HARDWARE
Research Brief

SASB’s Industry Brief provides evidence for the material sustainability issues in the industry. The brief opens with a summary of the industry, including relevant legislative and regulatory trends and sustainability risks and opportunities. Following this, evidence for each material sustainability issue (in the categories of Environment, Social Capital, Human Capital, Business Model and Innovation, and Leadership and Governance) is presented. SASB’s Industry Brief can be used to understand the data underlying SASB Sustainability Accounting Standards. For accounting metrics and disclosure guidance, please see SASB’s Sustainability Accounting Standards. For information about the legal basis for SASB and SASB’s standards development process, please see the Conceptual Framework.

SASB identifies the minimum set of sustainability issues likely to be material for companies within a given industry. However, the final determination of materiality is the onus of the company.

Related Documents

- Technology & Communication Sustainability Accounting Standards
- Industry Working Group Participants
- SASB Conceptual Framework
- Example of Integrated Disclosure in Form 10-K

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However, with increasing global resource scarcity and concerns about climate change and impacts of pollution on human health and the environment, Hardware companies that are able to harness their innovation potential to address the externalities of their product lifecycles are likely to be well positioned to protect and enhance shareholder value. Management (or mismanagement) of material sustainability issues has the potential to affect their valuation through impacts on profits, assets, liabilities, and cost of capital.

Hardware companies reporting in their regulatory filings metrics on the material sustainability risks and opportunities that could affect value in the near- and long-term, would provide investors with a more holistic and comparable view of performance. This would include both positive and negative externalities, and the non-financial forms of capital that the industry relies on for value creation.

Specifically, performance on the following sustainability issues will drive competitiveness within the Hardware industry:

- Integrating into products security features that protect customers from increasing cybersecurity threats;
- Recruiting a more diverse workforce that reflects the available talent pool and diverse customer base, and leveraging its potential for value creation;
- Managing environmental and social impacts throughout a product’s lifecycle; and
- Ensuring strategies for supply chain management and sourcing of key inputs that reduce externalities while lowering risks to company value.

The Hardware industry provides consumer electronics devices and information technology (IT) hardware infrastructure for businesses that are becoming fundamental to modern economies and livelihoods. The industry is revolutionizing communications and information sharing with the design of smaller and smarter devices, and enabling technology to reach into the hands of the masses. Driven by continuous innovation, hardware and software systems together provide enhanced efficiencies in business operations and have the potential to enable industries and consumers to lower their environmental impacts and expand social benefits.
INDUSTRY SUMMARY

The Hardware industry consists of companies that design or manufacture technology hardware products, including personal computers (PCs), consumer electronics, communications equipment, storage devices, components, and peripherals. Global industry revenues for Hardware companies totaled around $1.7 trillion according to the latest available annual data, which is around two percent of estimated gross world product in 2012. Sales of communications equipment, consumer electronics and computer hardware (including PCs) make up a significant proportion of industry revenues.

The Hardware industry is a significant contributor to real output growth in the economy. Projections from the U.S. Department of Labor indicate that computer and peripheral equipment manufacturing will have the fastest growth in real output from 2012 to 2022 among all industries in the U.S. economy, with an annual growth rate at just above nine percent. As output increases due to productivity growth in the Hardware industry, employment is expected to decline.

Not only is the number of hardware devices being sold increasing every year, but sales and new product development are also trending towards smaller, more mobile devices. In 2013, global smartphone shipments reached one billion units in a single year for the first time, driven by demand for cheap devices in emerging markets like China and India. While cheaper smartphones are driving volumes in the industry, mobile phone manufacturers face pressures on profit margins as a result.

In recent years, the PC market has shifted from a focus on corporate sales and desktops to consumers, retail channels, and portable devices. PC penetration in the U.S. (the share of U.S. households with at least one PC) increased from 69 percent in 2007 to around 77 percent in 2012. Despite this transition toward consumers, and given consumer preferences shifting to tablets and smartphones, corporations remain a significant customer base for both PCs and servers, although the Hardware industry has recently seen server revenue declines due to the expansion of cloud computing services by large corporations like Google and Amazon, which have the capacity to buy servers directly from original design manufacturers (part of the electronic manufacturing services and original design manufacturers (EMS & ODM) industry).

Hardware industry revenues are, therefore, exposed to fluctuations in corporate profits and IT spending across the economy, and consumer confidence and spending is a significant value driver for the industry. Purchases of components, materials, packaging, etc. are a significant cost component for the industry. According to 2011 data for U.S. hardware manufacturing, such purchases accounted for about 45 percent of the industry’s total value of shipments. Product demand and input costs are, therefore, key drivers of profits in the industry. Gross profit margins for five leading Hardware companies (listed in Appendix I) operating

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1 A list of representative companies appears in Appendix I.
across different Hardware industry segments averaged 36 percent in fiscal year (FY) 2012, with a 16 percent average operating margin (This includes profits associated with related activities such as software sales, IT services etc. that Hardware companies are often involved in). Many industry leaders are domiciled in the U.S., but generate revenues from global sales; in FY 2012, percentage of revenues from the Asia-Pacific region ranged from 16 to 60 percent for the five leading companies, with a similar range for sales in North America, and a somewhat lower range of sales in Europe. Intense global competition in hardware manufacturing limits manufacturers’ ability to charge premium prices. Profit margins for larger, more successful Hardware companies are typically greater than the industry average. These players rely heavily on the EMS & ODM industry for design, manufacturing, or assembly services, with a majority of manufacturing being outsourced to emerging countries, particularly in Asia, that have low production costs, while themselves offering related products or services (such as proprietary operating system software) that command higher profits, or engaging in product differentiation. Hardware companies are increasingly focusing on Research and Development (R&D), design, and marketing activities. Apple, for example, has over 200 suppliers around the world and typically does not own manufacturing facilities.

The Hardware industry faces emerging challenges associated with outsourced manufacturing and raw material scarcity. The industry continues to evolve with the development of new products and markets. Companies will have to navigate key industry trends, along with specific regulations and significant environmental and social issues affecting the industry or its customers, discussed below, in order to protect shareholder value over the long-term. Companies that manage these trends successfully will be able to capture opportunities for growth and attain a stronger competitive position.

NOTE ON INDUSTRY STRUCTURE

In developing this briefing and determining material disclosure topics and accounting metrics for Hardware companies, SASB used a “pure-play” definition of the industry, and considered that many Hardware companies do not engage in significant manufacturing activities. The issues discussed here therefore focus on the ability of Hardware companies to influence design, product lifecycle and supply chain sustainability performance, rather than companies’ manufacturing, software or other activities. SASB treats separately the following industries: Hardware; Electronics Manufacturing Services (EMS) & Original Design Manufacturing (ODM); Software & IT Services; and Internet Media & Services.

While this approach is necessary to ensure a coherent understanding of industry drivers and challenges, it does not always reflect the current structure of the industry, where some Hardware companies are sometimes directly involved in manufacturing of products and also provide software and IT services.

Therefore, depending on the specific activities and operations of Hardware companies, sustainability issues and accounting metrics associated with the EMS & ODM, Software & IT Services, and Internet Media & Services industries may also be material for them.
LEGISLATIVE AND REGULATORY TRENDS IN THE HARDWARE INDUSTRY

The regulatory environment surrounding the Hardware industry continues to evolve, particularly related to product lifecycle impacts. Legislation relating to material inputs, electronic waste, and conflict minerals has the potential to further emphasize the importance of performance and reporting on material sustainability issues. The following section provides a brief summary of key regulations and legislative efforts related to this industry.8

Concern over electronic waste (e-waste) has led to the introduction of several pieces of legislation in Congress. Although these efforts fall short of a federal framework, regulation is widely expected in the coming years. Meanwhile, Hardware companies are required to comply with various state regulations concerning the handling of electronics equipment at the end of its useful life. Currently almost half of all U.S. states have laws in place relating to the proper disposal of e-waste.11

Since a significant proportion of industry products is sold or manufactured overseas, Environmental, Health, and Safety (EHS) laws in other countries are likely to affect Hardware company financials. The impact of specific chemicals commonly found in hardware products on human health and the environment has been the source of regulatory scrutiny. Relevant European Union (E.U.) laws related to use of hazardous substances include the Restriction of Hazardous Substances in Electrical and Electronic Equipment (RoHS) and the Waste Electrical and Electronic Equipment (WEEE) Directives of 2003, and the REACH law of 2007. The first two aim to promote the collection and recycling or reuse of waste electrical and electronic equipment (e-waste) and also require heavy metals such as lead, mercury, cadmium, and hexavalent chromium and flame retardants to be substituted by safer alternatives.12 REACH is not specific to the electronics industry, but it relates to the Registration, Evaluation, Authorisation and Restriction of Chemical substances,13 potentially affecting Hardware industry products. Similar laws restricting hazardous substances in products and governing e-waste have been implemented in China, Japan and other countries where Hardware manufacturing or sales occur.

Although the U.S. currently does not have federal regulations governing hazardous substances in products, some states are pursuing their own initiatives, including California’s Safer Consumer Products regulations, which went into effect on 1 October 2013 and aim to reduce toxic chemicals in consumer products.14 Furthermore, the Safe Chemicals Act of 2013 was recently introduced in the U.S. Senate, and if passed, will require the EPA to identify and restrict chemicals that pose health and environmental risks.15 Lastly, the EPA is partnering with the industry on lead-free soldering, as part of its Design for Environment Program.16

In addition, legislation related to product energy-efficiency, such as the E.U.’s Ecodesign Directive for energy-related products, which

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8 This section does not purport to contain a comprehensive review of all regulations related to this industry, but is intended to highlight some ways in which regulatory trends are impacting the industry.
covers enterprise servers and data storage products under a priority list, could affect sales in the E.U.\textsuperscript{17} Voluntary programs like ENERGY STAR of the U.S. EPA are also setting standards and driving demand for energy-efficient computing products.\textsuperscript{18}

Furthermore, the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 and subsequent rules adopted by the U.S. Securities and Exchange Commission (SEC), require companies to publicly disclose their use of “conflict minerals” if they are “necessary to the functionality or production of a product” that the company manufactures, or contracts to be manufactured. These minerals include tantalum, tin, gold, or tungsten (3TG) originating in the Democratic Republic of Congo (DRC) or adjoining countries. Specifically the provision requires SEC-registered companies to determine if they have exposure to DRC-sourced 3TG, which are common in hardware products, among other industries. Companies with exposure must subsequently determine and report on the specific source.\textsuperscript{19} The rules, which would require companies to make their first filings effectively by 2 June 2014, have been upheld by the U.S. District Court for the District of Columbia, despite a legal challenge from trade associations.\textsuperscript{20}

In addition to these regulations, initiatives by industry bodies, including collaboration with government agencies, may create competitive drivers for the industry to act on environmental or social issues. For example, the Electronic Industry Citizenship Coalition (EICC) is a global industry initiative whose members commit to and implement a code of conduct related to environmental, social and ethical responsibility.\textsuperscript{21}

### SUSTAINABILITY-RELATED RISKS AND OPPORTUNITIES

Industry drivers and recent regulations suggest that while traditional value drivers will continue to impact financial performance, intangible assets such as social and human capitals, company leadership and governance, and the company’s ability to innovate to address environmental issues are expected to contribute increasingly to financial and business value.

Key industry characteristics drive the materiality of certain sustainability issues for the Hardware industry:

- **Product lifecycle innovation**: Rapidly increasing use of hardware products in the economy exacerbates the impacts of the industry’s raw material use including mineral, metal, and petroleum-based resources during manufacturing, as well as the impact of products at the use and disposal phases. The Hardware industry is well positioned to use its innovation potential to manage the product lifecycle and reduce associated negative environmental and social externalities.

- **Complex, global supply chains**: The Hardware industry is today characterized by complex supply chains dispersed globally, leading to intertwined sustainability and business risks. Sourcing decisions and supplier scrutiny are important for mitigating supply disruptions and price volatility for key inputs such as minerals and components.
• **Hardware and software integration:**
  Issues of social concern such as increasing cybersecurity threats require systems-based solutions, incorporating robust hardware, firmware, and software features.

• **Diversity as an engine of innovation:**
  The contribution of a diverse workforce to innovation and customer empathy is increasingly being recognized, even as the Hardware industry faces challenges in improving the proportion of women and minorities in the workforce.

As described above, the regulatory and legislative environment surrounding the Hardware industry emphasizes the importance of sustainability management and performance. Specifically, recent trends suggest a regulatory emphasis on environmental protection, which will serve to align the interests of society with those of investors.

The following section provides a brief description of each sustainability issue that is likely to have material implications for the Hardware industry. Included in the description is evidence of materiality as well as an explanation of how the issue could impact valuation. A table indicating the nature of the value impact and evidence of interest from stakeholders appears in Appendix IIA. Appendix IIB expands on the channels of financial impacts of each sustainability issue and the recommended disclosure framework appears in Appendix III.

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**ENVIRONMENT**

The environmental dimension of sustainability includes corporate impact on the environment, either through the use of non-renewable natural resources as input to the factors of production (e.g., water, minerals, ecosystems, and biodiversity) or through environmental externalities or other harmful releases in the environment, such as air and water pollution, waste disposal, and greenhouse gas emissions.

The most significant environmental impacts of Hardware companies come from their product lifecycle, including manufacturing, use and disposal. However, most of the industry’s manufacturing processes are outsourced to contract manufacturers, known as Electronics Manufacturing Services (EMS) companies. Hardware companies can influence the environmental impacts of their products primarily through improved design and lifecycle management processes, and ensuring suppliers manage their own environmental impacts. For example, Apple reports that while manufacturing accounts for 61 percent of its total greenhouse gas (GHG) emissions, only two percent of its total GHG emissions are from its own facilities (which include corporate offices, distribution hubs, data centers, and retail stores). Cisco reports that almost 90 percent of its product emissions occur during use.

Product lifecycle management and supply chain management and materials sourcing, discussed below under the categories of Business Model...
and Innovation and Leadership and Governance, are not only important from an environmental perspective, but also can have material impacts on the value of Hardware companies. To the extent that Hardware companies have significant manufacturing operations under their control, waste and water management could have material impacts on their operations similar to those for EMS companies.

**SOCIAL CAPITAL**

Social capital relates to the perceived role of business in society, or the expectation of business contribution to society in return for its license to operate. It addresses the management of relationships with key outside stakeholders, such as customers, local communities, the public, and the government. It includes issues around access to products and services, affordability, responsible business practices in marketing, and customer privacy and data security.

As the Hardware industry continues to shift from corporate to retail sales, social capital will increasingly impact corporate valuation. Specifically, the ability of companies to enable protection of consumer data in the context of growing cybersecurity threats will be critical to managing reputation and brand value.

**Product Security**

Increasing cybersecurity threats create both risks and opportunities for this industry. Products designed to ensure security will help companies to reduce reputational risks and enhance customer acquisition. Concerns about data security and related government actions can also serve as revenue generating opportunities for this industry through federal contracts, and the provision of specific security products.

Hardware companies face the risk that hackers could exploit certain product features to gain “back-door” access to their products, creating a threat for their customers’ intellectual property, personal data and revenues. Hardware companies that work with software companies and semiconductor chip manufacturers to limit such vulnerabilities and develop secure computing systems will be able to increase their market share and gain access to customers at the expense of their competitors who may have product vulnerabilities, particularly in sensitive sectors such as defense and finance. Undue exposure of confidential data from companies in such sectors could have significant repercussions for the wider economy.

Establishing relationships with credible and reputable suppliers along the value chain is essential to protect product security, as specific hardware or firmware vulnerabilities could be introduced at any point from the manufacturing stage to when the product is delivered to consumers. Detection or prevention require sophisticated solutions, and may not even be possible in some cases. Companies that have policies and programs in place to deal with the consequences of cybersecurity breaches will be able to provide some assurance to customers and protect their reputation.

The market for standalone security products is also expanding, accentuating the importance
of this issue. Hardware manufacturers conducting research and development (R&D) for sophisticated hardware solutions may gain a competitive advantage compared to legacy software solutions exploited commonly by hackers.

Evidence

With growing cyber-attacks exploiting existing software and network vulnerabilities, secure hardware products with an embedded physical layer preventing malware from infiltrating the operating system could make it more difficult for potential attackers to alter such systems. Conversely, malicious modifications to the hardware products themselves may make software-based security measures ineffective.

Cybersecurity requires both hardware and software systems to be secure and free from vulnerabilities, adapting to new threats as they emerge. Hardware and firmware vulnerabilities can have an impact on manufacturers through limiting sales to customers in defense or other sensitive sectors. Intelligence and defense agencies in the U.S., U.K., Australia, Canada, and New Zealand, have banned hardware products by computer manufacturer Lenovo from their classified networks due to concerns about hardware and firmware vulnerabilities in Lenovo chips that could allow attackers to access devices remotely without users’ knowledge.

Furthermore, reputational damage when product vulnerabilities are exploited or discovered could lead to loss of market share as competitors develop alternative software or hardware security solutions. For example, EMC’s RSA security tokens were compromised due to a cyber-attack in 2011, potentially affecting its defense sector and government customers, as a result of which the company was forced to replace millions of tokens. The RSA segment faced a loss of confidence in the product, accompanied by an expansion of competition offering alternative, and sometimes cheaper options. RSA’s market share dropped from 76 percent in 2011 to 60 percent in 2012, while competitors Vasco Data Security International and Gemalto NV doubled their market share.

In its 10-K for FY 2011, EMC discloses the impacts of the RSA breach and cybersecurity concerns on its financial results, “In the first quarter of 2011, we incurred and accrued costs associated with investigating the attack, hardening our systems and working with our customers to implement remediation programs. In the second quarter of 2011, we recorded a $66.3 million charge in cost of sales related to the expansion of the customer remediation programs. […] At December 31, 2011, we had a remaining reserve of $46.6 million included in accrued liabilities on the consolidated balance sheet.” EMC expanded its remediation programs due to customer concerns and media coverage about cyber-attacks, indicating the potentially significant impact of reputational damage on value. These additional costs from the RSA segment contributed a 53 basis points decrease to the overall gross margin in 2011 compared to 2010.

Another example where hardware vulnerabilities impacted value is that of revelations of the National Security Agency (NSA) surveillance

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29 Form 10-K filings mentioned throughout the document for different companies were obtained from company websites. The fiscal year for the filing is mentioned before each quote throughout the document.
program in 2013, with allegations that the U.S. agency hacked critical network systems, which affected sales of Hardware company equipment. Cisco expected revenues to fall by 10 percent in the final quarter of 2013, with revenues continuing to be affected into 2014, as the NSA surveillance revelations hurt demand for its equipment in emerging markets.  

Hewlett Packard in its FY 2012 Form 10-K explains the difficulty and resulting costs of ensuring cybersecurity in its products and services, “…sophisticated hardware and operating system software and applications that we produce or procure from third-parties may contain defects in design or manufacture […]. The costs to us to eliminate or alleviate cyber or other security problems […] and security vulnerabilities could be significant, and our efforts to address these problems may not be successful and could result in interruptions, delays, cessation of service and loss of existing or potential customers that may impede our sales, manufacturing, distribution or other critical functions.”

On the other hand, an environment of increasing cybersecurity concerns also presents opportunities for companies in the Hardware industry. The identity protection products industry is expected to reach $6.43 billion in 2016, from $4.51 billion in 2012.  

Cisco identifies the customer value proposition of its security solutions in its FY 2012 Form 10-K, “Security is a significant business concern, and we believe it is a top investment priority for our customers. Security threats continue to escalate, resulting in the loss of revenue, intellectual property, and reputation. Our security portfolio of products and services offers identity, network, and content security solutions designed to enable customers to reduce the impact of threats and realize the benefits of a mobile, collaborative, and cloud-enabled business.”

Value Impact

Evidence suggests that product security vulnerabilities have the potential to reduce market share, impacting revenues, as companies with a poor reputation for managing and addressing product security issues may find it difficult to attract and retain customers over the long-term. At the same time, Hardware companies have the opportunity to expand their market share in existing or new market segments for specific security products. Actual events resulting in unauthorized access to customer data can add to cost of sales due to remediation measures, and lead to extraordinary expenses and contingent liabilities associated with future impacts of breaches. Improvement in product security may also require additional R&D expenses. The risk of high impact, low probability events can also lead to higher risk premium and higher cost of capital.

As increasing amounts of sensitive personal and business data are moving to the systems of technology companies and to the Cloud, the probability and magnitude of these impacts are likely to increase in the future.
**Human Capital**

Human capital addresses the management of a company’s human resources (employees and individual contractors), as a key asset to delivering long-term value. It includes factors that affect the productivity of employees, such as employee engagement, diversity, and incentives and compensation, as well as the attraction and retention of employees in highly competitive or constrained markets for specific talent, skills, or education.

While companies in the Hardware industry increasingly depend on highly-skilled labor, productivity increases are expected to lower employment in the industry in the next decade. Research suggests, however, that productivity increases in high-tech, knowledge-intensive sectors are likely to depend on a more diverse workforce. Hardware companies that are able to recruit and leverage a diverse workforce are likely to experience greater value creation over the long-term.

**Employee Inclusion**

Despite efforts by the industry at improving workforce diversity and inclusion, Hardware company workforces are characterized by relatively low representation from women and minority groups. Not only is greater workforce diversity important for providing equal opportunity, but it also is likely to affect the value of Hardware companies that fail to leverage the potential of a diverse group of employees.

Greater workforce diversity is important for innovation, and helps companies understand the needs of their diverse and global customer base, to be able to design desirable products and communicate with customers effectively. It is also a means of attracting and retaining employees. These factors contribute to value creation in the Hardware industry, which is increasingly serving retail consumers, is knowledge-intensive, characterized by rapid innovation, and requires highly-skilled engineering employees in an environment in which Science, Technology, Engineering, and Mathematics (STEM) education is falling behind global recruitment needs.

Companies could achieve the benefits of greater diversity at all levels of the workforce by recruiting employees that at least reflect the make-up of local talent pools and their customers, providing adequate career support to traditionally under-represented employees, and discouraging implicit biases in promotions. Companies that are successful in recruiting and developing a diverse and inclusive workforce have the potential to enhance shareholder value over the long-term.

**Evidence**

Companies in the industry are making efforts to improve their performance on diversity, although numbers are still low at mid- and top-level employee positions and on the board of directors. For example, data from the U.S. Equal Employment Opportunity Commission shows that women represented only 22 percent of mid- and top-level positions at Cisco and 26 percent at Dell on average between 2006 and 2010. Similarly, non-white minorities only account for 20 percent of Dell’s mid- and
top-level positions; the figure is higher for Cisco at 33 percent. Major Hardware companies like Hewlett-Packard (HP), Apple, and Dell had even lower representation of women on their boards, ranging from 7.7 to 15.4 percent in 2011. Data on ten of the largest technology companies in Silicon Valley, including HP and Cisco, shows that while the number of employees at the ten companies increased by 16 percent between 1999 and 2005, the population of African-American workers at the companies fell by 16 percent, while the number of Hispanic workers dropped by 11 percent.

In addition to low representation of diverse groups in recruitment, differences in pay between men and women illustrate the potential for implicit or explicit biases, or lack of opportunities for women to advance towards core activities that drive value in an industry. The U.S. Department of Labor data shows that in 2009, women earned around 74 percent of men’s earnings in the Manufacturing sector; they earned 76 percent of men’s salaries in the Information sector. A 2009 study found that in Silicon Valley, men are 2.7 times more likely than women to be promoted to top level jobs such as vice president of engineering, or senior engineering manager. Such imbalances in the workforce of Hardware companies could create reputational risk, and affect their brand value.

Greater diversity in the workforce, and ensuring inclusion and participation of this workforce in core activities could enable companies to generate better returns on employee-related expenditures. Although purchases of finished components account for the majority of industry costs, wages are estimated at around seven percent of industry revenues.

A diverse and inclusive workforce is increasingly being recognized in Human Resources (HR) literature as contributing to company value. Recent research suggests that companies with effective management of gender diversity, especially at the leadership levels, outperform their peers. For example, companies with sustained high representation of women on the board of directors outperformed those with sustained low representation by 60 percent on Return on Invested Capital, and by 46 percent on Return on Equity. In a survey of 321 executives from global companies with annual revenues of more than $500 million, 85 percent of respondents agreed that a diverse and inclusive workforce provides different perspectives and ideas that foster innovation. A diverse workforce was also said to enable companies to provide products and services respectful of clients’ cultures, and attract and retain employees.

Although causality analysis and measurement of the impact of employee diversity and inclusion on profitability generally in the economy has been inconclusive or has data or methodological limitations, academic studies suggest that diversity is particularly likely to add value for high-tech, knowledge-intensive companies, indicating that that the issue is likely to be material for companies in the Hardware industry.

Diversity can enhance innovation potential of Hardware companies. Studies associate diversity and heterogeneity in teams with higher...
levels of creativity, ability to solve complex tasks better than homogenous teams, and higher levels of innovation and R&D.\textsuperscript{41}

As discussed in the Industry Summary, consumer spending is a significant value driver for the Hardware industry. Between 1990 and 2014, the buying power of minority groups in the U.S. has increased substantially; for example, the buying power of the Hispanic population is expected to reach $1.3 trillion in 2014, an increase of over 500 percent from 1990 levels, more rapidly than other groups. Research by Deloitte on the related retail and consumer goods industries indicates that diverse employees understand cultural nuances, enable companies to understand their diverse customer base, and provide better consumer insights. Employee diversity and inclusion in a way that reflects the population overall and the specific communities served,\textsuperscript{42} could enable Hardware companies, particularly those catering to retail customers, to establish a brand relationship with such customers, improving financial performance.

A 2013 working paper providing a synthesis of previous research on the impacts of diversity on productivity, wages, and profits, and analyzing these impacts for high-tech or knowledge-intensive sectors compared to others, suggests that a more gender-balanced workforce results in improved productivity in such sectors. The paper finds that if gender diversity increases by one standard deviation, productivity increases on average by between 2.5 to six percent in high-tech or knowledge-intensive firms. This may be explained by research suggesting that firms depending on innovations and whose activities involve complex tasks are likely to benefit more from diversity than traditional firms.\textsuperscript{43}

The paper concludes that effective diversity management, such that benefits of a more diverse workforce outweigh costs, is critical for a firm’s success. For increased productivity to translate into higher profitability “the gains of a more diverse workforce in terms of complementary skills and information sets” need to outweigh “additional costs related to communication and conflicts.”

**Value Impact**

Companies’ performance on ensuring workforce diversity can lead to value creation in the long-term through stronger innovation, and superior ability to cater to a diverse customer base, with impact on both market share and pricing power. It can also influence their reputation and ability to attract employees, as well as operating costs related to recruiting, developing, and retaining employees.

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**BUSINESS MODEL AND INNOVATION**

This dimension of sustainability is concerned with the impact of environmental and social factors on innovation and business models. It addresses the integration of environmental and social factors in the value creation process of companies, including innovation in the production process, as well as product innovation and looking at efficiency and responsibility in the design, use-phase, and disposal of products.

The Hardware industry commercializes products and services that have become essential for individual consumers and businesses and is at the forefront of IT innovation. The ability
to improve existing products and services and develop new ones to meet consumer demand while also addressing negative environmental externalities will increasingly impact shareholder value, particularly as legislation and consumer demand emphasize product lifecycle management.

Product Lifecycle Management

Hardware companies face increasing challenges associated with environmental and social externalities attributed to product manufacturing, transport, use and disposal. Rapid obsolescence of hardware products due to continuous innovation, difficult-to-replace obsolete components, and changing consumer preferences exacerbate the externalities. Managing lifecycle impacts of products could contribute to increasing shareholder value through improved competitive positioning, greater market share, and lower regulatory, demand and supply chain risks.

Chemicals used in technology products can leach into the environment when these products are disposed, with potential impact on human health. These concerns, together with rapid obsolescence of technology products, have led to existing and pending legislation addressing the chemicals used in, and disposal of, technology products, including the growing volumes of e-waste. Hardware products have a variety of materials, some in extremely small volumes, making recycling and end-of-life management difficult.

Another area of concern is the use of critical minerals and metals facing supply constraints and price volatility, which increases the importance of design strategies to reduce materials use, and improving recycling at the end of life to recover valuable materials. Certain minerals and metals used in hardware products may contribute to conflicts or human rights violations in the regions of their origin. Hardware products also depend on minerals known as rare earths, which have geographically concentrated sources of supply and are vital for several other industries including renewable energy, leading to global price fluctuations and potentially limiting the advances of essential technologies of modern economies. (Primarily discussed under Supply Chain Management & Materials Sourcing below).

Energy use of increasing volumes of computing products and other hardware technologies can contribute to climate change and lead to increasing energy demand in regions with poor energy infrastructure. More energy-efficient products would help alleviate such concerns, which are leading to related customer demand, legislation and procurement requirements, while lowering the total cost of ownership for customers.

As a result of these concerns, and due to the business value of addressing them, Hardware companies are focusing on product lifecycle management, including the design of more energy-efficient products, reducing or replacing harmful and critical materials, and putting in place end-of-life management practices such as product take-back programs and recycling.
Evidence

Studies on the full lifecycle impacts of computers and electronics products are limited or were conducted several years ago, thereby not providing a complete picture of a rapidly changing technology landscape. Nonetheless, regulations, customer demand and concerns over brand value are driving Hardware companies to implement product lifecycle management programs. Product design is an important avenue for innovation to reduce lifecycle impacts as it is estimated that over 80 percent of all product-related environmental impacts are determined during a product’s design phase.  

Hardware companies designing products to reduce or eliminate the use of toxic or supply-constrained materials in their products are likely to benefit from expanded market share relative to peers, lower regulatory compliance costs, and lower input price or supply volatility. Leading companies are disclosing risks and opportunities related to the chemical composition of products and recycling in their Form 10-Ks; however the use of metrics is rare in such filings.

Existing and planned legislation in the U.S. at the state level and in the E.U., China and other regions create compliance risks and limit the global market for hardware products that incorporate harmful chemicals in their products (see Legislative and Regulatory Trends section). Xerox reports the likely material impacts of E.U. REACH and other product-related regulations in its Form 10-K for 2012, “As these and similar initiatives and programs become regulatory requirements throughout the world and/or are adopted as public or private procurement requirements, we must comply or potentially face market access limitations that could have a material adverse effect on our operations and financial condition.”

A study on experiences with the E.U. RoHS finds a range of costs incurred by companies, including R&D and capital costs, stock management costs, and administrative costs such as requesting materials declaration from suppliers and testing components. Another study estimates that total weighted average cost (weighted by revenue) for electronics industry players (including Hardware companies) for initial RoHS compliance was almost $6 million, with annual maintenance costs at around $1.5 million. About 30 percent of surveyed electronics industry companies reported lost sales as a result of RoHS, with an average loss of about $1.8 million, primarily resulting from delayed new products or discontinued E.U. sales.

A majority of companies reported an average 11.6 percent increase in component, module, and manufacturing costs, as well as an average 21 percent increase in inventory levels. However, some companies gained from the legislation, with 15 percent reporting an increase in market share. Companies also reported being affected by hazardous substances legislation in other regions, including China, Korea, and California, with Chinese legislation being seen as particularly burdensome.

In an effort to address regulatory and consumer concern over materials inputs, Apple states in its sustainability report that it has eliminated lead, Brominated Flame Retardants (BFR), Polyvinyl Chloride (PVC), mercury, and glass containing arsenic from all its products.
weigh and manage the costs, externalities, and supply chain risks of using alternatives. In its Form 10-K for 2012, EMC reports that demand within the industry for a plasticizer free of harmful materials “is not yet sufficient to mitigate the supply chain risks of switching to this substitute material.”

Designing products that obviate the need for toxic materials in manufacturing is also likely to benefit Hardware companies, either directly as a result of lower regulatory penalties to the extent they manufacture and assemble their own products, or indirectly, by lowering risks in the supply chain, particularly as environmental regulations become more stringent globally (see next section).

Furthermore, designing for lifecycle materials efficiency, including packaging use, is likely to lower materials input and transport costs, which are major cost components for the industry, improving margins. According to the 2011 Annual Survey of Manufactures, total cost of materials, parts, containers, and packaging for the Hardware industry in the U.S.\(^\text{V}\) was around 46 percent of industry revenues, highlighting the significance of such costs to profitability.\(^\text{X}\) Some Hardware companies have been focused on lowering overall materials used in their products and manufacturing processes. For example, Apple’s latest iMac uses 68 percent less material than previous product generations due to the design of a new process.\(^\text{X}\)

Design decisions including ease of disassembly and upgradeability can influence the length of time in use and end-of-life impacts. While average product weight has decreased over the last few years as most hardware devices have become smaller and lighter, the total weight of products ready for end-of-life management has increased more than 120 percent over the last decade, as sales of electronics products increase and products rapidly become obsolete. According to the EPA’s 2011 report on e-waste, about 2.4 million short tons of e-waste were ready for end-of-life management and only 25 percent were collected for recycling,\(^\text{X}\) indicating significant potential for improvements in reuse and recycling, particularly as many components are still usable.

Due to concerns about growing amounts of e-waste and its environmental impacts, state and national governments globally have been introducing laws related to managing such waste (see Legislative and Regulatory Trends section). E.U. WEEE applies the producer responsibility principle, requiring manufacturers or importers of electronic equipment to bear the cost of recycling at the end of life.\(^\text{X}\) Penalties, costs, or lost revenues due to such laws, together with potential revenues generated from refurbishing and re-selling products, and cost savings and risk mitigation from critical materials recovery, are increasingly providing incentives for Hardware companies to manage end-of-life impacts.

It is estimated that in Japan, used electronics hold around 300,000 tons of rare earth materials, providing a significant opportunity for recycling and re-using such materials in the context of global supply constraints discussed below. Furthermore, used electronics in the country are said to contain 6,800 tons of gold, equivalent to around 16 percent of the global gold

\(^\text{V}\) (NAICS codes 3341, 3342, 3343).
mining reserves. Metals like gold and copper account for over 70 percent of the residual value of computers. Prior to mandatory product take-back policies, third-parties conducted most materials reclamation, providing little value to Hardware companies from recovering and re-using metals and other materials from products. With e-waste laws placing responsibility for product take-back with manufacturers, they have a greater incentive to maximize product and materials recovery. (However, from an environmental perspective, studies indicate that extending useful life of products provides greater returns in the form of energy savings than recycling materials).

Industry leaders are implementing design innovations allowing for “repair, disassembly, material recovery, re-use and closed-loop manufacturing.” Companies have also implemented take-back programs. Apple estimates its global recycling rate at over 70 percent since 2010 (as a percentage of weight of products sold seven years earlier). It also notes that its recycling programs have diverted more than 151,000 metric tons of equipment from landfills since 1994.

Another major impact of Hardware products lies in their energy consumption during the use phase. While customer actions influence how much energy is consumed, product design and customer education about power management options can help lower energy in product use.

Estimates vary as to the most significant source of energy consumption in the lifetime of hardware products between manufacturing and use phases. Some studies suggest that energy in the use phase accounts for a significant 38 percent of lifecycle energy in laptops, amounting to 1,868 to 3,113 MJ of energy per computer.

It is estimated that energy to operate residential and commercial PCs in California accounts for about 1.7 percent of energy used by the state’s commercial and residential sectors each year, and data centers consume about 1.5 percent of global electricity. The GHG emissions from such energy consumption are drawing public and regulatory attention to energy efficiency of hardware products. Apple and Cisco note in their sustainability reports that the use phase accounts for 30 and 90 percent respectively of total greenhouse gas (GHG) emissions in the product lifecycle. Since 2008, Apple has reduced the average power consumed by its products by 40 percent, and all its products exceed the EPA’s ENERGY STAR guidelines.

For Hardware companies, material impacts on value can arise from legislation such as the E.U.’s Ecodesign Directive for energy-related products (ErP), which can affect E.U. sales, voluntary programs like ENERGY STAR of the U.S. EPA, and ability to attract customers by lowering their total cost of ownership. Voluntary energy efficiency standards can eventually be used to set procurement requirements. In the U.S., for example, federal agencies are required to purchase ENERGY-STAR-qualified products, potentially affecting Hardware company sales. The value proposition for customers is significant. Dell estimates that customers using its “desktop power management features and settings have saved more than $4 billion in energy costs.”
Companies in the industry have started to identify this as a material issue in their Form 10-Ks; for example, in its FY 2012 Form 10-K, Xerox acknowledges the potential impacts of the ErP legislation and in addition states, “…environmentally driven procurement requirements voluntarily adopted by customers in the marketplace (e.g., U.S. EPA EnergyStar) are constantly evolving and becoming more stringent, presenting further market access challenges if our products fail to comply.”

According to a 2012 study by the Conference Board, which analyzed disclosure practices in different source documents, 31 percent out of 256 companies in the technology sector (which includes Hardware firms) reported developing energy-efficient products; the highest percentage of any other sector.

In general, industry leaders are beginning to adopt a Design for Environment (DfE) approach in developing their products. In its Corporate Social Responsibility (CSR) report, Cisco notes that in 2013, approximately 96 percent of its newly released products incorporated DfE principles.

Industry leaders have started to address the topic of product lifecycle management in their 10-K filings, including design and other initiatives to reduce product impacts. In its Form 10-K for 2013, HP sums up the overarching material impacts on its financial results from product lifecycle management and related laws, “…we face increasing complexity in our product design and procurement operations as we adjust to new and future requirements relating to the chemical and materials composition of our products, their safe use, the energy consumption associated with those products, climate change laws and regulations, and product take-back legislation. If we were to violate or become liable under environmental laws or if our products become non-compliant with environmental laws, we could incur substantial costs or face other sanctions, which may include restrictions on our products entering certain jurisdictions. Our potential exposure includes fines and civil or criminal sanctions, third-party property damage, personal injury claims and clean-up costs.”

**Value Impact**

Increasing public concern over environmental issues is likely to drive demand towards hardware products with a lower environmental footprint. Legislation, industry standards, and customer demand are likely to restrict companies’ ability to capture new markets and customers without effective, long-term product lifecycle management initiatives. This is likely to affect revenue growth and competitiveness of Hardware companies over the long-term, with impact on market share. Initiatives to lower environmental and social impacts during the lifecycle of products can also create operational efficiencies such as product and supply chain optimization, with short-term reduction of operating expenses and longer-term improvement in the cost structure and profitability. Conversely, companies could face extraordinary expenses and contingent liabilities related to regulatory compliance around conflict minerals and end-of-life impacts such as recycling and e-waste.
LEADERSHIP AND GOVERNANCE

As applied to sustainability, governance involves the management of issues that are inherent to the business model or common practice in the industry and that are in potential conflict with the interest of broader stakeholder groups (government, community, customers, and employees) and therefore create a potential liability, or worse, a limitation or removal of license to operate. This includes risk management, safety management, supply chain and resource management, conflict of interest, anti-competitive behavior, and corruption and bribery. It also includes risk of business complicity with human rights violations.

Hardware companies rely on increasingly complex and geographically dispersed supply chains, magnifying some of these risks. Subsequently, the ability of a firm’s leadership and governance structures to manage risks and opportunities associated with supply chains will be critical to shareholder value.

Supply Chain Management & Materials Sourcing

Due to the need to lower costs and remain competitive, companies in the Hardware industry have complex, global supply chains, and outsource much of their production to electronics manufacturing services (EMS) companies in emerging markets. Therefore, they have limited direct control over social and environmental standards in production, which may vary depending on region, with lax standards in some regions (e.g., labor conditions, human rights violations, air and water pollution, among others). Hardware companies are exposed to risk of supply chain disruptions, input price increases, and damage to brand reputation, particularly when rare earth or “conflict” minerals and metals are used in their products, or when suppliers violate environmental or social standards. Companies also face regulatory risks from the use of conflict minerals.

Recent examples of labor unrest in China, a global center for electronics manufacturing, highlight the potential for supply chain disruptions arising from environmental and social factors. Companies face pressure to track and eliminate the use of minerals responsible for conflict in the Democratic Republic of Congo (DRC) from legislation, actions by non-governmental organizations (NGOs), risk to brand value and input prices, and leadership from peers. At the same time, there are material sourcing risks related to rare earth minerals and metals due to a low substitution ratio, concentration of deposits in only a few countries, and geopolitical considerations. Technology companies also face competition from increasing global demand for these minerals from other sectors, including Transportation, Renewable Energy and Infrastructure, which, along with supply constraints, can result in significant price increase and supply chain-risks.

Hardware companies with strong supply chain standards, the ability to track and implement
corrective measures for supplier performance, and the ability to adapt to increasing resource scarcity will be better positioned to protect shareholder value. Innovations at the product-design phase to reduce dependence on some of these materials would also lead to lower risk.

**Evidence**

Despite limited data quantifying and monetizing supply chain risks, several macro- and industry-level drivers suggest that this is a material issue for Hardware companies. Suppliers of Hardware companies have in the past been found to violate local labor and environmental laws, requiring enhanced audit and other corrective measures from the Hardware companies. Companies like Apple, with over 200 suppliers around the world, face reputational risks and possible disruptions to production from poor labor and environmental practices among their suppliers.

Eighty-five percent of Apple's iPhone 5 handsets are estimated to be assembled in China. In September 2012, a riot forced the closure of a Foxconn factory in Taiyuan, China disrupting the production of Apple's iPhones. A month later, production was again halted when between 3,000 and 4,000 people walked off the job at a factory in Zhengzhou, China. The last event took place after employees were forced to work through a holiday week to meet demands by Apple to improve iPhone 5 quality. Apple's stock was unaffected in its primary trading market, however the company's shares fell 1.3 percent in German trading, indicating the potential for significant investor impact.

An audit of Apple suppliers' facilities in China by the Fair Labor Association, conducted at Apple's request, highlighted some improvements, but also continuing problems at Foxconn. As a result, the two companies created an action plan to address unresolved issues and by 2013, approximately 99 percent of the action items had been completed.

Labor rights violations and incidents in the supply chain can occur despite supplier codes of conduct and audit programs. Fluctuating demand for electronics products and inconsistent supplier understanding and government enforcement of labor laws in different countries continue to pose challenges in ensuring labor rights in the supply chain.

Due to supply chain risks in the Hardware industry, such as excessive working hours and underage labor, Apple has been publishing supplier audit reports for the past seven years. In 2012, the company conducted 393 audits at all levels of its supply chain. Apple also tracks weekly work hours for one million workers across its supply chain, and has achieved a 92 percent compliance rate on average with a maximum 60 hour work week. According to the company, work weeks exceeding 60 hours have historically been standard practice among Hardware industry suppliers. Overall, it found 77 percent of supplier practices in compliance with its Labor and Human Rights standards in 2012. Among different activities to lower supply chain risks, the company provides training to their suppliers’ employees with respect to local labor laws and their rights; 1.3 million workers and managers received such training in 2012.
Other companies have faced similar risks related to their suppliers. For example, Chinese government officials cited suppliers for Microsoft’s hardware business for failing to register young workers, and requiring employees to work excessive overtime hours, in violation of the local labor laws.\textsuperscript{72}

On environmental impacts of suppliers, such as water pollution, Apple targets high-risk suppliers for additional, focused environmental audits, and works with them to reduce impacts. In 2013, Apple identified 58 sites from more than 400 locations in China with 114 environmental violations. Apple is working with its suppliers and the Chinese NGO IPE to address problems; in 2013, 15 of the sites worked with IPE to remediate 26 violations. This highlights the risks to the supply chain of Hardware companies and the need for working with suppliers to reduce their impacts, particularly as regulatory scrutiny of waste, air and water pollution increases in emerging markets.\textsuperscript{73}

Apart from supplier performance on social and environmental standards, Hardware companies also face potential disruptions in the sourcing of materials within their supply chain. Several critical components in hardware products depend on minerals such as tantalum and tin that have the potential to fuel conflict, human rights violations and illicit activities in regions where they are mined, in addition to their environmental impacts. Such hardware components also depend on rare earth minerals, used by several industries, the global production of which is limited and prices subject to volatility.

Hardware products use 50 to 60 percent of global tantalum supplies, up to 26 percent of tin supplies, and nine percent of gold, accounting for a significant amount of global use of three of the four minerals (3TG) at the center of the “conflict minerals” issue. Artisanal and small-scale mining in the DRC is responsible for much of the current global output of 3TG. While such mining is an important source of livelihood to the local population, it also is helping to finance armed conflict in the region and has significant ecological impacts. Several legislative and project-based efforts are underway globally, including by industry associations such as the EICC, to improve traceability and due diligence of the supply of minerals from the DRC. These have the potential to affect Hardware companies and their suppliers, including providing incentives and resources for leadership in supply chain management.\textsuperscript{74} Companies are also motivated to improve scrutiny and manage the social impacts of their supply chains due to potential impacts on their brand value from consumer and NGO campaigns.\textsuperscript{75}

In the U.S., the SEC estimates that costs to comply with the Conflict Minerals provision of the Dodd-Frank Act will include a total of $3 to $4 billion in the first year and at least $200 million each year afterward. Other estimates suggest compliance costs may be as high as $16 billion.\textsuperscript{76} However, the SEC expects that non-reporting companies that are part of reporting companies’ supply chains will bear much of the cost of the final rule.\textsuperscript{77} The new disclosure rule was expected to affect approximately 6,000 issuers and their 275,000 suppliers; the technology Hardware industry was expected to be one of four most heavily impacted industries.\textsuperscript{78}
Apart from regulatory costs, global input prices of 3TG have shown volatility, sometimes directly related to the conflict in the DRC. A 31 percent increase in tin prices in 2008 coincided with a rebel offensive against the DRC’s primary tin trading center. The DRC also leads in the global production of tantalum, with various estimates suggesting it is responsible for 8 to 20 percent of global production. Due to supply constraints and rising demand, the price of tantalum increased from $110 in 2011 to nearly $300 in 2012.

Some companies have taken a leadership role in mitigating such risks. In April 2013, HP became the first Hardware company to publish its supply chain smelter list and to have the smelter identification process independently reviewed. Under the “Solutions for Hope” Project, Motorola demonstrated a pilot project where it effectively shortened its supply chain for tantalum, still sourcing from the DRC, but ensuring that the mineral sourced was “conflict-free.”

Nonetheless, new sources of minerals and related conflict require companies to continue to be vigilant in their supply chain management beyond the DRC, particularly as they look to diversify their supply chain and sourcing of minerals. Reports suggest that some Hardware companies purchase parts from a company whose supplier imports tungsten ore from Colombia, where tungsten extraction is said to supply cash to the Colombian FARC rebels. Similarly, concentration of rare earth minerals in particular geographies could pose problems to Hardware companies due to political or social unrest, climate change impacts, or other environmental and social factors; for example, 90 percent of all rare earth minerals used in the manufacture of Apple’s iPhone 5 (including circuitry, screen, speakers, and glass cover) are mined in China and Inner Mongolia. Half of the global reserves of lithium, a rare material used by the industry, is found in Bolivia alone. Furthermore, the British Geological Survey estimates that China is the top producer of 27 out of 52 critical minerals and metals.

Highlighting the supply chain risk of rare earth minerals, China restricted the export of rare earth elements in 2010 supposedly due to environmental concerns; this led to a five-fold increase in the price of such materials for international markets while Chinese companies were able to obtain the same materials at lower cost. Recent Yale University research shows that out of 62 metals or metalloids commonly used in technology hardware, none had alternatives that performed equally well, whereas 12 had no alternatives at all. Such geographic concentration, low substitution possibilities, and social and environmental impacts of rare earth and conflict minerals can constrain supplies of raw materials for manufacture of hardware products and create input price volatility, potentially affecting Hardware company operations materially. A 2011 survey conducted by PricewaterhouseCoopers target-

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VI Smelting is a process where heat is used to extract key metals, some of them tagged as “conflict” metals, for use in electronics manufacturing.

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ed 69 senior executives from different sectors, and found that 78 percent of respondents in the high tech sector perceived minerals and metal scarcity as a pressing issue for their company. 67 percent thought that their company would experience an unstable supply of these inputs within the next five years. Interestingly, only 33 percent of respondents indicated that their company was well prepared to mitigate this impact.88

Some shareholders are pressing Hardware companies to provide more disclosure on their supply chains and to ask suppliers to produce sustainability reports. The New York City pension funds were successful in negotiating withdrawals with Apple, Cisco, Hewlett-Packard and Dell, among Hardware companies; the companies agreed to ask their suppliers for sustainability reports. (Note however, that less than seven percent of votes supported a similar shareholder resolution at Motorola Solutions.)89

In the Risk Factors section of its FY 2012 Form 10-K, Apple states “Outsourcing partners in Asia perform final assembly of substantially all of the Company’s hardware products. Manufacturing or logistics in these locations or transit to final destinations may be disrupted for a variety of reasons including, but not limited to, natural and man-made disasters, information technology system failures, military actions or economic, business, labor, environmental, public health, or political issues.” Such reporting by Hardware companies highlights risks to their operations from disruptions to the supply chain associated with social and environmental factors.

Value Impact

Failure to effectively manage the supply chain and sourcing of key materials has the potential to result in price increases of key inputs, damage to brand value, and lost revenue due to disruptions in production. Companies can also face significant regulatory compliance costs related to their sourcing of conflict minerals. Hardware companies could also face higher costs with increasing demands for higher wages and fair working conditions at supplier facilities, if these costs are passed on to them. Lower labor standards in the supply chain can result in worker demands for higher wages and fair working conditions, leading to higher operating expenses and long-term increases in the cost structure and profitability. It can also lead to reputational damage and disruption in production with significant impact on brand value. Lastly, lower labor standards and scarcity or unavailability of key materials can increase the risk profile of companies and lead to higher cost of capital.
APPENDIX I: Five Representative Companies | Hardware

<table>
<thead>
<tr>
<th>COMPANY NAME (TICKER SYMBOL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple Inc. (AAPL)</td>
</tr>
<tr>
<td>Hewlett-Packard (HPQ)</td>
</tr>
<tr>
<td>Sony Corp-ADR (SNE)</td>
</tr>
<tr>
<td>Cisco Systems (CSCO)</td>
</tr>
<tr>
<td>Western Digital (WDC)</td>
</tr>
</tbody>
</table>

This list includes five companies representative of the Hardware industry and its activities. This includes only companies for which the Hardware industry is the primary industry, companies that are U.S.-listed but are not primarily traded Over-the-Counter, and for which at least 20 percent of revenue is generated by activities in this industry, according to the latest information available on Bloomberg Professional Services. Retrieved on 3 February 2014.
**APPENDIX IIA:**  
Evidence for Material Sustainability Issues

<table>
<thead>
<tr>
<th>Product security</th>
<th>IWGs</th>
<th>HM (1-100)</th>
<th>EVIDENCE OF INTEREST</th>
<th>EVIDENCE OF FINANCIAL IMPACT</th>
<th>FORWARD-LOOKING IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>%</td>
<td>Revenue / Cost</td>
<td>Asset / Liabilities</td>
<td>Cost of Capital</td>
</tr>
<tr>
<td>Product security</td>
<td>90</td>
<td>80</td>
<td>High</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Employee inclusion</td>
<td>45</td>
<td>90</td>
<td>Medium</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Product lifecycle management</td>
<td>95</td>
<td>85</td>
<td>High</td>
<td>•</td>
<td>Medium</td>
</tr>
<tr>
<td>Supply chain management &amp; materials sourcing</td>
<td>73</td>
<td>100</td>
<td>High</td>
<td>•</td>
<td>High</td>
</tr>
</tbody>
</table>

**HM:** Heat Map, a score out of 100 indicating the relative importance of the issue among SASB’s initial list of 43 generic sustainability issues. The score is based on the frequency of relevant keywords in documents (i.e., 10-Ks, shareholder resolutions, legal news, news articles, and corporate sustainability reports) that are available on the Bloomberg terminal for the industry’s publicly listed companies.

**IWGs:** SASB Industry Working Groups

**%:** The percentage of IWG participants that found the issue to be material. (-) denotes that the issue was added after the IWG was convened.

**Priority:** Average ranking of the issue in terms of importance. One denotes the most material issue. N/A denotes that the issue was added after the IWG was convened.

**EI:** Evidence of Interest, a subjective assessment based on quantitative and qualitative findings.

**EFI:** Evidence of Financial Impact, a subjective assessment based on quantitative and qualitative findings.

**FLI:** Forward Looking Impact, a subjective assessment on the presence of a material forward-looking impact.
## APPENDIX IIB:
Evidence of Financial Impact for Material Sustainability Issues

<table>
<thead>
<tr>
<th></th>
<th>Revenue</th>
<th>Operating Expenses</th>
<th>Non-operating Expenses</th>
<th>Assets</th>
<th>Liabilities</th>
<th>Cost of Capital</th>
<th>Industry Divestment Risk</th>
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</thead>
<tbody>
<tr>
<td>Market Share</td>
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<tr>
<td>Pricing Power</td>
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<td>COGS</td>
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<tr>
<td>R&amp;D</td>
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<td>CapEx</td>
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<tr>
<td>Extra-ordinary Expenses</td>
<td></td>
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<td></td>
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<tr>
<td>Tangible Assets</td>
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<tr>
<td>Intangible Assets</td>
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<tr>
<td>Contingent Liabilities &amp; Provisions</td>
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<tr>
<td>Pension &amp; Other Liabilities</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>HIGH IMPACT</th>
<th>MEDIUM IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product security</td>
<td></td>
<td></td>
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<tr>
<td>Employee inclusion</td>
<td></td>
<td></td>
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<tr>
<td>Product lifecycle</td>
<td></td>
<td></td>
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<tr>
<td>management</td>
<td></td>
<td></td>
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<tr>
<td>Supply chain</td>
<td></td>
<td></td>
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<tr>
<td>management &amp; materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sourcing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX III: Sustainability Accounting Metrics | Hardware

<table>
<thead>
<tr>
<th>TOPIC</th>
<th>ACCOUNTING METRIC</th>
<th>CATEGORY</th>
<th>UNIT OF MEASURE</th>
<th>CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Security</td>
<td>Discussion of approach to identifying and addressing data security risks to new and existing products</td>
<td>Discussion and Analysis</td>
<td>n/a</td>
<td>TC0103-01</td>
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<tr>
<td>Employee Inclusion</td>
<td>Percentage of gender and racial/ethnic group representation for: (1) executives and (2) all others</td>
<td>Quantitative</td>
<td>Percentage (%)</td>
<td>TC0103-02</td>
</tr>
<tr>
<td>Product Lifecycle Management</td>
<td>Percentage of products by revenue that contain IEC 62474 declarable substancesVIII</td>
<td>Quantitative</td>
<td>Percentage (%) by revenue ($)</td>
<td>TC0103-03</td>
</tr>
<tr>
<td></td>
<td>Percentage of eligible products by revenue meeting the requirements for EPEAT® certification or equivalentIX</td>
<td>Quantitative</td>
<td>Percentage (%) by revenue ($)</td>
<td>TC0103-04</td>
</tr>
<tr>
<td></td>
<td>Percentage of eligible products by revenue meeting ENERGY STAR® criteria</td>
<td>Quantitative</td>
<td>Percentage (%) by revenue ($)</td>
<td>TC0103-05</td>
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<tr>
<td></td>
<td>Weight of products and e-waste recovered through take-back programs, percentage of recovered materials that are recycled</td>
<td>Quantitative</td>
<td>Tons (t)</td>
<td>TC0103-06</td>
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<tr>
<td>Supply Chain Management &amp; Materials Sourcing</td>
<td>Percentage of products by revenue that contain critical materials</td>
<td>Quantitative</td>
<td>Percentage (%) by revenue ($)</td>
<td>TC0103-07</td>
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<tr>
<td></td>
<td>Percentage of tungsten, tin, tantalum, and gold smelters within the supply chain that are verified conflict-free</td>
<td>Quantitative</td>
<td>Percentage (%)</td>
<td>TC0103-08</td>
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<tr>
<td></td>
<td>Discussion of the management of risks associate with the use of critical materials and conflict minerals</td>
<td>Discussion and Analysis</td>
<td>n/a</td>
<td>TC0103-09</td>
</tr>
<tr>
<td></td>
<td>Percentage of suppliers audited in the EICC Validated Audit Process (VAP) or to an equivalent social and environmental responsibility code of conduct</td>
<td>Quantitative</td>
<td>Percentage (%) of facilities</td>
<td>TC0103-10</td>
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<tr>
<td></td>
<td>Suppliers’ social and environmental responsibility audit compliance: (1) priority non-conformance rate and associated corrective action rate, and (2) other non-conformances rate and associated corrective action rate</td>
<td>Quantitative</td>
<td>Rate in number per facility</td>
<td>TC0103-11</td>
</tr>
</tbody>
</table>

VIII Note to TC0103-03 – Disclosure shall include a discussion of the approach to managing the use of IEC 62474 declarable substances.

IX Note to TC0103-04 – Disclosure shall include a discussion of efforts to incorporate environmentally focused principles into product design.
APPENDIX IV: Analysis of 10-K Disclosures | Hardware

The following graph demonstrates an aggregate assessment of how the top ten U.S. domiciled companies, by revenue, in the Hardware industry are currently reporting on material sustainability issues in the Form 10-K.

**DISCLOSURE ON MATERIAL SUSTAINABILITY ISSUES**

<table>
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<tr>
<th>Hardware</th>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product security</td>
<td></td>
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<td></td>
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<td>Employee inclusion</td>
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<td></td>
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<td>90%</td>
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<tr>
<td>Product lifecycle management</td>
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<tr>
<td>Supply chain management &amp; materials sourcing</td>
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<td></td>
<td></td>
<td>100%</td>
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</tbody>
</table>

IWG Feedback*

*Percentage of IWG participants that agreed issue was material
References


6 SASB calculation for NAICS codes 3341, 3342, and 3343 based on data from the “Annual Survey of Manufactures: General Statistics: Statistics for Industry Groups and Industries: 2011 (REFRESH),” U.S. Census Bureau, Release Date 17 December 2013. Specifically, calculation uses data on “Materials, parts, containers, packaging, etc. used ($1,000)” and “Total value of shipments ($1000).”

7 Ratios obtained from Bloomberg Professional service for FY 2012, on 13 February 2014.

8 Data obtained from Bloomberg Professional service for FY 2012, on 12 March 2014.


23 “Focus Area: Environmental Sustainability Multiplying impact on the bottom line through sustainable solutions.” Web <http://www.csr.cisco.com/pages/environment/}


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33 ESG data on % women on board obtained from Bloomberg Professional service, Bloomberg Industries, 3 May 2013.


References (Cont.)


75 Ibid. Page 17.


References (Cont.)


87 “Rare material shortages could put gadgets at risk,” BBC News, 6 December 2013.

