CHANGES OF SUPPLY CHAIN MANAGEMENT IN THE INFORMATION TECHNOLOGY INDUSTRY AS FUNCTION OF SUSTAINABLE DEVELOPMENT

Full. Prof. Slobodan Aćimović, PhD
Faculty of Economics
University of Belgrade
Kamenicka 6, 11000 Belgrade, Serbia
Phone: +381 11 3021 240; Fax: +381 11 2639 560
E-mail: asloba@ekof.bg.ac.rs

Dijana Kršić, MSc
Faculty of Economics
University of Belgrade
Kamenicka 6, 11000 Belgrade, Serbia
Phone: +381 63 447 317; Fax: +381 11 2639 560
E-mail: dijanakrsic@yahoo.com

Scientific paper

Abstract

One of the world's strongest industries – information technology (IT) industry, is constantly facing ever increasing need for change. A short life cycle of IT products and continuous investment in innovation (production, distribution, recycling) led to a significant evolution of supply chain management, where environmental issues are top priority.

Through a completely new approach – high cooperation, partnerships, presence of many companies, more and more complex data and improved response times, today's multiple IT supply chains involve immense number of activities, not only to reach the business goals, but to take care of the environment and sustainability as well. Social issues (supply chain greening), product distribution choice, hub selection and production closer to customers (near-shoring) make the industry less polluting.

This paper presents some examples of IT supply chain adjustments to the environmental requirements and legislations, through the analyses of the world's biggest IT company – Hewlett-Packard.

Key words: sustainable supply chain management, environment, sustainability, greening, savings

1. INTRODUCTION

In the recent years, companies have recognized that the profit is only one of the elements of long-term success. Interest in green and sustainable supply chain (SC) has been growing over the last decade. The issue of sustainable supply chain management (SSCM) has received growing attention and has become an increasingly popular researching area.

Companies are facing many new challenges – financial crisis, rapid climate changes, increasing public interest in ecology, as well as in environmental sustainability and energy efficiency. In many countries, environmental legislation increased concern with this issue. Holistic approach to sustainability makes overall impact to the sales of goods and services, supporting the entire life cycle throughout the SC. Sustainability initiatives often involve many participants in the SC in order to achieve the desired goal.

Financial results are not the only indicators of success. Modern company is driven both by the profit and appropriate degree of social responsibility – employees' rights and environmental protection.

In this paper, we will present some features and prospects of IT SSCM, considering the example of the world's largest IT company – Hewlett-Packard (HP). Their recent activities undertaken in order to make their SC sustainable will be analyzed.

2. LITERATURE REVIEW

Sustainable development is defined as "a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. ...sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of

investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs." (WCED, 1987, p. 15-16).

According to Seuring and Müller we define sustainable chain management as "the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental and social, into account which are derived from customer and stakeholder requirements. In sustainable supply chains, environmental and social criteria need to be fulfilled by the members to remain within the supply chain, while it is expected that competitiveness would be maintained through meeting customer needs and related economic criteria" (Seuring & Müller, 2008, p.1700).

Carter and Rogers define SSCM as the strategic achievement and integration of the organization's social, environmental and economic goals, through systemic coordination of key inter-organizational business processes to improve the long-term economic performance of the individual company and its value network (Carter & Rogers, 2008, p. 368).

It has become a global issue and more and more companies put efforts in trying to consider both environmental and social implications of their SC. On the other side, the studies conducted by Mejias and Pardo for the period between 1990 and 2011, has shown that there is only 105 scientific papers dedicated to this topic (Mejias & Pardo, 2013, p. 62).

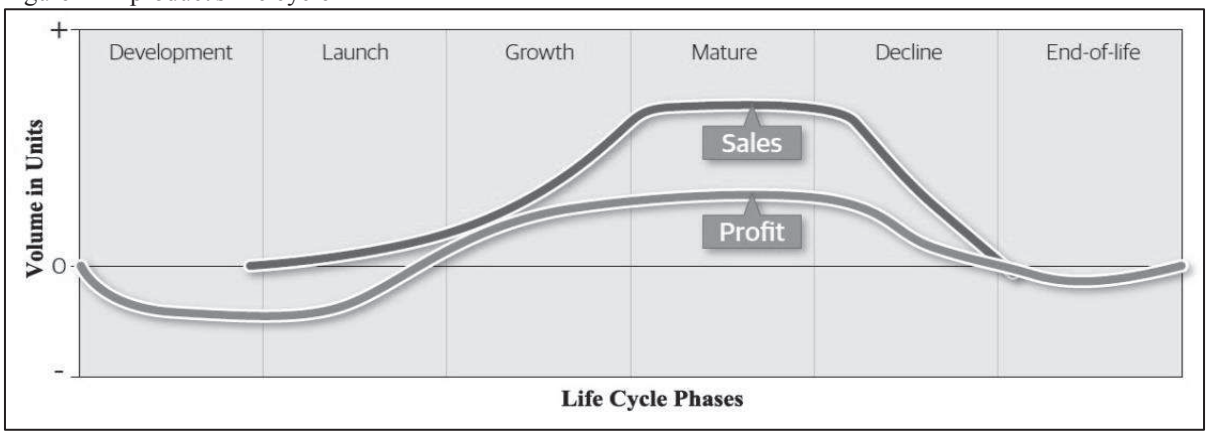
Recent research suggests that 30% of producers gain profit directly from sustainability initiatives (Blackhurst et al, 2012, p.1). Sustainability may be driven from within the company or may be the result of customer needs and pressures, as well as other supply chain partners. Modern SC has a huge number of participants which are located all over the world due to implemented global sourcing initiatives. This means that large companies have to ensure their partners adhere to SER (Social and Environmental Responsibility) standards, which often implies investment into their education (a good example is HP's project realized in the Czech Republic, Hungary and Slovakia[17]).

3. FEATURES AND PERSPECTIVES OF SUSTAINABLE SUPPLY CHAIN MANAGEMENT IN INFORMATION TECHNOLOGY INDUSTRY

As a global industry, IT is constantly looking for new supply sources, redefining the role of customer service, gaining better control of products' life cycles and finding ways to enter new markets more efficiently. One of the most important characteristics that differentiate IT from other industries is the complexity of SC, whereby most participants are business partners, included into the design and production of new products. IT effectively controls complex sales channels – distributors, dealers, partners, all the way to the end user. Majority of the data required to control SC operations are coming from external partners. Data collection, processing and utilization are complex tasks.

The fundamental nature of the IT industry is characterized by product's short life cycles products. Companies consider the entire life cycle of each individual product. Constant innovations are the reality of IT, also. Figure 1 illustrates 6 phases of an IT product's life cycle, with the implications each phase has on the sales and profit. The total profit equals the sum of the profits from all 6 phases.

Figure 1 IT product's life cycle



Source: Ellis S., 2013, p. 14

[17] „Small Suppliers in Global Supply Chains", a report by Danish Commerce and Companies Agency in cooperation with Hewlett-Packard and supliers in Central and Eastern Europe.

Designing SC is no longer a strategic decision, but rather a dynamic set of activities that continually consider arising opportunities and threats. Modern company operates as a network of companies - many business functions such as procurement, production, logistics, financial decisions and IT are often outsourced to specialized partners. Many of them are scattered all over the world. Today's SCs are longer, more dynamic and more complex.

Large IT companies have realized that the area of sustainable development has to be regulated – standards in the fields of labor, health care, safety, environment and ethics have to be set. Workers have to be treated with respect and dignity, business operations conducted environmentally responsible. Many positive experiences of SSCM enhancements could be seen in a comprehensive analysis of the operations of the IT world leader – Hewlett-Packard. Having dealt with this issue over the decades, HP has not only improved its market position, but increased efficiency and effectiveness, also. HP gave significant theoretical contribution used by many companies, even by its direct competitors.

4. HEWLETT-PACKARD'S SUSTAINABLE SUPPLY CHAIN MANAGEMENT – DESIGN AND EVOLUTION

HP's Global Citizenship activities promoted the company as the leader in the field of environmental sustainability. HP has identified three priorities that every business unit has to accomplish – raising social and environmental standards in the SC, improving the energy efficiency of the operations and products to reduce carbon emissions and promoting the renewable usage and recycling of products. At 2009 they created a system of 70 auditors who regularly check 200 plants owned by 150 key HP suppliers – more auditors than any other EICC (Electronic Industry Citizenship Coalition) member (Lowitt & Grimsley, 2009, p.13). HP sees sustainability as a competitive advantage.

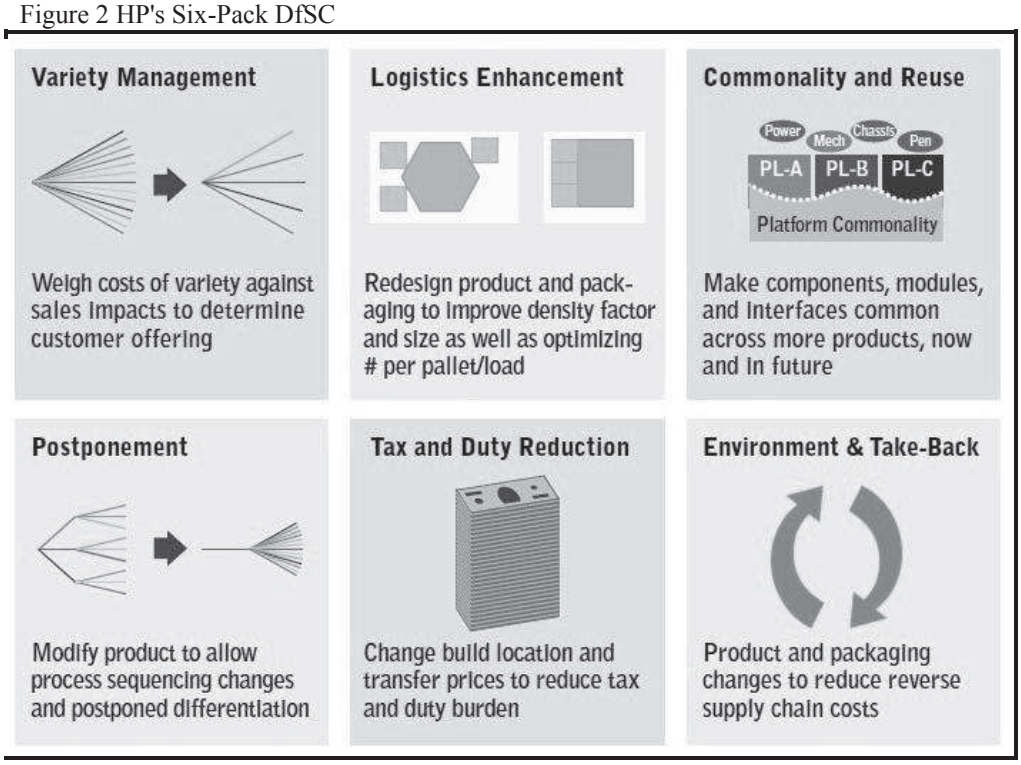
For the first time in the IT industry, HP published a complete carbon footprint report, as an impact a corporation is making on the environment – footprint of the extended SC of their operations, products and services. Based on HP report for 2012, from 79.609 million tons of carbon dioxide, their products and solutions emission are responsible for 60%, HP operations for 4% and SC for 36%. Reuse units reached 3,9 million units, and 133.550 tons of material was recycled (hardware and cartridges). Although in the total world carbon emission IT industry contributes with 2% only (Mingay, 2007, p.3), HP wants to reduce that, but also works to reduce the remaining 98% through the creation of new solutions for the market. For instance, a completely new category of commercial servers, launched in 2012, revolutionizes data centers, which compared to traditional servers consume 89% less energy, take to 80% less space, at 77% lower price, and are 97% less complex.

HP believes that IT has the opportunity to become a significant part of the energy efficiency solution, reducing the usage of raw material and replacing high-carbon with low-carbon emission processes. The elimination of personal printers and print jobs from desktops to centralized, cheaper and more efficient printing (printing outsourcing) is great example of that.

Faced with SC efficiency and effectiveness issues, HP has been analyzing the effect of sales channels to the decision-making process for more than 10 years. The result was the Design for Supply Chain program (DfSC), systematic, repeatable and wide accepted collaborations between developers and thousands of engineers within the company. Unique set of technologies, methods, training and infrastructure have been implemented to ensure fast and efficient decision making. DfSC enables making important decisions related to the SC partners, including suppliers, production and logistics partners, dealers, retailers and end-users. It also has an impact on the decisions over the entire product life cycle. It has been accepted that SC has to be included into new products designs. HP uses the portfolio of Six-Pack DfSC techniques to reduce SC costs, improve customer satisfaction, increase profit and SER. Standardization and consolidation of the processes throughout the company have enabled HP to provide the right product in the right place at the right time.

The following figure illustrates HP's Six-Pack DfSC.

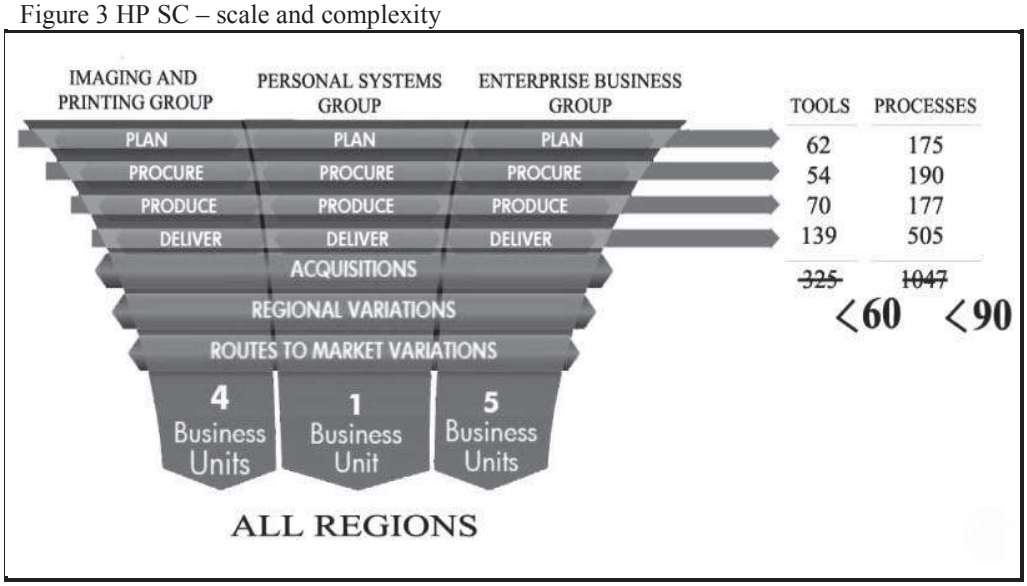
Figure 2 HP's Six-Pack DfSC



Source: Cargille & Fry, 2006, p. 38

Reducing SC scale and complexity by decreasing the number of tools and processes is used on daily basis. The number of tools was reduced from 325 to less than 60, while the number of processes decreased from 1047 to less than 90 (Figure 3).

Figure 3 HP SC – scale and complexity



Source: Bakker, 2011, p. 26

5. LATEST EXAMPLES OF HEWLETT-PACKARD'S SUPPLY CHAIN SUSTAINABLE DEVELOPMENT

HP implemented a holistic approach to supply chain management (SCM), and to SSCM, also. End-to-end design, from production to customer, requires many activities – high cooperation, partner relationships, presence of many companies and SC response rates increasing. SC optimizations consist of a large number of smaller and bigger steps, while progress in performance happens slowly. Several recent examples of SCM optimizations,

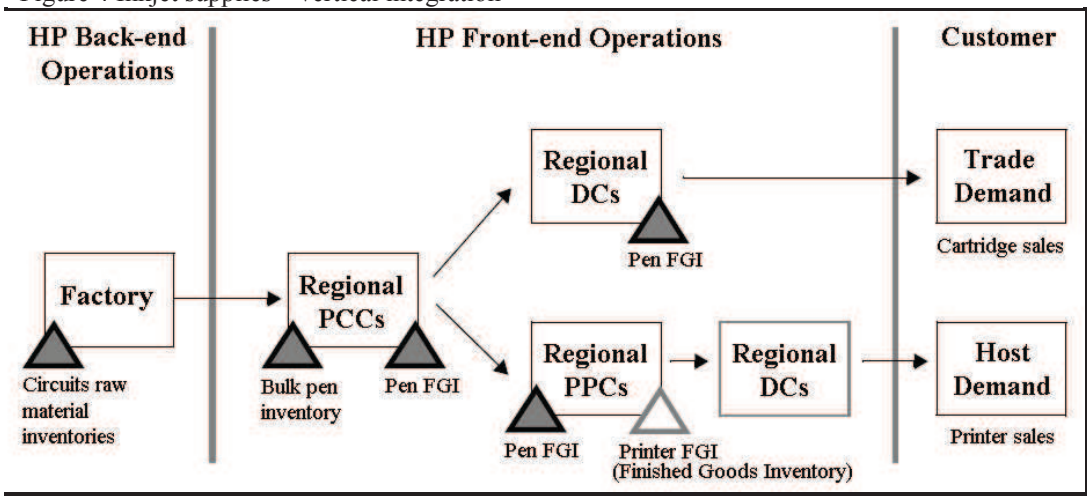
which have significant positive influence on the environmental protection and at company's long-term profitability will be presented.

Inkjet supplies - global optimization. HP introduced inkjet technology in 1984 and they never seized being the world leader in this area. Printing supplies are produced and distributed through several sales channels. There are over 250 different types of cartridges (they have significantly longer life cycles, installed base is measured in hundreds of millions), in fifteen production families.

HP SC supports two types of requirements – consumers who already have printers and new sales. Before HP decided to optimize inkjet supplies, the largest cartridges inventory was in bulk. HP's factories shipped cartridges to regional centers for localization and re-packing. These regional centers shipped finished goods to the partners in sales channels, as well as to a large number of HP distribution centers, and HP factories, where they were put into new printers.

In order to optimize SC, HP implemented the vertical integration into Inkjet Supplies business. HP's back-end operations ship bulk pens (inkjet cartridges) to regional pen completion centers (PCCs). After the PCCs localize and package the pens, they ship finished products in two streams. Replacement supplies (trade demand) for previously purchased printers go to regional distribution centers (DCs) and channel partners. Cartridges to be bundled with new printers (host demand) go to regional printer postponement centers (PPCs), which ship the bundled printer-cartridge products to regional DCs. Inkjet supplies optimization was done globally, taking into account the expected overall result.

Figure 4 Inkjet supplies – vertical integration



Source: Billington et al. 2004, p. 64

It increased HP raw material inventory in the factories and brought finished goods closer to the end-users. Global model reduced total worldwide stock and costs, and more than 90% of cartridges being transported over the ocean (Billington et al., 2004, p. 68).

„Silky Road". Using the economic incentives offered by the Chinese government, in 2010 HP developed manufacturing and infrastructure in the provinces at the west of China, which improved working conditions for tens of thousands of employees in Chongqing. In order to provide fast, cheap and socially responsible products supply, HP developed transcontinental railway route (passing through 6 countries – China, Kazakhstan, Russia, Belarus, Poland and Germany) which was set in 2012. Thousands of HP notebooks and monitors are transported through contemporary „Silky Road, more than 10.000 km long. It reduces costs and delivery times, but also has significant benefits for the environment (railway vs. air transport) and employees (providing jobs in the west of China).

Port of Piraeus – a new hub to improve the efficiency of the supply chain. Every minute of every day HP delivers 120 personal computers, 100 printers and 1200 ink or toner cartridges (Prophet, 2013). Having reduced the number of suppliers by almost 50% and transit hubs by 25% (to around 1.000 manufacturing suppliers and 410 hubs) and having opened the transit hub in the port of Piraeus, Greece, HP has gained access to the markets of Europe, Africa, the Middle East and central Asia in a faster, more efficient way and with less impact on the environment. Improved access to the markets (Piraeus port is strategically located at the center of the Mediterranean), fast delivery (product delivery time reduced by 7 days), reduced costs and the protection of the environment (ship delivery reduces carbon dioxide emissions by almost 57 times compared to air transport) are the results of innovation example implemented by HP into their SC.

HP near-shoring – the latest experience from Serbia. HP has invested significant resources into printing outsourcing, including regional optimizations solutions. Since the required printing level and quality is different from one region to another, HP has identified Serbia as a regional center for this business process (classic near-

shoring). Basic version of the printer, with a maximized paper tray (up to 5.000 sheets), will be assembled by local partners to the final version, and the new product will be available in this region only. Near-shoring approach meets customer requirements best way – by adjusting quality and price and involving local partners.

5. CONCLUSION

Procurement, production, packaging, transport, storage, re-packing, delivery and returns of recycling IT products significantly affect the environment. That is the reason behind many of the initiatives for the sustainable SC (greening). Green products are more and more present in the market.

The largest brands compress each segment of their SC without "touching" the products at every level. The awareness of the need for establishing SSCM has led to numerous activities, usually in small steps, which classify the IT industry as one of the greenest.

Due to the importance of IT in every company, the methods and techniques developed by the IT companies are widely accepted. More and more companies have recognized the significance of cooperation and collaboration. The best IT companies deliver knowledge through entire of their own SC, improve response to the market, and make the sustainable development possible.

Social an environmental responsibility concern leads to changes in the SC that have a positive influence on all business aspects, including profit. Analyzing some specific changes in the HP's SC, in this paper we have shown how IT industry is getting „greener", as well as SER contributes to the company profitability long-term.

6. REFERENCES AND SOURCES OF INFORMATION

1. Bakker, M. (2011). *HP's Global Supply Chain Optimization*, [available at: https://supply-chain.org/f/M_Bakker_SCC_SupplyChainWorld_v1.pdf, access February 11, 2014]
2. Billington, C., Callioni, G., Crane, B., Ruark, J., Willems, S. (2004). Accelerating the Profitability of Hewlett-Packard's Supply Chains, *Interfaces,* Vol. 34, No. 1, p. 59–72.
3. Blackhurst, J., Cantor, D., O'Donnell, M. (2012). *Sustainable Supply Chains: A Guide for Small- to Medium-sized Manufacturers*, [available at: http://www.ciras.iastate.edu/publications/CIRAS_Supply_Chain_Sustainability-2012.02.29.pdf, access February 2, 2014]
4. Cargille, B. & Fry, C. (2006). Design for Supply Chain - Spreading the Word Across HP, *Supply Chain Management Review,* Vol. 10, No. 5, p. 34-41.
5. Carter, C.R. & Rogers, D.S. (2008). A framework of sustainable supply chain management: moving toward new theory, *International Journal of Physical Distribution & Logistics Management*, Vol. 38, No. 5, p. 360-387.
6. Ellis, S., (2013). *Change in the (Supply) Chain: High-Tech Global Supply Chains: Shifting Gears* [available at: http://ct.org/wp-content/uploads/2013/11/2013ChangeintheSupplyChainWhitePaper.pdf, access February 12, 2014]
7. HP Global Citizenship summary report (2012). [available at: http://www8.hp.com/us/en/hp-information/global-citizenship/reporting.html, access February 12, 2014]
8. HP Next Team (2013). *Modern-Day Silk Road Optimizes HP's Supply Chain,* [available at: http://www8.hp.com/hpnext/posts/modern-day-silk-road-optimizes-hp-s-supply-chain#.U-U9lzitejw, access February 15, 2014]
9. Lowitt, E.M & Grimsley, J. (2009). *Hewlett-Packard: Sustainability as a Competitive Advantage*, [available at: http://www.hp.com/hpinfo/globalcitizenship/environment/commitment/accenturestudy.pdf, access February 10, 2014]
10. Mingay, S. (2007). *Green IT: The New Industry Shockwave*, [available at: http://www.ictliteracy.info/rf.pdf/Gartner_on_Green_IT.pdf, access March 3, 2014]
11. Mejías, A.M. & Pardo, J.E. (2013). Best Practices in Sustainable Supply Chain Management: A Literature Review, *7th International Conference on Industrial Engineering and Industrial Management: Industrial Engineering and Complexity Management*, Universidad de Valladolid, Valladolid, 10-12th July, p. 59-66.
12. Prophet, T. (2013). *Investing in Transportation to Improve Supply Chain Efficiency at HP*, [available at: http://www8.hp.com/hpnext/posts/investing-transportation-improve-supply-chain-efficiency-hp#.U-U-ezitejw, access February 13, 2014]
13. Seuring, S. & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management, *Journal of Cleaner Production*, Vol. 16, Issue 15, p. 1699-1710.
14. WCED (World Commission on Environment and Development). (1987). *Our common future*[available at: http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf, access February 15, 2014]