WHAT WEEE ARE

The SHIFT Residency
May 23rd – June 2nd
2016

Introduction

Following the presentation at the Falling Walls Conference Lab in Berlin in November 2016, the WHAT WEEE ARE project was invited for an artistic residency at The SHIFT conference in Turku Finland.

The residency was held in three different locations. From May 24th to 27th the activities were held in the Information and Communication Technology department of Turku University - ICT City Hall. On May 28th and 29th the open lab was moved to BOOST headquarters in SparkUp Turku which is the start up accelerator of Turku University, and finally on May 31st and June 1st the final WHAT WEEE ARE art exhibition was held inside the halls, courtyard and garden of the medieval Turku Castle, which foundations date back to 1280.

Prior to the workshop, an e-waste collection campaign was organized asking people in Turku to bring their discarded electronics to the collection point installed in ICT City Hall. In total 62 Kilos were collected, counting various different items such as computers, coffee makers, toothbrushes, and other common household and office electronics. There was also a call for volunteers to participate in the WHAT WEEE ARE workshop. 7 students from different backgrounds applied.

Workshop

The workshop began with the WHAT WEEE ARE survey on consumer awareness, in order to involve the participants and introduce the topics of the activity. Following, a theoretical lesson on the properties of metals, metal extraction and responsible use of raw materials allowed the participants to learn more about the story and production of common household and office technology.

After this brief 2 hour theoretical introduction, the volunteers were introduced to the core part of the workshop which consisted in disassembling all the e-waste. Personal Protection Equipment including gloves, dust mask, apron and eye-wear was provided along with a set of hand tools. Disassembly operations took 3 part-time (5 hours) working days. Not all 7 volunteers could donate their time together and on average 2 volunteers at a time worked in the workshop.

Some 900 screws of different sizes and heads were unscrewed and completing operations took an average of 3 hours per day employing 2 people for three days. This adds up to less than 18 man hours to complete operations,thus yielding an average 4kg per man hour of which 1.2 kg (30%) were average grade Printed Circuit Boards as shown in table 1. Considering the operators were first time volunteers in the project, trained and remunerated operators could achieve considerably higher yields per man hour as well as more hours per shift. Still taking into account diminishing returns

this result is nevertheless impressive. In addition, disassembling is not particularly repetitive and requires a certain degree of concentration resulting in somewhat of an entertaining and challenging job, which however cannot be done for more than a few hours at a time because quite mentally tiring.

Table 1, shows percentages of different materials out of the total 62 kg of e-waste collected. After disassembly and separation, plastics including both thermoplastic and thermosetting material accounted for about 11% in weight and an average 30% in volume. 22 kg of Ferromagnetic metals were found (30% ca.) along with 3 kg of aluminium (5% ca.). Finally 17 kg (27% ca.) of Printed Circuit Boards (PCB) were harvested from the bulk e-waste as well as 1 Kg (1.5%) of hazardous waste composed mainly by batteries as well as a very small quantity of Radioactive material (most probably Americium 241) found in a smoke detector. This finding in particular should endorse further thoughts on the contents of our household appliances and safety wear, since the radioactive material emits gamma rays also when in function inside our kitchen, bedroom or living room. Therefore, deeper knowledge of the electronic objects surrounding us could prove beneficial in avoiding base radiation that may also involve health hazards in the long run.

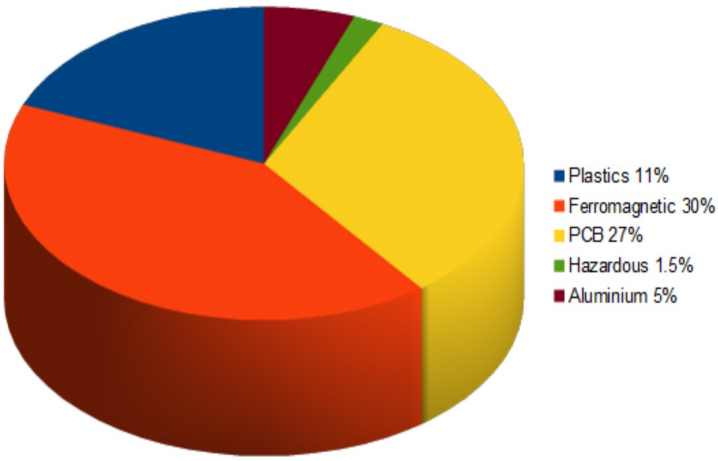


Table 1

After disassembly, the materials found were used to produce sculptures of various sizes resembling insects, crabs, jellyfish as well as a 4 meter-long dragon and other smaller creatures and decorations. The volunteers had the opportunity to help out and follow the artistic process of the WHAT WEEE ARE sculptor and 2 participants also produced their own models. The sculptures were then used to decorate the halls, courtyard and garden of the Turku Castle, where The Shift conference took place on May 31st and June 1st. The sculptures were greatly appreciated by the staff, organizers and audience and were inspiring to introduce discussions regarding the topic of e-waste and responsible use of raw materials. The public was engaged in questioning their habits and lifestyle and their relationship with household, office and everyday technological products.

Survey

During the entire period, walk-bys were asked to fill in the WHAT WEEE ARE survey in order to better define the average consumer awareness of the targeted audience. The survey involved 67 people in total, of which 39 male and 23 female aged between 17 and 75. 34 of them were professionals with various titles, including high level representatives, CEOs and electronic engineers; 33 academics of which 27 students from different backgrounds such as applied sciences, arts, marketing and information technology; 2 high school students and 6 teachers and professors. Table 2 shows the composition of the survey sample.

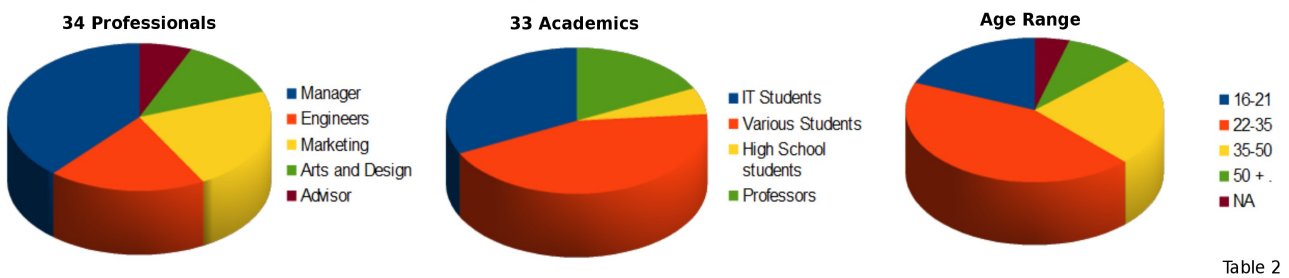


Table 2

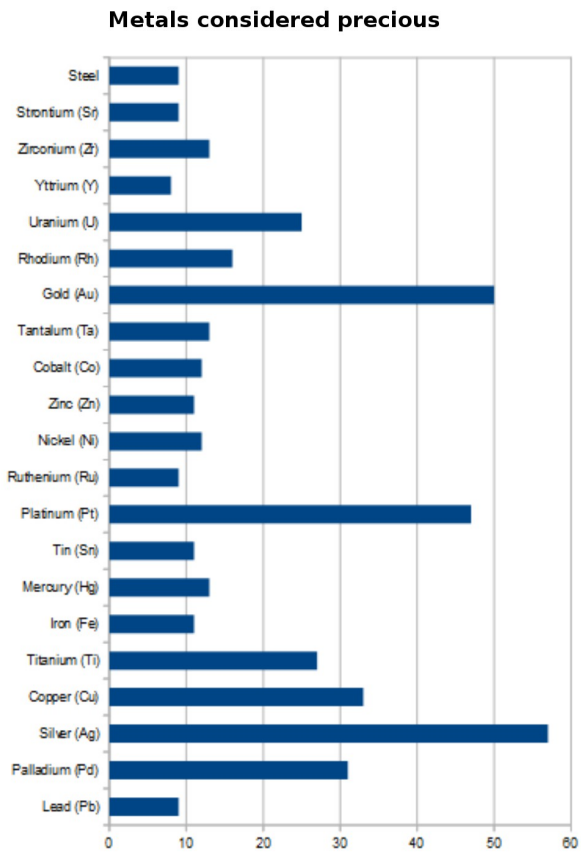


Table 3

The WHAT WEEE ARE survey is divided into two sections. The first part focuses on material science and resources, while the second investigates the awareness people have regarding the material contents of everyday technology. The final part of the survey studies the number of electronics and waste electronics owned by the average person as well as the disposal habits of the participants.

The questions in the WWA survey are simple, yet motivate people to question their common awareness of material science and consequently invite them to ponder upon their lifestyle and everyday behaviour.

Survey section 1 – consumer perception and value of metals

The first section of the questionnaire enquires the perception people have of some 21 metals on the periodic table of elements. The question is simple: "*Which of these metals are Precious Metals?"* Table 3 shows the results of the survey. It is interesting to note the three peaks represented by Gold, Platinum and Silver of which the latter is seemingly considered even more precious than Gold by over 75% of those interviewed. Also Palladium, Copper, Titanium and Uranium are particularly appreciated by up to 50% of the sample. By contrast Ruthenium is not particularly valued along with Lead, Iron, Yttrium and Steel which were selected by less than 10 out of 67 participants. Finally, Rhodium, Mercury, Tantalum, Nickel and Zirconium are rather commonly appreciated by 30% of the sample's population.

Table 4 figure 2 shows answers the people interviewed gave to the question: *"Why are certain metals precious?"* According to the results over 60 participants (91%) appreciate metals for their usefulness and their particular properties. Weight and optical properties were not particularly reinforced as preferential (under 20%) while scarcity as reason for value is strongly perceived by over half of the population (58%)..

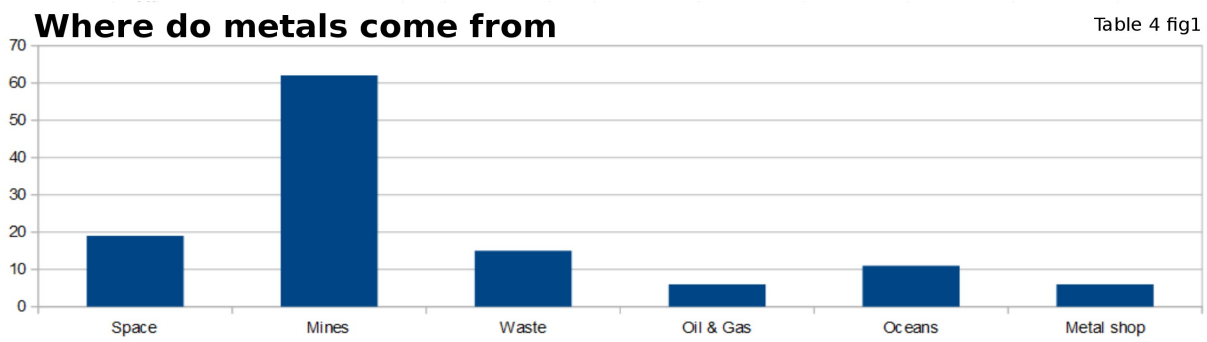


Table 4 fig1

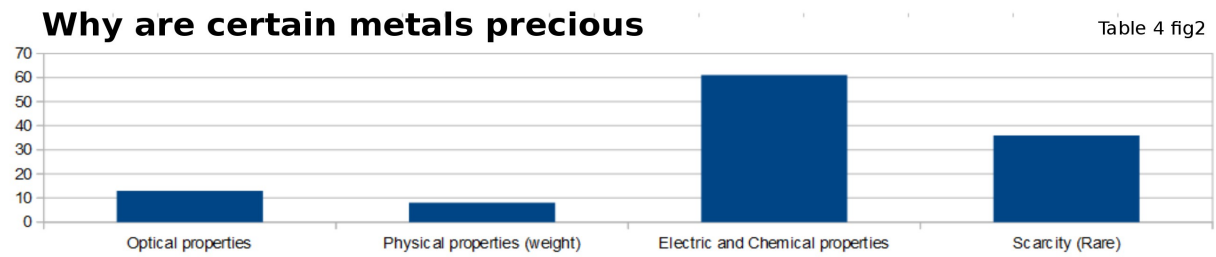
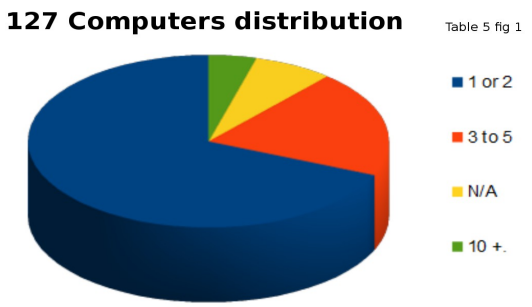


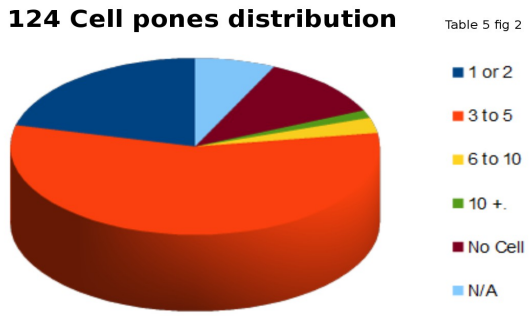
Table 4 fig2

When asked *"Where do metals come from?"* over 92%, yet not all (62 out of 67), are aware that metals come from mines and only one person commented/stated that metals also come from mines in Africa. 11 people (16%) know that metals can be extracted from ocean water. Instead only two people said metals also come from plants, while none replied they come from animals. 3 replied that metals can come from secret laboratories. In particular, as shown in Table 4 figure 1, only a very low percentage of the population interviewed (under 25%) is aware metals can be extracted and regenerated from waste streams. Almost one third (28%) recognizes that metals in some way come from space.

Survey section 2 – Electronic equipment ownership and awareness

The second part of the survey investigates the distribution and quantity of electronic equipment people own and the distribution of such equipment throughout the population. Table 5 figure 1 shows the distribution of some 127 computers or more throughout the population of 67 individuals participating in the survey, thus averaging 1.85 devices per capita. Many of the devices may still be.functioning, but obsolete for modern software, Others may be broken or yet some users may have more than one fully functioning device in their household. It is interesting to observe the difference in distribution of cell phones compared to computers. In fact, while over 70% of the people interviewed declares owning only one or two computers, up to 60% of people claimed to own three to five cell phones. Curiously over 10% do not have a cell phone, yet only 7% do not possess a computer.





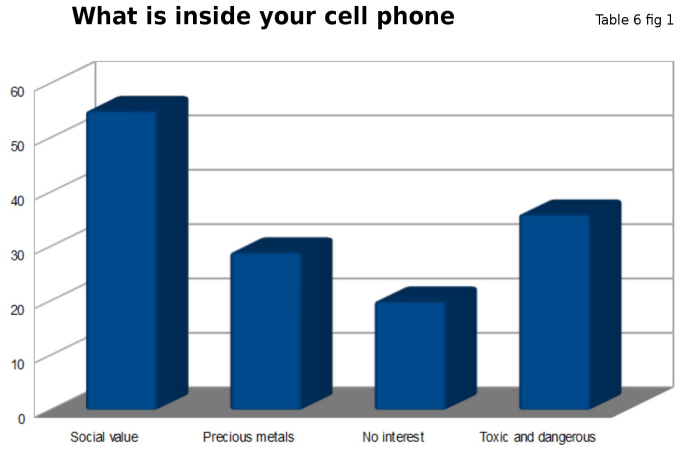
Although about 80% of the population declares to own one or more cell phones and 92% say to own one or more computers, with an average of about 2 phones per person, only 10% is aware that a common cell phone contains more than 90 elements from the periodic table. 83% particularly enjoy the social value and entertaining features of their technology while 30% have no particular interest in furthering their knowledge regarding the contents of their phones or computers as described in table 6 figure1. Furthermore only 37% of the interviewed knew that the acronym WEEE stands for Waste Electric and Electronic Equipment.

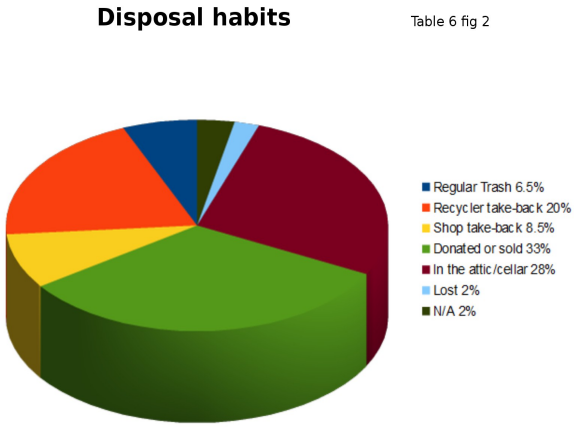
Survey section 3 – value and disposal of e-waste

This section investigates what people think is inside their everyday technology and how they value and dispose of their e-waste. In particular, it is comforting to know that over half of the sample (53%) knew that technologies also contain toxic elements which can be dangerous if released into the environment, yet only 43% are aware that there is a considerable content of precious metals such as gold and silver.

Regarding disposal and value of e-waste it is interesting to notice how the population divides into three main behaviours as visually discernible in table 6 figure 2. One third of the discarded electronics (33%) appears to head towards secondary markets, being donated to others or sold for second hand market value. 28.5% of the e-waste is handled through the take-back system including both in-shop take-back as well as recycling collection frameworks, with a high predominance of the latter (about 20%).

Finally, another 28% of waste electronics is stored in peoples' attics, cellars and garages while unfortunately over 8% of total e-waste is thrown into/next to the regular trash bin or lost.





Conclusions

The 9 day WHAT WEEE ARE residency at The SHIFT in Turku, Finland has proven to be mutually beneficial both for the business festival organization as well as for the WWA project. Through this residency, the Festival organization, including Turku University, SparkUp Turku, The Boost and Werstas co-working space, were able to promote environmental and social awareness regarding e-waste and responsible use of raw materials. Also the e-waste sculptures produced by the WWA artist were highly appreciated by the audience, press and other institutions connected to the event. Including artistic works within the festival's activities and decorations was not only beneficial to creating an interesting setting for the event. but also highly effective to invite people to question and introduce discussions over issues related to our technological world and e-waste in particular.
Many professors, engineers and professionals were interested in the project and were available to take part in the WWA survey, thus participating actively in the workshop and in the research herein. The Finland Residency has also proven beneficial to the WHAT WEEE ARE project allowing it to travel and be known in Turku Finland. The setting inside the Turku University - ICT City Hall was ideal for attracting an audiences already interested in Electronics, who were also able to provide valuable insights about the ICT industry, production and hardware development.

In conclusion, it is interesting to note that although almost 30% of the population interviewed included people with higher levels of education, many have disposed of their old technology through either the recycler's or the in shop take-back systemsUnder 25% of the sample is aware that metals can be extracted from waste streams. Moreover, despite over half of the population is aware technologies may contain toxic and dangerous elements, few (under 45%) are aware they contain considerable quantities of precious metals. It is interesting to observe that almost one third of the population prefers giving their device a second life through second hand markets or donating their old technologies to people who do not have any. In general, people interviewed in this context are rather waste wise and have chosen to dispose of their e-waste in the formal recycling sector, by giving it give it another life. The majority of people store their old devices at home, either because they do not know where to put them, or because they do not have the time to bring them to the local e-waste collection point.

People in Finland have thus demonstrated a very high level of knowledge of e-waste and are very interested in the issue, nevertheless there is still room to improve and raise further awareness. This is very important as there appears to be a very high use of electronics, currently as much as 1.8 personal computers and 2 phones per capita, which are likely to increase in the near future along with the waste which such use will eventually produce.