Ecodesign of electronic devices

UNIT 3: Eco certificates and labels of electronic devices

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Chapter summary:

–Environmental policy background
–Certificates for electronic devices
–Ecolabels

3.1 Introduction

Management of electronic devices is traditionally related to directives and regulations which impose the manufacturers to pay more attention to the products and be responsible for them through the whole lifecycle. Lately, advocates of eco-friendly products are searching for new tools, approaches, and labels which are signaling ecological characteristics of products. Ecolabels and certificates inspire and encourage manufacturers to design production facilities and devices with reduced environmental effects.

3.2 Environmental Policy Background

Manufacturer's responsibility is a principle which highlights, encourages and demands the manufacturer to lead and manage whole product lifecycle. This approach enables clear insights into production and product use in the sense of low environmental effects.

The term environmental responsibility from the ecodesign perspective began in 1994 when the German government has introduced a law that required the manufacturers to acquire product packaging and use it for reuse or recycling. This approach was later adopted by the European Union which extended the responsibility policy to all manufacturing sectors, not only the packaging. This policy was introduced for electronic waste, batteries, automobiles, etc.

Environmental policy of European Union has spread to other countries including Japan, Korea, Canada and the United States of America which introduced environmental requirements for a broad array of products and materials.

3.3 Responsible products, the change motivators

The primary goal of the term responsible products is that the manufacturer also includes environmental effects in the development and production. With internalization and awareness about environmental effects the manufacturer undertakes the initiative of new approaches to product development or redesigns the existing products to be environmentally compliant. For example, if the manufacturers are responsible for collecting and recycling their products, they will tend to choose materials that can be easier reused or recycled since the designing phase. With a good strategy, this approach

in the long-term lowers production costs as there is less demand for supplying new resources.

The initiative is visible with manufacturers who themselves take care of recycling their products or products of other manufacturers. Despite clear evidence that responsible products encourage different developmental and design methods, their connections are still a subject of many debates.

Responsible products, their motivation, and encouragement to more advanced design approaches vary between manufacturers and their developmental program.

3.4. Extended product control with ecolabels and certificates

Restrictions related to the traditional product control question if the classical methods and policy instruments can assure that all responsible products aspects will be realized in the product lifecycle.

Standards, ecolabels and product certificates are precious comparing to the standard methods. These approaches define marketing advantages of ecological products as well as encourage innovation with the use of ecological and less toxic materials. Primarily, they tend to use health friendly and environmentally less hazardous substances. Ecological standards also stimulate the manufacturers to establish their own recycling programs and to take in their products after the end of lifecycle.

3.5. From environmental requirements to ecological standards

Environmental requirements and declarations which encourage environmental aspects of specific products were introduced in 1970. With the introduction of standards, certificates, and ecolabeling this area became more regulated, and it experienced an expansion of environmental products. The interests of environmental standards and labeling are subject to different factors. Larger organizations are increasingly focused on environmental attributes while designing selling and purchasing strategies. The manufacturers also want to often emphasize environmental awareness through their products because this brings certain advantages on the market.

The rise of ecological standards and certificates provide a market incentive for the manufacturers who give complete information on products' ecological compliance through certification procedures. Many new ecological standards have a flexible approach with different established criteria. They also enable the manufacturer to decide which criteria they want to emphasize in the product. For example, if the manufacturer decides that their new product will be focused on materials that can be recycled, then they will not be willing to completely fulfill criteria on energy efficiency.

Amongst all characteristics of the certification program is a consensus that is used for establishing standard. This approach leads to higher credibility, impartiality of the program and uses a measurable matrix for evaluating device. The trend to standardize products enables benefits to larger buyers as it offers harmonized purchasing criteria. This reduces the means used, at which the businesses and buyers have to use supply strategies and specification. Standards also support an aspiration of many governments to be the leaders of establishing ecological aspects at purchasing.

New trends in developing standards can be seen especially in cooperation between different stakeholders who support and introduce the ecological programs. This is a voluntarily managed approach which engages manufacturers as well as governmental institutions. This process encourages the manufacturers to preferably strengthen environmental products while gathering information and market demands after the specific products.

3.6. Product standards – Approach types

Product standards, certification, and ecolabeling cover a wide range of approaches. These include governmental programs, as well as standards, introduced by private organizations. For a better understanding of differences and different approaches to ecological evaluation, it is beneficial to consider the systematics of ecolabeling managed by the International Organization for Standardization ISO and standard series ISO 14020.

- Type I is a voluntary program. It is led by an independent group that allocates ecolabels by multiple criteria based program, the licenses within a certain product groups.

- Type II is a program based on the declared environmental requirements.

- Type III is a program that uses third person verification for evaluating quantitative databases for lifecycle evaluation, established by outer organization parameters.

3.6.1 LEED and the growth of certification systems

Label LEED stands for Leadership in Energy and Environmental Design. The growth of nongovernmental environmental standards and programs for product certification has significantly increased over the years. For example, the LEED organization, which has developed generally recognized design criteria for high energy efficient and environmentally friendly buildings. LEED certificate encourages the engineers for ecodesigning and reaching the norms, defined by LEED. This certification system has

helped increase inquiries on buildings that are ecological during use and were build with ecological approaches and materials.

3.6.2 EPEAT news standard generation

The efforts of different European and foreign countries have led to the new generation of environmental standards named EPEAT (Electronic Product Environmental Assessment Tool). EPEAT was inspired by other standards, especially from construction standards. Development of EPEAT started in 2002 when EPA invited stakeholders with the intention to promote ecologically suitable information technology – IT. Members of the group came from different sectors, such as manufacturing, recycling, purchasers of IT systems, governmental and nongovernmental representatives. In three years the EPEAT standard was developed.

EPEAT is ecological evaluation tool that is intended for large purchasers of desk computers, laptops and monitors. EPEAT present a growing trend of standardization, and it includes multiple environmental effects in one standard. This standard is not focused only on narrow criteria, such as energy consumption and recycling, but it covers broader aspects and ecological adequacies. EPEAT standard present a flexible approach. It requires consideration of 23 specific criteria and at the same time offers 28 optional criteria in 8 categories. It also requires that all IT systems and components meet European standard on the restricted use of hazardous substances RoHS. Directive RoHS restricts and prevents the use of lead, mercury, cadmium, etc. Another example of EPEAT application is modular designing of devices, use of recycling materials and recycling. EPEAT is not an ecolabel or a certification process. Nevertheless, it guarantees a robust standard for testing systems on the spot. The test products that are used for evaluation if they meet the established ecological standards are randomly selected. This standard was first used in 2006. Since the introduction, it got a lot of approval from the largest IT manufacturers and many IT equipment purchasers.

Similar attempts to EPEAT are in progress in different areas, such as wood and textile industry. Just like EPEAT, other standards are designed based on the stakeholder consultations. The stakeholders, who are coming from different areas, submit their suggestions on the standardization of ecological suitability of products, processes, and devices.

3.7. Problems and challenges

The topics such as ecological standardization, program certification, and ecolabels do not exist without a consensus among stakeholders. Some of the main entry points are:

- Will the standards determine the lower limit which will encourage manufacturers to improve products and provide a development plan and initiative? Or will the standards serve as guidelines which will reward manufacturers with the most ecologically efficient trends and products?
- Which external audit procedure is suitable? External independent evaluators are seen as an expense and can be a challenge to the manufacturers in case of rapid technological development and quick entry of product to the market.
- Will the consumer market accept the standardization program? This question is vital for determining if the ecological standards will improve and critically evaluate the ecological characteristics of devices. Until now, the market extensively knew only a few environmental standards.
- How will the ecological standards affect small businesses and manufacturers? Such effects are not only additional costs for product certification but also additional taxes for maintenance and standard authentication. It is also important to consider that public purchasers can enable the access of small business to the market.
- Depending on the fast technological growth and short period needed for developing new devices, it is essential that the criteria used for evaluating ecological suitability are often revised and updated.
- For increasing awareness about ecological standards and certificates on the regional market, it is essential that the national authorities support and demand the ecological standards to be also introduced on the national level.

3.8. Guaranteeing responsible products through standardization, certification, and ecolabels

Ecological standards for different electronic products supplement the ecological directives. Often they are focused on introducing the restrictions of specific materials or demand from manufacturers to take responsibility and include lifecycle analysis of the

manufactured products. The standards are also a tool for government and politics, who legitimately influence development and expansion of ecological approaches and at the same time achieve the same results as ecological directives. These results can reflect as ecodesign and device functionalities.

Certification scheme of ecological products typically creates feedback line between design possibilities and cost evaluation though device lifecycle. This is especially noticeable when certification programs are demanding collecting or recycling of devices that are not wanted by the market anymore. In this regard, this approach makes certification program even more effective and of higher quality, especially when other standards do not include recycling and returning of products to the manufacturer. From a broader perspective standardization and certification programs are promoting the internationalization of ecological products.

Standards and ecolabels which require operating with products when their lifecycle ends are forcing the manufacturers to implement a logistic plan that foresees the activities regarding product processing. Product processing at the end of lifecycle can be enabled by different partnerships with subjects who work in product processing and recycling. When the manufacturers have to take responsibility for recycling, product processing and dedicate a resource to the processing than the standards lower certain operational barriers which prevent them from being involved in the manufacturer's business model.

From the public order perspective, certification programs lead to positive effects regarding environmental protection faster than programs and directives which generally need more time to get into general practice. The directive deadlines extend significantly when the negotiations between stakeholders and government begin.

Manufacturers do not want to undertake the recycling costs which can not be foreseen when designing. The standards and certification processes can bypass these problems and help predict which advantages will the manufacturer have if they consider the ecological standards. It is also possible to foresee market share and new niche markets which the manufacturer can cover.

Product standards are often more aligned with the business priority sphere and, therefore, get more approval than other controlling types or verification of ecological products.

3.9. Ecological labels and certification

Ecolabels appear on different products and services. They give information on model and type of ecological product eligibility. Through that, we can quickly determine which certificates and environmental directives are met with this product or device. Due to this, it is an essential source of information when buying different products.

Below, we will present the leading ecolabels and their management:

The central premise of the label 80PLUS is that the computer manufacturers have to attain the additions of the innovative programs which they use to achieve integration of energy efficient power supply in the personal computers. This program was developed within the Plug Load Solutions program, which promotes and offers a wide range of highly energy efficient business and trade technologies.

Label AENOR-Medio Ambiente is a system, intended for recognition of environmentally friendly products or services. The certification process is based on audit approaches and laboratory measurements. The label marks products with low environmental effects. It is mainly focused on labeling consumer products.

Organisation BASF SE has developed a label for products which were evaluated with an eco-efficiency analysis. The label has high requirements and is given after an analysis and evaluation by the third party. Analysis results and findings need to be presented through the Internet.

This label can be awarded every three years. During this period, another audit and analysis need to be carried out due to the constantly developing market and increasing diversity of products. The eco-efficiency analysis is performed by the methodology which was designed by TÜV Rheinland / Berlin-Brandenburg (Germany) in NSF International (USA).

B Corporations are a new type of businesses which use the business power to solve social and environmental problems. B corporations differ from the traditional companies by reaching advanced and transparent social and environmental standards through stakeholders who are united under one brand.

Legal structures and B corporations are spreading the corporate responsibility and enable reaching of liquidity while fulfilling the mission. Transparent and advanced standards enable that the consumers can show support for companies which are aligned with the given standards. This way the investors can achieve the highest investment effect and the governments and multinational corporations will have a better implementation of sustainability policies.

The Better Environmental Sustainability Targets (BEST) certification is intended for manufacturers of lead batteries which meet the minimal emission standards and accept used batteries for environmentally friendlier recycling. This label's goal is reduction of emissions made during production and recycling of lead-acid batteries and guarantee the lowest poisoning of environment and living beings with lead.

Label Blue Angel was initiated by the German government and an independent commission which awards this label to products and devices which are environmentally friendlier than comparable products.

Each label shows that the product or service is focused on one of four different environmental goals: health, climate, water, and resources.

Label Blue Angel is managed by four subjects:

1. Independent environmental jury consists of representatives from environmental and consumer associations, syndicates, industry, trade, crafts, local authorities, science, media, church and federal states.

2. Federal Ministry of the Environment and Nuclear Safety is the owner of this label, and they regularly inform the public on environmental decisions and new measures.

3. Federal Environment Agency has departments for ecolabelling, eco declarations, and eco-public orders. These strive for the development of technical criteria for achieving ecolabel Blue Angel.

4. RAL gGmbh is the agency that realizes the certification.

Blue Angel encourages for environmental and consumer protection. The label is awarded to electronic devices, products, and services that are beneficial to the environment and meet high environmental and security standards.

CarboneCare scheme encourages and recognizes effects of an organization that fights against climate change with three steps. These are measurements, reduction, and leveling of carbon footprint.

The scheme is defined by many acts, documents and different labels for different emissions.

To acquire the label, it is necessary to perform an emission audit by the given protocol and then commit on the yearly level that the emissions will decrease by 5% from the given state.

CarbonFree label is part of certification that is intended for raising awareness of increased product emissions and as a recognition of companies that lower carbon footprint. The label was created as a response to a growing market of environmentally friendly products and consumer inquiries on transparent, reliable and easily accessible information. By determining product's carbon footprint, reduction of it when possible and leveling of other carbon emission related to the product the Carbonfund.org organization has created a reasonably authentic and environmentally friendly way for companies that offer products with low emissions to their customers.

Carbon neutral certification is intended for companies that level or decrease carbon footprint on different levels.

Verus Carbon Neutral certification first calculates the carbon footprint of the companies that want to obtain this label. Then they calculate leveling of carbon footprint

which they verify as a carbon credit. Leveling gives the companies a chance to relieve the greenhouse gas emissions when they cannot guarantee high enough energy efficiency and other strategies for decreasing carbon footprint.

The Agency consists of a group of engineers, scientists and financial analysts who are specialized for measuring carbon footprint and ecological effects. Their primary task is raising awareness amongst manufacturers so they mindfully ecodesign products through the whole lifecycle.

Label Carbon Reduction is a public commitment that the product or service carbon footprint is measured and confirmed. The product's or service's owner commits to reducing carbon footprint in the following two years. The calculated footprint will be consistently measured and compared relating to PAS2050 standard and Footprint Expert. This will determine an evaluation of the whole lifecycle, including manufacturing, use, and removal of the product. The certification needs to be repeated after two years to prove that the carbon footprint was reduced.

The label is managed by an independent organization Carbon Trust which consists of experts from different areas from all over the world.
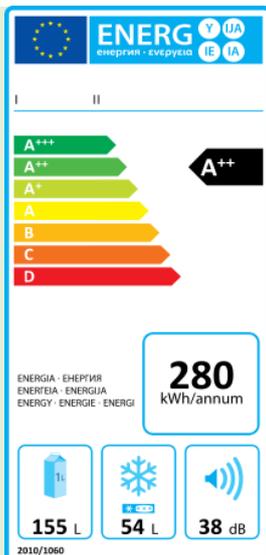
By law, all electronic devices sold in European Union need to be labeled with an ecolabel. The ecolabel is an indicator of efficiency and savings.

Directive is used for the following types of household appliances, even when they are used in a non-household way. The appliances that need to have ecolabels are: refrigerators, freezers and combined appliances, washing machines, dryers and their combinations, dishwashers, stoves, water heaters and hot water storage tanks, light sources and air conditioners.

Household appliances for sale or rent need to be categorized into energy classes together with standard data about the product. The energy classes present the device's energy efficiency.

The appliances are evaluated from A to G. With A we label the most efficient and with G the least efficient appliances.

A+ and A++ are additional classes for efficient refrigerators and freezers.

The supplier needs to provide technical documentation and guarantee the accuracy of information on the label.

The energy label is managed by the European Commission.

The goal of the Climatop label is labeling of the most climate-friendly products and services (best in their class). Similar products from the same group are compared by the emissions. The products that cause CO_2 emission equivalent, which is generally 20% lower than emissions of similar devices in their group are awarded the Climatop label. Only products that have an ecological balance in the production process and are better or same as their competitors in the same group can have this label. The label is awarded based on the lifecycle assessment (LCA) calculation for products that are in compliances with the standard ISO 14040. LCA evaluation is done by an independent organization. The label is valid for two years.

The Cradle to Cradle Certified is a program for labeling companies that encourage intelligent ecodesign. The certification process is managed by a nongovernmental organization and includes:

- Use of materials that are environmentally safe during all phases of use.
- Products, which can be recycled or reused.
- Use of renewable energy sources.
- Efficient water usage and production related to water usage.
- Strategies of companies with social responsibility.

Cradle to Cradle certificate is a four-stage approach to labeling that consists of the evaluation scale: basic, silver, gold, and platinum. This certification program is valid for materials as well as for final products.

Cradle to Cradle Certified CM is a certification label, issued by the organization Cradle to Cradle Products Innovation Institute.

DIN CERTCO is an organization that manages certification of products by different providers. They evaluate and issue certificates services, products, companies, and personnel. The organization helps the customer or company choose the appropriate certificate and the certification process depending on the product or service that they offer.

ECO-living label is part of the organization Living Direct. The label is awarded to online stores, specialized devices and ventilation devices. ECO-living label is awarded to environmentally friendly products and is certified by Energy Star, RoHS, and HEPA (High-Efficiency Particulate Air) certificate.

ECOLOGO label is part of UL Environment which is a member of UL-Underwriters Laboratories. ECOLOGO certificate is based on multiple criteria evaluation of lifecycle standards. All products certified with ECOLOGO certificate need to meet or exceed the lifecycle standards. ECOLOGO certificate is classified, similar to ISO TIP1 for the environment and is successfully evaluated by the global ecological network, which additionally confirms its credibility.

Since establishment in 1988, ECOLOGO is recognized and referenced in more than 350 specifications and standards. UL Environment has lots of public events and teams for raising awareness, intended for further strengthening of the label and visibility.

European eco-flower is a label for products that met the required ecological criteria. The European eco-flower is awarded based on the European Council and Parliament Directive EC 66/2010/EEC. Its management is carried out by the European Commission together with other European Union members and other stakeholders. The European eco-flower is a voluntary program, which means that the manufacturers, traders, and importers can apply for the evaluation of their products. The primary condition for allocation of the eco-flower is that the product has to

meet the criteria for environmental protection defined by EU Directives.

http://ec.europa.eu/environment/ecolabel/index_en.htm

The main objective of EPD Environmental Product Declaration is to guarantee appropriate, verified and comparable information for fulfilling requirements of different customers and the market needs. The international system helps and supports organizations with maintaining the environmental efficiency of their products (goods and services).

EPEAT is a global system for management of ecological electronic devices. Users of EPEAT (Electronic Product Environmental Assessment Tool) can evaluate and compare different electronic components and devices in 43 countries. EPEAT is currently managing the following categories: personal computers, televisions, printers, copy machines, scanners, etc. Mobile phones and servers are currently in development.

EPEAT evaluates products based on their lifecycle. The system deals with waste hazardous substances, use of recycled and recyclable materials, designing products for recycling, long product lifetime, energy efficiency, business success and packaging characteristics. The products are ranked based on the fulfillment of the environmental criteria and can attain golden, silver or bronze label.

The manufacturers register their product in EPEAT based on fulfilling the standards and agreements which are opened and reviewed by all stakeholders. Manufacturer statements are subject to constant verification to reach and guarantee credibility of the register.

EPEAT is managed by stakeholders who together with the advisory council, Council for Quality Management and manufacturers precisely and transparently co-create the EPEAT product register. Consumers from all over the world are another stakeholder group which helps the users identify ecological electronic devices.

E-Stewards certification consists of individuals, corporations, nonprofit organizations and governmental agencies which support ethical and responsible standards for recycling and reuse of electronic devices. They successfully prevented the import of illegal and dangerous electronic waste into developing countries and created a safe, green and fair international connection of practical laws on recycling electronic devices.

E-Stewards certificate is the highest certificate for recycling electronic devices. It is intended for and open to electronic industry which deals with recycling and processing in developed countries.

Energy Star presents the level that every environmentally aware manufacturer wants to reach.

Energy Star program was established as an agreement between the European Union and the United States of America for a coordinated energy labeling of office supplies in 1992. It is used for labeling energy-efficient electronic devices, such as personal computers, screens, optical devices, uninterruptible power supply devices (UPS) and servers. European energy star evaluation is defined by Directive 2014/202/EU.

https://www.eu-energystar.org/

ECMA is a voluntary identification standard and labels environmental attributes which are linked to information and communication technologies and electronic devices through the whole product lifecycle. This declaration does not have fixed requirements but it gives information on product efficiency.

This label is used as credential of ecological products by Siemens company. It is awarded when products meet the highest environmental standards, production methods, energy efficiency, recycling, use of nonhazardous materials and packaging materials. Super green products are characterized as environmentally friendly products which were made in ecologically oriented production. For acquisition of this label the products are tested for energy efficiency with the lifecycle method.

Green productions standard enables and helps consumers understand a growing number of ecological products. The standard includes an in-depth lifecycle analysis of each product. Depending on the lifecycle results the Green production standard evaluation is awarded for the eco-friendliness.

Green Tick Sustainable Certified is an independent organization that manages evaluation and certification of ecological products. The product or service evaluation is based on the lifecycle analysis depending on certain standards of Green Tick organization. The products are evaluated by independent commission according to standards ISO 17011, ISO 17021, ISO 190011, etc. The certificate can be awarded for three years, meaning it needs to be renewed.

The forum is presented by the European Environment Agency and government department which cooperates with the industry. Information from the industry is obtained with volunteer cooperation of industry's stakeholders and agencies. The forum is focused on efficient use of energy for IT devices, household appliances, office devices and consumer electronics.

A Simple Switch is a label by company Philips which presents to their customers and society that the ecological suitability of the product is improved for at least 10%. The ecological suitability covers efficient energy use, lowered or restricted use of hazardous substances, reduced product weight, prolonged lifetime and packaging. The ecolabel is exclusively used on Philips products and presents development and the company efforts to design less environmentally dangerous devices.

TCO is an international label for IT devices, and it includes a wide range of criteria, such as ecodesign, longer lifetime, recycling and reuse. The certificate merges social responsibility in the production process, where the product is manufactured, the safety of production, product ergonomics as well as lower environmental effects. The certificate requires verification after a certain period, to evaluate if the product still meets ecological and social standards.

TerraCycle are waste collection programs in 10 countries. They deal with collecting of waste that cannot be recycled. This waste is processed into new materials. TerraCycle label notifies the consumer or user that the material is not waste and that it will be sent to the TerraCycle assembly center at the expense of the company. The company has over 60.000 assembly locations and more than 12 million members which are part of the collection process. The label also presents that a certain product was made of waste materials which would be, according to established practice, buried in a dump or burned in waste incinerators. The company also manages return of their processed materials which they try to reuse in other useful products.

UL Underwriter Laboratory offers services for verification of devices that meet requirements on energy efficiency. Through UL services the manufacturers can show their customers, users or competitors that they meet strict regulation of energy efficiency with their devices. UL program verifies and tests the energy efficiency of devices according to the energy standards.