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ELECTRONIC MANUFACTURING SERVICES & ORIGINAL DESIGN MANUFACTURING
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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With increasing global resource scarcity and concerns about climate change, and impacts of pollution on human health and the environment, hardware companies are focusing on addressing the externalities of their product lifecycles, creating pressures for EMS & ODM companies to minimize the impacts of their own operations. Management (or mismanagement) of material sustainability issues has the potential to affect the valuation of EMS & ODM companies through impacts on profits, assets, liabilities, and cost of capital.

EMS & ODM 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 EMS & ODM industry:

- Reducing water use and waste generation in manufacturing while ensuring proper waste management;
- Ensuring fair working conditions and wages, protecting worker health and safety, and eliminating child labor and other harmful labor practices;
- 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.

INDUSTRY SUMMARY

The electronic manufacturing services & original design manufacturing industry comprises two primary segments. Electronic manufacturing services (EMS) provide assembly, logistics, and after-market services for original equipment manufacturers (OEM). The original design manufacturing (ODM) portion of the industry provides engineering and design services for OEM, and may own significant intellectual property. ODM companies may sell products under their own brand name, in addition to products marketed under the OEM brand. Some companies in the EMS & ODM industry also distribute technology hardware, software, or other services, although revenues from this segment are small. Global revenues of EMS & ODM companies amounted to just over $460 billion according to the latest annual data\(^1\) and average 2012 operating margin for the major industry players ranged from 2.3 percent to 4.5 percent (compared to a NASDAQ industrial index benchmark of 8.8 percent for the same year).\(^2,1\)

As suppliers to hardware companies, EMS & ODM companies are exposed to fluctuations in corporate profits across the economy. In recent years, there has been a shift in the Hardware industry from corporate sales and desktops to consumers, retail channels, and portable devices. Thus, consumer confidence and spending on hardware devices have become significant value drivers for this industry. Top global markets based on technology spending (in U.S. dollars) include the U.S., China, Japan, U.K., and Germany, with the majority of growth in EMS & ODM revenues coming from Asia in recent years.\(^6\)

With trends in consumer behavior shifting spending priorities away from Personal Computers (PCs) towards smartphones and tablets, ‘consumer devices’ is the fastest-growing segment for EMS firms, and accounted for 42 percent of total EMS revenues in 2012.\(^7\) Increasing demand for data storage and cloud computing has also contributed to growth in the EMS & ODM industry.\(^8\)

The EMS & ODM industry relies heavily on low-cost and contract labor, with a high concentration of manufacturing facilities located in China and other parts of Asia. In fact, major global

\(^1\) A list of five representative companies appears in Appendix I.
Electronic manufacturing companies are beginning to seek manufacturing locations outside of China, due to increasing wages, competition, and changing demographics in China’s traditional manufacturing hubs. The industry’s ability to manage labor costs and the challenges associated with production activities located in emerging economies (e.g., labor conditions, IP protection) is critical to profitability.\(^9\)

Due to the nature of their activities, accounts receivable and inventories account for the majority of current assets of EMS & ODM companies, whereas property, plant, and equipment (PPE) account for most of the long-term assets of such firms. Additionally, accounts payable make up the majority of current liabilities.\(^12\) Therefore, impacts on inventory turnover and PPE due to environmental or social risks or opportunities could have a material impact on value.

The EMS & ODM industry continues to adapt to the needs of clients, primarily the Hardware industry. In addition to new technologies, companies in this industry must demonstrate the ability to respond to current and emerging sustainability issues. Specifically, the industry faces risks and opportunities associated with environmental and human capital. The ability to manage these forms of capital, which increasingly contribute to market value, will allow EMS & ODM companies to protect and enhance shareholder value. These issues will emphasize further innovative business models, and strong leadership and governance.

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**LEGISLATIVE AND REGULATORY TRENDS IN THE EMS & ODM INDUSTRY**

EMS & ODM companies that provide manufacturing and other services to OEMs are affected by the evolving legislative and regulatory environment surrounding the Hardware industry, particularly related to product lifecycle impacts and supply chain management. Legislation relating to material inputs, electronic waste (e-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 affecting the EMS & ODM industry.\(^9\)

Due to the direct impact of various Environmental, Health and Safety (EHS) laws in different countries on the Hardware industry, EMS & ODM companies are likely to face related demand pressures for their products and services. Furthermore, it is becoming increasingly material for EMS & ODM companies to take action on the environmental performance of their manufacturing and assembly operations as governments in manufacturing hubs like

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\(^9\) 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.
China and Taiwan are introducing more stringent laws and regulations, particularly related to water pollution. Companies operating in the U.S. face regulations such as the Clean Air Act and Clean Water Act that can affect value.

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), 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 with safer alternatives. REACH is not specific to the electronics industry, but it relates to the Registration, Evaluation, Authorization and Restriction of Chemical substances, potentially affecting EMS & ODM industry products. Similar laws restricting hazardous substances in products and governing e-waste have been implemented in China, Korea and other countries where EMS & ODM and Hardware industry 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. 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. Lastly, the EPA is partnering with the industry on lead-free soldering, as part of its Design for Environment Program.

Concern over 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. Currently almost half of all U.S. states have laws in place relating to the proper disposal of e-waste. In addition, legislation related to product energy-efficiency, such as the E.U.’s Ecodesign Directive for energy-related products, which covers enterprise servers and data storage products under a priority list, could affect EMS & ODM company sales in the E.U. Voluntary programs like ENERGY STAR of the U.S. EPA are also setting standards and driving demand for energy-efficient computing products.

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 expo-
sure must subsequently determine and report on the specific source. 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.

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.

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 environmental 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.

Broad industry trends are driving the importance of sustainability performance in the EMS & ODM industry:

- **Hardware industry supply chain**: There is increasing consumer and regulatory pressure on hardware companies, the EMS & ODM industry's main customers, to improve environmental and social performance across their supply chain. This is the major driver of sustainability risks and opportunities for the EMS & ODM industry, as Hardware companies have significant bargaining power, particularly over EMS companies.

- **Complex production processes**: The manufacturing and assembly of computer and electronics products, and components involves the use of specialized chemicals and production technologies that are inherently different from manufacturing processes of other products. Many of the chemicals used are hazardous to human health and the environment, creating significant negative environmental externalities subject to increasingly stringent environmental laws.

- **Use of low-cost labor**: Facing pressures to compete on low margins, companies inclined toward compromised labor practices to lower their costs in the short-term are likely to face remediation costs from corrective actions requested by their customers, the Hardware companies, which face reputational risks related to using such suppliers.

- **Materials dependency**: EMS & ODM companies depend on rare earth minerals or minerals commonly found in regions of conflict for manufacturing various components. This has the potential to create global supply chain risks or impact demand for their products.

- **Product lifecycle innovation**: Rapidly
increasing use of hardware products in the economy exacerbates the impacts of raw material inputs, use, and end-of-life of hardware products, which use significant mineral, metal, and petroleum-based resources and produce externalities throughout their lifecycle. Perhaps most importantly, the EMS & ODM industry and, in essence, the entire Technology and Communications sector, is well positioned to drive innovations that help solve some of the most acute environmental and social challenges.

As hardware companies start demanding better environmental and social performance from their supply chain, sustainable management of energy, waste, and water, as well as appropriate human capital management systems, will be crucial for the industry. Furthermore, 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 EMS & ODM 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.

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.

As manufacturers, EMS & ODM companies rely heavily on environmental capital. Specifically, these firms utilize water and other resources, while producing significant externalities in the form of pollution and waste. Companies that are able to reduce costs and manage risks associated with environmental capital will be well positioned to protect shareholder value.

Water & Waste Management in Manufacturing

The manufacturing of computers, computer components, and other electronics requires significant volumes of water and chemicals and generates air and water emissions and solid waste, including hazardous substances.

Water is becoming a scarce resource around the world, due to increasing consumption from
population growth and rapid urbanization, and reduced supplies due to climate change. Furthermore, water pollution in developing countries makes available water supplies unusable or expensive to treat. Based on recent trends, it is estimated that by 2025 important river basins in the U.S., Mexico, Western Europe, China, India and Africa will face severe water problems as demand overtakes renewable supplies. Many important river basins can already be considered “stressed.” Water scarcity can result in higher supply costs, supply disruptions, and social tensions, which companies across different industries, particularly water-intensive ones, will need to contend with.23

EMS & ODM manufacturing facilities, depending on their location, may be exposed to the risk of reduced water availability due to the factors discussed above, and related cost increases. Extraction of water from sensitive areas for the purposes of manufacturing, or contamination of such water by EMS & ODM operations may also create tensions with local communities, for example, if they are deprived of drinking water, possibly inviting government intervention.

As state, federal and foreign environmental laws place increasing emphasis on resource conservation and waste management, EMS & ODM companies that are able to reduce waste produced and water used during manufacturing and ensure waste that is generated is reused, recycled or disposed of appropriately will face lower regulatory risks and could benefit from cost savings.

Evidence

Limited up-to-date data exists about the extent of water use and waste generation from electronics manufacturing, particularly in emerging markets, where many of the EMS & ODM manufacturing operations are located. However, based on available data, the significant volumes of water needed for manufacturing electronics and the increasing water scarcity in such regions indicate the materiality of this issue for EMS & ODM companies. Furthermore, several instances of violations of water pollution limits have invited scrutiny by hardware company customers and government agencies as environmental laws around the world become more stringent.

A study comparing materials use and waste generation for different segments of the electronics manufacturing industry uses data prior to 2002 and shows that 780 liters of water per desktop system were used for producing printed circuit boards (PCB). Liquid-Crystal Display (LCD) production at the time consumed 1,290 liters of water per monitor. (For comparison with the Semiconductors industry, corresponding amounts for chip manufacturing were 310 liters per computer). Global water use for PCB production in 1995 was estimated at 241 billion liters. PCB manufacturing also resulted in significant volumes of waste acids, alkali, sludges, and waste plastic, according to the study. Waste acids in particular were significant, at 1.63 million metric tons generated globally from PCB manufacturing in 1995. Large volumes of metals, copper, chromium etc., used in electronics manufacturing need to be managed to avoid affecting public waste-
water treatment facilities. While the industry is likely to have made progress in improving environmental efficiencies in manufacturing since then, the increasing complexity of electronics products poses continued challenges to reducing water use and waste during the manufacturing phase.

In China, a global hub for electronics manufacturing, total water demand is expected to increase by approximately 16 percent by 2030, with industrial demand driving a substantial portion of the increase. Direct costs associated with water scarcity are estimated at 1.3 percent of China’s GDP, and those associated with pollution an additional one percent. While China has detailed guidelines for acceptable standards for industrial water emissions, requiring manufacturers to obtain permits and approvals, local level implementation has thus far been weak. However, global Hardware companies face increasing reputational risks from dealing with suppliers that have a poor record on waste and water management practices, and are focusing their supply chain management efforts on EMS & ODM companies violating environmental laws or supplier codes of conduct.

A report by BSR analyzing the wastewater management performance of China-based suppliers to member companies of the Electronic Industry Citizenship Coalition (EICC) finds that approximately five percent of the sample of suppliers (33 out of 640) was associated with violations related to water pollution, the majority of these being in provinces where electronics manufacturers are concentrated. The study also finds that more than 20 percent of these suppliers were linked to multiple violations.

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 of poor waste management practices to EMS & ODM companies, particularly as regulatory scrutiny of waste, air and water pollution increases in emerging markets.

Manufacturing hubs like Taiwan are introducing stringent environmental regulations. For example, the Taiwan Environmental Protection Administration is committing to increase inspection of plants and impose greater fines following a revision to the Water Pollution Control Act in 2011, which requires the suspension of operations found to be violating effluent discharge rules. Revised regulations require operators to install automatic monitoring equipment in their sewer systems and continuously transmit data electronically to local authorities. The Taiwan Water Pollution Control Act has been amended 10 times since its implementation in 1987. Industrial wastewater is monitored by “issuing permits, supervising operations, controlling emissions, and holding unscheduled inspections,” all implying potentially material costs and risks for EMS & ODM companies operating in the area.

In the U.S., data from the U.S. EPA’s 2005 Pollution Abatement Costs and Expenditures survey shows that the electronics hardware manufacturing industry accounted for about three percent of all U.S. manufacturing indus-

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8 SASB calculations include computer and peripheral equipment manufacturing (NAICS code 3341), communications equipment manufacturing (NAICS code 3342), audio and video equipment manufacturing (NAICS code 3343), and semiconductor and other electronic component manufacturing (NAICS code 3344) excluding semiconductor machinery and semiconductor and related device manufacturing (NAICS codes 333295 and 334413) respectively.
tries’ pollution-related permits and fees and about 1.2 percent of all costs related to site clean-up. The electronics hardware manufacturing industry spent about $280 million on pollution abatement operating costs, of which about 50 percent was spent on “Treatment” and only 12 percent each on “Prevention” or “Recycling.” Twenty-five percent of the abatement operating costs were related to disposal, indicating potential for ongoing cost savings from reducing waste and emissions during manufacturing, or increasing amounts recycled. The industry accounted for around 1.4 percent of the total $20.7 billion pollution abatement operating costs in all manufacturing industries in 2005 (but less than one percent of the total pollution abatement capital expenditures). Water pollution abatement was responsible for around 50 percent of both operating costs and capital expenditures, solid waste for 30 percent, with the remaining being related to air emissions.  

EMS & ODM companies generally acknowledge the materiality of water and waste management in their Form 10-Ks. In its fiscal year (FY) 2013 Form 10-K, Jabil Circuit highlights growing consumer concerns related to waste management, in addition to its clean technology investments. In its FY 2012 Form 10-K, CTS Corp. notes the importance of waste management beyond regulatory compliance requirements, saying, “because we are a generator of hazardous wastes, even if we fully comply with applicable environmental laws and requirements, we may be subject to financial exposure for costs, including costs of investigation and any remediation, associated with contaminated sites at which hazardous substances from our operations have been stored, treated or disposed of.” Some EMS & ODM companies also mention “water shortages” in the Risk Factors section of their 10-K filings.

Value Impact

Performance of EMS & ODM companies on waste management is becoming a factor in the supplier selection and review process for their Hardware company customers, with potentially direct impacts on revenue and growth prospects, and ultimately, market share. Compliance with waste management standards and regulations can increase operating costs and require additional capital expenditures. Small but frequent waste incidents can have a chronic impact on value while more substantial violations of environmental laws or standards can lead to large, contingent liabilities and higher costs of capital.

Use of large quantities of water in the manufacturing process has direct impacts on costs and profitability. More efficient use of water over time could generate cost savings, and lower operating expenses. Large water withdrawals in water-scarce regions create operational risks related to price and availability, potentially disrupting production, creating additional permitting requirements, and thereby affecting companies’ ability to meet demand. This could have an impact on long-term profitability and the risk profile of a company, and therefore its cost of capital.

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.
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. It also addresses the management of labor relations in industries that rely on economies of scale and compete on the price of products and services or in industries with legacy pension liabilities associated with vast workforces. Lastly, it includes the management of the health and safety of employees and the ability to create a safety culture for companies that operate in dangerous working environments.

Companies in the EMS & ODM industry face significant challenges in this area due to the importance of lower costs and meeting demand in time, along with rising labor costs in some emerging economies. Greater pressure from customers to ensure fair working conditions and compliance with labor standards also contribute to these challenges.

Fair Labor Practices

EMS & ODM companies operate in a highly competitive environment based on cost and therefore they rely heavily on securing low cost and contract labor. Additionally, they may be required to meet tight production deadlines for big-ticket product launches by Hardware companies. These factors can create conditions for laxity in labor practices. However, the industry faces increased scrutiny from customers and government officials over labor standards after numerous highly publicized examples of poor working conditions and unrest at industry facilities. Apart from their internal management practices, the practices of labor agencies that EMS & ODM companies use to hire employees, both short- and long-term, could influence whether labor laws and customer supplier standards are being violated.

Hazardous materials used in the manufacturing process also raises concerns about worker health and safety.

Despite potential short-term cost challenges, EMS & ODM companies that are able to ensure fair working conditions and wages, protect worker health and safety, and eliminate the use of child or forced labor will be better positioned to retain customers with stricter supplier standards and limit regulatory liabilities.

Evidence

In 2010, a report by the National Labor Committee found illegal or unreasonable working conditions at Jabil Circuit’s factory in Guangzhou, China. The report indicated that 6,000 workers were affected by conditions that ranged from standing 12 hour shifts to poor housing accommodations. Similarly, in September 2012, a riot forced the closure of a Foxconn factory in Taiyuan, China disrupting Apple iPhone production. 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 latter occurred after employees were forced to work through a holiday week to meet demands by Apple to improve iPhone 5 quality. In the last seven years, 17 Foxconn employees have committed suicide. These were mostly attributed to poor working conditions. Following an audit of Apple suppliers’ facilities in China by the Fair Labor Association at Apple’s request, which highlighted some improvements, but other continued problems at Foxconn, the two companies created an action plan to address these problems. Approximately 99 percent of the action items had been completed by 2013.

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. According to the company, work weeks exceeding 60 hours have historically been standard practice among Hardware industry suppliers. Overall, it found only 77 percent of supplier practices in compliance with its Labor and Human Rights standards in 2012.

EMS & ODM companies found lacking in labor practices may be asked to make compensation payments to workers, which are likely to affect value. For example, Apple required suppliers to reimburse $6.4 million in excess foreign contractor fees in 2012, bringing the total repaid to workers to around $13 million since 2008. In cases of egregious violations, Hardware companies may terminate their relationships with EMS & ODM companies. For example, in 2012, Apple ended its relationship with a supplier of standard circuit board components after discovering 74 cases of underage workers. Apple found that one of the largest labor agencies in the region knowingly provided underage workers to the supplier, conspiring to forge documents. This highlights the importance to EMS & ODM companies of scrutinizing their own supply chains for fair labor practices, in addition to ensuring high standards in their own operations.

EMS & ODM companies also face regulatory risks related to their labor practices. 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.

EMS & ODM companies are reporting risks related to labor practices in their 10-K filings. For example, in its Form 10-K for 2013, Jabil Circuit notes, “Our international operations are, have been and may be subject to a number of risks, including: …increased scrutiny by the media and other third parties of labor practices within our industry…which may result in allegations of violations, more stringent and burdensome labor laws and regulations, increased strictness and inconsistency in the enforcement and interpretation of such laws and regulations, higher labor costs, and/or loss of revenues if our customers become dissatisfied with our labor practices and diminish or terminate their relationship with us…”

Some processes in electronics manufacturing, such as electro-less copper plating for PCB manufacturing, require hazardous chemicals such as formaldehyde that can pose worker
A number of worker health impacts from the use of such chemicals, including cancer, reproductive disorders, and lung disease have been identified in electronics manufacturing facilities in China, Korea, Malaysia etc. Musculoskeletal problems from repetitive motion have also been identified at such facilities. While there is no uniform standard for protecting workers in the global electronics industry, supplier codes of conduct from Hardware companies generally include protection of worker health, safety, and well-being, with similar repercussions for non-compliance as those discussed above.

These standards may be more stringent than local health and safety laws. For example, Sony’s Supplier Code of Conduct for health and safety is based on recognized management systems such as OHSAS 18001 and ILO Guidelines on Occupational Safety and Health. In its supplier audits, Hewlett-Packard (HP) found a 45 percent rate of major non-conformance with the EICC code of conduct for industrial hygiene in Greater China in 2012. HP plans to increase surveillance events for worker health and safety in the region.

Discussing social responsibility on its website, Flextronics states, “We have invested millions of dollars to upgrade dormitories, cafeterias and safety standards across our facilities in China to provide employees with more conducive work and living environments.” This highlights the significant cost to EMS & ODM companies of upgrading facilities to ensure fair working conditions for their employees.

In its Form 10-K for FY 2013, Plexus Corp. notes the risks to its operations from such scrutiny and standards, “Our commitment to social responsibility extends to […] labor practices, the environment, worker health and safety, fair operating practices […].” It goes on to discuss in the Risk Factors section, “We are subject to extensive government regulation and industry standards […], including regulations and standards relating to labor and employment practices, workplace health and safety.” Referring to customer standards on overseas labor, the company states that these may require it to comply with standards to which it would not otherwise be subject, and the company’s compliance with standards and third party certification requirements could be costly, with the potential to affect operations, customer relationships, reputation, and profitability.

**Value Impact**

Recurring concerns about labor practices can lead to loss of customers and affect reputation, lowering revenues in the long-term. Disruptions to production due to labor unrest could affect profits due to cost increases, or production shortfalls. In addition, companies that have historically relied on below-market wages could face higher costs as workers demand higher compensation. EMS & ODM companies may also incur extraordinary expenses and contingent liabilities associated with regulatory action or demands for corrective actions from customers.

**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 resource efficiency and other 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.

EMS & ODM firms engaged in design, engineering and after-market services have a significant opportunity to develop products that meet client demands while also addressing regulatory and consumer concerns about material inputs, product energy efficiency, GHG emissions, and end-of-life management.

Product Lifecycle Management

EMS & ODM and 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. For EMS & ODM companies, addressing product lifecycle concerns 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. While EMS & ODM companies may be directly affected by some of these regulations, they are primarily affected indirectly through changes in customer demand and supplier standards.

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; these 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).

Furthermore, 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 end-users.
Customers of EMS & ODM companies – the Hardware companies – are increasingly focusing on product lifecycle management, including the design of more energy-efficient products, reducing or replacing harmful materials, and putting in place end-of-life management practices such as product take-back programs and recycling. Leading EMS & ODM companies are beginning to leverage such demand drivers to develop innovative solutions to lifecycle management issues. EMS & ODM companies that comply with existing regulations and enable their customers to do so, while working in advance of future regulations concerning product design and lifecycle management will be better positioned to protect shareholder value.

**Evidence**

Extensive regulation in Europe and other markets (see Legislative and Regulatory Trends section) concerning the use of chemicals in electronics devices and the disposal of e-waste demonstrates the likely material impact on the EMS & ODM and Hardware industries of product lifecycle management.

The role of the EMS & ODM industry in product design is critical to mitigate some of the concerns. 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. As several of the EMS & ODM industry’s clients in the Hardware industry have identified product design and lifecycle issues as high priority or material (see SASB standards for the Hardware industry), and face direct risks associated with regulations such as RoHS and WEEE, demand is increasing for EMS & ODM companies to design for reducing or eliminating toxic materials in products, and provide after-market services for product recycling and refurbishment. EMS & ODM companies at the forefront of such design and end-of-life innovations are likely to gain market share relative to peers. In addition, some companies in the industry may be directly affected by e-waste or other laws if they sell products under their own brand name.

A study estimates that total weighted average cost (weighted by revenue) for electronics industry players (including EMS & ODM companies) for initial RoHS compliance was almost $6 million, with annual maintenance costs at around $1.5 million. According to the study, EMS service providers had to dedicate most personnel to update business processes and systems, while component manufacturers spent resources on reviewing bills of materials, and product redesign. All types of electronics industry companies (OEM, EMS, and ODM) shared the burden of additional R&D needed to ensure compliance. A majority of companies reported an increase in inventory levels, with an average increase of 21 percent, while an average of $700,000 of reported value of inventory was scrapped or written down.

However, some companies gained from the legislation, with 15 percent overall reporting an increase in market share, and EMS companies gaining particular advantages. Half of them reported a gain in market share as a result of RoHS; other advantages included improved supply chain processes and rationalization of product lines. 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 their Form 10-Ks, EMS & ODM companies recognize the materiality of enabling their customers to comply with various European, Chinese and other regulations concerning product lifecycle management, and of ensuring that they comply with such regulations when they apply to them. In its FY 2013 Form 10-K, Jabil Circuit highlights that it could incur significant expenses related to compliance or non-compliance with product stewardship and producer responsibility laws or regulations, including those requiring “design changes, supply chain investigation or conformity assessments or those relating to the recycling or reuse of products” they manufacture.

In its FY 2012 Form 10-K, Benchmark notes, “Through our Component Engineering Services, we are helping our customers deal with the changing international environmental laws or regulations on content, packaging, labeling of their products or similar issues concerning the environmental impact of their products” and references Europe’s RoHS, REACH, and WEEE, and Chinese laws. On its website, the company notes that it has invested in an extensive R&D program for product assembly using materials compliant with RoHS and WEEE.47

Regarding where the responsibility of e-waste laws lies, Flextronics discusses in its annual report that although WEEE places compliance responsibility primarily with importers into or producers in the E.U., rather than EMS companies, customers may seek services of EMS companies that can enable them to comply with the regulations. Flextronics states that discussions on e-waste classifications could affect the company and its customers through impacts on repair and refurbishment capability and obligations.48

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 obsolescent. 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,49 indicating significant potential for improvements in reuse and recycling, particularly as many components are still usable.

Leading and innovative companies in the industry are tackling this challenge by providing services to extend the useful life of products and reduce obsolescence. For example, in its FY 2013 Form 10-K, Plexus outlines several “sustaining” solutions it offers to customers, such as engineering solutions to extend the product lifecycle and mitigate obsolescence, component lifecycle analysis, refurbishment and upgrading of outdated products.

Besides protecting revenues and expanding market share from end-of-life management, EMS & ODM companies (or their customers) could also benefit from cost savings and risk mitigation from critical materials recovery. 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 mining
reserves. Metals like gold and copper account for over 70 percent of the residual value of computers. These opportunities provide EMS & ODM companies 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).

Another major impact of EMS & ODM company products lies in their energy consumption during use by customers of Hardware companies. While end-user actions influence how much energy is consumed, product design 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 consumed in the use phase accounts for a significant 38 percent of lifecycle energy in laptops, amounting to 1,868 to 3,113 MJ 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.

Increasing demand from Hardware companies for more energy-efficient components and devices, driven by consumer demand and legal requirements, could drive expanded market share for EMS & ODM companies providing such products. According to Apple, since 2008, it has reduced the average power consumed by its products by 40 percent, and all its products exceed the EPA’s ENERGY STAR guidelines. Apple achieves this through using more efficient power supplies, components requiring less power, and power management software.

In general, Hardware industry leaders are beginning to adopt a Design for Environment (DfE) approach in developing their products, driving demand for EMS & ODM products and services that lower product lifecycle impacts. In its Corporate Social Responsibility (CSR) report, Cisco notes that in 2013, approximately 96 percent of its newly released products incorporated DfE principles. This is driving leading EMS & ODM companies like Flextronics themselves to incorporate a DfE approach in their operations.

**Value Impact**

Increasing public concern over environmental issues is likely to drive demand towards hardware products with a lower environmental footprint. This is likely to affect revenue growth and competitiveness of EMS & ODM companies over the long-term. Legislation, standards and customer demand are likely to restrict their ability to capture new markets and customers without effective, long-term product lifecycle management initiatives and services. Companies may face significant increases in operating and capital expenditures through both direct and indirect impacts of product content and end-of-life regulations. On the other hand, product lifecycle management initiatives may create operational efficiencies such as product and supply chain optimization that reduce operating expenses of EMS & ODM companies.
either significantly in the short-term through major design or business model changes, or cumulatively over a period of time through continuous improvement, strengthening profit margins.

The dynamic regulatory environment around product lifecycle suggests that the probability and magnitude of these impacts are likely to increase in the future.

**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.

EMS & ODM companies rely on numerous materials as inputs to manufacture specialized products for clients in different sectors. The industry will, therefore, face material risks as certain minerals and metals essential to manufacturing become increasingly scarce or hard to obtain due to their concentration in certain geographic and political locations. The financial implications of supply chain management will also be articulated by the need to comply with regulations relating to conflict minerals (e.g. those mined in conditions of armed conflicts and human rights abuses). Firms must demonstrate strong leadership and governance to manage the risks associated with their supply chains.

**Supply Chain Management & Materials Sourcing**

EMS & ODM companies are exposed to risk of supply chain disruptions, input price increases, and regulatory compliance costs, particularly when rare earth or “conflict” minerals and metals are used in their products.

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), and supply chain management practices of Hardware companies. 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.
EMS & ODM companies with strong supply chain management and materials sourcing practices 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 contribute to lowering risks.

**Evidence**

Despite limited data quantifying and monetizing supply chain risks, several macro- and industry-level drivers suggest that this is a material issue for EMS & ODM companies. Several critical components in hardware products that EMS & ODM companies design or manufacture 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 under-
Customers of EMS & ODM companies are actively working to mitigate such risks, which is likely to put pressure on EMS & ODM companies to track their own sourcing of conflict minerals. For example, 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.\textsuperscript{63}

New sources of minerals and related conflict require companies to continue to be vigilant in their supply chain management, 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.\textsuperscript{64}

Several EMS & ODM companies report the likely material impacts of the Dodd-Frank Act and use of conflict minerals in their 10-K filings. In its Form 10-K for FY 2013, Jabil Circuit highlights risks from the Dodd-Frank legislation and ensuing customer pressure, stating, “Portions of the Dodd-Frank Act will require certain companies to conduct due diligence and make certain disclosures regarding the source of certain minerals contained in their products and these requirements may decrease the supply of such minerals, increase their cost and/or disrupt our supply chain if we decide, or are instructed by our customers, to obtain components from different suppliers.”

The risks are echoed by Plexus in its Form 10-K for FY 2013, which states, “Compliance with such requirements could increase costs and affect the manufacturing and sale of our products,” and Benchmark notes the failure to comply with such regulations in its Form 10-K for 2012, “Failure to comply with this new regulation could result in additional costs (including but not limited to, fines or penalties) as well as affect our reputation.”

Concentration of rare earth minerals in particular geographies could pose problems to EMS & ODM 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 various components of Apple’s iPhone 5 (including circuitry, screen, speakers, and glass cover) are mined in China and Inner Mongolia.\textsuperscript{65} 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.\textsuperscript{66,67}

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.\textsuperscript{68}

\textsuperscript{63} Smelting is a process where heat is used to extract key metals, some of them tagged as “conflict” metals, for use in electronics manufacturing.
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 EMS & ODM company operations materially. A 2011 survey conducted by PricewaterhouseCoopers targeted 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.69

**Value Impact**

Failure to effectively manage the supply chain has the potential to result in price increases or supply constraints of key inputs and lost revenue due to disruptions in production. Companies could face significant regulatory compliance costs or damaged relationships with customers and therefore lower revenues, related to their sourcing of conflict minerals.

The increasing scarcity or unavailability of certain key materials used by EMS & ODM companies increases their risk profile and can lead to a higher cost of capital. It also suggests that the probability and magnitude of these impacts will increase in the future.
APPENDIX I: Five Representative Companies | Electronic Manufacturing Services & Original Design Manufacturing

<table>
<thead>
<tr>
<th>COMPANY NAME (TICKER SYMBOL)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flextronics International (FLEX)</td>
<td></td>
</tr>
<tr>
<td>Jabil Circuit (JBL)</td>
<td></td>
</tr>
<tr>
<td>Anixter International (AXE)</td>
<td></td>
</tr>
<tr>
<td>Benchmark Electronics (BHE)</td>
<td></td>
</tr>
<tr>
<td>Plexus (PLXS)</td>
<td></td>
</tr>
</tbody>
</table>

VI This list includes five companies representative of the EMS & ODM industry and its activities. This includes only companies for which the EMS & ODM 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 23 January 2014.
## APPENDIX IIA:

### Evidence for Material Sustainability Issues

<table>
<thead>
<tr>
<th>EVIDENCE OF INTEREST</th>
<th>EVIDENCE OF FINANCIAL IMPACT</th>
<th>FORWARD-LOOKING IMPACT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HM (1-100)</strong></td>
<td><strong>Revenue / Cost</strong></td>
<td><strong>Probability/ Magnitude</strong></td>
</tr>
<tr>
<td><strong>IWGs</strong></td>
<td><strong>Asset/ Liabilities</strong></td>
<td><strong>Externals</strong></td>
</tr>
<tr>
<td><strong>%</strong></td>
<td><strong>Cost of Capital</strong></td>
<td><strong>FLI</strong></td>
</tr>
<tr>
<td><strong>Priority</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water &amp; waste</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>management in</td>
<td></td>
<td></td>
</tr>
<tr>
<td>manufacturing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>100</td>
<td>4</td>
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<tr>
<td>Fair labor practices</td>
<td>High</td>
<td>High</td>
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<tr>
<td>73</td>
<td>86</td>
<td>2</td>
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<tr>
<td>Product lifecycle</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>management</td>
<td></td>
<td></td>
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<tr>
<td>57</td>
<td>86</td>
<td>3</td>
</tr>
<tr>
<td>Supply chain</td>
<td>High</td>
<td>High</td>
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<tr>
<td>management &amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>materials sourcing</td>
<td></td>
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</tr>
<tr>
<td>28</td>
<td>100</td>
<td>1</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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<tbody>
<tr>
<td>Market Share</td>
<td></td>
<td></td>
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<tr>
<td>Pricing Power</td>
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<tr>
<td>COGS</td>
<td></td>
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<tr>
<td>R&amp;D</td>
<td></td>
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<tr>
<td>CapEx</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Extra-ordinary Expenses</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Tangible Assets</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Intangible Assets</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contingent Liabilities &amp; Provisions</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pension &amp; Other Liabilities</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

- Water & waste management in manufacturing
- Fair labor practices
- Product lifecycle management
- Supply chain management & materials sourcing

<table>
<thead>
<tr>
<th></th>
<th>HIGH IMPACT</th>
<th>MEDIUM IMPACT</th>
</tr>
</thead>
</table>
### APPENDIX III: Sustainability Accounting Metrics | Electronic Manufacturing Services & Original Design Manufacturing

<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>Water &amp; Waste Management in Manufacturing</td>
<td>Total water withdrawn, percentage recycled, percentage in regions with High or Extremely High Baseline Water Stress</td>
<td>Quantitative</td>
<td>Cubic meters (m³), Percentage (%)</td>
<td>TC0101-01</td>
</tr>
<tr>
<td></td>
<td>Amount of hazardous waste from manufacturing, percentage recycled</td>
<td>Quantitative</td>
<td>Tons (t), Percentage (%)</td>
<td>TC0101-02</td>
</tr>
<tr>
<td>Fair Labor Practices</td>
<td>(1) Total Recordable Injury Rate and (2) Near Miss Frequency Rate for (a) full time employees and (b) contract employees</td>
<td>Quantitative</td>
<td>Rate</td>
<td>TC0101-03</td>
</tr>
<tr>
<td></td>
<td>Number and total duration of work stoppages</td>
<td>Quantitative</td>
<td>Number, Worker days</td>
<td>TC0101-04</td>
</tr>
<tr>
<td></td>
<td>Percentage of (a) facilities and (b) suppliers facilities 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>TC0101-05</td>
</tr>
<tr>
<td></td>
<td>Social and environmental responsibility audit compliance for (a) registrant and (b) suppliers: (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>TC0101-06</td>
</tr>
<tr>
<td>Product Lifecycle Management</td>
<td>Percentage of products by revenue that contain IEC 62474 declarable substances</td>
<td>Quantitative</td>
<td>Percentage (%) by revenue ($)</td>
<td>TC0101-07</td>
</tr>
<tr>
<td></td>
<td>Percentage of eligible products by revenue meeting the requirements for EPEAT® certification or equivalent</td>
<td>Quantitative</td>
<td>Percentage (%) by revenue ($)</td>
<td>TC0101-08</td>
</tr>
<tr>
<td></td>
<td>Weight of end-of-life materials recovered, percentage of recovered materials that are recycled</td>
<td>Quantitative</td>
<td>Tons (t), Percentage (%)</td>
<td>TC0101-09</td>
</tr>
<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>TC0101-10</td>
</tr>
<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>TC0101-11</td>
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<tr>
<td></td>
<td>Discussion of the management of risks associated with the use of critical materials and conflict minerals</td>
<td>Discussion and Analysis</td>
<td>n/a</td>
<td>TC0101-12</td>
</tr>
</tbody>
</table>

**Note to TC0101-04** – Disclosure shall include a description of the reason for the work stoppage, the impact on production, and any corrective actions taken.

**Note to TC0101-07** – Disclosure shall include a discussion of the approach to managing the use of IEC 62474 declarable substances.

**Note to TC0101-08** – Disclosure shall include a discussion of efforts to incorporate environmentally focused principles into product design.
APPENDIX IV: Analysis of 10-K Disclosures | Electronic Manufacturing Services & Original Design Manufacturing

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

### DISCLOSURE ON MATERIAL SUSTAINABILITY ISSUES

<table>
<thead>
<tr>
<th>EMS / ODM</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>Water &amp; waste management in manufacturing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td>Fair labor practices</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>86%</td>
</tr>
<tr>
<td>Product lifecycle management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>86%</td>
</tr>
<tr>
<td>Supply chain management &amp; materials sourcing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

IWG Feedback*

<table>
<thead>
<tr>
<th>NO DISCLOSURE</th>
<th>BOILERPLATE</th>
<th>INDUSTRY-SPECIFIC</th>
<th>METRICS</th>
</tr>
</thead>
</table>

*Percentage of IWG participants that agreed issue was material
References

1 Data from Bloomberg Professional service accessed on February 13th 2014 using ICS <GO> command. The data represents global revenues of companies listed on global exchanges and traded over-the-counter (OTC) from the EMS & ODM industry, using the Levels 2 Bloomberg Industry Classification System.


6 According to 2012 global technology spending data and industry-specific data obtained from Bloomberg Professional Services (using BI EMSOG <GO> command) on 23 January 2014.


12 Based on Balance Sheet data for the representative companies listed in Appendix I. Obtained from Bloomberg Professional Services on 23 January 2014.


References (Cont.)

26 Ibid. Executive Summary.


37 Ibid.


46 Ibid.


References (Cont.)


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