Chapter 40
Green ICT and Architectural Frameworks

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ABSTRACT

Green ICT Practices fall in two different extremes of either only recommendations to reduce the resource usage such as electricity, or high level strategic management techniques such as Green Balanced Scorecard. The one extreme is very micro level operational approach and the other extreme is just paper strategies without a roadmap for total sustainability. This chapter proposes the enterprise architecture framework and mathematical model providing dynamic model for total sustainability. A brief description of currently popular Green ICT Metrics in practice is presented, together with a discussion of architectural frameworks providing three different architecture layers and a roadmap to achieve desirable "total sustainability indicator (TSI™) - a measurement framework based on mathematical models and game theory.

INTRODUCTION

This chapter proposes an enterprise architecture framework that is dynamic and aimed at providing total sustainability for the organization. An ICT architectural framework providing the physical, logical and strategic architecture layers and a roadmap to achieve desirable "Total Sustainability Indicator (TSI™)" is presented.

The TSI is a measurement framework based on mathematical models and games theory. The TSI has been developed by the authors over several years, basing the architectural framework on game theory and has the following specific advantages when it comes to Green ICT:

- Green ICT is result of cooperative and collaborative efforts among competing business units. They could be competing on finances, resources or performance results,

but game theory tells them that there exists a saddle points for co-operation and collaboration to achieve global optima for the enterprise as a whole.

- Game theory takes into consideration the uncertainties and risks through probabilistic distribution of various alternative options.
- Game theory puts the evaluation of alternative choices from the perspective of players instead of perspective of a central force such as board or chair. This gives a more realistic evaluation as business units acting as players choose not only the best for themselves but also for the organisation as an holistic optimum solution.

While currently "Green ICT" appears to be a combination of facts and hype, it is necessary to consider it nonetheless in the context of business. However, there is debate raging at political level, particularly within Australia, as to the costs – and who would bear them – in terms of carbon emissions. It is hoped that once the government finalizes the carbon emission policies and procedures, that there will be opportunities for businesses to firmly shape and implement their Green strategies. When it comes to Green ICT, businesses will need an architectural framework that will provide a sustainability roadmap to the organizations embarking on Green ICT journey. This architectural framework can be an extension of an existing framework, or can be created anew. This chapter discusses the extension and use of a Green ICT architectural framework for an environmentally conscious business.

CURRENT SITUATION

Modern building architectural practices are currently used to architect buildings with energy efficiency techniques. Green Architecture, or Green Design, is an approach to building that minimizes harmful effects on human health and the environment. The "Green" architect or designer attempts to safeguard air, water, and earth by choosing eco-friendly building materials and construction practices (About.com, 2009).

In case of ICT architecture, the approaches to Green ICT can be categorized either by the recommendations to reduce the resource usage based on physical layer of servers and client devices (optimization of the infrastructures or databases) especially the power usage, or on the other scale high level strategic management techniques such as Green Balanced Scorecard to attain Green ICT (Goel, Tiwary, & Schmidt, 2010). These two extremes are either very operational that is only looking at the current costs of the ICT or paper strategies without roadmaps for total sustainability.

ICT architecture can play multi-facet roles of assisting in building systems that makes organization become greener and thus reduce carbon foot prints. ICT architecture also follows the initiatives from building architectures to provide eco-friendly systems that will reduce the resource usages as following:

- An optimised architecture of the system that reduces the power consumptions.
- Reduces the paper copy requirements.
- Reduce the resources requirements (optimised processes).
- Reduce the customer interaction time that will result in fewer resources.

ORGANISATIONAL PROCESS LANDSCAPE

Organizations will structure themselves in various structures to provide a clear demarcation to the roles and responsibilities defined in the organizations. These structures are used for grouping relationships arrangement in formal roles and responsibilities. In a typical organization divided in functional level, figure 1 shows an organization

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