Winter 1-2013

END OF LIFE OF ELECTRONIC DEVICES

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END OF LIFE OF ELECTRONIC DEVICES

Masters Degree

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01 / 2013

Prishtine

I.ABSTRACT

Considering that an electronic recycling system is a cost-benefit controlled management process that utilizes end-of-life/surplus electronic devices as resource to recover the greatest return from the materials at the lowest possible cost while complying with applicable environmental laws and regulations.

Knowing that Kosovo has economic problems and it is very necessary to make electronic equipment recycling.

Considering that electronic equipment contain substances harmful to the environment and human health is necessary to make electronic equipment recycling.

Kosovo is a country that claims state to join the EU, one of the conditions is that Kosovo must find solution about waste management

I have made a comparison of the system for managing electronic waste in developed country and system for managing electronic waste in Kosovo.

I have made a comparison of the system for flow of Waste Electrical and Electronic Equipment in Macedonia, Serbia and developed countries and came to a conclusion what we should do in Kosovo.

I have made calculate a cost of collection point in Kosovo and analyze how much it costs per ton waste collection.

II.ACKNOWLEGMENT

First I want to thank UBT as an institution of education and president of UBT professor Edmond Hajrizi which made it possible to pursue studies and made it possible the realization of this thesis.

Also I want to thank Dr. Muzafer Shala, who is the supervisor of this thesis, who without hesitation has given advice for each part and he supported me with literature.

I also want tot hank my family who have supported me in all life areas.

Table of Contents

IV.LIST OF FIGURES

V.LIST OF TABLES

1.History Of Electronic Devices Evolution

Although wireless telegraphic communication dates back to 1844, electronics is basic allya 20th century concept that began with the invention of the vacuum tube amplifier. An early vacuum tube that allowed current in only one direction was constructed by John A. Fleming in 1904. Called the Fleming valve, it was the forerunner of vacuum tube diodes. In 1907, Lee DeForest added a grid to the vacuum tube. [1-3]

Fig.1.John A. Fleming and Vacuum-tube [4.]

The new device, called the audiotron, could amplify a weak signal. By adding the control element, DeForest ushered in the electronics revolution. It was an improved version of his device that made transcontinental telephone service and radios possible. In 1912, a radio amateur in San Jose, California, was regularly broadcasting music!

Fig.2.Audiotron [5.]

In 1921, the secretary of commerce, Herbert Hoover, issued the first license to a broadcast radio station; within two years over 600 licenses were issued. By the end of the 1920sradios were in many homes. A new type of radio, the super heterodyne radio, invented by Edwin Armstrong, solved problems with high-frequency communication.[1,6]

Fig.3.The first radio [7.]

In 1923, Vladimir Zworykin, an American researcher, invented the first television picture tube, and in 1927 Philo T. Farnsworth applied for a patent for a complete television system.

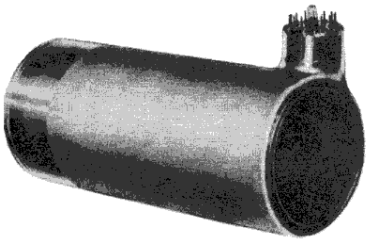

Fig.4.The first television picture tube [8.]

The 1930s saw many developments in radio, including metal tubes, automatic gain control, "midget" radios, and directional antennas. [1,9]

Also started in this decade was the development of the first electronic computers. Modern computers trace their origins to the work of John Atanasoff at Iowa State University. [1,11]

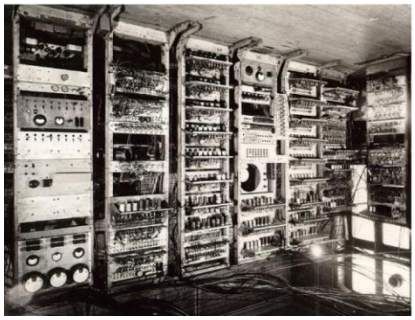

Fig.5.The first electronic computers [10.]

Beginning in 1937, he envisioned a binary machine that could do complex mathematical work. By 1939, he and graduate student Clifford Berry had constructed a binary machine called ABC, (for Atanasoff-Berry Computer) that used vacuum tubes for logic and condensers (capacitors) for memory. [1,12]

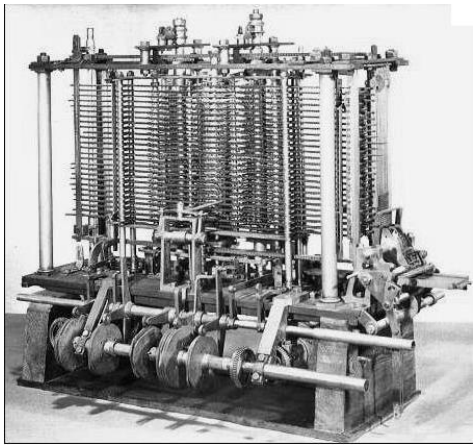

Fig.6 Binary Machine [13.]

In 1939, the magnetron, a microwave oscillator, was invented in Britain by Henry Boot and John Randall. In the same year, the klystron microwave tube was invented in America by Russell and Sigurd Varian. [1,14,15]

Fig.7.The klystron microwave tube by Russell and Sigurd Varian [16.]

The decade of the 1940s opened with World War n. The war spurred rapid advancementsin electronics. Radar and very high-frequency communication were made possible by themagnetron and klystron. Cathode ray tubes were improved for use in radar. [1,17]

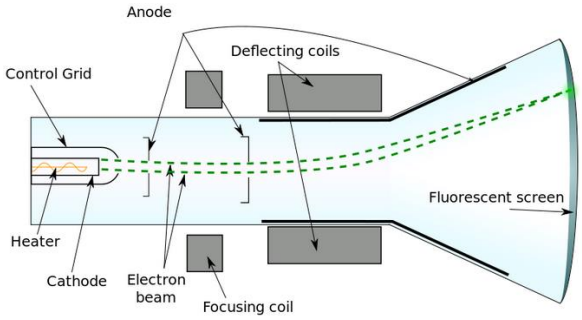

Fig.8. Cathode ray tubes [18.]

Computer work continued during the war. By 1946, John von Neumann had developed the first stored program computer, the Eniac, at the University of Pennsylvania. One of the most significant inventions ever occurred in 1947 with the invention of the transistor. The inventors were Walter Brattain, John Bardeen, and William Shockley. All three won Nobel prizes for their invention. PC (printed circuit) boards were also introduced in 1947. Commercial manufacturing of transistors didn't begin until 1951 in Allentown, Pennsylvania. [19.]

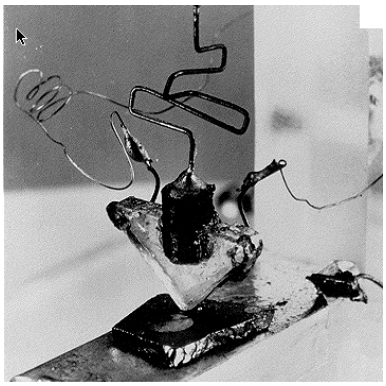

Fig.9. Invention of the transistor [21.]

The most important invention of the 1950s was the integrated circuit. On September 12,1958, Jack Kilby, at Texas Instruments, made the first integrated circuit , for which he was awarded a Nobel prize in the fall of 2000. This invention literally created the modern computer age and brought about sweeping changes in medicine, communication, manufacturing, and the entertainment industry. Many billions of "chips"-as integrated circuits came to be called-have since been manufactured. [22.]

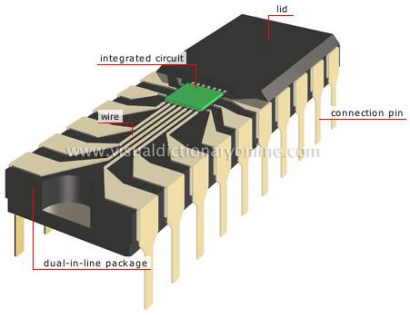

Fig.10. Integrated circuit [23.]

The 1960s saw the space race begin and spurred work on miniaturization and computers. The space race was the driving force behind the rapid changes in electronics that followed. The first successful "op-amp" was designed by Bob Widlar at Fairchild Semiconductor in 1965. Called the /lA 709, it was very successful but suffered from "latch-up" William Shockley 1910-1989 John Bardeen 1908-1991. [1,24.]

An electrical engineer and physicist born in Madison, Wisconsin, Dr. Bardeen was on the faculty of the University of Minnesota from 1938 to 1941 and a physicist at the Naval Ordnance Lab from 1941 to1945. He then joined Bell Labs and remained there until 1951. Some of his fields of interest were conduction in semiconductors and metals, surface properties of semiconductors, and superconductivity. [26.]

While at Bell Labs he jointly invented the transistor with colleagues WaIter Brattain and William Shockley. After leaving Bell Labs in 1951, Dr. Bardeen joined the faculty at the University of Illinois. (Photo credit: AlP Emilio Segre Visual Archives,W. F.Meggers Gallery of Nobel Laureates) An American born in London, England, Dr. Shockley obtained his PhD in 1936 from M.I.T. He joined Bell Labs upon graduation and remained there until 1955. His research emphasis included areas of energy bands in solids, theory of vacuum tubes, photoelectrons, ferromagnetic domains, and transistor physics. While at Bell Labs, Dr. Shockley joined John Bardeen and Waiter Brattain in the invention of the transistor in 1947. [27.]

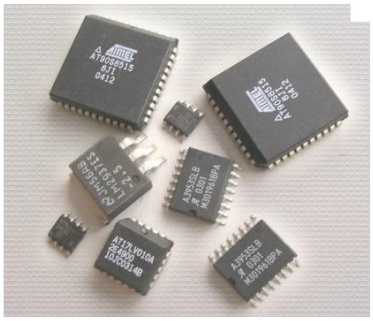

Fig.11. Semiconductor devices [28.]

After leaving Bell Labs, Dr. Shockley spent time at Beckman Instruments and at Stanford University. (Photo credit: AlP Emilio Segre Visual Archives, PhysicsToday Collection) netron, a microwave oscillator, was invented in Britain by Henry Boot and John Randall.

In the same year, the klystron microwave tube was invented in America by Russell and Sigurd Varian. The decade of the 1940s opened with World War n. The war spurred rapid

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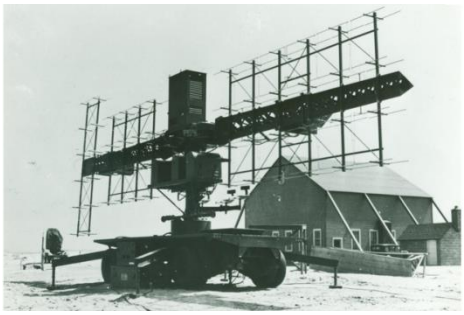


Fig.12. Radar [30.]

Cathode ray tubes were improved for use in radar. Computer work continued during the war. By 1946, John von Neumann had developed the first stored program computer, the Eniac, at the University of Pennsylvania. One of the most significant inventions ever occurred in 1947 with the invention of the transistor. The inventors were Walter Brattain, John Bardeen, and William Shockley. All three won Nobel prizes for their invention. PC (printed circuit) boards were also introduced in 1947. Commercial manufacturing of transistors didn't begin until 1951 in Allentown, Pennsylvania. [31.]

Fig.13. Printed Circuit 1947 [32.]

Later, the most popular op-amp ever, the 741, took shape at Fairchild. This op-amp became the industry standard and influenced design of op-amps for years to come. Precursors to the Internet began in the 1960s with remote networked computers. Systems were in place

within Lawrence Livermore National Laboratory that connected over100 terminals to a computer system (colorfully called the "Octopus system").

In an experiment in 1969 with remote computers, an exchange took place between researchers at UCLA and Stanford. The UCLA group hoped to connect to a Stanford computer and began by typing the word "log in" on its terminal.

By 1971, a new company that had been formed by a group from Fairchild introduced the first microprocessor. The company was Intel and the product was the 4004 chip, which had the same processing power as the Eniac computer. Later in that same year, Intel announced the first 8-bit processor, the 8008. In 1975, the first personal computer was introduced by Alt air, and Popular Science magazine featured it on the cover of the January 1975 issue. The 1970s also saw the introduction of the pocket calculator and new developments in optical integrated circuits.[33, 34]

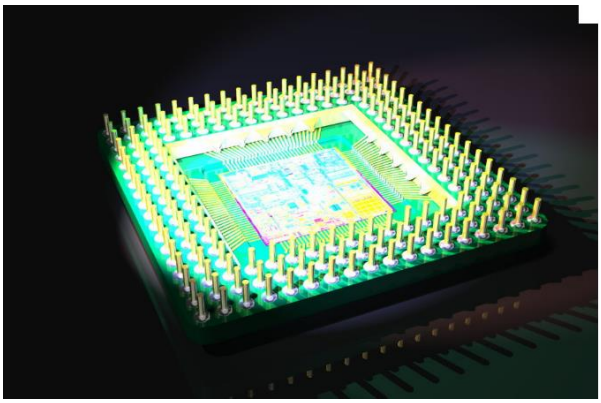


Fig.14. Microprocessor [35.]

By the 1980s, half of all U.S. homes were using cable hookups instead of television antennas. The reliability, speed and miniaturization of electronics continued throughout the 1980s, including automated testing and calibrating of PC boards. The computer became apart of instrumentation and the virtual instrument was created. Computers became a standard tool on the workbench.

The 1990s saw a widespread application of the Internet. In 1993, there were 130 websites; by the start of the new century (in 2001) there were over 24 million. In the

1990s,companies scrambled to establish a home page and many of the early developments of radio broadcasting had parallels with the Internet. The exchange of information and ecommerce fueled the tremendous economic growth of the 1990s.

The Internet became especially important to scientists and engineers, becoming one of the most important scientific communication tools ever.

In 1995, the FCC allocated spectrum space for a new service called Digital Audio Radio Service. Digital television standards were adopted in 1996 by the FCC for the nation's next generation of broadcast television. As the 20th century drew toward a close, historians could only breathe a sign of relief. As one person put it, "I'rn all for new technologies, but I wish they'd let the old ones wear out first." [36.]

The 21st century dawned on January 1, 2001 (although most people celebrated the new century the previous year, known as "Y2K"). The major story was the continuing explosive growth of the Internet; shortly thereafter, scientists were planning a new supercomputer system that would make massive amounts of information accessible in a computer network. The new international data grid will be an even greater resource than the World Wide Web(WWW),giving people the capability to access enormous amounts of information and the resources to run simulations on a supercomputer. Research in the 21st century continues along lines of faster and smaller circuits using new technologies. One promising area of research involves carbon nanotubes, which have been found to have properties of semiconductors in certain configurations. [1.]

1.1.Some electronic devices

Electronics and electronic devices are used in a huge variety of manufactured products. From everyday popular items such as cameras and thermometers to the robotic welding machines used in industry, the use of electronics is continually growing.

This unit provides a practical introduction to basic electronic devices and analogue and digital electronic principles. [37.]

Will present some of electronics devices:

- Cameras & Video Equipment
- Cathode Ray Tubes (CRTs) / Monitors
- Cellular Phones
- Computer Monitors
- Computer Peripherals
- Computers
- Copy Machines
- Faxes / Printers
- Hearing Aids
- Printers / Faxes
- Sewing Machines
- Stereos & Radios
- Televisions

1.2.Electronic Devices Benefit Society

Consumer electronics dominate telecommunications as well. In the old days, people relied on analogue land line telephones in order to make call but nowadays, society has cellular phones to do that. Moreover, cellular phones give users the advantage of being able to make calls anywhere and anytime they need to, as opposed to landlines where you have to be in a specific location in order to make a call. [38.]

Almost everything has become electronic. Digital cameras, for example, are the result of an evolution from mechanical and film cameras to those that make use of electronics. One advantage is that one is no longer limited by the capacity of film media when taking pictures, plus they get to see the results right away. The use of digital media storage also enhances and speeds up the processing of pictures, reducing costs along the way.

- Online testing and teaching English on the Internet
- English lessons and TV licensing for students that come from abroad
- Learning languages and a video conferencing service for doctors [38.]

1.3.The disadvantages and advantage of using electronic devices in daily life

1.3.1.Some disadvantages and advantages of using the Mobil phone:

Since the year 1991, the number of mobile phone users all across the globe has risen drastically. This sharp increase has been mostly observed in developing Asian countries like China and India, that have surpassed the US in the number of mobile phone consumers. Certainly, there are several advantages of mobile phones that hashelped in the cell phone success by leaps and bounds. However, there are some disadvantages of cell phone as well that can't be ignored. I'll talk about both facets of cell phone usage further. [39.]

Few advantages of using Mobil phone

Ease to Express Yourself, By allowing instant access to anybody across the globe, mobile phones have changed the landscape of communication. Not only globally, cell phones are important in day to day life. You want to talk to someone at home, a friend or your spouse, just give a call! You forget something important at home and now you need it in your office. Give a call at home! So on and so forth.cell phones are a necessity. Aren't they? More than Communication, Entertainment Love listening to music? Or playing video games? Or watching movies? Do all you wish, by purchasing some affordable mobile phones. Entertainment, especially when you're traveling or getting bored, was never so easy. Nowadays, you can even browse Internet on your cell phones. Cell phone manufacturers cater to the needs of every mobile user, with the up gradation of latest features and technology. There are so many applications and features in mobile phones that people hardly have time to learn all of them! More Safety

Although, having cell phones is not a guarantee for safety, it certainly can be helpful for you in emergency situations. Keeping cell phones in your car while traveling is one of the topmost personal safety tips. In case of any accidents or unexpected events, you can inform

someone, who can rush to your rescue. Similarly, cell phones can be helpful to old and disabled people. Although, lifts in offices and residential buildings come with phone extension and alarm buttons, cell phones are anytime better to call for help, in case of elevator failure. Similarly, there can be many more instances in daily life, where mobile phones are a necessity. [39.]

Few Disadvantages of Mobile Phones

Not all are positive about mobile phones. There are some demerits of mobile phones that are discussed below. Health Effects Electromagnetic radiation from cell phones may cause health problems. Rigorous studies are being carried out to know about the negative effects of cell phones. Sleep deprivation, stress and brain problems have been linked to overuse of cell phones, and are considered as the possible effects of cell phone radiation. Some studies have reported that cell phone usage can trigger male infertility symptoms. But nothing has been proved yet, though we can lessen mobile use to some extent. Children Suffer Children have been found to have some worrisome effects of mobile phone usage. Since they have weaker immune system, thinner skin and developing nervous system, waves generated from mobile phones can harm their body cells. It has been found that children can absorb radio waves to a far greater extent than adults. Legal Issues Mobile phones come with cameras and hence this has led to hundreds of thousands of cases pending in courts about privacy problems. There have been instances in the past, in countries like Saudi Arabia, Japan, Korea, where a ban was imposed on camera phones, making it a strict rule to sell only those cell phones that come with an appreciable click sound! Moreover, crime rate has also increased with miscreants like robbers and terrorists pursuing their nefarious schemes through mobile phones. Driving and Mobile Phones If not anything, this is certainly one of the most dangerous disadvantages of cell phones. In the US, cell phone and driving have become a major concern among traffic officials. The seriousness of this issue in the eyes of the federal government was highlighted when a US court in 2009, imposed a whopping million dollar fine for talking on phone while driving, on a Texan driver. It is the highest fine imposed in the world, for someone using mobile phone while driving. Many accidents can be averted if people are cautious, and avoid cell phone usage while driving. [39.]

1.3.2.The disadvantages and advantages of using computers

Disadvantages of using computer

Some of the disadvantages of using computers is that it takes one away fromsocializing with others in person. Another disadvantage is that you do not see the other person you might be chatting with on IM. Spending too much time playing online games or chatting instead of reading books, taking walks, and doing homework. [40.]

Advantages of using computers:

•Quick entry

•Easy to edit and restructure

•Many tools to produce various kinds of output (html, text, books, pdfdocuments, etc.)

•Storage is inexpensive and doesn't take up much space

•Easy to search/navigate through documents for organization

•Many different kinds of tools from Palm software to Franklin Covey, to GTD based on David Allen's system, to flat text files alatodo.txt(http://www.todotxt.com) by Gina Trapani.

•Once a document is in electronic form it is easy to store and many, many documents can be stored on one computer in much less space than in a file cabinet.

•Easy to search for programming

•Most programming requires the use of computers

•Using a computer makes it easy to search code and tools make it easier to understand it

•Easily gather programs from other creators

•Easily distribute your own works For research

•Access to the Internet has become invaluable as a research tool

•Easily gather huge amounts of information and store/catalog it

•Easily search for new information or search the information already acquired

•Interact with other researchers to create/gather more research

•Almost instant access to many remote or obscure locations of the globe and their researchers/experiences/knowledge

Easily disseminate results of your own research Computers are not a panacea. There are many things for which a computer does not add significant advantages. But, used in an appropriate and realistic way, computer can enhance and facilitate certain activities. [40.]

1.3.3.The disadvantages and advantages of using television

Advantages of using television

Nowadays, television has become the most popular media of human kind. It's also the indispensable device in our daily life. By watching TV , we can see many things happened in the surrounding us world , therefore it help us to catch and avoid being dropped back from the world of information. Everyone must agree that the advantages of watching TV are very considerable . [41.]

Disadvantages of using television

A bad effects - on the kids - because they learn every bad thing shows on the TV.

Some of the companies use it for sex TV films and programs , and that of course case a lot of social problems .

It be the first information source for a lot of people , and that make them away from the first really clean source the books ! [41.]

2.Life Cycle Stages

Most electronic parts pass through several life cycle stages corresponding to changes in part sales. Fig.1 is a representative life cycle curve of units shipped per time, which depicts the six common life cycle part stages: introduction, growth, maturity (saturation), decline, and phase-out. We include an additional category called Obsolescence. Table I and the proceeding discussion summarizes the characteristics of the stages of the part life cycle. [41, 42]

2.1. Introduction Stage

The introduction stage in the part life cycle is usually characterized by high production costs driven by recently incurred design costs and low yield, frequent modifications, low or unpredictable production volumes, and lack of specialized production equipment. Marketing costs, at this stage, may also be high. Early adopter customers who buy a part in its introductory stage tend to value performance over price. [41,43]

2.2. Growth Stage

The growth stage is characterized by the part's market acceptance. Increased sales during this stage may justify the development and use of specialized equipment for production, which in turn improves economies of scale of production. Mass production, mass distribution, and mass marketing often bring about price reductions. This stage often consists of the largest number of competitors, as opportunity seeking firms are attracted by the part's profit potential and, strategic acquisitions and mergers have not yet taken place.[41,43]

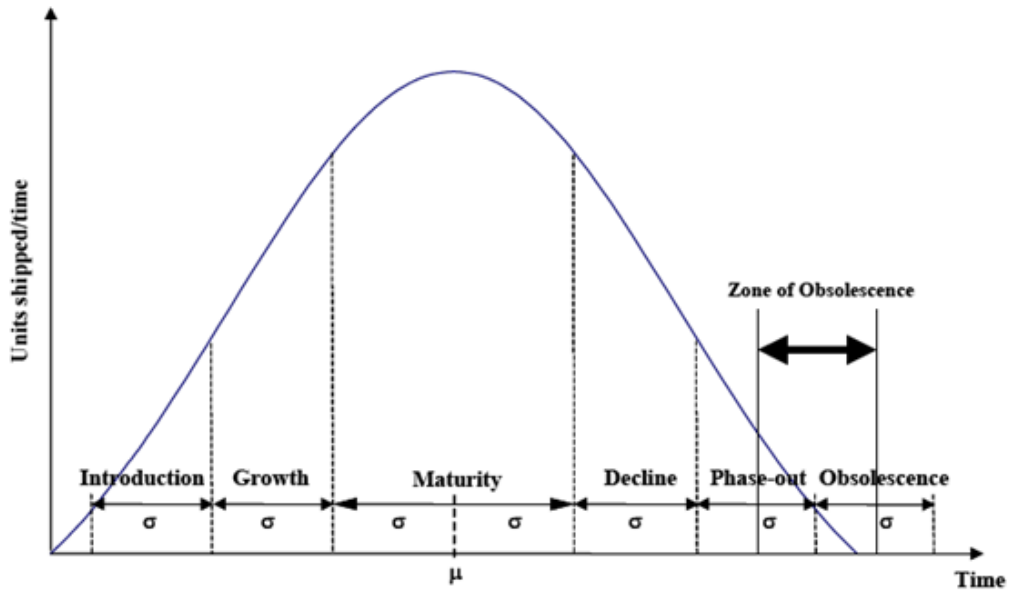


Fig.15. Definitions for a standardized life cycle curve for a device/technology group.μ and σ represent curve fitting parameters. [41]

2.3. Maturity Stage

The maturity stage of the part life cycle is characterized by high-volume sales. Competitors with lower cost of production may enter the market, or domestic competitors may shift production facilities to less expensive locations to enable them to lower manufacturing costs. The 16M DRAM is an example of a mature part.[41]

2.4. Decline Stage

The decline stage is characterized by decreasing demand and generally decreasing profit margin. Towards the end of the decline stage, only a few specialized manufacturers remain in the market. TTL logic ICs are examples of parts that have been available very late in this stage due to continued sales in the black and white television market.[41]

Characteristic	Introduction	Growth	Maturity	Decline	Phase-out	Obsolescence
Sales	Slow but increasing	Increasing rapidly	High	Decreasing	Lifetime buys may be offered	Sales only from aftermarket sources, if at all

Price	Highest	Declining	Low	Lowest	Low	Not applicable or very high if available from aftermarket sources
Usage	Low	Increasing	High	Decreasing	Decreasing	Low
Part modification	Periodic die shrinks, and possible mask changes	Periodic die shrinks	Periodic die shrinks	Few or none	None	None
Competitors	Few	High	High	Declining	Declining	Few
Manufacturer profit	Low	Increasing	High	Decreasing	Decreasing	Decreasing

Tab.1. Typical life cycle characteristics for the six generic stages of a part life cycle [41]

2.5. Phase-out Stage

Phase-out occurs when the manufacturer sets a date when production of the part will stop. Generally, the manufacturer issues a discontinuance notice to customers, provides a last-time buy date, and suggests alternative parts or aftermarket manufacturers. As an example, on September 2, 1999 Texas Instruments (TI), Standard Linear and Logic Group announced the discontinuance of ULN2803A, a Darlington Transistor Array. TI stated that the product would be discontinued on September 2, 2000 with the last (and non-cancelable) order date being March 2, 2000.[41]

2.6. Discontinuance and Obsolescence

Discontinuance occurs when the manufacturer stops production of the part. The part may still be available in the market if the production line or part stocks were bought by an aftermarket source. A part is obsolete when the technology that defines the part is no longer implemented. Thus, obsolescence occurs at a technology level, while discontinuance occurs at a part number or manufacturer specific level. Diode Transistor Logic (DTL) and

Resistor Transistor Logic (RTL) parts are examples of obsoleted part technologies. National Semiconductor's military Quad SPST JFET Analog Switch in a ceramic DIP package is a discontinued part. The last time buy date for this part was December 7, 1999. A non-military part of the same functionality and technology remains available from National Semiconductor. In this case, the military part is discontinued, but the technology is not obsolete.[44]

2.7. Special Cases of the Life Cycle Curve

Not all parts conform to the six life cycle stages presented in Fig. 17. Some parts undergo a false start and die out, or may be associated with a niche market. Some parts may also be revitalized after the decline stage. Other possibilities can also arise due to various economic, social, and environmental occurrences.

A false start typically suggests that a part starts out with a strong period of growth only to stall because of one or more of the following factors:

• introduction of a superior competing part

• improvement of a competing part

• identification of a problem associated with the part

• failure to reach the critical mass that allows economies of scale to be realized

• lack of a unique and compelling application for the part.

Niche parts generally have some unique applications and thus hold at a constant but relatively low sales level. An example is GaAs ICs, which found a niche market in telecommunications, military, and space applications.

Decline can often be delayed or reversed by revitalizing the original part. Defining new market segments, new applications, or creating a new image for the part, and thereby increasing the demand can cause revitalization. [41,45]

2.7.1. End Of Life

Recycling may be defined as the reprocessing of materials into new products. Recycling generally prevents the waste of potentially useful materials, reduces the consumption of raw materials and decreases energy usage. These result in less greenhouse gas emissions compared to virgin production. [45.]

Recycling has been a common practice throughout human history. In pre-industrial times, scrap made of bronze and other precious metals were collected in Europe and melted down for perpetual reuse. In Britain dust and ash from wood and coal fires was ”down cycled” as a base material in brick making. The two main drivers for these types of recycling were the economic advantage of obtaining recycled feedstock instead of acquiring virgin material, as well as a lack of public waste removal facilities. Paper recycling began in Britain in 1921, when the British Waste Paper Association (now Confederation of Paper Industries) was established to encourage trade in waste paper. [45.]

Resource shortages caused by the world wars, and other such world-changing occurrences greatly encouraged recycling. Massive government promotion campaigns were carried out in World War II in every country involved in the war, urging citizens to donate metals and conserve fiber, as a matter of significant patriotic importance. Resource conservation programs established during the war were continued in some countries like Japan, which did not have an abundance of natural resources, even after the war ended.

The next big investment in recycling occurred in the 1970s due to rising energy costs. Today, the result is that recycling aluminum utilizes only 5% of the energy required by virgin production. Glass, paper and metals have a less dramatic effect but very significant energy savings when recycled feedstock is used. The passage of the Clean Water Act of 1977 in the USA created strong demand for bleached paper (office paper whose fiber has already been bleached white increased in value as water effluent became more expensive).

In 1973, the city of Berkeley, California began one of the first curbside collection programs with monthly pick-ups of newspapers from residences. Since then several states, cities and counties have started and expanded various doorstep collection schemes. Around this time,

Woodbury, New Jersey became a forerunner in the recycling industry in the United States, being the first state to mandate it.[45.]

One event that initiated recycling efforts in the plastics industry occurred in 1989. Berkeley banned the use of polystyrene packaging for keeping McDonald's hamburgers warm. By 1999,The Dallas Sierra Club 2 of 5 Take Action! – Recycling Dallas, TX updated: 5/20/2008there were 1,677 companies in the USA involved in the post-consumer plastics recycling business. [45.]

The boom in the internet industry increased the consumption of electronic equipment in businesses as well as homes. There are several e-recycling efforts that are in effect today as it is important to recycle electronic equipment and such in a proper manner due to their highly toxic nature.[45.]

2.7.2.Materials contain for electronic devices

Electronic waste accounts for 70 percent of the overall toxic waste currently found in landfills, according to Global Futures Foundation. In addition to valuable metals like aluminum, electronics often contain hazardous materials such as mercury.

When placed in a landfill, even in small doses, these materials can contaminate soil as well as drinking water. Here's a breakdown of what toxic materials are found in an average electronic device.[46.]

2.7.2.1. Materials contain for Television

Fig.16.Television[47.]

Before there were plasma screen and liquid crystal display (LCD) TVs, we watched our Super Bowl games and sitcoms on cathode ray tubes (CRT). While the CRT model effectively provided room for all switches and wires in a box behind the screen, it also contained a great deal of lead.

Approximately 20 percent of CRTs are comprised of lead, equivalent to between 4 and 8 pounds per unit. Combine this with the fact that, as of Feb. 19, 2009, the FCC requires that all televisions must run a digital signal, and we could be looking at a lot of lead headed for landfills. Even the smallest amounts of lead can be a serious environmental issue.[48.]

2.7.2.2. Materials contain for Cell Phones

Fig.17. Cell Phones [49.]

While your trusty cell phone may not contain as much toxic material as larger electronic devices such as TVs, its shelf life is only about 18 months for the average consumer. With hip new products coming out on a regular basis, it's estimated that there are more than 500 million used cell phones ready for disposal.[48.]

Cell phone coatings are often made of lead, meaning that if these 500 million cell phones are disposed of in landfills, it will result in 312,000 pounds of lead released. However, possibly the most hazardous component of the cell phone is the battery.

Cell phone batteries were originally composed of nickel and cadmium (Ni-Cd batteries). Cadmium is listed as a human carcinogen that causes lung and liver damage. Alternatives contain potentially explosive lithium or toxic lead. [48.]

2.7.2.3. Materials contain for Computers

Fig.18. Computer [50]

Lead is present in CRT computer monitors. Also, there are other toxic elements that you should be aware of when you're recycling that PC or Mac. Many laptops have a small fluorescent lamp in the screen that contains mercury, a toxic material when inhaled or digested.[48.]

Mercury is also found in computer circuit boards, along with lead and cadmium. Circuit boards can also include batteries made of mercury, as well as mercury switches.

In 2005 alone, almost 2 million tons of e-waste were land filled. While toxic materials comprise only a small amount of this volume, it doesn't take much lead or mercury to contaminate an area's soil or water supply. Keep this in mind when deciding what to do with those old electronic devices.[48.]

2.7.3.E-waste management

Today the electronic waste recycling business is in all areas of the developed world a large and rapidly consolidating business. Part of this evolution has involved greater diversion of electronic waste from energy-intensive down cycling processes (e.g., conventional recycling), where equipment is reverted to a raw material form. This diversion is achieved through reuse and refurbishing. The environmental and social benefits of reuse include diminished demand for new products and virgin raw materials (with their own environmental issues); larger quantities of pure water and electricity for associated manufacturing; less packaging per unit; availability of technology to wider swaths of society due to greater affordability of products; and diminished use of landfills.[51.]

Audiovisual components, televisions, VCRs, stereo equipment, mobile phones, other handheld devices, and components contain valuable elements and substances suitable for reclamation, including lead, copper, and gold.

One of the major challenges is recycling the printed circuit boards from the electronic wastes. The circuit boards contain such precious metals as gold, silver, platinum, etc. and such base metals as copper, iron, aluminum, etc. Conventional method employed is mechanical shredding and separation but the recycling efficiency is low. Alternative methods such as cryogenic decomposition have been studied for printed circuit board recycling, and some other methods are still under investigation.[51.]

Fig.19. Case of disassembly computer [52.]

In developed countries, electronic waste processing usually first involves dismantling the equipment into various parts (metal frames, power supplies, circuit boards, plastics), often by hand. The advantages of this process are the human's ability to recognize and save working and repairable parts, including chips, transistors, RAM, etc. The disadvantage is that the labor is cheapest in countries with the lowest health and safety standards.[51.]

In an alternative bulk system, a hopper conveys material for shredding into an unsophisticated mechanical separator, with screening and granulating machines to separate constituent metal and plastic fractions, which are sold to smelters or plastics recyclers. Such recycling machinery is enclosed and employs a dust collection system. Some of the emissions are caught by scrubbers and screens. [51.]

Magnets, eddy currents, and trommel screens are employed to separate glass, plastic, and ferrous and nonferrous metals, which can then be further separated at a smelter.

Leaded glass from CRTs is reused in car batteries, ammunition, and lead wheel weights, or sold to foundries as a agent in processing raw lead. Copper, gold, palladium, silver, and tin are valuable metals sold to smelters for recycling. Hazardous smoke and gases are captured, contained, and treated to mitigate environmental threat. These methods allow for safe reclamation of all valuable computer construction materials. Hewlett-Packard product recycling solutions manager Renee St. Denis describes its process as: "We move them

through giant shredders about 30 feet tall and it shreds everything into pieces about the size of a quarter. Once your disk drive is shredded into pieces about this big, it's hard to get the data off."[51.]

An ideal electronic waste recycling plant combines dismantling for component recovery with increased cost-effective processing of bulk electronic waste.

Reuse is an option to recycling because it extends the lifespan of a device. Devices still need eventual recycling, but by allowing others to purchase used electronics, recycling can be postponed and value gained from device use.[51.]

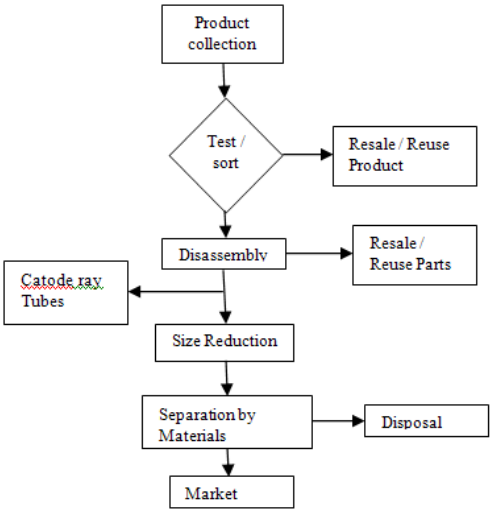


Fig.20. Concept of waste in development country

2.7.4. Beginning to organize collection of waste in Kosovo

After Second World War in1947 began to organizethe collection of waste, but at that time is not supposed separation of waste(e.g. plastic, iron, paper, toxic materials, etc.), waste disposal is done through land fill. By the following table will see units that are received and are created for the collection and disposal of waste.

[53.]

Municipality	year of establishment	Name of organization	Number of employs
Prizren	1947	Cooperative housing sanitation	19
Gjakove	1951	Office cleaning city "Erenik	n/a
Rahovec	1953	"komunalja" company	10
Gjilan	1961	"Pastertia" Company	n/a
Sharr	1968	Municipality enterprise	12
Mitrovice	1953	"Pastertia" enteprise	18
Malishev	1999	"komunalja" company	11

Table 3.Collecting waste by municipality From KPA [53.]

The first studies to thoroughly waste production in quantity and quality were made in 2003 and 2004 where held the proper analys is based on European methods. They were planned and financed by GTZ – Office for Water and Waste Management in Prizren, supported by the Waste Management Section, implemented by NGO "Greens". Analyses were performed in 5 municipalities of Prizren, Pristina and Gjilan. Results are calculated at 2,320,000 residents and smugglers are presented in the following: [53.]

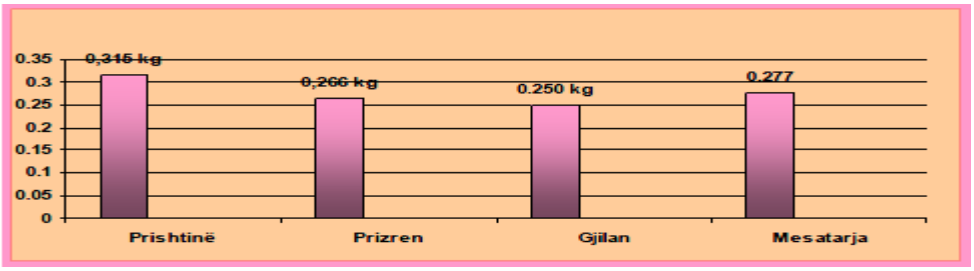


Fig.21.2 Ratio collecting waste by municipalities [53.]

Generate, types of waste	Average daily/kg/habitant	annual amount kg/habitant	Annual amount ton
household waste	0.277	101	232541
Commercial waste	0.25	91.25	209875
hospital waste	0.0024	0.876	2.0145
Ash waste	0.907	331	76142.6
Construction /deconstruction waste	0.2	27	167900
Other waste (package, plastic, rubber, electronic etc)	0.360	131.4	30220

Table 4. Annual average collected waste. From GTZ 2004

As a result of industrial production, cessation of production and other activities encountered many dangerous materials. In the following table are presented data on types of these waste disposal sites / warehouse and their amount up to year2006.[53.]

TYPE OF WASTE	AMOUNT/UNIT	LOCATION	MUNICIPALITY
Waste and solid chemical substances	49045 m3	Kosova A	Obiliq
Waste and solid chemical substances	186 ton	Kosova A	Obiliq

Radioactive sources	34 unit	Kosova A	Obiliq
Waste and solid chemical substances	25505 m3	Trepça Foundry	Mitrovicë
Calcium hypochlorite	6.5 tonnes	Shipol	Mitrovicë
Waste and liquid chemical substances	6300 tonnes and 165 barrels	Metallurgy	Mitrovicë
Waste and liquid chemical substances	600 litre	Metallurgy	Mitrovicë
Waste and liquid chemical substances	2000 litre	Chemical Industry	Mitrovicë
Waste and solid chemical substances	10 tonnes	First tunnel	Mitrovicë
Radioactive sources	3 barrels	First tunnel	Mitrovicë
Waste and solid chemical substances	8500 kg	Industrial Park	
Waste and liquid chemical substances	42900 litre	Industrial Park	
Oils, PCB	4 electrical transformations	Lead Plant	Zveçan
Waste and solid chemical substances	136 tonnes	Lead Plant	Zveçan
Different dissolutions	2 tonnes	Metallic - Janjevë	Lipjan
Waste and solid chemical substances	7.0 m3	Metallic - Janjevë	Lipjan
Waste of photo films	3000 kg	IMK-Plant	Ferizaj
X ray	3 pcs	IMK-Plant	Ferizaj
Waste and liquid chemical substances	20 tonnes	Plant of tools	Ferizaj
Photo films waste	2.5 tonnes	Plant of tools	Ferizaj
Textile paints, chemical substances	9100 kg	Sharr-Tex	Sharr
Waste and solid chemical substances	4370 kg	Sharr-Tex	Sharr
Used oils	1200 litre	“Adi”	Lipjan
Radioactive waste	184 rings of americium	Youth Palace	Prishtinë
Waste and solid chemical substances	85 tonnes	Mine-Trepçë	Leposavic
Solid chemical waste	22.2 tonnes	Shoe and leather factory	Pejë
Waste and liquid chemical substances	17340 litre	Factory of vehicles spare parts	Pejë

Waste and solid chemical substances Factory of vehicles spare	200 kg	Factory of vehicles spare parts	Pejë
Waste and solid chemical substances	6180 kg	Sharr-Tex	Sharr
Waste and liquid chemical substances	3265 litre	Sharr-Tex	Sharr
Solid chemical substances	231.8 kg	Laboratory in Kishnicë	Prishtinë
Plastic barrels with acid	9 barrels	Laboratory in Kishnicë	Prishtinë
Unknown plastic boxes	9 barrels	Laboratory in Kishnicë	Prishtinë
Bottled substances without label	15 pcs	Laboratory in Kishnicë	Prishtinë
Waste and solid chemical substances	5 tonnes	Textile factory	Gjakovë

Table 5.Type ,location and amount of waste in Kosova [53.]

Management of dead leaves of iron, plastics, cans, etc., began in Kosovo before three years but not with any special organization. This organization was started mainly with individuals making the collection point for economic reasons that are making a very favorable profit. Accumulation of metal and then they make agreements with companies mainly from Macedonia, Albania and then send them abroad for the purpose of recycling. There are some trade or Price or such compensation if the recycling plant has received 75 tons of metal they receive1/3Armature in order they make e business.[53.]

2.7.5.Benefits of Recycling

Recycling raw materials from end-of-life electronics is the most effective solution to the growing e-waste problem. Most electronic devices contain a variety of materials, including metals that can be recovered for future uses. By dismantling and providing reuse possibilities, intact natural resources are conserved and air and water pollution caused by hazardous disposal is avoided. Additionally, recycling reduces the amount of greenhouse

gas emissions caused by the manufacturing of new products. It simply makes good sense and is efficient to recycle and to do our part to keep the environment green.[54.]

2.7.5.1.Conserves natural resources

Valuable material can be recovered from old electronics, and these materials can be used to make new products. For example, precious metals are used in computer circuit boards and other electronic components, and of course glass and plastics are used for TV and computer monitors. Recycling these products reduces the need to mine the earth for new raw materials. [55.]

2.7.5.2.Supports the community

Donating your old electronics supports schools, low-income families, and non-profit agencies by providing them with refurbished computers, cell phones, and other electronics. Individuals are helped by being able to access technology that they could not otherwise afford. Check with these groups first to make sure your equipment meets their needs. [55.]

2.7.5.3. Creates jobs locally

As demand for electronics recycling grows, new businesses will be forming and existing companies will be looking to hire more people to staff their facilities to recover recyclable materials (more than 90% of electronic equipment is recyclable!). [55.]

2.7.5.4.ProtectPublic Health and the Environment

Most electronics contain hazardous or toxic materials which can cause an environmental problem if discarded in the trash. Safely recycling and reusing electronics helps keep substances like lead and mercury from harming people or the environment.

Examples:

- Computer monitors and televisions are hazardous because they contain significant amounts of lead (an average of four pounds of lead each).

- Printed circuit boards contain hazardous metals such as lead, chromium, cadmium and mercury, with significant variation depending on the board.
- Batteries in electronic and electrical products may contain lead, mercury and cadmium.
- Mercury-containing components like switches and relays are found in some electronic and electrical products, including the popular flat screen monitors.
- PCBs may be found in televisions and computers made before the early 1980s.[55.]

2.7.5.5. Tips to Prevent and Reduce Waste

Besides recycling, there are many other things you can do to reduce electronics waste.

- **Lease computer equipment.** An advantage of leasing it that when it's time to upgrade to a newer product, the old unit is returned to the vendor, often for a credit toward a future purchase.
- **Avoid "gadgets."** Electronic versions of traditional household appliances and tools may not actually be an improvement, may be more costly, and may wear out faster.
- **Buy quality products.** When shopping for electronic and electrical items, review the product's repair history and consumer reliability ratings.
- **Repair instead of replace.** Repairing an electronic or electrical item may be cheaper than replacing it. Use some of the parts of an old system to build a new system.
- **Buy upgradeable gear.** Some products can be upgraded by replacing a single component instead of the entire unit. This saves money and reduces waste. [55.]

2.7.5.6. Donate, But Don't Overwhelm

Donating your old computer to a school or charity can be a good option, but it is important to understand that obsolete equipment frequently becomes a burden for the charity. If the

organization cannot easily use or upgrade your equipment, they then have to find a safe way to dispose of it. Always call first to make sure they can use your equipment.[55.]

3.Electronics Recycling System

An electronics recycling system is a cost-benefit controlled management process that utilizes end-of-life/surplus electronic devices as resources …to recover thegreatest return from the materials at the lowest possible cost while complying with applicable environmental laws and regulations.[56.]

3.1.Four steps of a recycle system

In the following will be presented4steps ofarecyclingsystem:

3.1.1. 1st Step: Is System (Device) Usable?

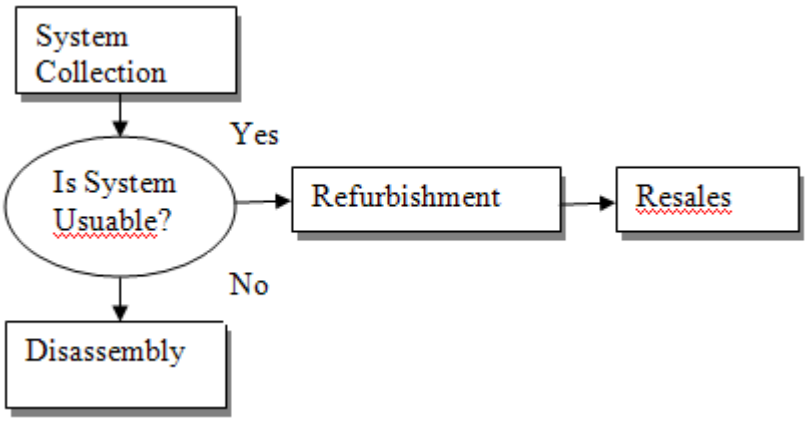


Fig.22 System usuable [56.]

System collection-

For waste collection companies suggest:

Step 1: Take an inventory of your home, office, garage, storage etc. & determine whether you need something or don't. (Keep what you need and get rid of what you don't. That's rule one of recycling. If you don't need it, it's going to sit around and collect dust)

Step 2: Divide your "trash" (which happens to be our treasure) & set aside a corner for all things that plug into an outlet. From microwaves and toaster ovens to lamps & plasma screens – all of this stuff is considered eWaste.

Step 3: Check our site for an upcoming eWaste event in your area or simply give us a ring so we can discuss drop off or pick up opportunities.[59.]

Disassembly (State of the art and outlook)

Disassembling, as the first and most important point in the recycling process, will be a part of the industry with a high rate of expansion. Currently disassembly for recycling, if it is done anyway, is mainly a manual and sometimes also mechanized process. But with the enormous increasing amount of products to be recycled and therefore also to be disassembled, such as computers, printers, telephones, all sort of household-machines and other electr(on)ic devices, it is necessary to automate this aim to increase the effort. High flexibility and low-cost of disassembly processes will be necessary.[60.]

Until now a very high standard in the field of automation and robotics have been reached, but focused only on assembly. Few parts of electronic scrap are recycled after disassembling, however, the degree of automation is still very small - only some pilot or demonstration projects are realized mainly in research institutes. For the expected mass of products which will comeback to recycling and disassembling companies in the future, the existing manual disassembly is totally insufficient. At the moment especially parts of high

quality products, i.e. those which contain precious metals, are disassembled in order to re-use some components.[60.]

For a lot of products, especially those used in private households, the effort of manual work would not be worth it. Today most household products are shredded without any disassembly. In this case a separation of toxic components is not economically feasible and therefore not done at all. Because of the tremendous increasing amount of electronic products to be recycled (and also to be disassembled), makes it necessary to (partially) automate this separation process to increase the efficiency.

A broad realization of a mechanized disassembly has been prevented mainly due to the following limitations:

· Unfavorable design of the products

· High variety and diversity of the products

But nevertheless these limitations still exist the automation potential will be one of the most important productivity factors for this new production process and becomes a new challenge for engineering.

The main goals are

(a) to reduce the costs of disassembling for optimizing the recycling processes and

(b) to create a humane working environment in disassembly factories.

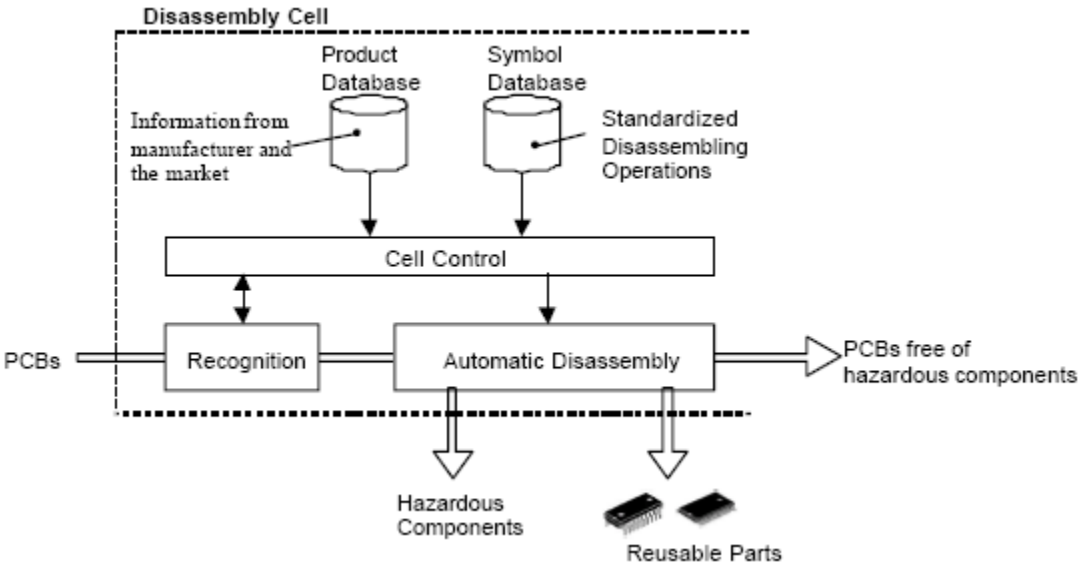


Fig.23 Schematic description of the disassembly cell [60.]

3.1.2. 2nd Step: Areparts usable?

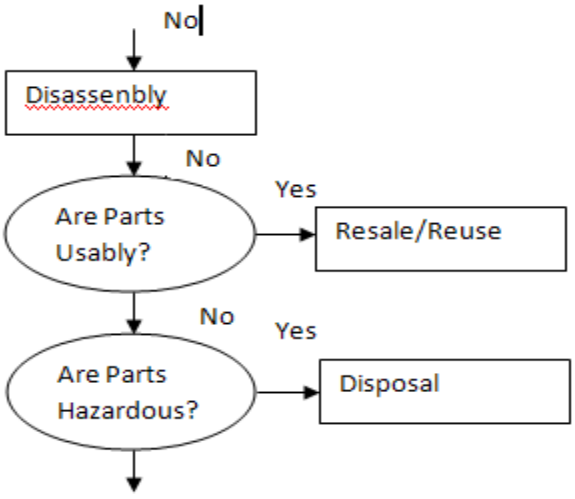


Fig.24 Parts usuable [56.]

We see parts if they are reusable or not, if they are we can resale, if they aren't we must see are hazardous if not continue in the third step if it is we disposal them.

3.1.3. 3rd Step: Are Automated Shredding Facilities Available ?

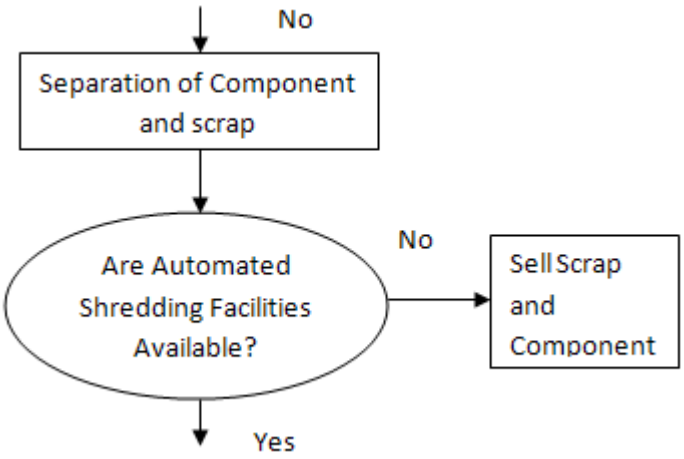


Fig.25 Bloc diagram of Automated Shredding Facilities[56.]

As can be seen from the bloc diagram that in the third step we make separation of component and scrap and as we have done separation we can see are automated shredding facilities available if they aren't we can sell if they are we can see the what to do in the fourth step.

3.1.4. 4th Step: Shredding / Destruction / Smelting

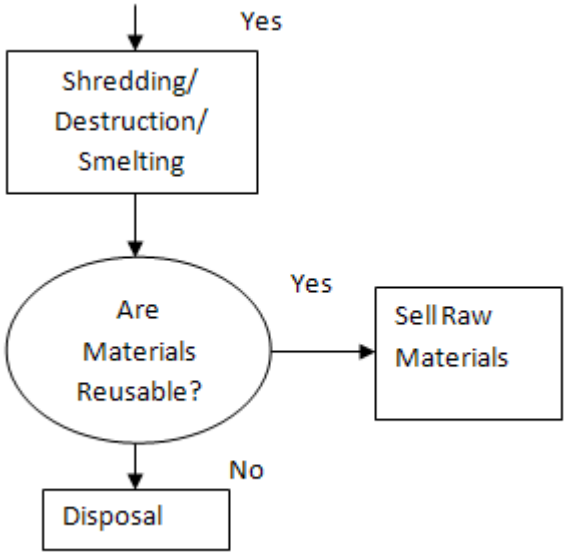


Fig. 26 Bloc diagram of Shredding / Destruction / Smelting [56.]

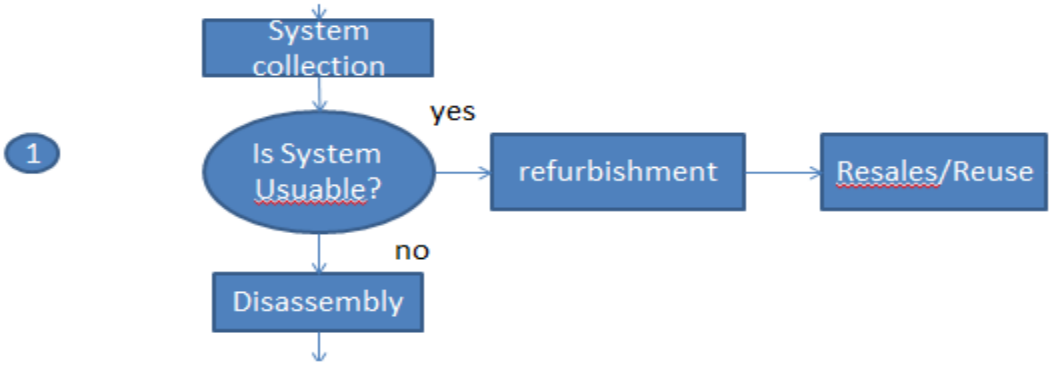
As can be seen from the bloc diagram that in the fourth step we can see are the material reusable if they are we can sell, if not we mast to disposal them. on the contrary if not done destruction comes to contaminate environment and damage to human health

3.2. Electronics recycle systems in Kosovo

Based on my research we present recycling system in Kosovo.

Given that Kosovo did not solve the recycling system we have managed to present only two steps of the four steps.

3.2.1. 1stStep: Is System (Device) Usable in Kosovo?



System collection- Collection waste in Kosovo made by the repair company, this means that Kosovo not have instead of collecting. That we see in the following figure.

Fig. 27 System collection in Kosovo

Is system Usuable-

If the system is usable they refurbishment it and then resell, if the system is not usable they disassembly that. This case we see in the following figure.

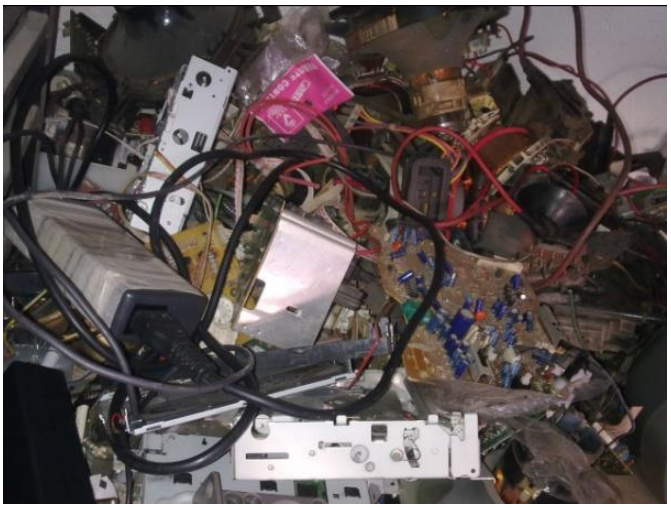
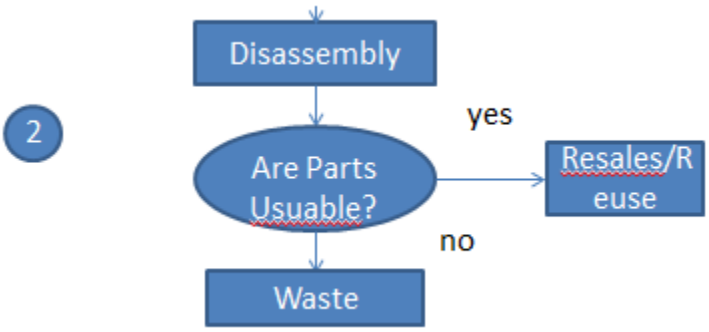


Fig. 28 Disassembly case in Kosovo

As seen from the figure, there is a big difference between the disassembly in developed countries and in Kosovo. When they make disassembly go to the second step.

3.2.2 2nd Step: Are parts usable?



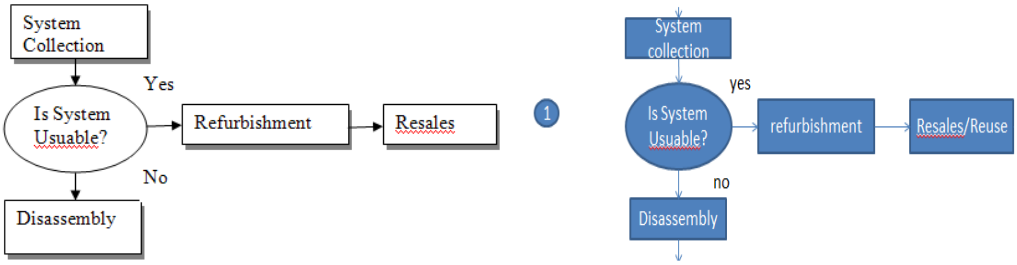
Are parts usable?

Terms of whether they are usable parts, they do not check all the parts, but only at the needs for the moment, in future step they push it in the waste. That we can see in the following figure.

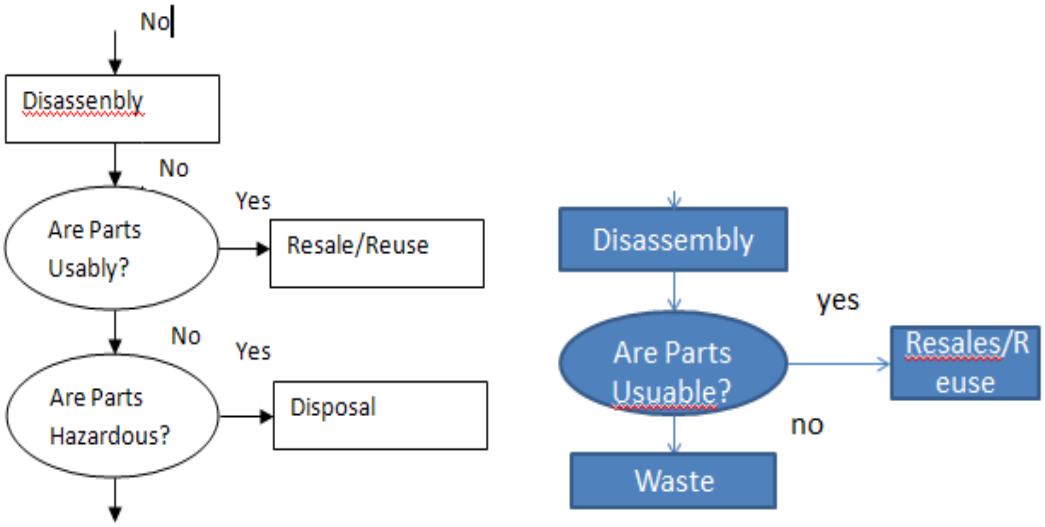
Fig.29 Electronic waste in Kosova

3.3. Comperate of electronic recycle system with electronic recycle system in Kosovo

In this section we make a comparison of the two systems to represent what the problem is in Kosovo and which step was terminated system.



As can be seen from the appearance of the part where the system must be separate of component and scrap in Kosovo the parts close in the waste.



When we make a comparison of the two block diagrams we see that the system in developed countries went on, however in Kosovo come to termination.

Considering the research we have found some factors why Kosovo interrupted system, one of them is not functioning law. If that would work law repair companies will not be allowed to shed electronic waste in any part of the environment knowing how harmful are they for the environment.

4. WEE flow

4.1.WEEE flow in Developed Countries

Retailers are the primary actors responsible for collecting the end-of-life products from household to regional aggregation stations. Upon the request of consumers, the retailers are responsible for accepting a) an old appliance when selling a similar new product (old-for-new), and b) an old appliance that they themselves have sold (ECOLAS/RPA, 2007).
For those products not collected by the retailers, municipalities and designated legal entities, the government appointed the Association for Electric Home Appliances (AEHA) as a designated legal entity. With regard to collection, designated legal entities collect products from remote areas in response to the request of municipalities governing the area or of local residents themselves (ibid).[57.]

Producers have the obligation to establish the regional aggregations stations and transfer the discarded products to recycling plants. Producers also have the responsibility to recycle their products either themselves or delegate their responsibility to the third party. In the initial phase, they need to achieve differentiated recycling rate targets on weight basis, which are 60% for air conditioners, 55% for TV sets, and 50% for refrigerators and washing machines. The recycling rate must be achieved by reuse of components or material recycling. Only the recycled materials that have positive or zero monetary value can be included when calculating the recycling rate.
Recycling of products whose producers cease to operate in the market (orphan products) is done by the designated legal entity. Producers also have to recycle the ozone depleting substances used as freezing agents in refrigerators (ibid).[57.]

The total number of products collected in the first year of implementation was 8,538,000 (April 2001-March 2002) while the figure for the second year (April 2002-March 2003) was 10,147,000. The legislation does not set any collection target (Tojo, 2003 in ECLOS/RPA, 2007)

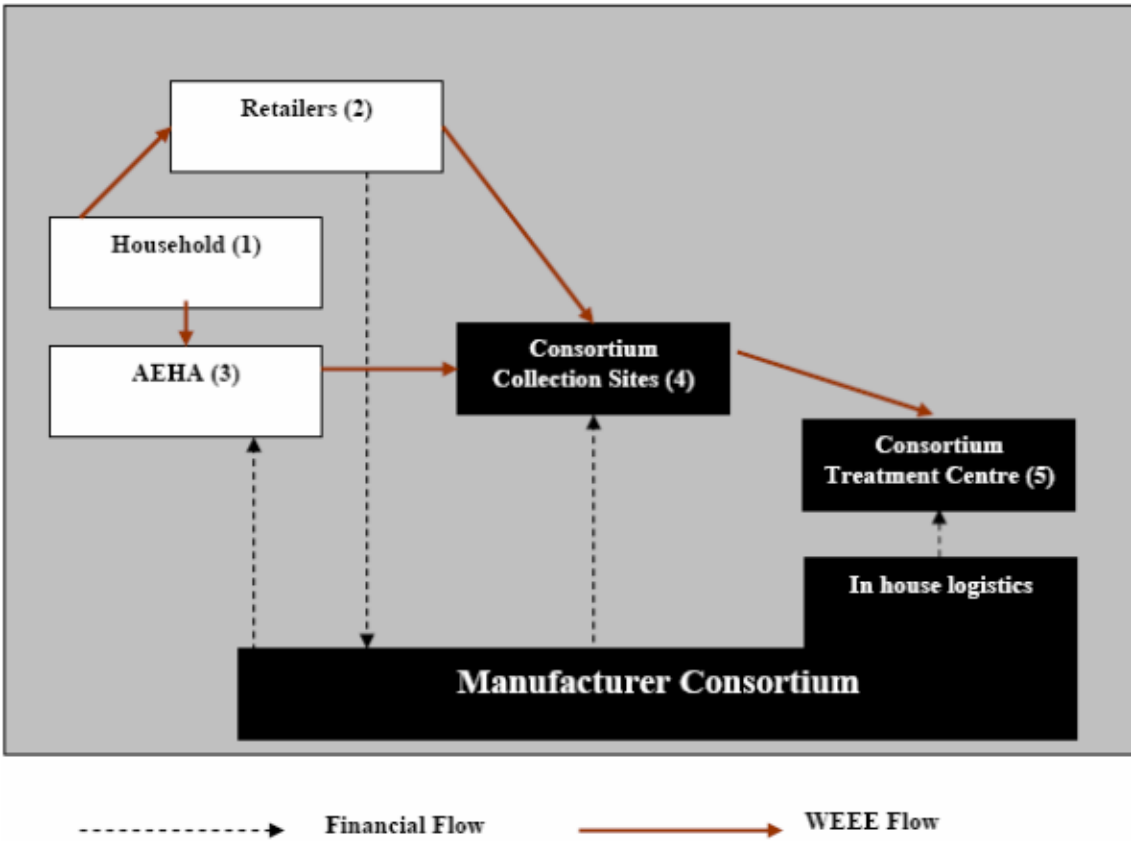


Fig 30: Japanese WEEE Take back Systems – A Consumer/Retailer based System,[57.]

For the recycling of home appliance, the consumers pay for the collection at the time of disposal(end-user-pays) (Donovan, 2003). The consumer also must buy a recycling ticket (available at post offices and retail stores), which they provide to the collection agent to demonstrate that the recycling fee (INFORM, 2003). The fee is announced by those who are physically responsible for collection. The majority of the fees per item set by the retailers have been between 500 and2500 JPY (3.5-17.4 Euro), while in some cases, the set fee is more than 3100 JPY (21.6 Euro).[57.]

This fee also covers the management of the regional aggregation stations (Takahashi, 2003, in Tojo, 2003). The cost associated with the physical responsibility of the producers (establishment of regional aggregation stations and transport of discarded products from

the regional aggregation stations to recycling plants) is covered within the recycling fee (Tojo, 2003). In the case of PCs, to recycle the old computer, manufacturer has to be contacted. Then the consumer either takes the unwanted PC to the nearest post office, or arranges for the post office to pick it up. Japan Post then delivers it to the appropriate manufacturer's recycling centre (Donovan,2003).[57.]

For products, especially computers, manufactured by those not members of the Japan Electronics and Information Technology Industries Association, such as overseas-made PCs and those whose manufacturers have gone out of business, the association is expected to bear the cost of disposal (Donavan, 2003).

In the case of collection and recycling of personal computers, the Revised Law for Promotion of Effective Utilization of Resources, adopted in 2000, mandates a front-end financing system(INFORM, 2003).[57.]

4.2.Key trends in the development of WEEE management

Both countries, Macedonia and Serbia, do not have complete and functional WEEE management system. Macedonia is in the phase of setting the legislative framework incompliance with the WEEE Directive and Serbia is in the phase of enforcing the adopted legislation. The governments of both countries are in the process of establishing models and schemes for adequate WEEE management. When setting the scheme of the WEEE management system it is important to consider all factors that will, depending on the characteristics of each country, influence the efficiency and effectiveness of the operation of the model (Savage et al. 2006). National implementation model drivers are:

- Distance and geography;
- Population size and density;
- Cost of labour and length of time in operation;
- Product type and volume;
- Recycling standards, treatment and standardization of reporting;
- Consumer behavior.[58.]

Smaller distances between operational stakeholders significantly reduce transport and logistics costs. For instance, for a management scheme established in Norway associated costs for transport are much larger than those in the Netherlands. Furthermore, countries like Greece, with significant number of islands have geographical problem of managing WEEE properly. Places with dense population and urban areas influence greater generation of WEEE relative to costs (economic efficiencies and economies of scale). High intensive activities such as collection, treatment and sorting have laobour cost component. Over time these costs could be reduced in case of adequate functioning of the established scheme. Generated greater volume of WEEE could obtain better economic efficiency with better positioning on the market, which would be beneficial for negotiating better rates. [58.]

Additionally, each WEEE product type has a different cost associated with its recovery and recycling (Savage et al.2006). Each country in the European Union was responsible for setting its own standards and definitions for recycling, therefore the level of recycling standards, quality control systems and processes varies significantly across countries. Low supplier contract costs in certain countries may reflect lower contractor recycling standards. Furthermore, reporting of the data vary considerably between WEEE schemes. Some schemes report in terms of units collected, others do it in terms of kg, while some schemes report both according to product category
(Savage et al. 2006).
The level of WEEE recycling awareness is a key driver for functioning of the scheme (Huisman et al., 2008). That was confirmed in the report "Implementation of the WEEE Directive in the EU" where collection rate was evidently higher in Member states that already had WEEE culture.
In order to establish efficient and effective WEEE management scheme in Macedonia and Serbia it is necessary to consider these drivers to examine the characteristics of each country.[58.]

4.3. WEEE management in Republic of Macedonia

Republic of Macedonia is in the phase of drafting secondary legislation on WEEE and transposing the WEEE Directive into national legislation. The Law on Waste Management will lay the basis for the national WEEE Regulation, which will set rules and obligations for all stakeholders of WEEE. According to the National Waste Management Plan and Strategy, creation of waste management schemes, plans, targets, and feasibility studies on WEEE management is planned to start from 2011. Establishment of organizational, financial and operative structure for the collection, treatment, recovery/recycling of WEEE is also envisaged to start in 2011. [58.]

In accordance with the Law on Waste Management, this report presents a scheme (Scheme 1) on how the future WEEE flow in Macedonia will look like.

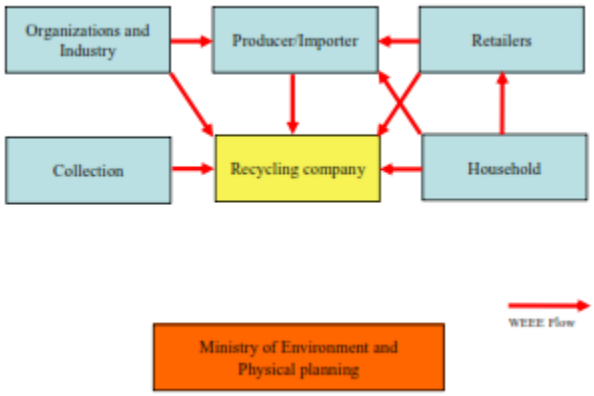


Fig. 31 WEEE flow of Republic of Macedonia[58.]

4.4. WEEE management in Republic of Serbia

Serbia is currently in process of enforcing the WEEE Regulation and the newly introduce deco taxes (for importers and producers). These taxes, which are part of the revenues of the Environment Protection Fund, starting from 2011 will be used for subsidising recycling companies. The recycling companies will then distribute part of these subsidies to the registered WEEE collection companies. The infrastructure for collection of WEEE is still

in developing phase. However, when the WEEE Regulation entered into force it significantly influenced the amount of collected WEEE (see chapter 6.2. recyclers).[58.]

In accordance with the Law on Waste Management, the National Waste Management Strategy of Republic of Serbia, the National WEEE Regulation, and through the conducted interviews with relevant stakeholders, this report presents a scheme of the planned WEEE Flow and WEEE Financial Flow in Serbia.

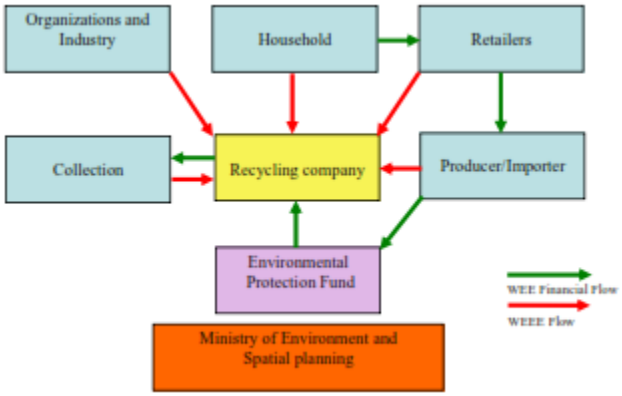


Fig. 32 WEEE Financial Flow and WEEE Flow of Republic of Serbia [58.]

4.5.WEEE flow management in Kosovo

Considering that Serbia and Macedonia a both have problem with WEEE flow management then the best option remains to present WEEE flow management of developed countries to analyze the steps that Kosovo should be taken in the future.

Based that in Developed Countries the retailers are the primary actors responsible for collecting the end-of-life products from household to regional aggregation stations, Kosovo needs to make control over retailers and receive data for goods imported by them.

Upon the request of consumers, the retailers are
responsible for accepting
a) an old appliance when selling a similar new product (old-for-new),

and

b) an old appliance that they themselves have sold

Unlike the developed countries have made Electric Home Appliances Kosovo should make a point of collection, whose gross customer can throw electronic waste.

Followed in mind that Kosovo has no electronic equipment production company responsible for making payments for WEEE falling importing companies.

Bused in my research may submit a WEEE flow management for Kosovo.

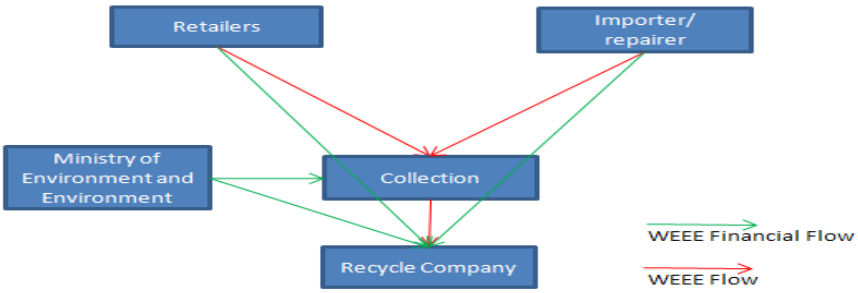


Fig. 33 WEEE Flow caste Kosovo

After that in my research I have done calculations for a waste collection point in Kosovo and the conclusion is that it must be then for me it is reasonable that WEEE to go through point collection to recycling company.

In Kosovo in most places where the repairer are also importers, therefore for me are in the same point.

Most importers from production companies receive from 3% equipped with free, for this they need to be WEEE Financial flow.

Knowing that the state is responsible for recycling the main part for this are among the main factors WEEE Financial flow.

5. Household electronic waste in Kosova

Given the population and average number of members for a family in Kosova, can approximately calculation some household electronic equipment.

Should be noted that these calculations are not all included because, waste producers companies, other tools which is not house usually equipment common as tools pump for water etc couldn't get exactly information.

List of household electronic equipment are:

- TV
- Radio
- Receiver
- Pc
- Fix telephones
- Washing machines
- refrigerator
- Dishwashers machine etc.

From unofficial information from registration of inhabitants in Kosova in year 2011, we have around 1 738 348. Taking theaverageofthe5memberfamilieswehave:

1 738 348 / 5 = 347669 families.....()

Calculation weight of each household electronic equipment like as in table bellow:

Equipments	weight/kg
TV	24 of e-waste mass
Pc	18
Received	2
Radio	4
washing machines	50
Fix telephone	0.5
Tools	10
Refrigerator	20

Dishwashers machine	35
Total weight	163.5

Table 6 Household equipments

TV	14.67% of e-waste mass
Pc	11% of e-waste mass
Received	1.22% of e-waste mass
Radio	2.44% of e-waste mass
washing machines	30.58% of e-waste mass
Fix telephone	0.3% of e-waste mass
Tools	6.11% of e-waste mass
Refrigerator	12.23% of e-waste mass
Dishwashers machine	21.4% of e-waste mass

Table 7 Household equipments in %

If supposed that all this equipment should bechangedevery10years, then we get result

347669 X 163.5 kg = 18567.2 ton.....()

Calculation is for 10 years, if calculate for one year

18576.2 ton/10 = 1857.62 ton per year .....()

In those calculation are not included and some electronic waste like in industry, other machine tools etc.

6. Collection Point In Kosovo

Considering that Kosovo is a small country we can surfacein central Kosova to build a landfill because e most lately from the border to the centeris100km.

Plantation must have at least two hectares surface, because the idea of Collecting point is to make places like below:

- Space of dismantling
- Parts toxic Warehouse
- Warehouse, the plastic
- Pwb warehouse etc.

To start the collection must first bean agreement with all companies that collect garbage for the possibility of divisions the containers for Electronic Waste, engaging in some form of advertising media to inform the population.

At least 5 vehicles transporting carrier, driver, Personnel, brochures, equipment, logistic, etc.

All these can calculate as:

$$C_p = C_l + C_c + C_t + C_{pp} + C_s + C_o \text{.....()}$$

C_p-collection point

C_l- Cost land or rent land

C_c-Cost for construction and building warehouses

C_t-Cost of bought transportation cars, maintenance, fuel

C_{pp}-Cost for personnel

C_s- Costs for brochures and their distribution

C_o- Costs for equipment, special clothing, logistic etc.

A problem that could be is the high initial investment, let us take these expenses in euros, for ten years.

C_l- Cost land – because the standards we should befar urbanism, then for two hectares of land cost much lower C_l= 40 000euros.

C_{pp}-Cost for personnel -knowing that in Kosova the unemployment rate is very large and work will be organized in one shift, all this can be done with 25 employees with averages alary 250euros

C_{pp}=25*10*260*12=780.000€

Average Employee Wage	€12/day
Working days	260 days/yr
Number of shifts	1 shifts/day
Paid time	8hrs/shift
Financial Rate of Return	15%
Equipment Life	10Yrs
Building Life	20Yrs
Price of Electricity	€ 0.12 /kWh
Price of Building Space	€2 /sq m

Table 7 Cost of collection point in Kosovo

C_c-Cost for construction and building warehouses –after that they are constructions montage, except the part that required for the toxic material that is specific and most expensive may cost C_c= 350.000 euro.

C_t-Cost of bought transportation cars, maintenance, fuel –cars for transport costis not expensive and should not be too large, because they need to get through the field, then bring the point of dismantling C_t=(1000+180*20+50*5*1.6*10)*5=1000+3600+4000=43000€

Transportation cars	€ 1000
Maintenance	€ 180 / six month
Fuel	5 l/100km
Number of transportation cars	5
	€1.6

Table 8 cost of transformation waste

C_s-Costs for brochures and their distribution - cost, in terms for the beginning is great until the information is then distributed need not major expenditures for information C_s= 15000

C_o- Costs for equipment, special clothing, logistic etc.- after that the system is not automated and the dismantling not very particular equipment, clothing especially where toxic material work should be safe as well as other costs that include taxes and logistics in general, fee per unit that is made after the client have interest to bring C_0=350000 euro.

$C_p = C_l + C_c + C_t + C_{pp} + C_s + C_o$

C_p=40.000 +780.000+350.000+43.000+15.000+350.000=1.578.000euro

These costs is not very large for some facts contribute to the reduction of landfill, environmental protection, meeting the EU criteria and creating a second market because ithas many parts that can be reused (decrease costs).

Kosovo hasn't still recycling factory, and factories for the construction of electronic devices, all these wastes must export abroad that would have reduced the costs of investing for Collecting point and dismantling. Also need the experts to handle hazardous materials for transportation in order to determine the fate, can transport or should be disposal it.

Waste of electronic devices in Kosovo for 10 years is 18567.2 ton

Cost of collection points for 10 years is: C_p= 1.578.000 euro

Price collection for ton:

Ct=1.578.000/18576.2=84.94 €/ton

On the basis of these analyzes, in Kosovo should become a collection point.

VI.CONCLUSION

Based on my research concludes that recycling system in Kosovo does not work, after a few steps, as we have shown earlier come up to the cessation of the system.

Based on my research, I come to the conclusion that Kosovo should make a point of collection, the importer and the customer to pay for the waste to operate waste management flow.

I have analyzed the costs of building a collection point in Kosovo, as analysis shows there is not very high cost considering the profits made from the recycling of electronic equipment.

After Kosovo to make the point of collection should be analyzed costs to do or not recycling company in Kosovo if not to make agreements with neighboring countries to make recycling there.

Kosovo should soon start implementation of the law on waste, as and pretending to be part of the EU, one of the condition to be part of the EU is a waste solution.

VII.APPENDIXES

UBT-Universiti of Busines and Teknology

WEEE-Waste Electrices and electronicequipment

EOL- End Of Life

PC- Printed Circuit

Op-Amp … Operator Amplificator

U.S- United States

UCLA- University of California, Los Angeles

WWW … World Wide Web

CRTs … Cathode Ray Tubes

TV … Television

LCD … Liquid Crystal Display

CD … Color Display

DRMA … Dynamic Random Access Memory

TI … Texas Instruments

DTL … Diode Transistor Logic

RTL … Resistor Transistor Logic

EPA … Environmental Protection Agency

RAM … Random Access Memory

VR …Videocassette Recorder

EU … European Union

IT … Information Technology

WEEE … Waste Electrical and Electronic Equipment

EMAS … Environmental Management and Auditing System

EEC … European Economic Community

EINECS … European Inventory of Existing Commercial chemical Substances

RP … Rear Projection

DLP … Digital Light Projection

LCD … Liquid Crystal Display

PDP … Plasma Display Panel

LED … Light Emitting Diode

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