



White Paper: 'Sustainable IT' through 'Sustainable Product Service Systems'



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A complete literature review and summary containing the full references herein along with an annotated bibliography are available in separate documents.

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In many of today's leading enterprises, business decisions are based on environmental issues as much as they are on economic and traditional business issues.

Executive Summary

In many of today's leading enterprises, business decisions are based on environmental issues as much as they are on economic and traditional business issues. In the past, the main decision criteria were economic measures such as return on investment. Today, however, decisions are also influenced by market trends, legislation, and incentives for business to consider environmental issues. In many industries, the leading enterprises are those that leverage their core business toward market trends and business incentives rather than merely complying with legislation.

The IT industry is no exception. When considering the economic success of the top few IT vendors, it seems addressing environmental issues as equal to economic issues (rather than as an afterthought) should be at the top of every vendor's agenda. A key reason behind the success of these vendors is that addressing environmental issues automatically addresses some of their customers challenges. Two key IT challenges that large companies face arise predominantly from early-generation products and services.

1. Managing Complex Systems

Large IT systems are complex and many enterprises do not have the expertise nor the resources to manage the systems cost-effectively. An emerging solution is to partner with a skilled service provider to manage part or all of the IT system ownership and management. The focus is to make the solution simple, flexible, dynamic, responsive, low-risk, value-adding and cost-effective for managing complex and growing IT systems.

2. Minimising Environmental Impact

IT products produce adverse environmental impacts throughout their whole life cycle. Two key sources of these impacts are energy consumption during operation and waste at product end-of-life. In response to high energy consumption, enterprises need to plan and manage their IT systems with a focus on energy efficiency. For example, optimising data centre cooling systems and product layout together can reduce energy consumption substantially with no additional capital investment. In response to growing waste issues, many countries are now adopting or proposing legislation that requires responsible product end-of-life management. For example, the European Union's *Waste Electrical and Electronic Equipment Directive*¹ stipulates that, as of 31 December 2006, the recovery rate of waste appliances must be at least 70-80 percent by weight, depending on product type.

¹ European Union (2003).

To overcome these two challenges, IT vendors, like HP, have coupled their established product and service offerings to create holistic, end-to-end product service systems for large enterprises. HP's focus on developing a *Sustainable Product Service Systems offering*, leads the Australian market. In *Sustainable Product Service Systems*, customers receive the services of IT systems while HP maintains ownership, responsibility and stewardship of the products. The aims are to remove aged technology with minimal environmental impact while customers maximise their investment on their IT systems.

Some customers may perceive a rapid transition to *Sustainable Product Service Systems* to be technically risky and economically costly. In response, HP provides the option for customers to make the transition in phases. The *Sustainable Product Service Systems* model comprises several modular product and service offerings. The modular structure facilitates customers making either a rapid or gradual transition to *Sustainable Product Service Systems* by engaging offerings strategically and sequentially. To facilitate an effective transition to *Sustainable Product*

Service Systems, HP has developed the Roadmap to *Sustainable Product Service Systems*. Using the Roadmap customers can first identify which offerings they have already deployed and then construct the subsequent phases of the transition to a Sustainable Product Service System in a way that meets their performance and investment expectations.

HP is currently providing *Sustainable Product Service Systems* to several customers, and cost analysis undertaken by customers shows that the up-front investment can be recovered in as little as 15 months through savings in running costs, which then leads to reduced long-term costs. Performance analysis undertaken by customers also shows several enhancements including improved user satisfaction, improved technical support quality and response time, reduced downtime, reduced time to perform upgrades, and consolidation of resources. Together, these enhancements result in improved productivity for customers.

There are several actions that customers can take in partnership with HP to transition toward *Sustainable Product Service Systems*.

Drivers for 'Sustainable Product Service Systems'

Business Competitiveness and Asset Complexity

Drivers for *Sustainable Product Service Systems* are particularly compelling for customers with upwards of 500 workstations. Customers require their IT systems to support their operations by providing the right services as well as having the flexibility to adapt to new demands. Increasingly, customers are relying on the latest IT technologies, e-business applications and mobile technologies to improve competitiveness.² However, without in-house expertise, these new business tools can also complicate IT asset management, add substantial cost and increase system downtime.³

*Constant technological advances, rendering yesterday's innovations obsolete, require companies to continually update technology to remain competitive. Today's mobile lifestyle has moved more technology out of the controlled office environment, making asset management progressively more difficult. Combined with an endless number of expansions, mergers and acquisitions, many organizations are left with a concoction of diverse technologies, making effective asset management even more difficult.*⁴

Sustainable Product Service Systems is the answer many customers are looking for. *Sustainable Product Service Systems* involve procurement, maintenance, upgrading, and retirement of IT products and services. *Sustainable Product Service Systems* can standardise the operations, release human and financial resources and significantly streamline information access, storage and support operations. It can also eliminate the risk related to pollution and waste regulations and market expectations.

Market Forces, Legislation and Environmental Pressures

There are several market trends supporting *Sustainable Product Service Systems*:

- There is a growing tendency for IT customers to prefer product service systems over un-serviced product ownership.⁵
- The market, in general, is maturing so as to favour *Sustainable Product Service Systems*⁶ and other market-ready sustainable products and services.
- In Australia, *Sustainable Product Service Systems* can provide a competitive advantage for enterprises ahead of legislation that mandates strict management of waste IT products.
- Compliance is another driver that is making IT more service-centric. Not only do companies have to deliver excellent customer service, but they often have to rise to the challenge of meeting the regulations imposed on their industry at the same time.⁷
- There is pressure from consumers to reduce adverse environmental impacts from their end-of-life products. Currently, 75 percent of end-of-life computers are landfilled,⁸ with very few of the 1000 toxic substances, other than plastics, being removed first.
- There is pressure to reduce adverse social and environmental impacts. The toxic substances in IT products can be released into the industrial and natural environments at all stages of processing, operation and retirement,⁹ and can result in an array of negative impacts on humans and other organisms.¹⁰
- Vendors, with their expertise and experience, have much better control over environmental and social impacts than customers. HP leads environmentally- and socially-aware IT product design in Australia.

² Lane, J.C. (2001).

³ Ibid; Macquarie Group (n.d.) Equipment life-cycle management; Vosicky, J.J. (1992); Davey, N. (n.d.) quoting Melvin James.

⁴ Lane, J.C. (2001).

⁵ Alexander (1997) cited in Heiskanen, E. and Jalas, M. (2003); Vosicky, J.J. (1992).

⁶ Heiskanen, E. and Jalas, M. (2003).

⁷ Davey, N. (n.d.) quoting Marina Stedmann.

⁸ Environment Victoria (2005), p. 6.

⁹ Brigden, K. et al (2005), p. 3.

¹⁰ Ibid; Environment Australia (2005) pp. 8-9; Schmidt, C.W. (2002).

Benefits of 'Sustainable Product Service Systems'

Economic Flexibility and High Return on Investment

Sustainable Product Service Systems offers customers several economic benefits:

- Since the investment is spread out over the contract period, no large initial investment is required¹¹ and thus financial resources are freed for other activities.¹² Spreading out the investment can also yield improved purchasing power, easier financial forecasting, tax benefits, immunity to interest rates, and improved access to loans and overdrafts.¹³
- Flexibility to upgrade products and services at low immediate cost whilst not having to wait to pay off their current products.¹⁴
- High return on investment and hence substantial medium- and long-term cost savings.¹⁵

Better Service Performance and Flexibility with Less Risk

Sustainable Product Service Systems offers customers several other business benefits:

- Customers share the technological and economic risks with vendors.¹⁶ In fact, the overall risk is reduced since the vendor's expertise enables more accurate risk assessment and comprehensive asset management.
- Customers can upgrade and expand regularly, quickly and uniformly across their facility.¹⁷ *Sustainable Product Service Systems* accommodate business expansions and downsizing, ensuring that *the customer only pays for the products and services required at the time*.¹⁸
- A single-source, end-to-end *Sustainable Product Service System* minimises the delays, administration costs and complexity of engaging multiple vendors.¹⁹
- Customers enjoy better service performance and security, and hence perform better themselves. HP can manage products and services,²⁰ while customers can use freed human resources to concentrate on their core business or expansion.²¹

Lower Costs for Product End-of-life Management

Another key economic benefit is relatively low costs for product end-of-life management, which includes costs for collection, remanufacturing, recycling and disposal activities. This benefit is particularly important because it provides an incentive to respond to market pressure to reduce adverse environmental and social impacts from end-of-life products.

¹¹ Lane, J.C. (2001); Sopko, S. (1992); Schroder cited in Dwyer, J. (1995); Monash University (2002); Hewlett-Packard Development Company (2004).

¹⁴ Macquarie Bank (n.d.) Leasing; Hewlett-Packard Development Company (2006) Learn about the benefits of leasing.

¹⁵ Sopko, S. (1992); Schroder cited in Dwyer, J. (1995); Hewlett-Packard Development Company (2006) Learn about the benefits of leasing; Monash University (2002); Lane, J.C. (2001).

¹⁶ Vosicky, J.J. (1992); Schroder cited in Dwyer, J. (1995); Hewlett-Packard Development Company (2006) Learn about the benefits of leasing.

¹⁷ Thoughtware Worldwide (n.d.); IDC (2006); Hewlett-Packard Development Company (2005).

¹⁸ Charles, C. and Holmes, B. (n.d.); Macquarie Group (n.d.) Equipment life-cycle management.

¹⁹ Monash University (2002); Hewlett-Packard Development Company (2005).

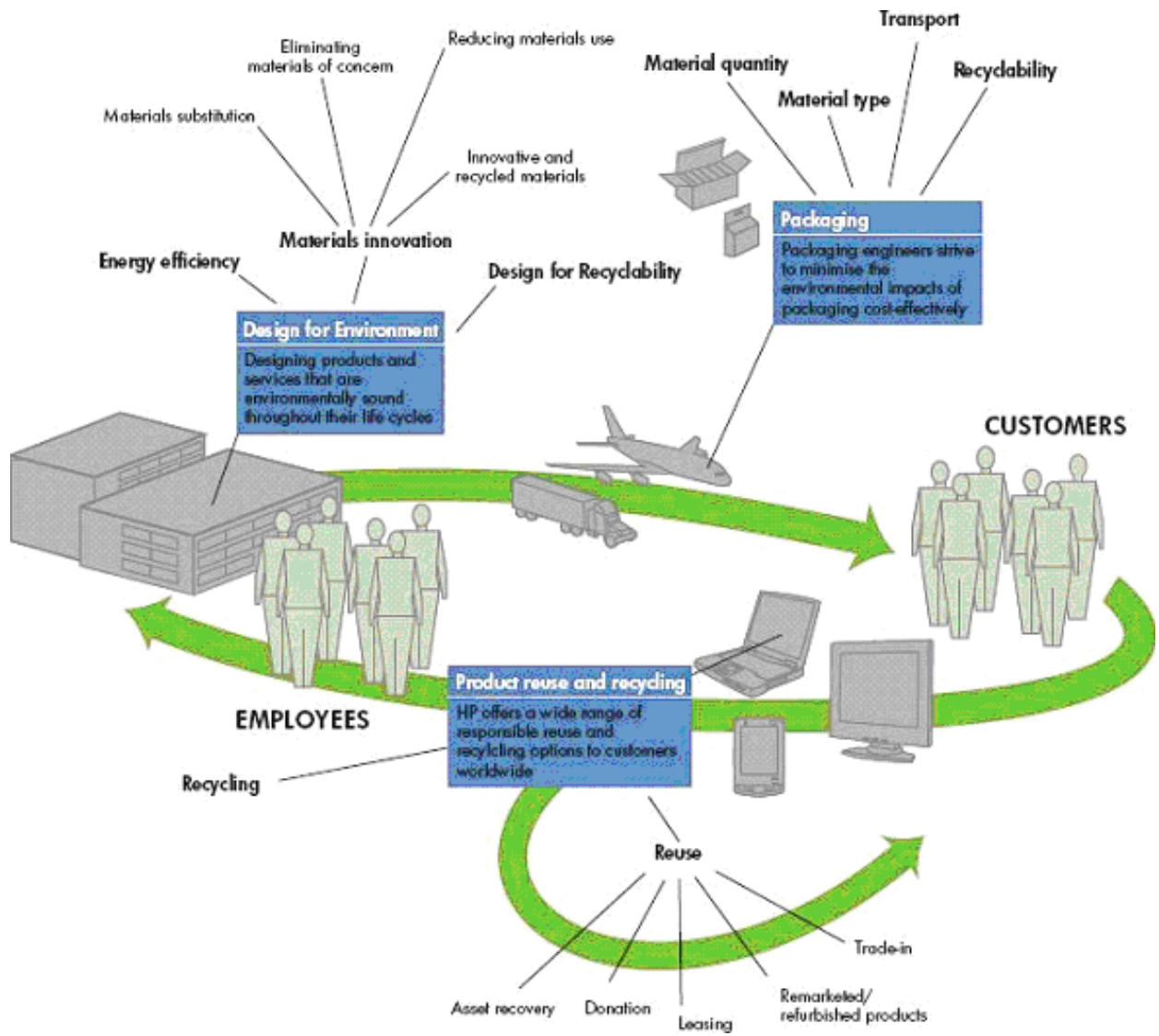
¹⁸ Hewlett-Packard Development Company (2006) Learn about the benefits of leasing.

¹⁹ Ibid; Macquarie Bank (n.d.) IT and Technology Financing; Hewlett-Packard Development Company (2005).

²⁰ Charles, C. and Holmes, B. (n.d.); Heiskanen, E. and Jalas, M. (2003); Hewlett-Packard Development Company (2005); Hochstein, A., Zarnekow, R. and Brenner, W. (2005).

²¹ Davey, N. (n.d.) quoting Ross Altman; Charles, C. and Holmes, B. (n.d.); Macquarie Bank (n.d.) IT and Technology Financing; Hewlett-Packard Development Company (2005).

Figure 1. HP's activities that contribute to Sustainable IT Solutions.



Source: Hewlett-Packard Development Company (2006).²²

²²Hewlett-Packard Development Company (2006) 2006/7 Global Citizenship Report: HP's contribution to the Australian community, environment and employees, p 7.

'Sustainable Product Service Systems'

Sustainable Product Service Systems integrate HP's three priority product and service activities: *Design for Environment, Packaging; Product Reuse; and Recycling*, as shown in Figure 1.

Design for Environment and Packaging

Sustainable Product Service Systems use HP products and packaging developed through the Design for Environment program, which was developed in 1992 to focus on three priorities; *Energy Efficiency, Materials Innovation, and Design for Recyclability*.²³ The program covers all HP products, from consumables such as ink cartridges and packaging, to consumer products such as computers, as well as integrated systems such as data centres.²⁴ Through the program, more than 1000 HP products have become qualified for international eco-labels in North America, Europe and Asia.²⁵

Product End-of-Life Management

Sustainable Product Service Systems rely heavily on product end-of-life management, which includes product collection, remanufacturing, recycling and disposal. HP has demonstrated expertise in product end-of-life management through several product collection and recycling programs. For example, HP's global *Planet Partners* program operates in more than 40 countries.²⁶ The recycled materials are used in new HP products, as well as a range of products in other industries.²⁷

HP also offers a full suite of product end-of-life management services for customers. HP recovers, inspects, audits, tests, refurbishes and recycles IT

products²⁸ in every product category²⁹ from any manufacturer.³⁰ HP acquires end-of-life products through returns, trade-ins, lease terminations and donations.³¹

In Australia, HP collects end-of-life products through various partnerships. HP is the sole industry partner in the *Byteback*³² computer recycling scheme, which is run in partnership with the Victorian State and Local Governments. Through *Byteback*, HP recycles computing and office IT products free-of-charge for Victorian residents and small businesses. Products are transported to a dismantling facility and the components are then transported to domestic and overseas processing facilities. HP also participates in *Cartridges 4 Planet Ark*, a national collection and recycling program for print consumables from printers, photocopiers and fax machines.³³

²³ Hewlett-Packard Development Company (2006) Responsible practices for a happy earth.

²⁴ Hewlett-Packard Development Company (2006) HP Everyday Papers and the environment; Hewlett-Packard Development Company (2006) Saving energy with HP.

²⁵ Hewlett-Packard Development Company (2006) Eco-labels.

²⁶ Hewlett-Packard Development Company (2006) HP environmental recycling programs.

²⁷ Hewlett-Packard Development Company (2006) More than 30 HP Business Computing Products Recognized for Environmental Achievement; Hewlett-Packard Development Company (2006) HP environmental recycling programs.

²⁸ Hewlett-Packard Development Company (2006) 2006 Global Citizenship Report, p 28.

²⁹ Hewlett-Packard Development Company (2006) Product return and recycling.

³⁰ Hewlett-Packard Development Company (2006) HP expands global recycling program.

³¹ Hewlett-Packard Development Company (2006) 2006 Global Citizenship Report, p 28.

³² Hewlett-Packard Development Company (2006) 2006/7 Global Citizenship Report: HP's contribution to the Australian community, environment and employees, p10.

³³ Ibid.

Sustainable Product Service Systems

One of HP's offerings for enterprises is *End-User Workplace Solutions*³⁴ (EUWS), which includes *Sustainable Product Service Systems*.

End-User Workplace Solutions demonstrate the cost-effectiveness and performance superiority of *Sustainable Product Service Systems*. Some customers have measured their results from *End-User Workplace Solutions*:

- The Universal College of Learning,³⁵ in New Zealand, invested in *End-User Workplace Solutions* to improve the IT facilities for its 650 employees. The venture delivered a 133 percent return on investment, which gives a pay back period of 15 months. The *End-User Workplace Solution* also resulted in several measurable improvements. For example, the Help Desk now receives 310 calls per month, down from 573; 80 percent of calls are solved within eight hours; and there are zero unresolved issues carried over to the next period (down from 118 per month). Server downtime, a measure of availability and reliability, now occurs 2-3 times per year, down from 52 times per year. The annual hardware and software product upgrades now take about two man-weeks per 1000 desktop computers, down from 2 man-months. Usage monitoring revealed that more than 200 computers could be, and were, eliminated from the network. Finally, the number of computers manageable per full time equivalent IT employee is now 115, up from 53.
- The International Rice Research Institute,³⁶ in the Philippines, invested in *End-User Workplace Solutions* to improve the IT facilities for its 1000 employees. The investment will save an estimated US\$2.46 million over the first three years. The *End-User Workplace Solution* has also resulted

in several measurable improvements so far, with further optimisations planned. For example, PC support time is down by an estimated 34 percent. The number of printers is down, with a goal of reducing total printers from 400 to 200 and thus saving an estimated 360 IT employee hours. Downtime is now eliminated - down from several times per year. Finally, time to deploy a new application is now almost immediate, down from 3-4 weeks.

Krung Thai Computer Services, in Thailand, invested in *End-User Workplace Solutions* to improve its IT facilities (which includes 12,000 PCs).³⁷ The investment has: reduced costs by 17.2 percent, which is comprised of a 25.2 percent saving in direct costs such PC acquisitions and services, PC management and support, and support overhead; and saved 4.1 percent in indirect costs such as end-user operations, and availability.³⁸ The *End-User Workplace Solution* has also resulted in several measurable improvements in its first year. For example, the call failure rate fell from 12.6 to 2.3 percent, and the number of times the agreed performance targets and response times were not met fell by about 50 percent.

HP was able to provide a true end-to-end solution, offering full business and IT benefits to customers from our portfolio of hardware, software and services, plus the financial management component that no IT vendor has ever offered...³⁹

³⁴ Hewlett-Packard Development Company (2006) HP End-User Workplace Solutions.

³⁵ Thoughtware Worldwide (n.d.).

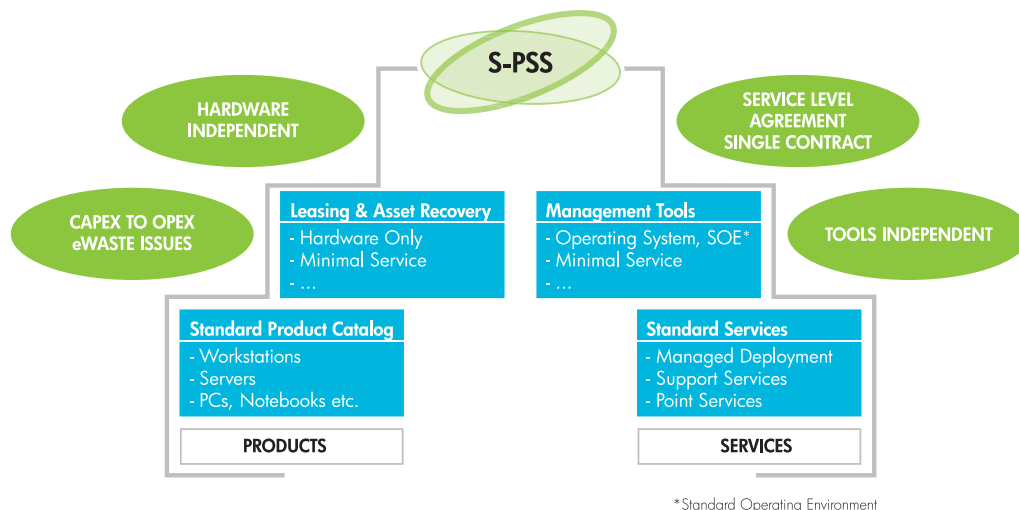
³⁶ IDC (2006).

³⁷ Hewlett-Packard Development Company (2005).

³⁸ Hewlett-Packard Development Company (2004).

³⁹ Hewlett-Packard Development Company (2005) quoting Sanpat Sapon.

Figure 1. HP Roadmap to Sustainable IT.



Source: HP internal document, *The HP roadmap to sustainable IT*.

Roadmap to 'Sustainable IT'

The success of Sustainable IT relies largely on three key activities. These activities streamline the transition to *Sustainable Product Service Systems* through planning and minimising uncertainties.

1. Internal Culture

Customers will need to establish appropriate internal culture, which includes committing to sustainability in, at least, the IT business function; developing a good understanding of *Sustainable Product Service Systems* concepts;⁴⁰ and committing to the *Sustainable Product Service System's* success.

A corporate commitment to sustainability provides support for the IT business function to maximise all benefits of *Sustainable Product Service Systems* by facilitating the activities that are critical to optimising *Sustainable Product Service Systems*. These activities include: defining and monitoring key sustainability indicators; developing employee guidelines for sustainable use and disposal of IT assets; developing marketing messages that demonstrate the IT business function's commitment to sustainability; and communicating with other business functions about sustainability related issues.

2. IT asset management and IT asset replacement strategy

Customers will need to partner with HP to perform *IT asset management* and develop an IT asset replacement strategy. IT asset management creates opportunities for optimising *Sustainable Product Service Systems*. Comprehensive *IT asset management* relies on assessing user profiles, maintaining accurate asset registers and establishing predictable usage patterns. In addition, software asset management involves managing media and licenses. For example, compared to hard media licensing, online licensing is easier to track and does not require collection or disposal at product end-of-life, and thus should be favoured.

The *IT asset replacement strategy* should complement *IT asset management*. A comprehensive *IT asset replacement strategy* incorporates options for product reuse, trade-in and recycling. The impact of capital and operating costs on asset selection as part of the *IT asset replacement strategy* is a key consideration in optimising *Sustainable Product Service Systems*.

For the initial engagement with HP, customers will need to identify where they are on the *Roadmap to Sustainable Product Service Systems* (see Figure 2). *Sustainable Product Service Systems* are comprised of several well-defined, modular product and service offerings that exhibit varying levels of advancement towards complete *Sustainable Product Service Systems*. While each offering will enhance performance and reduce total costs, *Sustainable Product Service Systems* that synergistically integrate all offerings will provide the greatest benefits per dollar invested. The modular structure permits customers to make either a rapid or gradual

⁴⁰Hochstein, A., Zarekew, R. and Brenner, W. (2005); Vassiliadis, B. et al (2006); Brezet J.C., Bijma, A. and Silvester, S. (2000).

transition to *Sustainable Product Service Systems* by engaging offerings strategically and sequentially. Using the *Roadmap to Sustainable Product Service Systems*, customers can first identify which offerings they have already deployed and then construct the subsequent phases of the transition to a *Sustainable Product Service System* such that they meet their performance and investment expectations.

3. Data center and business continuity considerations

Most *Sustainable Product Service Systems* incorporate a data centre. Customers will need to partner with HP to continuously review the data centre's design and operation to ensure that energy efficiencies are maximised. Critical factors affecting energy efficiency are floor design, intelligent building components, and server power consumption..

Compact server technology has led to higher server density and processing power density in data centres, but has also resulted in energy and cooling challenges.⁴¹

- Higher server density increases energy consumption. Many data centres now require more energy than can be supplied.
- Higher energy consumption increases heat load, while higher server density restricts cooling airflow. Modern data centre cooling systems rely on a relatively complex integration of control systems and cooling technology.

HP offers *HP Smart Cooling*,⁴² a thermal assessment process that models energy and airflow in data centres to determine the optimal product layout. *HP Smart Cooling* reduces cooling demand and product investment, and can reduce data centre energy consumption by approximately 25 percent with no additional capital investment. HP also offers *HP Dynamic Smart Cooling*,⁴³ a process that adjusts air conditioning to a changing environment. *HP Dynamic Smart Cooling* can further decrease data centre energy consumption.

When maximising energy efficiencies in data centres, business continuity should also be considered. For example, while putting part of a data centre on cold standby will improve energy efficiency, business requirements may include a fast response in getting those resources back online, in which case hot standby would be favourable. Other examples of energy efficiency and business continuity intersecting arise when managing shared resources in a data centre.

⁴¹ IDC (2007), p 4.

⁴² Hewlett-Packard Development Company (2006) Saving energy with HP.

⁴³ Ibid.

Successful 'Sustainable Product Service Systems' – Call to Action

There are several actions for customers to maximise the success of *Sustainable Product Service Systems*.

1. Develop Understanding and Acceptance

Poor understanding of the concepts and expected performance of *Sustainable Product Service Systems* often compromises success.⁴⁴

Misunderstandings arise from ambiguous definitions, inconsistent language, generalised language, and unspoken agreements, which can lead to costly disputes and performance under-achievement.⁴⁵ Customers can develop unrealistic expectations because of misguiding information, excessively ambitious technology objectives, and focussing on technology rather than on business issues.⁴⁶ Customers will need to involve representatives from accounting, legal, operations, treasury and top management.⁴⁷

Customers will also need to partner with HP to provide comprehensive training for employees.⁴⁸ Training should address not only *Sustainable Product Service Systems* concepts and operation, but motivations for common customer resistances and fears:

- Training should explain *Sustainable Product Service Systems* concepts and justify the benefits as there is often resistance to changing internal processes⁴⁹ and shifting from a product ownership model to a product service model.⁵⁰

*...the greatest challenge in implementing and establishing a service-oriented IT management was the lack of acceptance and missing understanding of the necessity for introducing 'new' processes. Employees were convinced that they were doing a good job and because of that misinterpreted new initiatives as a personal affront to their work. However, only with the support of employees and an understanding for service-oriented processes can such an initiative be successful. In final analysis that is why it was crucial for success to implement initiatives that promote acceptance and understanding in an effective way...*⁵¹

- Where there is fear of high risk in changing from a reliable and working IT system,⁵² the training should explain the *Roadmap to Sustainable Product Service Systems*, and the options to deploy *Sustainable Product Service Systems* in manageable and cost-effective phases. This allows the performance of each offering to be analysed before progressing.
- Where there is fear of forfeiting control of critical and security processes,⁵³ the training should explain the transparent communication processes and shared management processes in managing critical and security processes, and the cost savings from avoiding integrating the *Sustainable Product Service System* with the customer's legacy processes.⁵⁴

2. Engage in Support Activities

Support activities include: acquiring the support of upper management to facilitate changes; forming project teams to manage and develop the new activities; using short-term successes to demonstrate the effectiveness of *Sustainable Product Service Systems*; and striving for continuous improvement.⁵⁵ Customers will need to engage in these activities in cooperation with HP.

3. Contribute to Continuous Improvement

New *Sustainable Product Service Systems* deployments in Australia will offer lessons towards customisation for the Australian market. Customers will need to partner with HP to collect and release performance information for reporting and case study development.⁵⁶ Customers will also need to allocate a portion of the IT budget, particularly cost savings from initial *Sustainable Product Service Systems* deployments, on IT innovation, such as expansion or progression, rather than on maintenance.

⁴⁴Hochstein, A., Zamekow, R. and Brenner, W. (2005); Vassiliadis, B. et al (2006).

⁴⁵Vosicky, J.J. (1992); Lewis, E. (2000).

⁴⁶Vassiliadis, B. et al (2006).

⁴⁷Vosicky, J.J. (1992).

⁴⁸Hochstein, A., Zamekow, R. and Brenner, W. (2005).

⁴⁹Ibid.

⁵⁰IDC (2006), pp 15-16; Ness, D. et al (2005).

⁵¹Hochstein, A., Zamekow, R. and Brenner, W. (2005).

⁵²Vassiliadis, B. et al (2006).

⁵³Ibid.

⁵⁴Vassiliadis, B. et al (2006).

⁵⁵Hochstein, A., Zamekow, R. and Brenner, W. (2005).

⁵⁶Vassiliadis, B. et al (2006).

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