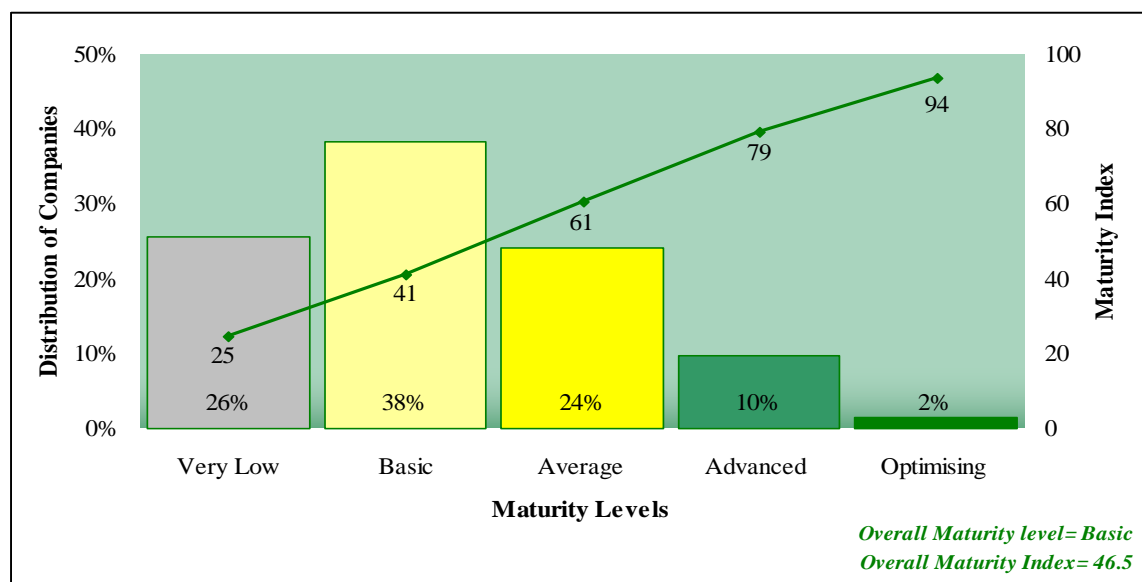
The data in Figure 5 indicate that only 12% of the respondents are positioned at a stage to provide products and solutions to enhance the eco-sustainability strategies of other enterprises. About 24% are developing such capabilities. While just over a third of the

respondents are paying some attention to developing the capability required to operate in the Green ICT market, close to one third of the respondents lack Green ICT capability or do not regard it as a priority.

Overall, at the time of this survey, Australian ICT firms have a GICTCAP maturity index of 46.5. The leaders (*Optimising* maturity level) have a GITCAP maturity index of 94 and the fast followers (*Advanced* maturity level) have a GITCAP maturity index of 79. Those that either lack or assign no priority to Green ICT perform at a maturity index of 25. The rest of the respondents have a maturity index of 61 (*Average* maturity level) or 41 (*Basic* maturity level).

Table 5: Salient Characteristics of Firms at different stages of GITCAP Maturity

Item	Very Low (n=34)	Basic (n=51)	Average (n=32)	Advanced (n= 13)	Optimising (n=3)
Index	25	41	61	79	94
Size	68% Micro and Small	59% Small and Medium	66% Small and Medium	46% Very Large	Small, Medium and large each
Climate for innovation	Lack senior management commitment and recognition of opportunities with climate change, low level of awareness of the role of ICT in eco-sustainability, no process in facilitating organisational learning and developing staff sustainability skills	Limited management commitment and recognition of opportunities with climate change, limited awareness of the role of ICT in enabling sustainability, lack organisational learning and staff sustainability skills developing	Demonstrable management commitment and recognition of opportunities associated with climate change and limited budget allocation, growing awareness of the role of ICT in eco-sustainability.	Strong senior management commitment, high recognition of opportunities with climate change, established organisation sustainability learning, committed resources for ICT for Green product development	Very strong management commitment, extensive sustainability learning, commit resources for ICT for Green product development, ISO 1400 certifications; strongly enforced environmental sustainability design principles
Established Green ICT product	None	None, initial offering of solutions that enable remote working and server virtualisation	Initial offering of solutions for energy use monitoring and that enable remote working and server virtualisation	Green ICT consulting, Green ICT advocacy, Green ICT monitoring and assessment, Green ICT Training, research	Green ICT strategic consulting, ICT solutions for energy efficiency, ICT solutions to remote working
Motivating factors	----	Senior management vision	Senior management vision, market demand	Senior management vision and product and market development strategy	Senior management vision, product/ market development strategy, market demand

Inhibiting factors	Not a business priority, lack of demand and competition	Lack of money/budget	lack of budget	------	------
Drivers vs. inhibitors	More of inhibitors	More of inhibitors	Mixed bag	More of motivators	More of motivators
Realised value	----	------	Intangible brand values	competitive edge, intangible brand values	Reduced cost, competitive edge and intangible brand values
Strategic action areas	Realisation of eco-sustainability enabling role of ICT	Realisation of eco-sustainability enabling role of ICT, staff sustainability skills development	Organisational learning, staff sustainability skills, eco-sustainability of internal processes	Third-party certification of greenness, value measurement and governance regime	Improve value measurement and governance regime

We hypothesise that there are five levels of GITCAP maturity through which ICT firms progress. We recognise that progress is not necessarily linear and might not be suitable or applicable for every ICT company. Our data show that some companies are yet to be convinced about the significance of climate change or the need to balance economic goals with environmental responsibilities. Some comments made by the respondents that illustrate such views are provided below.

> *"Climate change is simply a new way for governments to extract taxes from populations"*

> *"[in] our "organisation" - no emphasis is placed on wasting time and resources on propaganda such as 'climate change'.*

> *"I believe Greenness is propaganda created by companies to appeal to today's sensationalists."*

> *"Green = waste of money"*

> *Most businesses are concerned with making money that is why they are in business. "Being Green" is an option you need to look at but "making profit" is the prime driver.*

For other respondents, offering products and services that enable eco-sustainability will not be regarded as a priority in the immediate future; some are start-up companies, others have fixed business, product and marketing strategies, and others have decided Green ICT capability is irrelevant to them. The comments included the following:

> *"We are a start up applications company. Senior management is focused on funding and growth of pipeline"*

> *"We do not have any plan for "green" products at this time and it rates very low on our current priorities."*

A few respondents expressed a rather narrow understanding of Green ICT and have yet to realise the role of software and services for Green (that is, ICT for Green).

> *"We do not operate data centres or desk in hardware which appears to be the core focus of the Green ICT industry/ movement. As we are an applications provider we do not see this topic as being relevant to our business."*

4.2 GITCAP Maturity Levels and Indices by Organisation Size

The GITCAP Maturity levels and indices by organisational size (based on number of FTE employees) are presented in Figures 6-10. Table 6 summarises the maturity levels and indices by industry and location.

Figure 6: GITCAP Maturity Level and Indices of Micro Size ICT Firms (n=27)
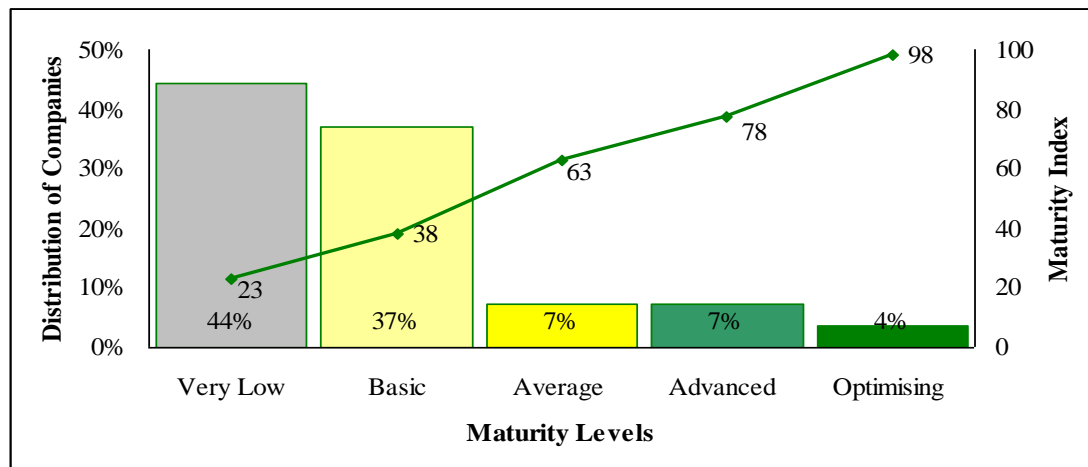
As can be seen from Figure 6, most of the Micro organisations do not demonstrate Green ICT capability. Slightly over one third have basic capability and only three are operating at the advanced or optimising levels. The maturity level of the Micro firms in the sample is basic with a maturity index of 38.4, less than the overall GITCAP maturity index of 46.5 (see Table 6).

Figure 7: GITCAP Maturity Level and Indices of Small Size ICT Firms (n=41)
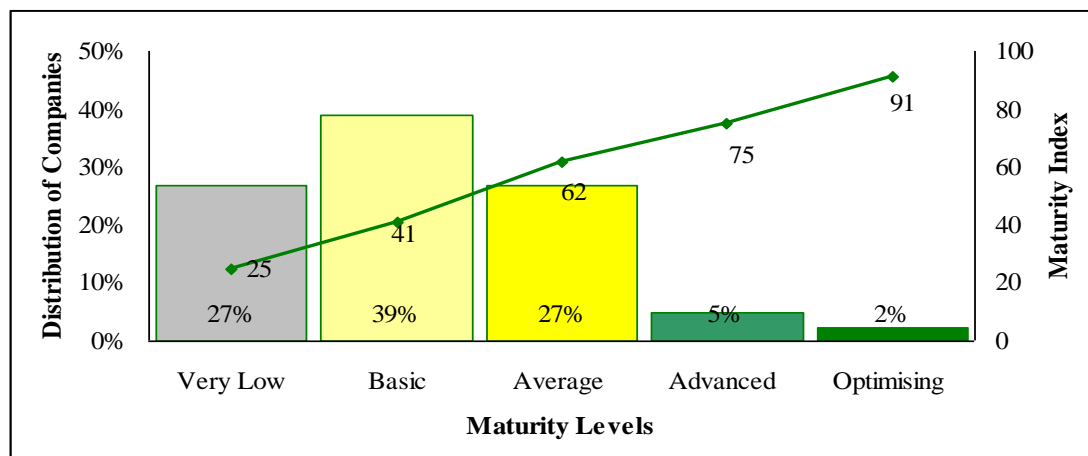
Most of the Small organisations in the sample demonstrate either a basic (39%) or average (27%) capability; just over 25% do not demonstrate Green ICT capability. There are very few organisations (three) in the sample that have achieved an advanced or optimising level of maturity. Overall, the maturity index of the Small size firms in the sample is 45.2, slightly less than the overall GITCAP index of 46.5, which can be interpreted as a basic level of maturity (see Table 6).

Figure 8: GITCAP Maturity Level and Indices of Medium Size ICT Firms (n=35)
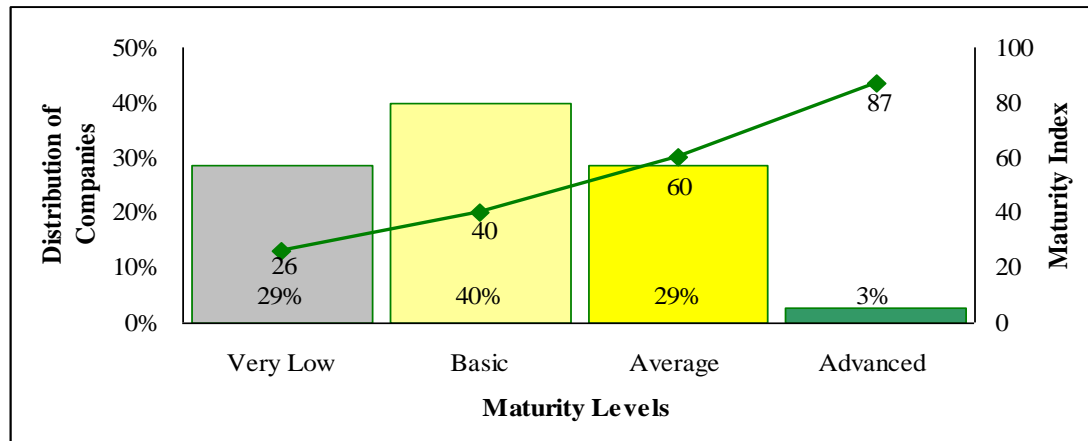
The majority of the Medium size organisations in the sample demonstrate a basic (40%) capability (Figure 8). Just over a quarter of the surveyed firms do not demonstrate Green ICT capability and the same proportion has average capability. None of the Medium size organisations in the sample achieved an optimising level. The maturity index of the Medium size firms in the sample is 43.3, slightly less than the overall GITCAP index of 46.5, which can be interpreted as basic maturity.

Figure 9: GITCAP Maturity Level and Indices of Large ICT Firms (n=9)
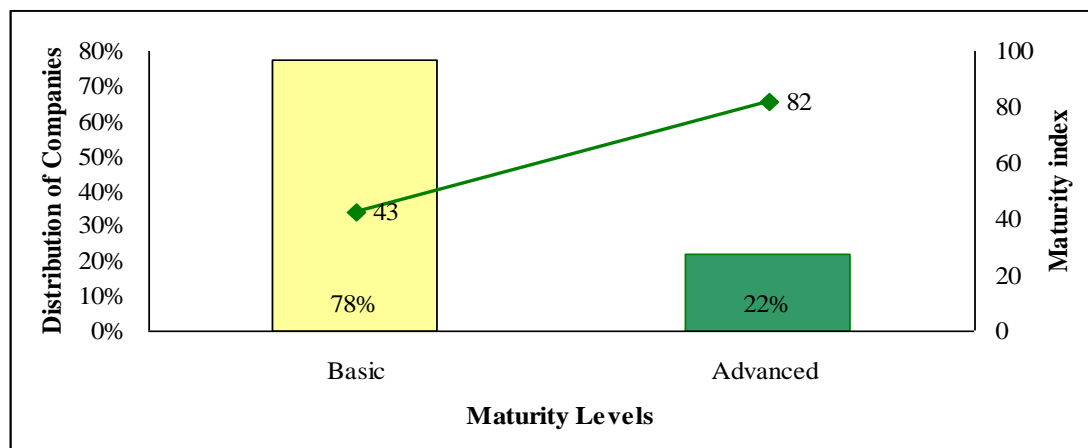
The Large size organisations in the sample demonstrate either basic or advanced level of maturity with a maturity level of average and maturity index of 51.4, above the overall index of 46.5.

Figure 10: GITCAP Maturity Level and Indices of Very Large Size ICT Firms (n=20)
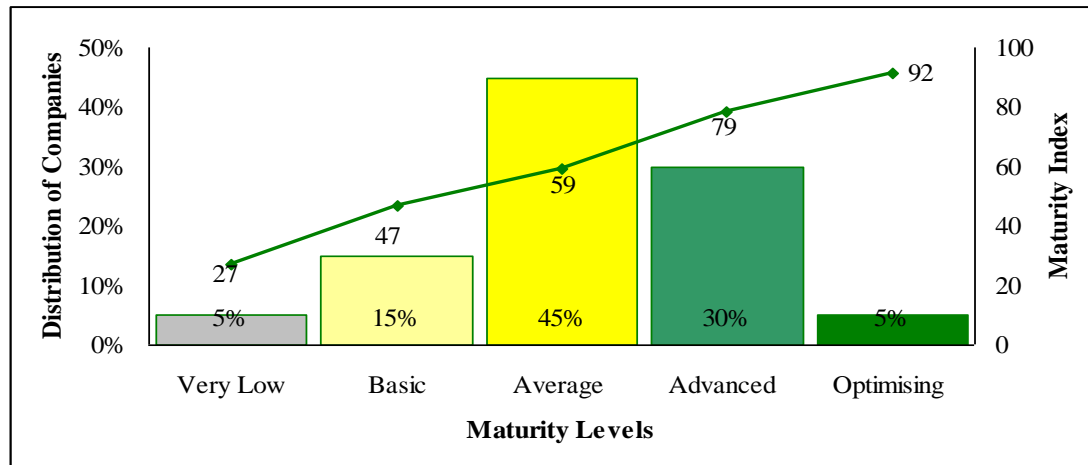
The majority of the Very Large size organisations in the sample have achieved average or higher maturity levels with a maturity index of 63.4, higher than the overall index of 46.5.

The data in Table 6 show that ICT organisations operating in the hardware sub-sector perform better (with GITCAP maturity index of 58.7) than the rest of the groups, while those in the telecom sector (maturity index 43.3) demonstrate the lowest level of Green ICT Capability maturity. As regards the location of the companies (only those that disclosed their location), while firms in Queensland have the highest level of maturity (53), closely followed by those in Victoria (52.7), those in the Australian Capital Territory demonstrate a lower level of maturity.

Table 6: GITCAP Maturity Levels and Indices Summary: Size, Industry and Location

Category	Classifciation	GITCAP Maturity	GITCAP Index
Organistional size (FTE equivalent)	Micro (FTE< =5)	Basic	38.4
	Small (6-20)	Basic	45.2
	Medium (21-100)	Basic	43.3
	Large (101-500)	Average	51.4
	Very Large (>500)	Averge	63.4
Industry (ANZSIC)	Hardware (manufacture, maintain, sell)	Average	58.7
	Software publishing and system design	Basic	45.9
	Services (consulting, webhosting, data processing and storage, managed ICT)	Basic	44.8
	Telecom (operator, ISP, portal, goods wholesaling)	Basic	43.3
	Other	Basic	45.3
Territory	ACT	Basic	40.2
	NSW	Basic	41.2
	NT	Average	50.4
	QLD	Average	53.0
	SA	Basic	42.1
	VIC	Average	52.7
	WA	Basic	46.8

4.3 GITCAP Component Maturity Levels and Indices

The GICAP Maturity model allows evaluation of the overall maturity of the companies and their relative performance along each of the capability components (*Eco-innovativeness, Eco-process, Eco-portfolio, Eco-marketing and Eco-value*). Figure 11 depicts the maturity indices of each of the components and Table 7 provides the frequency distribution of the maturity levels of the sampled organisations along the five GITCAP components.

Figure 11: GITCAP Component Maturity Indices

Eco-Innovativeness
50.5
Eco-Value 43.2
Eco-Process 46.9
43.9
Eco-Marketing 51.8
Eco-Portfolio

Overall GITCAP Maturity Index = 46.5
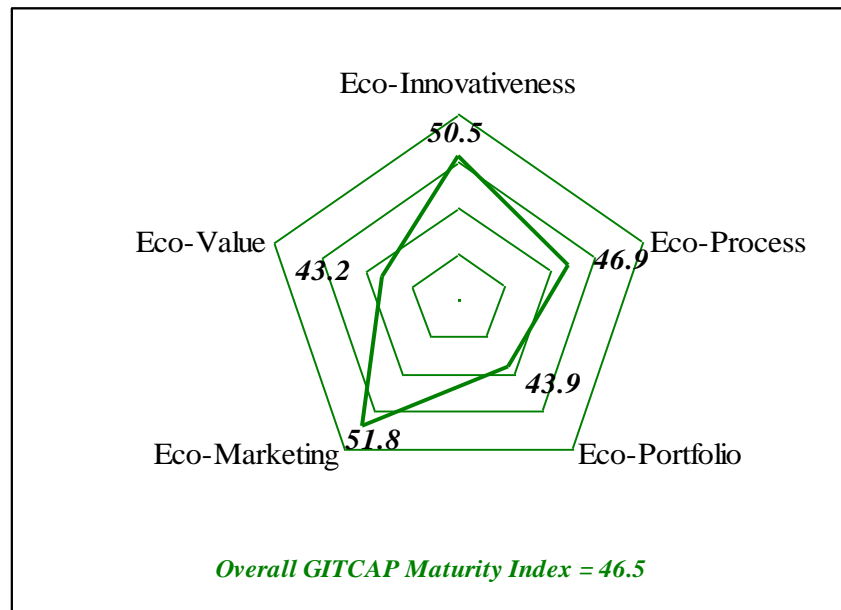
As of the beginning of 2010, Australian ICT firms appear to have relatively well-developed *Eco-marketing* (with an index value of 51.8) and *Eco-innovativeness* (with an index value of 50.5); the least developed capability is *Eco-value* (index value of 43.2). These results imply that ICT firms are doing well in cultivating a conducive and permissive climate for innovation and in creating, managing, monitoring and reinforcing a "Green" brand at both organisational and product levels, but their capability to measure the risks and benefits generated from the Green ICT offering and realise business value is relatively less developed.

Table 7: Number of Companies at Different GITCAP Component Maturity levels

GITCAP Component	Maturity Levels				
	Very Low	**Basic**	**Average**	**Advanced**	**Optimising**
Eco-Innovativeness	25%	29%	20%	20%	6%
Eco-Process	24%	36%	23%	15%	2%
Eco-Portfolio	32%	36%	23%	8%	2%
Eco-Marketing	31%	20%	20%	17%	12%
Eco-Value	42%	26%	16%	14%	3%

Table 8 provides a summary of the GITCAP component maturity indices of the different size, industry and location categories in the sample. The data indicate that the Very Large organisations in the sample have relatively well developed capabilities in all the GITCAP components. Further, those that are engaged in hardware manufacture, maintenance and sale tend to perform better than the other ICT sub-sectors. No Australian state emerged as a leader over all the GITCAP dimensions.

Table 8: GITCAP Components Maturity Indices Summary: Size, Industry and Location

Category	Classification	GITCAP Components Indices				
		Eco_Innovativeness	Eco_Process	Eco_Portfolio	Eco_Marketing	Eco_Value
Organisational size	Micro	48.2	39.8	34.4	42.1	34.9
	Small	47.6	47.6	43.8	48.8	41.0
	Medium	46.8	43.3	39.4	51.4	41.7
	Large	52.4	53.7	51.0	55.8	44.5
	Very Large	65.4	58.9	62.1	70.4	61.3
		50.6	47.0	44.0	51.9	43.2
Industry	Hardware (manufacture, maintain, wholesale)	55.8	56.7	58.5	64.8	56.8
	Software publishing and system design	50.2	46.1	43.2	50.2	44.0
	Services (consulting, webhosting, data processing and storage, managed ICT)	51.2	45.3	42.0	49.7	40.6
	Telecom (operator, ISP, portal, goods wholesaling)	47.1	39.0	40.0	55.6	38.3
	Other	48.5	48.3	41.3	53.1	41.5
Teritory	ACT	46.2	43.6	37.7	45.5	33.0
	NSW	43.1	40.0	41.0	45.8	36.2
	NT	62.8	41.4	35.7	78.9	53.8
	QLD	63.8	58.4	45.3	62.2	48.9
	SA	62.8	60.0	33.8	35.6	37.6
	VIC or Office in VIC	57.0	52.1	48.6	60.1	52.1
	WA	45.7	44.1	46.8	51.4	44.7
	Not Disclosed	47.5	45.2	43.6	48.0	41.3

4.4 Eco-Innovativeness Capability Maturity

Developing a Green ICT capability starts with an ICT firm's ability to cultivate a sustainability vision and resources for product and service innovation. Seven of our survey questions assessed the extent to which the firms have developed a capability to innovate products and services that can improve eco-sustainability. The results of analysis of the responses to those seven questions are plotted in Figure 12. The numbers in parentheses indicate the maturity indices of each item.
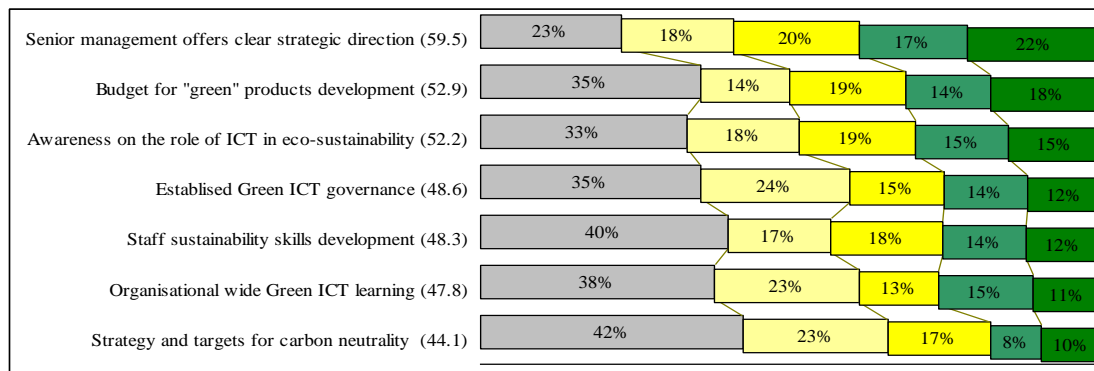
Figure 12: The Maturity Levels of Firms' Eco-innovativeness Capability

Senior management offers clear strategic direction (59.5)	23%	18%	20%	17%	22%
Budget for "green" products development (52.9)	35%	14%	19%	14%	18%
Awareness on the role of ICT in eco-sustainability (52.2)	33%	18%	19%	15%	15%
Establised Green ICT governance (48.6)	35%	24%	15%	14%	12%
Staff sustainability skills development (48.3)	40%	17%	18%	14%	12%
Organisational wide Green ICT learning (47.8)	38%	23%	13%	15%	11%
Strategy and targets for carbon neutrality (44.1)	42%	23%	17%	8%	10%

Figure 12 shows that the most firms are developing clearer strategic direction about the opportunities associated with climate change. Thirty-nine per cent of the firms have very clear strategies to enable the eco-sustainability of other industries. In another 38%, such clarity is emerging and only 23% of the respondents remain either unconvinced or inactive about the need for developing a sustainability vision or consider it as inapplicable to their business.

Firms' strategic clarity is being demonstrated in terms of budget allocation for Green product development and taking actions to build company-wide awareness about the role of ICT in causing environmental problems and in enabling eco-sustainability. More than 50% of the respondents are allocating budget (32%, a significant proportion) for developing Green ICT products and services and close to 50% of the firms are aware of the impact of the ICT industry and ICT artifacts in causing environmental problems and the role of the ICT industry in enabling sustainability. Nevertheless, the surveyed ICT firms have a long way to go to cultivate their human capital; this could be achieved either through the development of sustainability skills among staff or putting in place processes that facilitate organisational learning for Green ICT.

Some of the companies at level one of maturity believe that Green ICT innovation issues are not relevant to them, as indicated by their comments:

> *"[These questions] are not applicable to our business. The bulk of our operations occur within someone else's premises. Our staff typically work on client sites and are expected to adhere to our customers' requirements and policies while on site – for example recycling policies or waste disposal policies that may apply when working in someone else's office."*

> *"These issues are not really relevant for us even though we are aware of sustainability issues."*
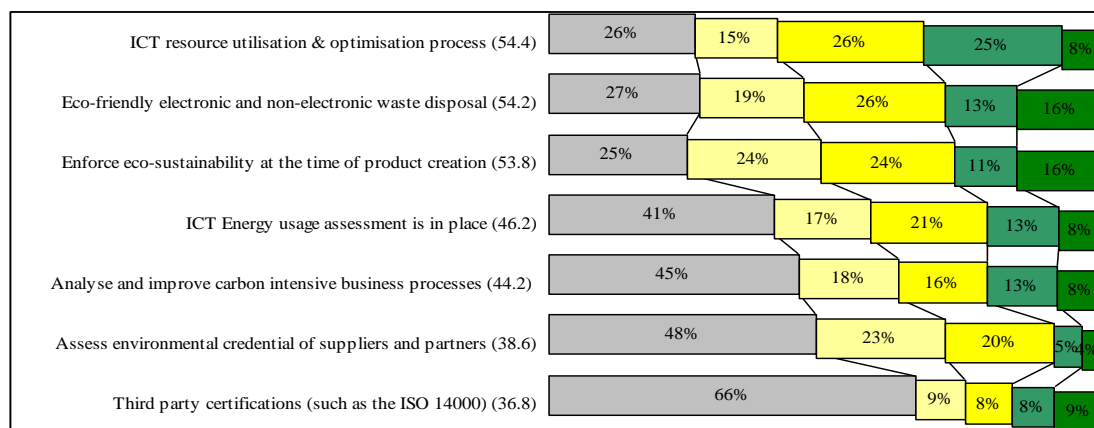
> *"We are an SME [Small to Medium enterprise] building data security products; green IT does not get considered."*

> *"We do not have a budget for green initiatives."*

4.5 Eco-Process Maturity

Developing a Green ICT capability requires establishing processes to ensure that environmental issues are considered throughout the entire life-cycle of the organisation, including raw-material sourcing and product design and development processes. Seven of our survey questions assessed the maturity of ecological considerations in key business process areas; the resulting data are plotted in Figure 13.

Figure 13: The Maturity Levels of Firms' Eco-Process Capability

Process					
ICT resource utilisation & optimisation process (54.4)	26%	15%	26%	25%	8%
Eco-friendly electronic and non-electronic waste disposal (54.2)	27%	19%	26%	13%	16%
Enforce eco-sustainability at the time of product creation (53.8)	25%	24%	24%	11%	16%
ICT Energy usage assessment is in place (46.2)	41%	17%	21%	13%	8%
Analyse and improve carbon intensive business processes (44.2)	45%	18%	16%	13%	8%
Assess environmental credential of suppliers and partners (38.6)	48%	23%	20%	5%	4%
Third party certifications (such as the ISO 14000) (36.8)	66%	9%	8%	8%	9%

From Figure 13, it can be seen that firms have a relatively well-developed processes for ICT resources such as servers, storage, applications, networks, telephony, office systems and other materials utilisation and optimisation. In addition, 29% of the surveyed firms reported mature practices of disposing electronic and non electronic waste in an eco-friendly manner. In 27% of the firms, eco-sustainability design principles such as use of less energy, less waste, less toxic chemicals, and more use of recyclable, reusable and renewable resources are being enforced at the time of product design.

While eco-friendly practices are quite common among the participating firms, 75% have yet to acquire any third party certification for their environmental performance. This figure is dominated by the responses from Micro and Small firms in the sample; more than 50% of the Large and Very Large organisations in the sample are either at maturity level four or five. By comparison 96% of the Micro firms and 71% of the Small firms are at level one of maturity.

> *"We are currently in the process of obtaining ISO environmental certification"*

> *"We specialise in providing e-waste solutions to companies and are at the ISO14001 GAP Analysis stage".*

Once again, some of the sampled firms with very low maturity believe that applying environmental considerations in their business processes is irrelevant:

"As an SME we don't have as urgent a need for 'company process' as a corporation may. But we talk about these Green IT issues and work on them every day - they are implicit to our work."

"The relevance of [enforcing environmental sustainability design principles] will differ depending on the product type. For example, software products have little scope to build in environmentally sustainability design principles."

"Our company is essentially a virtual company. We work mostly from home and we use IT to communicate rather than trips.

4.6 Eco-Portfolio Maturity

The maturity of 21 Green ICT products, solutions and services were assessed to determine the product offering capability of firms; these indices are shown in Figure 14.

Figure 14: The Maturity Levels of Firms' Eco-Portfolios
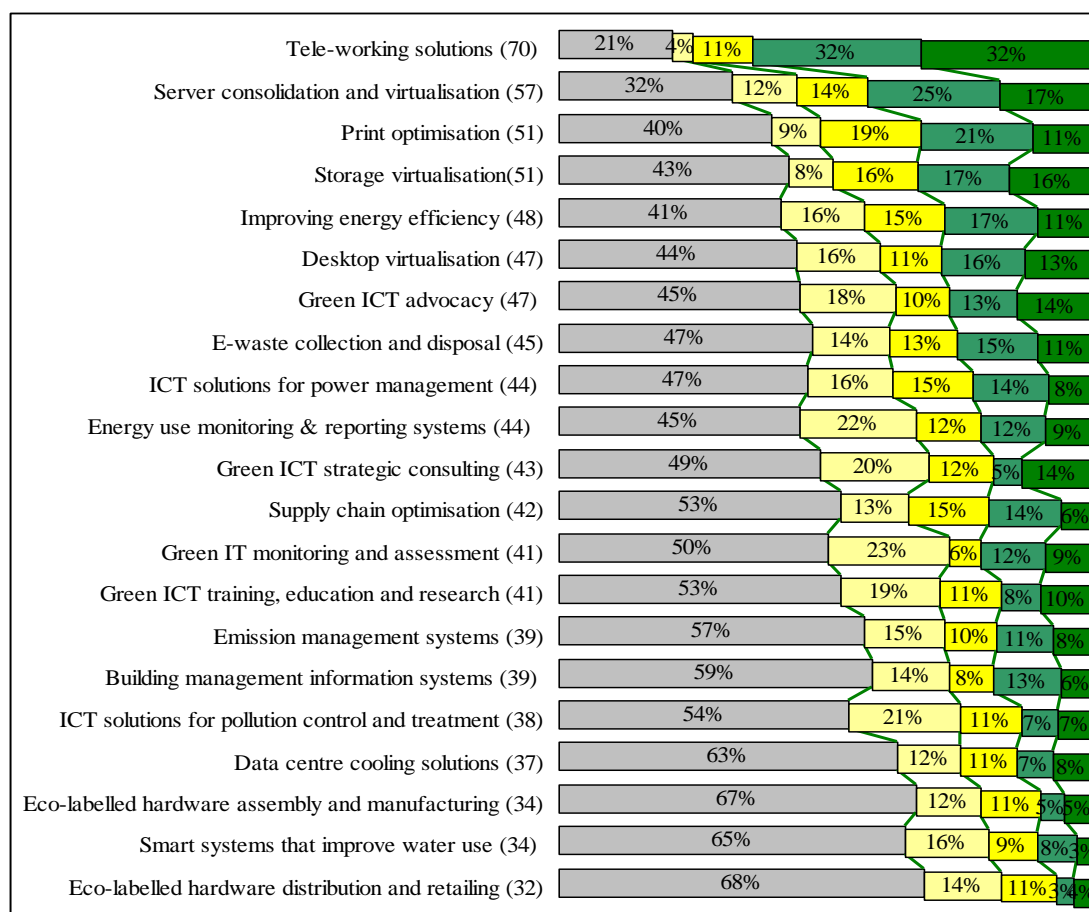
The results show that ICT solutions that enable workers to work remotely, such as video conferencing, telepresence, and telecommuting are the most mature offerings in the

Australian ICT sector. Such products are well established in 32% of the surveyed companies and these companies are working to maintain and improve the value contribution from their offerings. For another 32% of the companies, the product category has market visibility and is a source of revenue. Only 21% of the respondents have no plan to offer ICT solutions that enable workers to work remotely, possibly because the product category is not applicable to their business:

> *"A number of the response where we have responded '1' is due to the fact that this is not the product or service industry that we operate even though we are applying these solutions internally."*

There is, however, a promising portfolio of development and initial offering product categories. For example, more than one third of the companies have either allocated resources for development or are offering solutions for energy use monitoring and reporting, for improving energy efficiency, for remote power management, and/or for pollution control and treatment. An equal proportion is also developing capability in Green ICT strategic consulting and Green ICT training, education and research.

Although eco-labelled hardware distribution and retailing appears to be the least matured of all product categories, in 90% of the firms in the hardware sub-sector the offering has market visibility and is a source of revenue.

ICT solutions that facilitate remote working are the most established offerings (that is, have market visibility and are a source of revenue) for 83%, 67% and 57% of the firms in the telecommunications, software and IT services sub-sectors respectively. In terms of the size of organisations, the product is established in 64% of the Micro and Small-sized organisations, 57% of Medium, 66% Large and 75% of Very Large organisations.
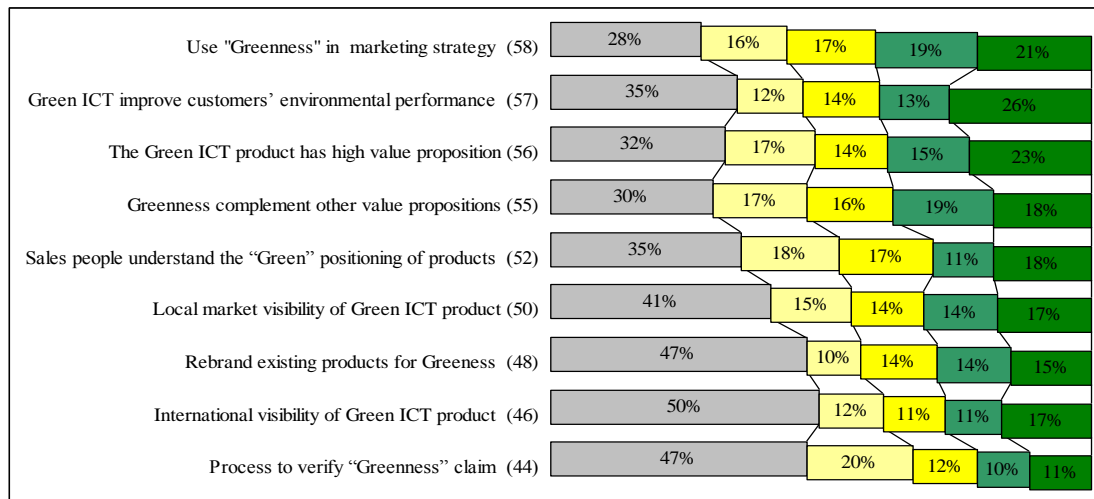
Server consolidation and virtualisation is an established product line in 44% of the participating software firms, and in 37%, print optimisation is established. Between 15%-20% of the software firms have launched storage virtualisation, energy efficiency, supply chain optimisation and power management solutions. Twenty-seven per cent of software firms generate revenue from emissions management and pollution control and treatment IT solutions.

Firms in the IT services sub-sector have established (that is, with market visibility and as sources of revenue) server consolidation and virtualisation (43%), desktop virtualisation (32%), and storage virtualisation (30%) offerings.

4.7 Eco-Marketing Maturity

Nine of the survey questions assessed the ability of firms to create, manage, monitor and reinforce a Green brand at both their organisational and product levels. The data yielded by these questions are plotted in Figure 15.

Figure 15: The Maturity Levels of Firms' Eco-marketing

Question					
Use "Greenness" in marketing strategy (58)	28%	16%	17%	19%	21%
Green ICT improve customers' environmental performance (57)	35%	12%	14%	13%	26%
The Green ICT product has high value proposition (56)	32%	17%	14%	15%	23%
Greenness complement other value propositions (55)	30%	17%	16%	19%	18%
Sales people understand the "Green" positioning of products (52)	35%	18%	17%	11%	18%
Local market visibility of Green ICT product (50)	41%	15%	14%	14%	17%
Rebrand existing products for Greeness (48)	47%	10%	14%	14%	15%
International visibility of Green ICT product (46)	50%	12%	11%	11%	17%
Process to verify "Greenness" claim (44)	47%	20%	12%	10%	11%

The data show that 40% of the companies have recognised the brand value of "Greenness" and are either at advanced or above level in using "Green" in their marketing strategy. Using Greenness in marketing strategy shouldn't always be interpreted as "Green-washing" as one of the respondents strongly believes:

> *"Green marketing is politically correct crap to people who know no better. It is a waste of time and space"*

Most of the companies that use Greenness in their marketing strategy use it to enforce and complement other value propositions such as price, quality and service. These companies are not simply re-branding existing products for Greenness but are providing either mature or initial products or services that have compelling value propositions and that can be used to improve the environmental performance of their customers. Some of these value propositions include:

> *"We provide strategic sustainability consulting services and software solutions to our clients. Our solutions are addressing product sustainability (LCA) and corporate sustainability (carbon management, environmental management, sustainability management)."*

> *"Our service eliminates the need for many hard copy letters to be sent to suppliers and customers."*

"The core of our carbon management software is not to play the 'Green' marketing angle but to provide practical value in optimising carbon management from financial perspective. So the value proposition is to manage carbon management obligations at least cost – not to make a company greener. They will have made that decision by themselves."

"Our corporate customers benefit by diverting many thousands of kilograms of e-waste from landfill or by extending the useful life of working equipment no longer required in their environment."

There are also a few companies that do not use "Greenness" in their marketing strategy, even if they have products that can be branded that way:

"Although our products can help companies achieve their Green Star rating we do not actively jump on the Green band wagon as everyone else does."

"Green IT does not help overall marketing."

"[We do] not make any claims about the Greenness of [our software]. Our product is marketed as a tool for managing environmental data; in the process of managing that data properly a corporation may make bottom line improvements and reduce emissions and energy consumption but it is all about managing the environmental data."
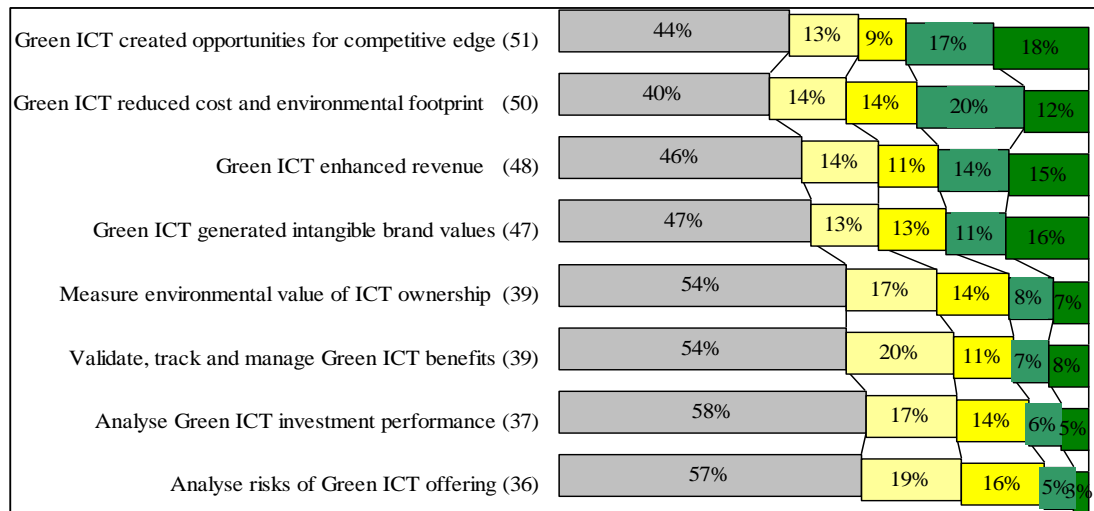
"Green ICT is somewhat secondary. We look for simplification, reuse and flexibility in our internal ICT activities. These all have Green outcomes. So for some it's Green for others it's efficiency. They are becoming and will become more synonymous with each other. Green as a marketing tool is somewhat a "spin" in my view."

Seventeen per cent of the companies believe that their Green ICT offerings have achieved high international and local market visibility, whereas another 14% and 11% have achieved advanced levels of local and international market visibility respectively.

About 21% of the respondents have relatively well-matured processes to verify their Greenness claims and avoid contradictions. In another 12% of the firms the process of verifying Greenness is emerging and in 20% it is getting some consideration but has yet to be developed fully.

4.8 Eco-Value Maturity

The value dimension measures both a company's ability to assess value as well as benefits realised from Green ICT. The results are shown in Figure 16.

Figure 16: The Maturity Levels of Firms' Eco-value

Green ICT created opportunities for competitive edge (51)	44%	13%	9%	17%	18%
Green ICT reduced cost and environmental footprint (50)	40%	14%	14%	20%	12%
Green ICT enhanced revenue (48)	46%	14%	11%	14%	15%
Green ICT generated intangible brand values (47)	47%	13%	13%	11%	16%
Measure environmental value of ICT ownership (39)	54%	17%	14%	8%	7%
Validate, track and manage Green ICT benefits (39)	54%	20%	11%	7%	8%
Analyse Green ICT investment performance (37)	58%	17%	14%	6%	5%
Analyse risks of Green ICT offering (36)	57%	19%	16%	5%	3%

The Eco-value component has two dimensions. While the first dimension measures a company's ability to measure value, the second assesses the extent of realisation of tangible and intangible values from Green ICT investment. The results show that, overall, the companies perform better in indicators of value realisation than value measurement.

Thirty-five per cent of respondents believe that their Green ICT products provide them with opportunities to gain a competitive edge. Thirty-two per cent have obtained high cost and environmental footprint reduction from their internal Green ICT initiatives. Some 40% of respondents claimed that their Green ICT products have enhanced revenue (29% stated that the enhancement is substantial). Twenty-six per cent of the firms had generated high brand values out of their Green ICT products.

> *"Our product greatly enhanced the brand value … in an intangible manner – it created an environment where ground-level employees became engaged in actively reducing waste, establishing an office recycling program and on project sites things like reducing water and fuel consumption became priorities as project managers gained visibility into the data relating to those items".*

Nevertheless there are some firms who do not perceive either monetary or other value to be generated out of Green ICT:

> *"Green IT has not been a money spinner."*

> *"There is NO VALUE in these activities. They are a waste of resources that can be better directed."*

Maturity of Green ICT value measurement and governance systems is low in the surveyed firms. Fewer than 10% of the respondents have well-matured processes to track, validate and

measure Green ICT benefits, Green ICT investment performance and analyse the risks associated with their offering.

5. DRIVERS AND INHIBITORS

Institutional and organisational motivation frameworks provide useful insights into the factors that influence the maturity of Australia's Green ICT capability. For example, institutions (such as market forces, government, professional associations and other interest groups) can intervene in two forms - influence or regulation - by creating either demand-pull or supply-push actions[8]. Influence initiatives can change the behaviour of firms by providing resources and without the direct use of force or exercise of command. On the other hand, regulatory actions can directly and indirectly affect the behaviour of firms, through directives or actions that limit options and modify behaviours. Either way, influence and regulation can result in different but related outcomes depending on whether supply-push (production of innovative product or process) or demand-pull (willingness to use the product) forces drive the innovation.

In the context of ecological sustainability, there are three forms of motivations, or drivers - *eco-efficiency, eco-equity and eco-effectiveness*[9]. Eco-efficiency refers to a business's ability to deliver "competitively priced goods and services … while progressively reducing ecological impacts"[9]. Eco-equity focuses on "equal right of people to environmental resources" and a business's "social responsibility for the future generations"[9]. Eco-effectiveness on the other hand, "aims to stop contamination and depletion…by directing individual and organizational attention to the underlying and fundamental factors of environmental problems … through a fundamental redesign of the system" [9]. How these motivations affect Australia's Green ICT capability is the subject of the next section.

5.1 Drivers

This section presents the findings of the survey in relation to those factors motivating Green ICT capability development. The survey questions covered both internal and external drivers.

Figure 17 Drivers of Green ICT Capability
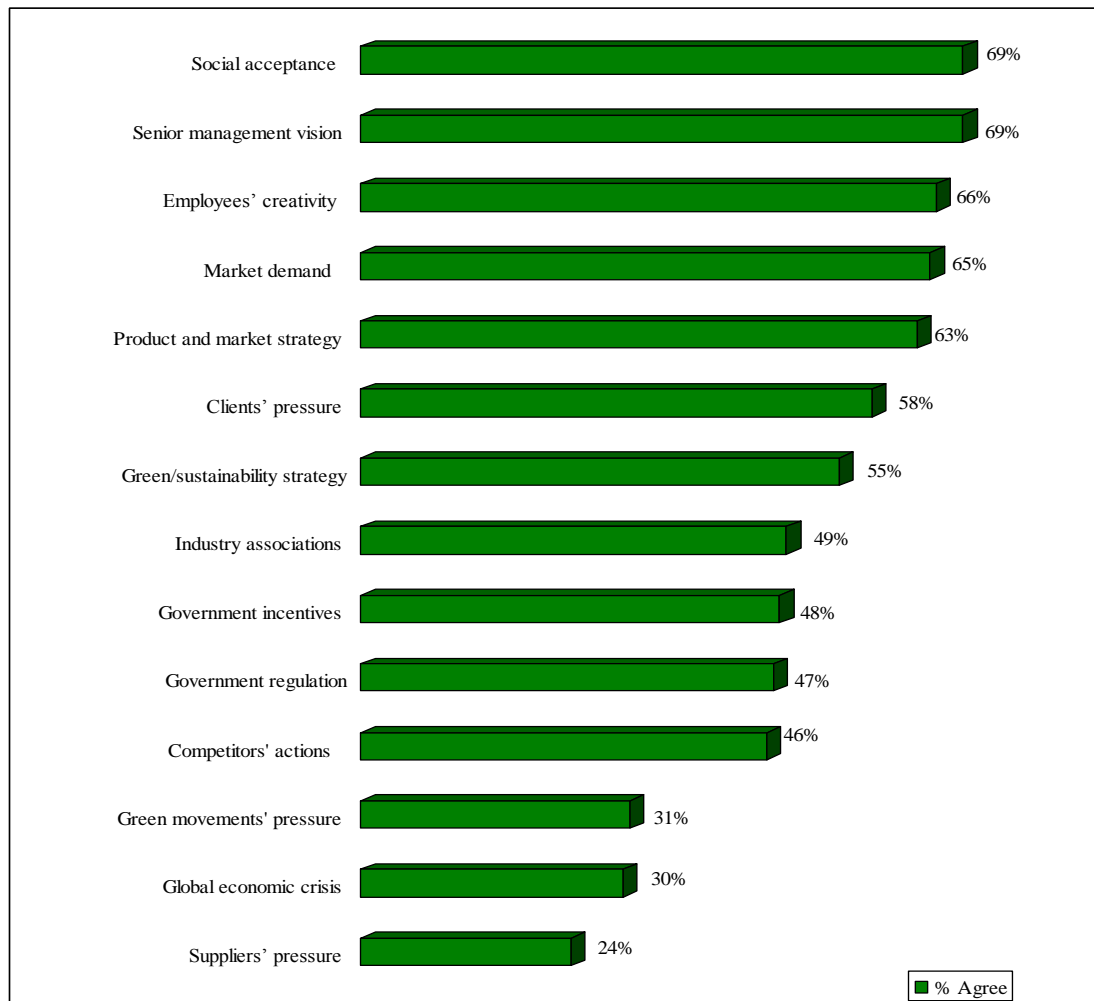
Most (69%) of the respondents identified two key drivers as most significant: (1) the need for pursuing wider social legitimacy as concerned members of global and local communities (being Green, and being seen to help others to be Green), and (2) the vision of senior management. Firms which identified these drivers also recognised the market demand for their value proposition and benefited from the creativity of their employees, underscoring the importance of cultivating the sustainability capability of staff.

The top three drivers identified by participating firms (see Figure 17) are all internal rather than external. When external drivers were mentioned, they were related to market institutions that influence the demand for products (65% and 58% for market demand and client pressure) rather than regulatory forces that sanction behaviour or encourage supply. Indeed, external and institutional drivers such as government incentives and regulations, industry associations, and other green interest groups were not ranked as highly as those of internal drivers.

There were no significant differences among the different organisational size groups in their ranking of the importance of the different Green IT drivers. However, within each size categories, there are differences in terms of the strengths of the drivers. For example, while all the Large and 95% of the Very Large organisations recognised the senior management vision as an important driver, only 52% of the Micro size and 68% of the Small organisations did likewise. In addition, the perceived major drivers appear to be slightly different across the different industries. Sixty-nine per cent of the firms in the hardware sector and 63% of the firms in the software sector identified market demand for Green ICT as the most important driver. By comparison, 53% of firms in the IT services sector and 33% of the firms in the telecom sector perceived their company's desire for acceptance as a good corporate citizen as the most important driver.

Additional drivers identified by the firms include "*strategic partnerships, culture - sustainability is embedded in how we do business, investor/shareholder value*".

5.2 Inhibitors

Figure 18 shows that the fact that Green ICT is not considered to be a priority tops the list of inhibitors, followed by lack of demand and money. Nevertheless, lack of money was not regarded as a major inhibitor by those organisations that have budgeted for Green ICT and allocated specific resources. Fear of failure is the least important of the inhibitors.

For 63% of Micro and 44% of Large enterprises, the most important factor inhibiting Green ICT capability was lack of demand. For 66% of Small organisations, the fact that Green ICT is not regarded to be a priority was the most important inhibiting factor. For Medium organisations the most important inhibitor was lack of senior management leadership on Green ICT (60%) whereas for Very Large organisations lack of skill/expertise (60%) was most important.

**Figure 18: Inhibitors of Green ICT Capability**
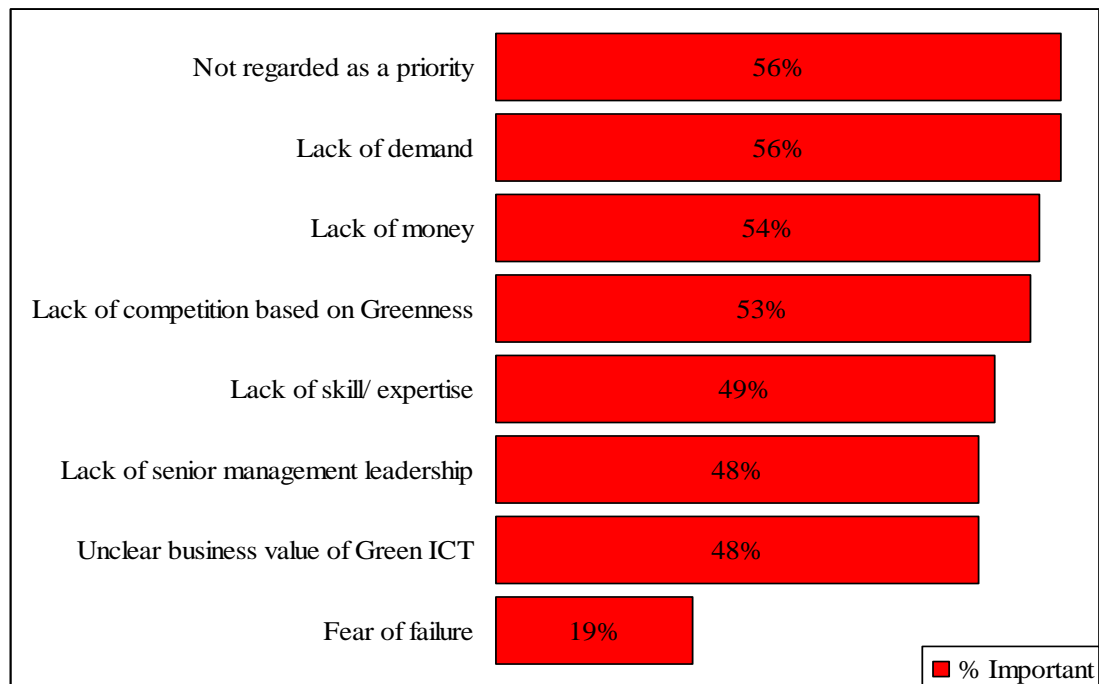
For firms in the hardware sectors, the most important factors inhibiting Green ICT capacity were lack of money (69%) and unclear business value from Green ICT offerings (69%). For those in the software sector, lack of money (66%) topped the list. While IT services companies recognised lack of demand as a major inhibitor (65%), participants from the telecommunications sector put unclear business value (66%) at the top of the inhibitors ranking.

6. COMPARING THE ICT INDUSTRY WITH OTHER INDUSTRIES

In 2009, we assessed the Green IT readiness (G-readiness) of 143 organisations (92% from non-ICT sectors)[10]. The G-readiness assessment tool has five dimensions – *Attitude, Policy, Practice, Technology* and *Governance.* Our assessment produced a G-readiness index of 55.1 (*Average* level of maturity). Because the GITCAP assessment tool was custom designed to assess the capability of ICT firms, it is not possible to make direct comparisons between the GITCAP of the ICT sector and the G-readiness of other industries; however, the following observations can be made.

Different industries' relative level of commitment for using and producing Green ICT is depicted in Figure 19, and shows that while IT vendors and IT users demonstrate comparable levels of senior management commitment, the ICT industry is leading in terms of resource deployment.

**Figure 19: Commitment for Green ICT**
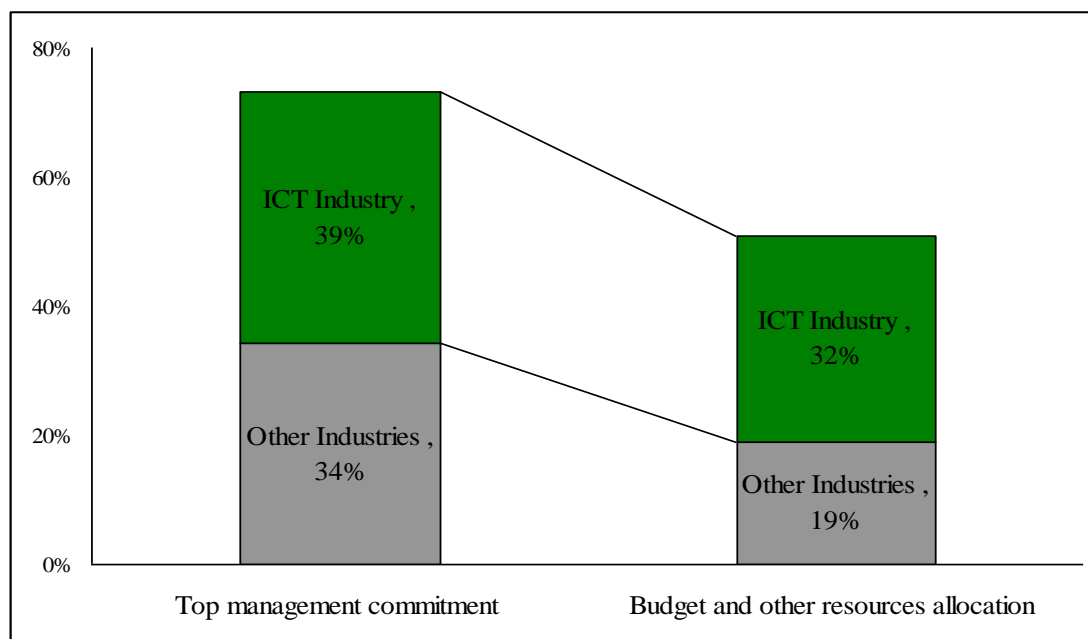
Across all industries, the most important drivers for Green ICT are internal to the enterprises (Figure 20). For firms outside the ICT industry, business strategies that emphasise environmental consideration and cost savings top the list of drivers. For the ICT industry, the need to be legitimised as a concerned member of global and local communities and senior management's vision top the list.

Figure 20: Common Drivers of Green ICT in the ICT vs. Non-ICT Industries
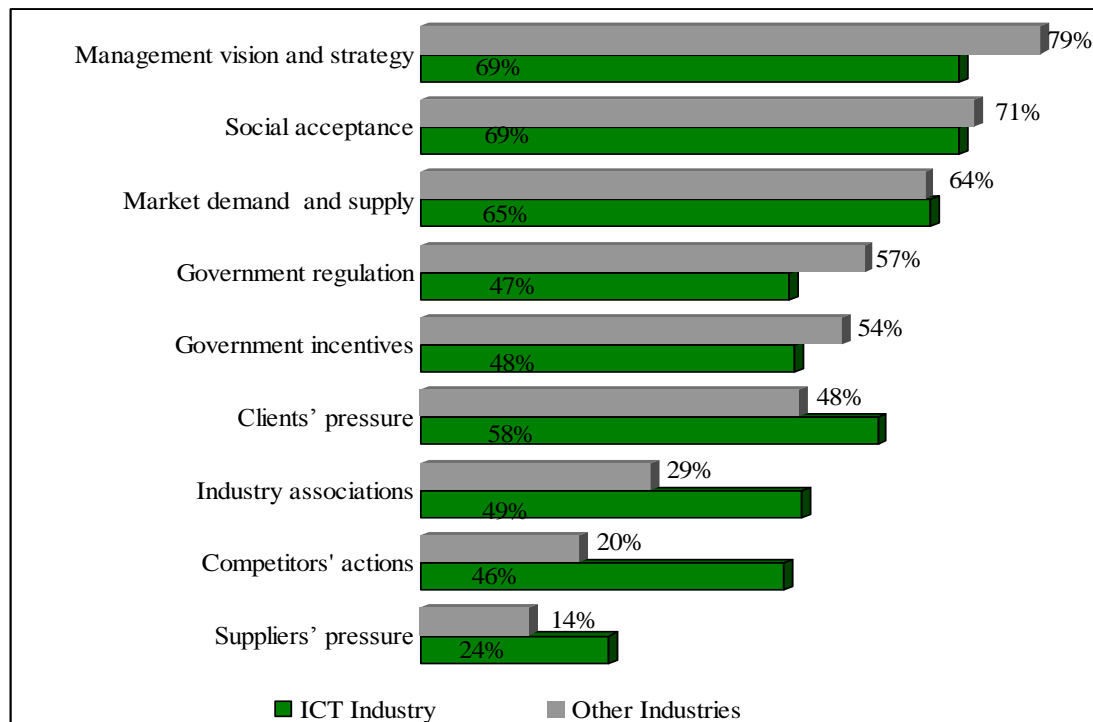
While ICT firms identified lack of priority, demand and money at the top of the list of inhibiting factors (see figure 18), non-ICT firms were mostly likely to pinpoint the cost of Green IT solutions, unclear business value and lack of government incentives. Figure 21 compares some of the inhibitors commonly identified by both groups.

Figure 21: Inhibitors of Green ICT in the ICT vs. None ICT Industries
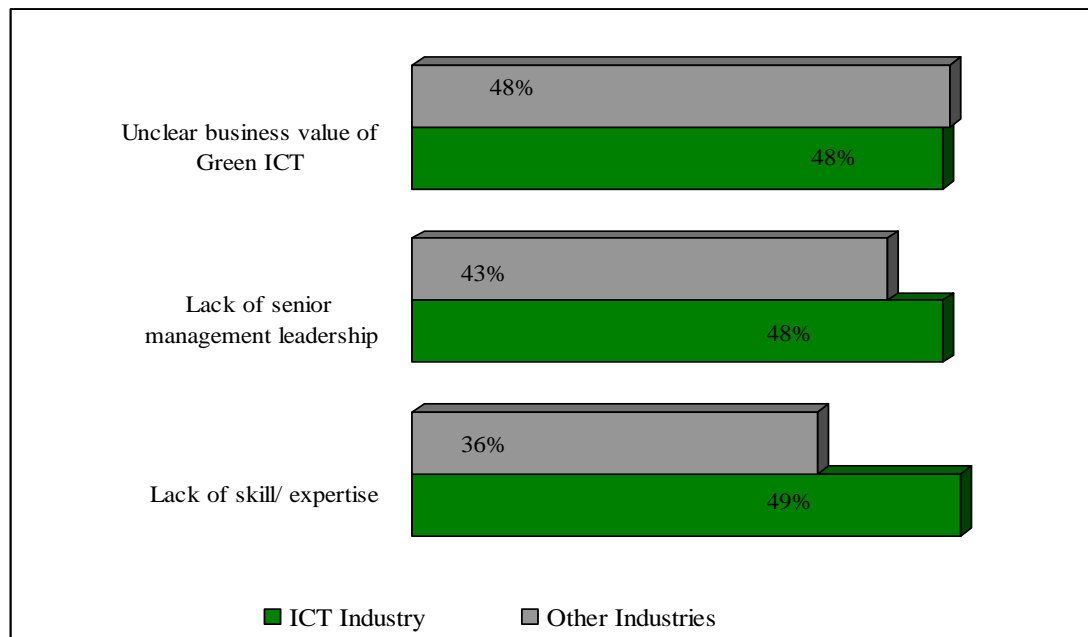
6. SUMMARY

This study defined a Green ICT Capability (GITCAP) of the ICT industry and identified five components to assess its maturity – *Eco-innovation, Eco-process, Eco-portfolio, Eco-marketing and Eco-value*. The overall maturity of GITCAP among the surveyed organisations is at the *Basic* level. Although the GITCAP maturity model hypothesises that there are five levels of maturity through which ICT firms progress with respect to their GITCAP, the results show that progress is not linear and might not be applicable to every ICT company. For those that consider offering Green ICT products and services to be an important value proposition to their business, the model will help them to identify the necessary strategic action areas.

The results of this study indicate that within the Australian ICT sector, firms are developing clearer strategic directions about business opportunities for enabling the eco-sustainability of other industries. A few firms have developed genuine value propositions that can improve the sustainability (both economical and ecological) of their clients by offering products and services that solve customers' existing problems. These firms need to ensure that eco-sustainability considerations govern their internal processes and their claim of Greenness is verifiable either by a third party or by a transparent internal process. Another area that requires attention is the development of systems and methodologies for tracking and measuring tangible and intangible Green ICT benefits.

Most respondents view their own sustainability vision and their social acceptance as good corporate citizens as the main drivers for adopting Green ICT. Lack of demand and allocating low priority to Green ICT appear to be the primary inhibitors for developing Green ICT products and services. These findings suggest that current drivers of Green ICT product development have more to do with eco-efficiency and effectiveness and less with regulatory and other institutional influences. This implies that only organisations that are aware of their responsibility beyond commercial objectives, that have developed a sustainability vision and that recognise the enabling role of IT, are likely to take concerted actions to develop their GITCAP. If the future of the global economy is in becoming cleaner and Greener, then such enterprises will be in a better position to take advantages of business opportunities associated with such transformation.

Although the role of industry associations was not perceived as being at the top of the list of drivers of adopting Green ICT, they can play a significant role in facilitating the exchange of knowledge among ICT firms, in cultivating a sustainability mindset among thought leaders, in creating platforms for IT vendors to showcase their innovative Green ICT solutions and products, and in assessing trends and demands for Green ICT.

Naturally, ICT firms' responses to the issue of environmental sustainability vary. This report will be useful to those enterprises that are convinced that their firms have a future in eco-

sustainability and that would be interested in benchmarking their current performance against historical performance, against the performance of their peers and against data for the wider industry. This report provides a comprehensive set of indicators by which firms can choose to measure progress and success in improving Green ICT capability.

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