


ASSIGNMENT 1 FRONT SHEET

Qualification	BTEC Level 5 HND Diploma in Computing		
Unit number and title	Unit 13: Computing Research Project		
Submission date	15 December 2022	Date Received 1st submission	
Re-submission Date		Date Received 2nd submission	
Student Name	Pham Minh Khanh	Student ID	GCH200087
Class	GCH0907	Assessor name	Nguyen The Lam Tung
Student declaration I certify that the assignment submission is entirely my own work and I fully understand the consequences of plagiarism. I understand that making a false declaration is a form of malpractice.			
		Student's signature	

Grading grid

P1	P2	P3	P4	P5	M1	M2	M3	D1	D2

☐ **Summative Feedback:**☐ **Resubmission Feedback:****Grade:****Assessor Signature:****Date:****Internal Verifier's Comments:****Signature & Date:**

Contents

1. Introduction.....	5
1.1. Project purpose	5
1.2. Project objective	5
2. Literature review	5
2.1. Discuss research methodologies	5
2.1.1. Primary research	5
2.1.2. Secondary research	7
2.1.3. Qualitative.....	9
2.1.4. Quantitative:.....	10
2.1.5. Research will be used in assignment.....	11
2.2. Secondary research	11
2.2.1. Overall	11
2.2.2. Side-effect of digital transformation	12
2.2.3. Method to reduce impact of e-waste to environment and its benefits.....	13
2.2.4. Difficulties in handling e-waste	14
2.2.5. Positive effect of e-waste recycling	14
2.2.6. Secondary research costs, access and ethical issues	15
2.2.7. Conclusion and hypothesis	15
3. Primary research	16
3.1. Primary research objective:.....	16
3.2. Scope of the research	16
3.3. Research plan.....	16
3.4. Research technique	17
3.5. Primary research costs, access, and ethical cost	21
4. Analyze the result of primary research	22
4.1. Analytic data:.....	22
4.2. Conclusion	32
5. Future research.....	33
6. Research proposal	33
Bibliography	41

Figure 1: Primary research.....	6
Figure 2: Secondary research.....	7
Figure 3: Qualitative.....	9
Figure 4: Quantitative	10
Figure 5: Difficulties in handling e-waste.....	14
Figure 6: Survey 01	18
Figure 7: Survey 02	19
Figure 8: Survey 03	20
Figure 9: Survey 04	21
Figure 10: Answer 1	22
Figure 11: Answer 2	23
Figure 12: Answer 3	23
Figure 13: Answer 4	24
Figure 14: Answer 5	24
Figure 15: Answer 6	25
Figure 16: Answer 7	25
Figure 17: Answer 8	26
Figure 18: Answer 9	26
Figure 19: Answer 10	27
Figure 20: Answer 11	28
Figure 21: Answer 12	29
Figure 22: Answer 13	29
Figure 23: Answer 14	30
Figure 24: Answer 15	31
Figure 25: Answer 16	31
Figure 26: Answer 17	32

1. Introduction

The amount of data created and stored globally is expected to reach 175 Zettabytes by 2025, meaning that the future will require additional hardware and energy consumption; however, the downside would be increasing the environmental impact of the digital sector and there is now increasing attention on the environmental footprint of ICT devices and services as they become more pervasive. In all aspects of human life. While digital technology is one of the areas where greater efficiency is achieved; gain about 100 times more computing power from the same amount of energy per decade, it is still unsustainable.

Through the above scenario, we draw the conclusion that digital transformation in the future takes place and becomes common, which also leads to the use of more electronic devices, and will also emit a lot of electrical waste into the environment. Therefore, we need solutions to reduce environmental pollution caused by e-waste. This project will study how to classify, filter, treat, sanction and repair e-waste, contributing to reducing current and future e-waste by using an app help user handle their electronic waste.

1.1. Project purpose

Identify and define what digital transformation is, the relevance of e-waste and digital transformation, the harmful effects of e-waste on the environment, thereby finding solutions to limit those problems.

1.2. Project objective

- The project helps to classify e-waste into 2 categories: treated and untreated.
- The project analyzes components in equipment and manufactured components into two categories. Class 1, serviceable parts and removable parts to replace damaged parts of other electronic equipment. Type 2, components are treated to remove treatable metals and materials such as iron, copper, silver, gold.
- The project analyzes ways of sanctioning and disposing of old electronic devices.
- The project analyzes ways to repair old electronic equipment.
- All operations will be managed and researched by the application.

2. Literature review

2.1. Discuss research methodologies

2.1.1. Primary research

○ Definition

Primary research is defined as research that involves the collecting of unique data for a given study endeavor. When conducting primary research, the researcher collects information firsthand rather than depending on material accessible in databases and other publications.

This form of study is frequently conducted with the objective of providing new knowledge, which is why it is also known as original research. Researchers conduct primary research to answer questions

that have never been answered or even questioned before. This level of originality distinguishes primary research from secondary research (Bouchrika, 2022).

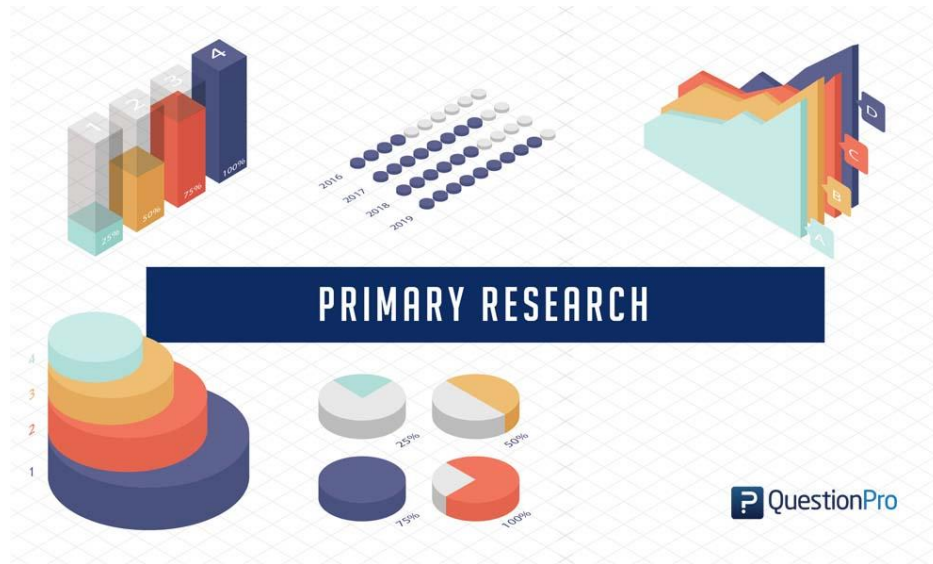


Figure 1:Primary research

- There are 5 popular types of primary research:
 - Surveys are a type of data collection method in which people are asked to answer specific research questions about their feelings, beliefs, attitudes, and behavior. Because of the set nature of the questions, this type of questioning is less flexible than interviews. Surveys, on the other hand, are useful for gathering information from big groups of people.
 - Interviews are a practical technique to gather information from individuals or small groups of people. Interviews can also be used by researchers to obtain expert viewpoints on their subjects of study.
 - Observation is a fundamental research approach that entails witnessing individuals, events, and other variables relevant to the investigation or study. The process of measuring and recording quantitative or qualitative data is known as observation. This research method is excellent for learning without the biased viewpoint that can sometimes be found in interviews.
 - Data analysis entails gathering data and organizing it according to criteria specified by the researcher. This primary research method can be used to identify trends or patterns in data.
 - Focus groups - Focus groups, which normally consist of up to 12 people, can also be used by researchers to obtain information. The researcher usually facilitates a guided discussion on the topic in focus groups. This qualitative data-gathering strategy is frequently utilized to acquire a better understanding of societal problems (Bouchrika, 2022).
- Advantages:
 - The information gathered in this study is firsthand and accurate. In other words, there is no data dilution. This research approach can also be tailored to meet individual needs as well as the demands of organizations or corporations.

- Primary research focuses on the topic at hand, which means that all attention is focused on finding a likely answer to a certain subject area. Primary research enables academics to delve deeply into a subject and investigate all viable solutions.
- Control over the data obtained is possible. Primary research allows you to choose how data is gathered and used. It is up to the firms or organizations gathering data to decide how to effectively use the data to gain significant research insights.
 - Disadvantages:
- One of the biggest downsides of primary research is that it can be rather costly to undertake. Depending on the setting or primary research method chosen, a significant number of money may be necessary. Not all businesses or organizations can afford to spend large sums of money.
- This type of study might be time-consuming. Conducting interviews and sending and receiving online surveys can be time-consuming and require patience. Furthermore, time will be required to evaluate data and apply the findings to improve products or services.

2.1.2. Secondary research

○ Definition

Secondary research is summarizing or synthesizing data and literature that has already been organized and published by others. Researchers use and analyze data from primary research sources when conducting secondary research.

- Secondary research is frequently employed in a variety of disciplines and sectors, including legal research and market research. A systematic review, for example, is one of the most popular methods of secondary research in the sciences. In a systematic review, scientists use systematic procedures to analyze current literature and studies on a certain issue, assessing all relevant studies to synthesize their conclusions (Bouchrika, 2022).

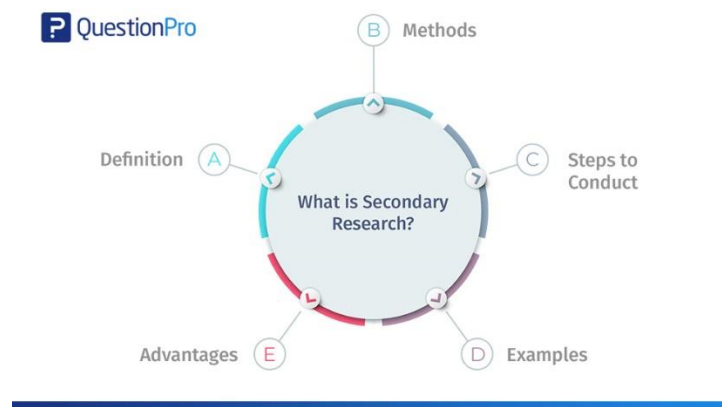


Figure 2: Secondary research

- There are 5 popular sources for secondary research:
 - Academic peer-reviewed publications - These frequently incorporate original research conducted by authors or researchers.
 - Published books and articles - Many books include primary-source information as well as the author's commentary.
 - Government agencies - Many government agencies keep archives or databases of documents and reports that contain data that researchers might use.
 - Educational institutions - Colleges and universities do extensive research and provide data that researchers can use.
 - Commercial information sources - Secondary research can benefit from information sources such as newspapers, periodicals, and television shows. These sources, for example, offer personal information and insights into political objectives, market research, and economic developments (Bouchrika, 2022).
- Advantages:
 - There are numerous data sources that have been pre-collected for use, both in person at local libraries and online via the internet. This data is typically sorted by filters or exportable into spreadsheet format, implying that little technical knowledge is required to access and utilize the data.
 - People do not need to conduct primary research because the data is already published and available to the public. This can make the research easier and faster because you can get started with the data right away.
 - Most secondary data sources are available for free or at a modest cost to the researcher, lowering overall research expenditures. Furthermore, by saving on preliminary research, the researcher's time costs are reduced.
 - The insights acquired can be used to support future research initiatives or to add value to existing ones.
- Disadvantages:
 - Secondary sources can be updated on a frequent basis, but if you explore the data between two updates, it may be out of date. Researchers must assess whether the data supplied gives the correct research coverage dates, allowing for accurate and timely insights, or whether the data needs to be updated. Secondary data may also expire soon in fast-moving markets.
 - A researcher must study and analyze large amounts of data from a single source. For accuracy and to verify you're using the proper data for your research, the data may need to be validated against other data sets or your hypothesis.
 - Invalid data can alter the results because the researcher was not involved in the secondary research. It is consequently critical that the process and controls be thoroughly examined to ensure that data is collected in a systematic and error-free manner.

- Because data sets are widely available, there is no exclusivity, and multiple researchers can use the same data. This might be troublesome when researchers seek to have exclusive rights to the research results and risk future research duplication.

2.1.3. Qualitative

○ Definition:

Qualitative research entails gathering and evaluating non-numerical data in order to better comprehend concepts, opinions, or experiences. It can be utilized to gain in-depth insights into a topic or to generate fresh research ideas.

Qualitative research is used to learn more about how people see the world. While there are numerous ways to qualitative research, they all have the flexibility of preserving rich meaning when evaluating data (Bhandari, 2022).



Figure 3: Qualitative

- There are 5 popular methods in qualitative research:
 - Observations: taking thorough field notes on what you see, hear, or encounter.
 - Interviews are one-on-one conversations in which you individually ask them questions.
 - Focus groups: a group of people who are asked questions and have a discussion.
 - Surveys involve the distribution of questionnaires containing open-ended questions.
 - Secondary research entails gathering previously collected data in the form of texts, photos, audio or video recordings, and so on (Bhandari, 2022).
- Advantages:
 - The data collection and analysis process can be adapted as new ideas or patterns emerge. They are not rigidly decided beforehand.
 - Data collection occurs in real-world contexts or in naturalistic ways.
 - Detailed descriptions of people's experiences, feelings and perceptions can be used in designing, testing or improving systems or products.

- Open-ended responses mean that researchers can uncover novel problems or opportunities that they wouldn't have thought of otherwise.
- Disadvantages:
 - Because of uncontrollable factors that alter the results in the real world, qualitative research is frequently unreliable.
 - Qualitative research cannot be reproduced because the researcher's major involvement is in data analysis and interpretation. In data analysis, the researcher selects what is significant and what is irrelevant, therefore interpretations of the same data might vary greatly.
 - Small samples are frequently employed to get extensive information on certain contexts. Despite rigorous research processes, drawing generalizable findings is challenging since the data may be biased and unrepresentative of the larger population.
 - Although software can be used to organize and record enormous amounts of text, data analysis is frequently done manually.

2.1.4. Quantitative:

○ Definition:

In the social sciences, quantitative approach is the dominant research framework. It refers to a set of tactics, methodologies, and assumptions used to investigate psychological, social, and economic processes by examining numerical patterns. Quantitative research collects a wide range of numerical data. Some numerical data is quantitative by definition, whereas in others, the numerical structure is imposed. The acquisition of quantitative data enables researchers to do simple to extremely advanced statistical studies that aggregate the data, highlight links between the data, or compare across aggregated data. In contrast to qualitative research, quantitative research use procedures such as questionnaires, organized observations, or experiments. Qualitative research entails gathering and analyzing narratives and/or open-ended observations using methods such as interviews (David Coghlan, 2014)



Figure 4: Quantitative

- Purpose of quantitative research:

The purpose of quantitative research is to generate knowledge and create understanding about the social world. Quantitative research is used by social scientists, including communication researchers, to observe phenomena or occurrences affecting individuals. Social scientists are concerned with the study of people. Quantitative research is a way to learn about a particular group of people, known as a sample population. Using scientific inquiry, quantitative research relies on data that are observed or measured to examine questions about the sample population (David Coghlan, 2014).

- Advantages:

- Statistical analysis can be used to interpret quantitative data, and because statistics are based on mathematical principles, the quantitative approach is considered scientifically objective and rational.
- It can be used to test and validate theories that have already been developed.
- Sophisticated software eliminates much of the need for extended data analysis, especially when dealing with large datasets.
- Quantitative data is based on measured values and can be double-checked by others because numerical data is less vulnerable to interpretation ambiguities.
- Because statistical analysis is used, hypotheses can also be tested.

- Disadvantages:

- Quantitative experiments are not conducted in natural settings. Furthermore, they do not allow participants to explain their choices or the implications of the questions for them.
- A lack of understanding of how to apply statistical analysis can have a negative impact on the analysis and subsequent interpretation.
- For more accurate analysis, large sample sizes are required. Because there is a limited amount of data in small scale quantitative studies, they may be less reliable. This has an impact on the ability to extrapolate study results to huge populations.
- Confirmation bias occurs when a researcher's attention is drawn to theory or hypothesis testing rather than the theory of hypothesis generation.

2.1.5. Research will be used in assignment

I will do secondary research first, then primary research to conduct research on the topic. In the primary research part, I will use both qualitative and quantitative research methods to get information and user opinions. I conduct secondary research using publicly available and verified data sources such as articles, research papers, books.

2.2. Secondary research

2.2.1. Overall

Digital transformation is an irreversible trend, according to IDC's 2018 survey, digital transformation is becoming a strategy in businesses and organizations in the fourth industrial revolution. Nearly 90% of businesses have started digital transformation with different steps from learning, researching, to starting implementation and implementation. More than 30% of business leaders surveyed consider digital transformation to be a vital issue, confirming its effectiveness in many aspects such as customer perception, increasing labor productivity, and promoting innovation.

However, the amount of data generated during digital transformation is huge. The amount of data created and stored globally is expected to reach 175 Zettabytes by 2025, a sixfold increase from 2018. This will require additional hardware and energy consumption; and the disadvantage in the digital transformation process is that old electronic devices, also known as e-waste, are released into the environment when they are damaged or outdated, which pollutes the living environment and affects the environment. adversely affect human health.

2.2.2. Side-effect of digital transformation

According to Sunil Herat (2007), E-waste or e-waste is one of the fastest growing areas of international waste streams and is growing at a much higher rate than all other waste streams. The rapidly growing electronics industries arise from the need of digital transformation such as information and communication technology worldwide along with rapid product obsolescence and lack of management options. end of the life cycle, all have resulted in unsustainable waste stream management. For example, Computers are manufactured from more than 1,000 materials, many of which are hazardous, and they contribute significantly to the e-waste stream, estimated at approx. 20 to 50 million tons per year.

Also following by Osibanjo and Nnorom (2007), information and telecommunications technology (ICT) and the computer Internet have penetrated nearly every aspect of modern life and are positively affecting people's lives even in the most remote areas of the world developing. In response to today's digital transformation needs, the processing capacity of electronic devices is increasing day by day, but this also reduces their lifespan thereby increasing the large amount of electrical and equipment waste, electronic devices (e-waste) are generated every year.

In response to today's digital transformation needs, the processing capacity of electronic devices is increasing day by day, but this also reduces their lifespan thereby increasing the large amount of electrical and equipment waste. Electronic devices (e-waste) are generated every year, about 40 million tons per year. For example, the average lifespan (2 years) of a new computer in 2005 was less than half of that (4.5 years) in 2000, and has been continually declining.

ICT development in most developing countries, especially in Africa, is highly dependent on outdated or refurbished old electronic equipment, most of which is imported without no functional validation testing. As a result, a large amount of e-waste is currently being managed in these countries.

Developing countries face many problems in managing e-waste including: lack of infrastructure for proper waste management, limited disposal-specific legislation on sub-e-waste, lack any framework for end-of-life product recalls or exercise extended manufacturer responsibility.

According to Zhang, Kai, Jerald L. Schnoor, and Eddy Y. Zeng (2012), E-waste contains a variety of toxins, including, but not limited to, heavy metals, polychlorinated biphenyls, polybrominated diphenyl ethers, and polychlorinated dibenzo-p-dioxins and dibenzofurans, which can be filtered into the surrounding environment. In the process of handling e-waste by rudimentary methods, posing serious risks to the environment and human health.

2.2.3. Method to reduce impact of e-waste to environment and its benefits

In the process of digital transformation, a large amount of e-waste is generated, polluting the environment and affecting human health, so it is necessary to have methods and solutions to reduce that impact.

According to by Osibanjo and Nnorom (2007), in developing countries, effective management of e-waste requires implementing EPR, establishing product reuse through remanufacturing, and introducing efficient recycling facilities. The implementation of a global system for standardization and certification/labeling of second-hand equipment intended for export to developing countries will be required to control the export of recycled electronics (e- scarp) under the name of the old device.

Some of the common methods adopted by countries to dispose of e-waste are environmentally cleaner production design, improved manufacturer responsibility, product standards and labeling, and management, recycling, and remanufacturing.

According to Zhang, Kai, Jerald L. Schnoor, and Eddy Y. Zeng (2012), Well-managed sanitary landfills have proven to be the most effective way to prevent toxic substances in e-waste such as heavy metals from being released into the environment.

The composition of electronics also includes precious and/or rare materials such as gold, palladium, copper and plastic, among others. A previous study found that e-waste includes more rare metals than conventional metal mines. Thereby, we conclude, e-waste recycling can at least partially meet the global demand for metals, especially in areas where resources are often scarce. Reusing old electric and electronic equipment is also recommended to prolong their life and help reduce environmental pollution.

By applying digital transformation, we can effectively, scientifically, and systematically treat old electronic devices as e-waste, helping to reduce the pollution they cause to the environment the human health.

2.2.4. Difficulties in handling e-waste

The treatment of e-waste is still limited because there are no specific regulations and guidelines, so most e-waste recycling methods are still primitive. For example, dismantling e-waste often takes place without gloves or protective gear, burying itself in dust and debris, and sorting copper wires, capacitors, recyclable plastics, and aluminum. Other unsafe practices include cathode ray tube cracking and emptying, acid chip removal, printed circuit board recycling, plastic chipping and melting, and residual waste dumping. For example, to recover copper from electronic waste, electrical wires are pulled out, piled up and burned, while printed circuit boards are baked and disassembled. These processes can release organic pollutants such as dioxins, as well as toxic cyanide and acids used to remove gold from printed circuit boards.



Figure 5: Difficulties in handling e-waste

2.2.5. Positive effect of e-waste recycling

E-waste is a rich source of plastics and precious metal. Recycling e-waste helps to save resources, limit environmental pollution during the production of raw materials and reduce production costs.

According to Zhang, Kai, Jerald L. Schnoor, and Eddy Y. Zeng (2012), Primary production of metals from ore mining consumes considerable land and energy, and generates large amounts of wastewater, sulfur dioxide, and carbon dioxide. For example, the amount of carbon dioxide emitted is 10,000 tons for the primary production of 1 ton of gold, palladium or platinum and is 3.4 tons for 1 ton of copper. By comparison, recovering metals from e-waste produces only a fraction of these carbon dioxide emissions and is also beneficial in terms of land use and energy.

For 1 kg of aluminum obtained from e-waste recycling, the amount of energy used is 1/10 or less of the energy required for primary production and e-waste recycling also reduces emissions 1, 3 kg of bauxite residue, 2 kg of carbon dioxide and 0.011 kg of sulfur dioxide.

In addition, recycling 75,000 tons of metals from 300,000 tons of recycling and metallurgical by-products of Umicore Precious Metals Refining, Belgium reduced carbon dioxide emissions by 1 million tons in 2006. China recycled 28 million tons in 2006. tons of e-waste per year, which reduces carbon dioxide emissions by more than 90 million tons per year, accounting for more than 1.2% of the total carbon dioxide emitted by the whole of China in 2009 (7710.5 million tons).

2.2.6. Secondary research costs, access and ethical issues

The studies identified and analyzed above were all taken from free research articles and literature published online, so secondary research will be free.

Since research materials and materials used are freely accessible, secondary research will not violate any ethical standards.

2.2.7. Conclusion and hypothesis

The main objective of the digital transformation and e-waste research project is to study the relevance of digital transformation and e-waste, the harmful effects of e-waste on the environment, and methods to help reduce waste. it's pollution.

Secondary research data clearly shows that the problem of environmental pollution caused by e-waste globally, and especially in developing countries in the process of digital transformation

The data collected has demonstrated the significant impact of hazardous wastes in e-waste on the environment and human health by specific figures. In addition, the study also points out solutions to help sanction and treat e-waste and the benefits from its sanction from the economic point of view to limiting environmental pollution.

Most of the solutions are not really optimal, only focusing on certain conditions such as developing countries and the solutions are comprehensive, not going into details.

The solution is to create a tool, a system to help users in handling e-waste such as sanctions and classification steps.

○ Hypothesis:

H1: The digital transformation process causes a lot of e-waste.

H2: Substances and components in e-waste adversely affect the environment and human health.

H3: The handling of e-waste must be done properly or it will cause adverse consequences to the environment and human health.

H4: There is a tool, a system to help effectively handle e-waste.

3. Primary research

3.1. Primary research objective:

This part of the research report is titled 'E-waste sorting project' will include:

- Conduct surveys and analyze data collected from research subjects about the problems they are facing related to the given problem.
- Plan proposed system features.
- Analyze and survey the suggested application to evaluate the main features that this application brings to see if it solves the problems that the research subjects are facing or not.
- Based on the collected data, determine if the hypothesis is viable.

3.2. Scope of the research

The survey will focus on students and lecturers at certain universities, with the topic of analyzing the effects of digital transformation and e-waste, their harmful effects, and surveying opinions about the system. proposed e-waste classification. About 30 people from two different positions and universities are expected to take part in the survey.

The purpose of this study is to collect opinions of users because they have certain insights and only the most impactful process of digital transformation and e-waste.

Survey URL: <https://forms.gle/D3qWiuaoSE1hgi3MA>

3.3. Research plan

The following steps would be taken to carry out this research:

Step 1: Identify the research topic

Step 2: Draft a research question to be answered through the research.

Step 3: Determine which research methods will answer the question.

Step 4: Design a plan for carrying out the selected research method.

Step 5: Determine how to collect and analyze the data.

Step 6: Conduct the research

3.4. Research technique

In order to be able to reach more user opinions, the main research will be conducted using online survey technique via Google Form. Online surveys are a fast and free way to collect customer feedback and preferences. Using this method can save the project team money while surveying a large number of people at once and collecting data in the most efficient way.

Furthermore, quantitative and qualitative methods are used for primary research. Some of the benefits of this approach are reasons to choose it:

- Quantitative researchers aim to create a common understanding of behavior and other phenomena in different contexts and populations. So we can get opinions from many users with different conditions,
- The speed and efficiency of the quantitative method attracts many researchers. The data computing device enables rapid data processing and analysis, even with large sample sizes from many respondents. Surveys, polls, statistical analysis software, and weather thermometers are all examples of tools used to collect and measure quantitative data.
- Researchers can clearly communicate quantitative results using statistics from survey respondents' responses. When done correctly, an analysis allows researchers to make predictions and generalize to larger, more universal populations outside of the test sample.
- Using quantitative research, we collect user opinions to determine if the opinion we provide in it is true or false.
- Reliable quantitative research requires the knowledge and skills to scrutinize your findings. This means carefully reviewing and reporting on the test variables, predictions, data collection, and testing methods before reaching a final conclusion.
- Using qualitative research, we get more intuitive opinions from users

E-waste sorting project

The project helps to classify e-waste into two categories: sanctioned and non-regulatory. The project analyses the components in the equipment and the components that are manufactured into two categories. Category 1, finable components and components that can be removed to replace damaged components of other electronic equipment. Category 2, the component is processed to remove metals and materials that can be processed such as iron, copper, silver, and gold.

What 's your name



Trả lời ngắn

Vấn bản câu trả lời ngắn



Bắt buộc



How old are you *

☐ 15 - 17

☐ 18 - 20

☐ 21 - 22

☐ 23 - 24

☐ 25 - 30

☐ Khác...

Where are you come from? *

Vấn bản câu trả lời ngắn

Figure 6: Survey 01

What is your position? *

☐ Student

☐ Teacher

☐ Lecture

☐ Professor

☐ Khác...

Where are you work at? *

☐ Greenwich University

☐ FPT University

☐ University of Oxford

☐ University of Cambridge

☐ Massachusetts Institute of Technology (MIT)

☐ Harvard University

☐ Khác...

Do you ever have a definition of electronic waste? *

☐ Yes

☐ No

☐ Maybe

According to Greenwich University, the amount of data created and stored globally is expected *
to reach 175 Zettabytes by 2025, which will increase the use of electronic device and lead to
much e-waste. Do you agree with those points?

☐ Agree

☐ Strongly agree

☐ Disagree

☐ Khác...

Figure 7: Survey 02

How important that people should know how to treat, distinguish and recycle waste? *

1

2

3

4

5

☐
☐
☐
☐
☐

Which digital end points devices is the most popular? *

☐ Smartphone
 ☐ Laptop
 ☐ Camera
 ☐ Television

If you have an e-waste like smartphone, do you know how to treat, distinguish and recycle it? *

☐ Yes
 ☐ No
 ☐ Maybe

Name 1 way to recycle a popular device such as smartphone *

Vấn bản câu trả lời ngắn

.....

How much money you think e-waste can make by recycle, repair and reuse? (Count by \$) *

Vấn bản câu trả lời ngắn

.....

Do you know material of e-waste can make bad effect to environment? How worse it can be? *

1

2

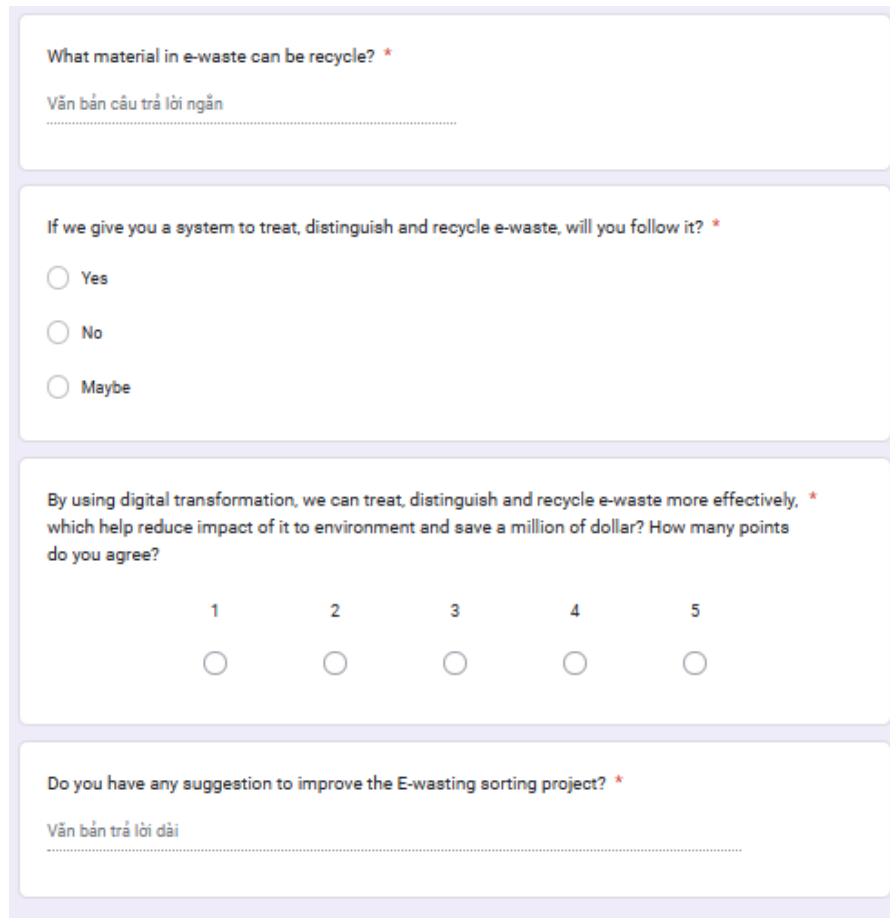
3

4

5

☐
☐
☐
☐
☐

Figure 8: Survey 03



The survey form consists of five sections, each with a question and a response area. The first section asks for materials in e-waste that can be recycled, with a short-answer text field. The second section asks if the respondent would follow a system to treat, distinguish, and recycle e-waste, with three radio button options: Yes, No, and Maybe. The third section asks for agreement with a statement about digital transformation's effectiveness in e-waste management, with a five-point Likert scale. The fourth section asks for suggestions to improve the E-wasting sorting project, with a long-answer text field.

What material in e-waste can be recycle? *

Vấn bản câu trả lời ngắn

If we give you a system to treat, distinguish and recycle e-waste, will you follow it? *

☐ Yes

☐ No

☐ Maybe

By using digital transformation, we can treat, distinguish and recycle e-waste more effectively, *
which help reduce impact of it to environment and save a million of dollar? How many points
do you agree?

1 2 3 4 5

☐ ☐ ☐ ☐ ☐

Do you have any suggestion to improve the E-wasting sorting project? *

Vấn bản trả lời dài

Figure 9: Survey 04

3.5. Primary research costs, access, and ethical cost

Most of the research here is done through online meeting and online survey and the survey subjects are students, lecturers from universities, the surveyed people will receive the survey url and can Choose to accept the survey or decline, so this study is completely free.

Furthermore, the study uses online references, technology forums and academic resources in its core research on technology, digital transformation, e-waste. It's completely free and accessible to everyone.

Other ethical issues to consider when conducting primary research include:

- Research sources will be specifically cited in the document.
- Personal information of interviewees and survey responses is confidential and can only be accessed by project members for research purposes.

4. Analyze the result of primary research

4.1. Analytic data:

As expected, the survey was answered by 11 people with different characteristics

What 's your name

11 câu trả lời

Nguyen Hong Duc

Duc Anh

Pham Van Khanh

Johnny Nguyen

Nguyen Van Lan

Jack Bow

Le Van Xuyen

Le Phuong Anh

Huy

Figure 10: Answer 1

According to the survey, the 11 interviewees accounted for different ages with 27.3% being 23 to 24 years old, 18.2% being 25 to 30 years old, 27.3% being 18 to 20 years old, and 27.3% being 21 to 22 years old. Thereby, we see that the number of interviewees is very diverse in age

How old are you

11 câu trả lời

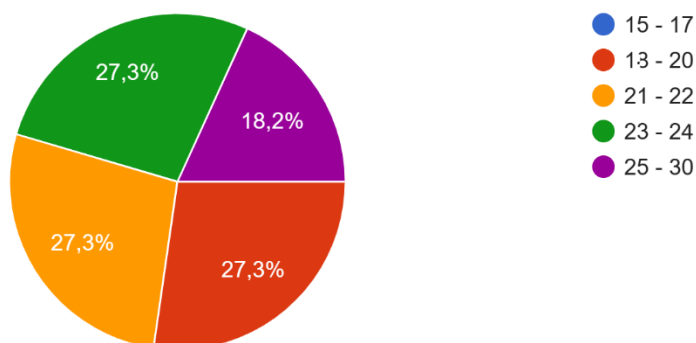


Figure 11: Answer 2

The interviewees are very diverse and they come from many different countries, of which 9.1 % are from the USA, 9.1% are from England, and 81.9 % are from Vietnam, the most common in the two cities of Hanoi and NgheAn.

Where are you come from?

11 câu trả lời

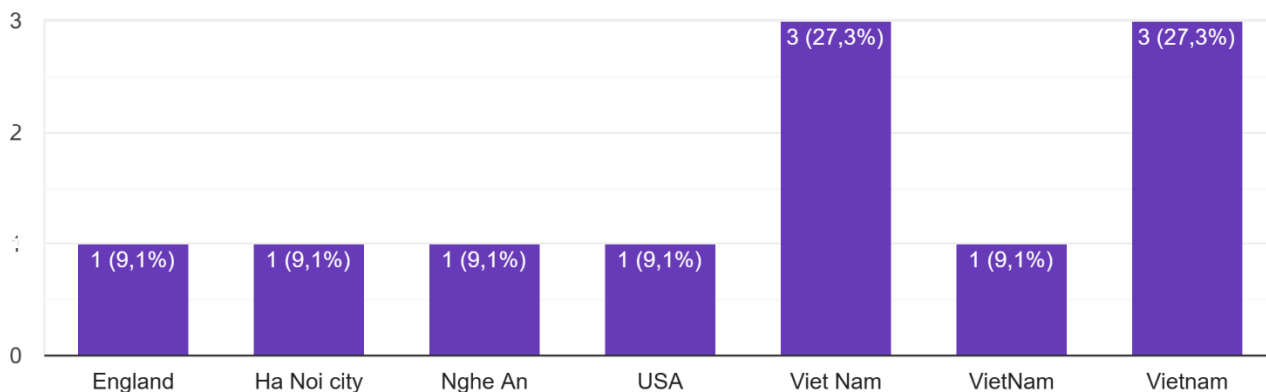


Figure 12: Answer 3

The majority of the interviewees were students, accounting for 72.7%, 18.2% were lectures, and the remaining 9.1% were professors.

What is your position?

11 câu trả lời

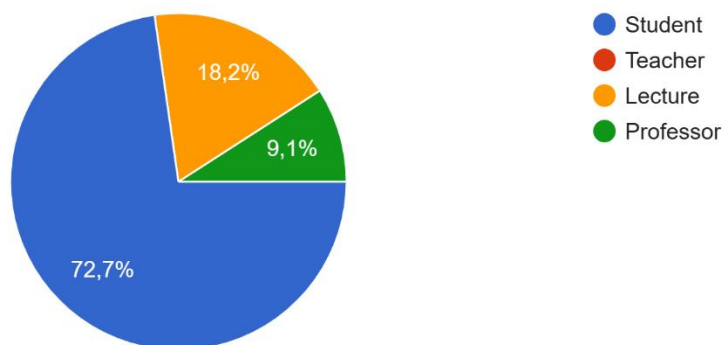


Figure 13: Answer 4

Interviewees came from many different universities, making up the majority, 63.6% from Greenwich University, 18.2% from FPT University, 9.1% from Cambridge University, 9.1% from Harvard University. Thereby, we see a very diverse range of interviewees.

Where are you work at?

11 câu trả lời

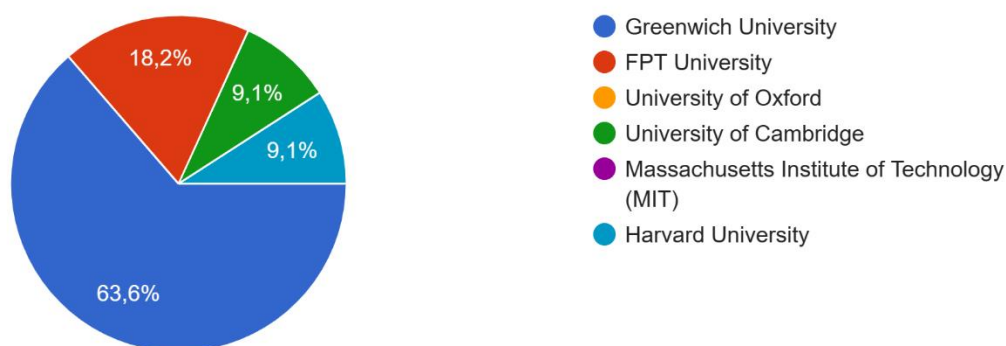


Figure 14: Answer 5

Most of the interviewer has the knowledge about electronic waste, it takes 81.8 % and only 18.2% interviewer do not have that definition.

Do you ever have a definition of electronic waste

11 câu trả lời

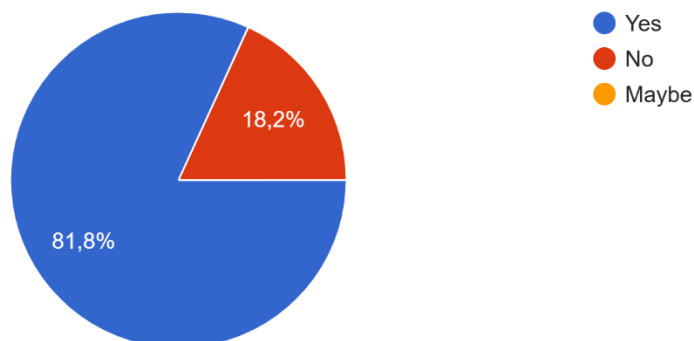


Figure 15: Answer 6

The number of interviewees agreed with the idea that the amount of data generated and stored globally is expected to reach 175 Zettabytes by 2025, which will increase the use of electronic devices and lead to more electrical waste. death, accounting for 54.5% and the number of people strongly agreeing is 45.5%. Thereby, we see that all the interviewees agree with the above opinion and have no objections.

According to Greenwich University, the amount of data created and stored globally is expected to reach 175 Zettabytes by 2025, which will increase...to much e-waste. Do you agree with those points?

11 câu trả lời

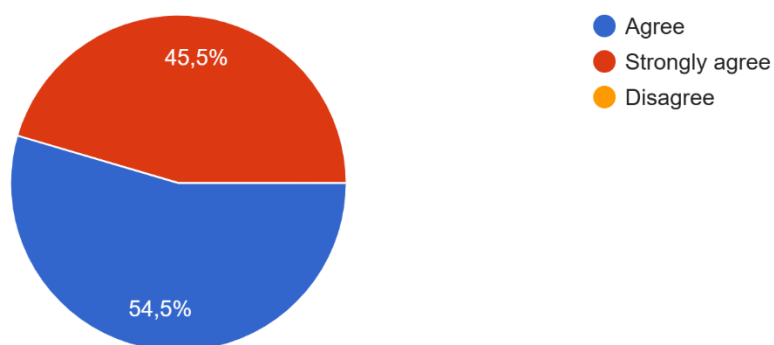


Figure 16: Answer7

On a scale of 1 to 5 of the problem 'How do important people know how to handle, segregate and recycle waste?' , there are 27.3% rated 2, 9.1% rated 3, 18.2% rated 4 and the highest is 45.5% rated 5,

no one rated at 1. Thereby we see the majority of people All agree with the above opinion and have a profound concept of the issue of e-waste.

How important that people should know how to treat, distinguish and recycle waste?

11 câu trả lời

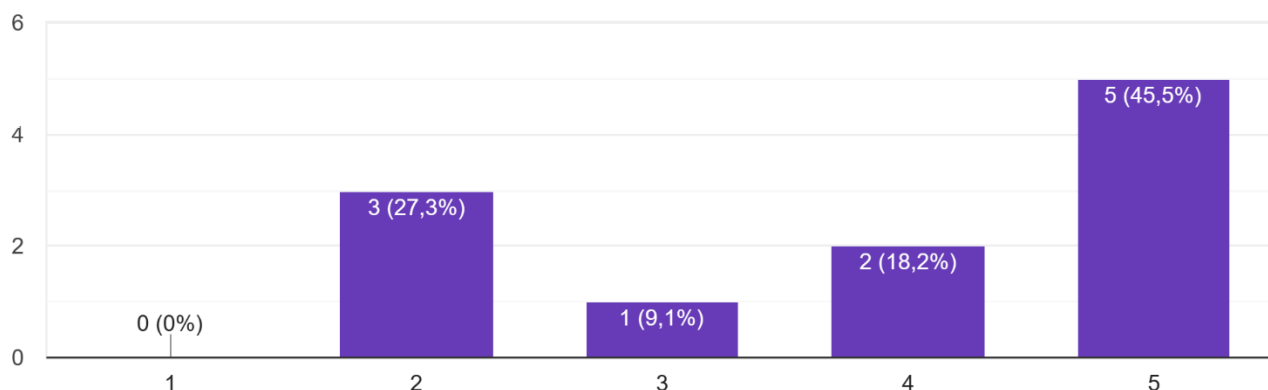


Figure 17: Answer 8

According to the interviewees, the most popular electronic devices are smartphones, accounting for 63.6%, the rest are 9.1% laptops, 18.2% cameras, 9.1% televisions.

Which digital end points devices is the most popular?

11 câu trả lời

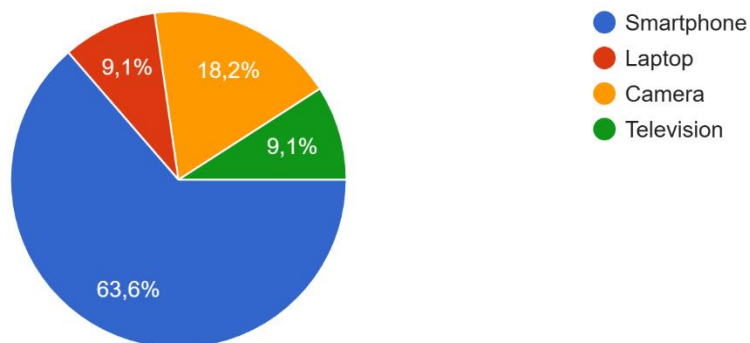


Figure 18: Answer 9

Through the above survey, we find that the interviewees are capable of handling old electronic devices such as smartphones, accounting for 63.6%, however, 27.3% of users are confused about the sanction method and 9.1% do not know how to handle them.

If you have an e-waste like smartphone, do you know how to treat, distinguish and recycle it?

11 câu trả lời

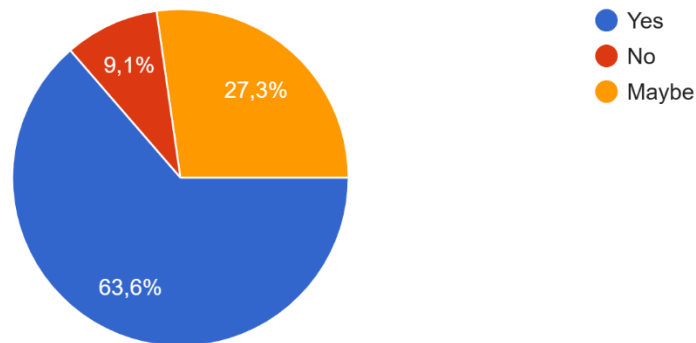


Figure 19: Answer 10

Interviewees gave many answers in how to handle electronic waste such as smartphones. Some useful ways are: Turn old smartphone to an alarm clock, Turn old smartphone to a camera, Turn smartphone to a camera, and many more. Thereby, we see that users also have certain knowledge and concepts about handling e-waste.

Name 1 way to recycle a popular device such as smartphone

11 câu trả lời

collection to recycling plant processing

Turn it Into a Security Camera

Reusing it

Use part of old device in order to repair new devices

Turn old smartphone to an alarm clock

Turn old smartphone to a camera

change it to a monitor

Turn smartphone to a camera

Recycle

Figure 20: Answer 11

When asked about the profit of e-waste recycling, users gave different opinions, the most common being \$5, accounting for 18.2%, \$10 accounting for 18.2%, and the remaining 63.7% equally divided into denominations. price: 1\$, 1000\$, 2\$, 4\$, 400\$, 6%. Through user opinions, we draw the conclusion: the profit from the processing of e-waste is relatively large.

How much money you think e-waste can make by recycle, repair and reuse? (Count by \$)

11 câu trả lời

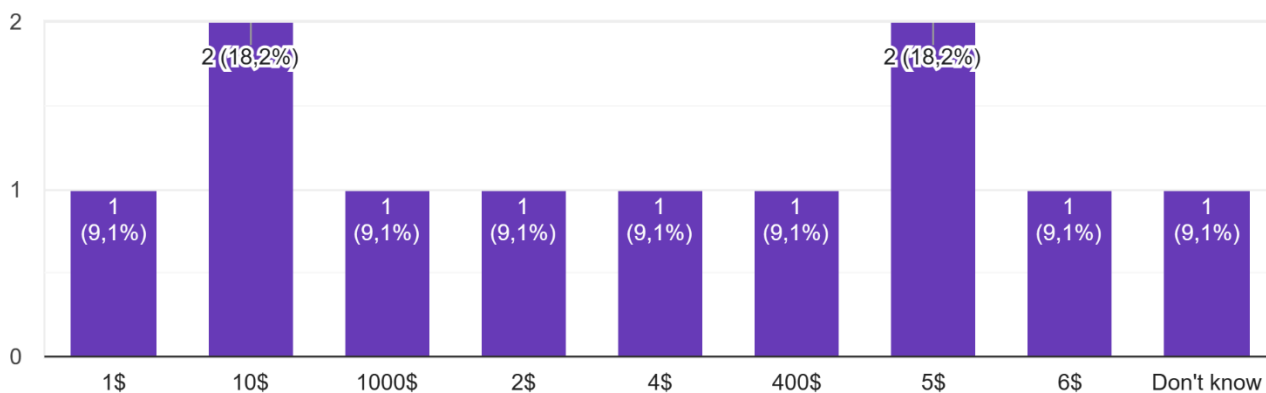


Figure 21: Answer 12

According to users' evaluations from the level of pollution from components, waste from electronic waste on a scale from 1 to 5, we have the following assessments, most of them choose level 5, accounting for 45.5%, 9.1% choose level 4, 18.2% choose level 3 and level 2, 9.1% choose level 1. Thereby, we see that e-waste can cause serious pollution to the environment.

Do you know material of e-waste can make bad effect to environment? How worse it can be?

11 câu trả lời

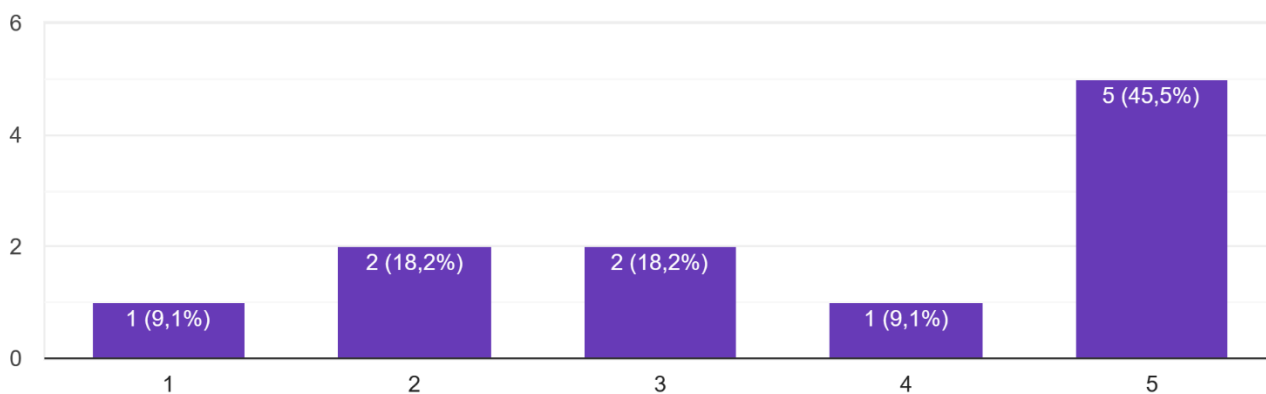


Figure 22: Answer 13

Respondents gave a variety of responses when asked which ingredients in e-waste could be recycled, the answers included: silver, gold, plastic, metal, glass. Thereby, we see that e-waste can be recycled and gives us many necessary resources.

What material in e-waste can be recycle?

11 câu trả lời

- gold, silver, hard metal
- gold, silver, metal, glass
- plastic
- gold
- Silver
- metal
- Gold
- Water bottles
- platinum

Figure 23: Answer 14

When asked if users want to use the electronic waste classification, sanctions and treatment system, the majority of respondents chose Yes, accounting for 72.7%, the remaining 18.2% chose No and 9.1% chose No. Maybe. Thereby, the user is ready to choose and use the proposed processing system of the project.

If we give you a system to treat, distinguish and recycle e-waste, will you follow it?

11 câu trả lời

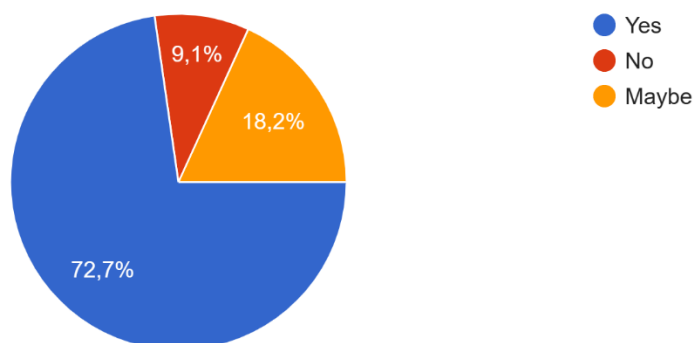


Figure 24: Answer 15

When asked about the importance of the problem 'By using digital transformation, we can treat, distinguish and recycle e-waste more effectively, which help reduce impact of it to environment and save a million of dollars?' on a scale of 1 to 5, there are 36.4% of users choosing level 5, 27.3% of users choosing level 4, 18.2% of users choosing level 3, 9.1% of users choosing level 1 and 2. Thereby we see the interviewee The consultant agrees with the idea that e-waste sanctions help save money and protect the environment.

By using digital transformation, we can treat, distinguish and recycle e-waste more effectively, which help reduce impact of it to environment and ... million of dollar? How many points do you agree?

11 câu trả lời

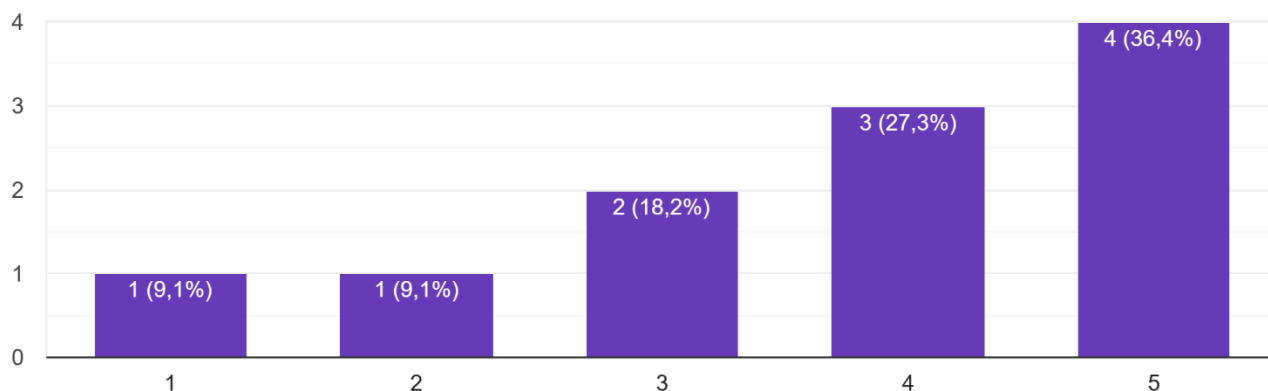


Figure 25: Answer 16

The interviewee also gave us many suggestions to help improve the e-waste classification project, for example: This project should have a function to classified e-waste, This sorting system should be more detail, This project should have a better friendly display, This project should be more specific in classifield.

Do you have any suggestion to improve the E-wasting sorting project?

11 câu trả lời

- No
- Nothing
- This project should have a function to classified e-waste
- This sorting system should be more detail
- This project should have a better friendly display
- This project should be more specific in classifield**
- I do not have suggestion
- I suggest the system should have a better interface
- Yes

Figure 26: Answer 17

4.2. Conclusion

The hypotheses were confirmed for a variety of reasons by conducting surveys and gathering opinions from the main study:

- The majority of survey respondents think this is an important topic.
- Survey participants all expressed their desire for an effective e-waste treatment system
- Survey participants showed a keen interest in environmental pollution and e-waste issues.
- Survey participants gave suggestions and ideas to help improve the e-waste sorting system better.

5. Future research

Through the project of researching, classifying and handling electronic waste, we have seen the close relationship of the digital transformation process to the increase of e-waste. the negative side of the digital transformation process, and at the same time point out the harmful effects of e-waste on the environment and human health. At the same time, the article has pointed out the benefits of e-waste treatment through economic and environmental parts, and the current advantages and disadvantages of e-waste treatment. However, the article has many limitations such as:

- The issues and situations pointed out are even more extensive and detailed.
- The way to handle e-waste is general, not going into details
- The literature on e-waste treatment is limited, with a number of cases occurring in developing countries such as Africa and China.

To improve the above disadvantages, in the future there will be more studies including:

- Study more situations of broader problems, in many areas and areas around the world, such as the problem of e-waste in Europe and America.
- Research how to handle e-waste including sanctions, repairs, and categories in more detail so that readers can follow the instructions.
- Study guidebook for electronic waste treatment
- Research more documents on analysis and treatment of e-waste in developed countries with efficient and smart treatment such as Singapore
- Update new data on the issue of e-waste

6. Research proposal

Templates

Research Proposal Form

Student name	Pham Minh Khanh	Student number	GCH200087
Centre name	HaNoi	Date	November 22, 2022
Tutor	Nguyen The Lam Tung		
Unit	Computing Research Project		

Proposed title: E-waste sorting project

Section One: Title, objective, responsibilities

Title or working title of research project (in the form of a question, objective, or hypothesis):
E-waste sorting project

Research project objectives (e.g. what is the question you want to answer? What do you want to learn how to do? What do you want to find out?):

- The project helps to classify e-waste into two categories: sanctioned and non-regulatory. The project analyses the components in the equipment and the components that are manufactured into two categories. Category 1, finable components and components that can be removed to replace damaged components of other electronic equipment. Type 2, the component is processed to remove metals and materials that can be processed such as iron, copper, silver, and gold.
- The project also analyses how to deal with unsanctioned equipment.
- All operations will be managed and studied by the application.

Section Two: Reasons for choosing this research project

Reasons for choosing the project (e.g. links to other subjects you are studying, personal interest, future plans, knowledge/skills you want to improve, why the topic is important):

The amount of data created and stored globally is expected to reach 175 Zettabytes by 2025, a sixfold increase from 2018. This will require additional hardware and power consumption; on the contrary, will increase the environmental impact of the digital sector and there is now increasing attention to the environmental footprint of ICT devices and services as they become more pervasive in all aspects. edge of human life. While digital technology is one of the areas where greater efficiency is achieved; gaining about 100 times more computing power from the same amount of energy per decade, it's still unsustainable. Therefore, a research project to treat e-waste by digital transformation is necessary to reduce environmental pollution caused by e-waste. Through the project, people will know how to treat, distinguish and recycle waste and also highlight the importance of those actions.

Section Three: Literature sources searched

Use of key literature sources to support your research question, objective or hypothesis:

Bhandari, P., 2022. *Scribbr*. [Online]

Available at: <https://www.scribbr.com/methodology/qualitative-research/>

[Accessed 15 December 2022].

Bouchrika, I., 2022. *Research.com*. [Online]

Available at: <https://research.com/research/primary-research-vs-secondary-research>

[Accessed 15 December 2022].

David Coghlan, M. B.-M., 2014. *The Sage Encyclopaedia of Action Research*. 2nd ed. Los Angerles, London, New Delhi, Washington DC: SAGE.

Forti, V. B. C. P. K. R. B. G., 2020 . *The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential*. 5th ed. Bonn, Geneva, Rotterdam: United Nations University/United Nations Institute for Training and Research, International Telecommunication Union, and International Solid Waste Association.

Herat, S., 2007. *Sustainable Management of Electronic Waste (e-Waste)*. 2nd ed. Carolina: WILEY.

Kai Zhang, J. L. S. E. Y. Z., 2012. E-Waste Recycling: Where Does It Go from Here?. In: 3rd, ed. *Environmental Science & Technology* . China: American Chemical Society, pp. 10861-10867.

O. Osibanjo, I. N., 2007. *Waste Management & Research*. 2nd ed. Uturu, Ibadan: ISWA.

Section Four: Activities and timescales

Activities to be carried out during the research project (e.g. research, development, analysis of ideas, writing, data collection, numerical analysis, tutor meetings, production of final outcome, evaluation, writing the report) and likely durations:

Milestone one: Research on how to apply digital transformation to e-waste treatment projects

Target date (set by tutor): 7 days, 2 October to 8 October, 2022

Milestone two: Research type and how to recycle, reusing e-waste

Target date (set by tutor): 3 days, 9 October to 11 October, 2022

Milestone three: Develop a management app for the e-waste project

Target date (set by tutor): 14 days, 12 October to 26 October, 2022

Milestone four: Collect data of the following point: impact of e-waste to environment, reusing and recycle method, quantity of waste collected, the number of finable devices, number of devices that cannot be controlled

Target date (set by tutor): 7 days, 27 October to 2 November, 2022

Milestone five: Analysis collected data

Target date (set by tutor): 4 days, 3 November to 7 November, 2022

Milestone six: Final output of the project

Target date (set by tutor): 5 days, 9 November to 14 November, 2022

Milestone seven: Evaluation of the project

Target date (set by tutor): 2 days, 15 November to 17 November, 2022

Milestone eight: Report writing of the project

Target date (set by tutor): 4 days, 18 November to 22 November, 2022

Section Four: Research approach and methodologies

Type of research approach and methodologies you are likely to use, and reasons for your choice:

- I will use two research methods: qualitative, quantitative and I will use survey because I want to reach many different user opinions for data collection and analysis.

What your areas of research will cover: Environment, Electronic, E-waste, Recycle.

Comments and agreement from tutor

Comments (optional):

I confirm that the project is not work which has been or will be submitted for another qualification and is appropriate.

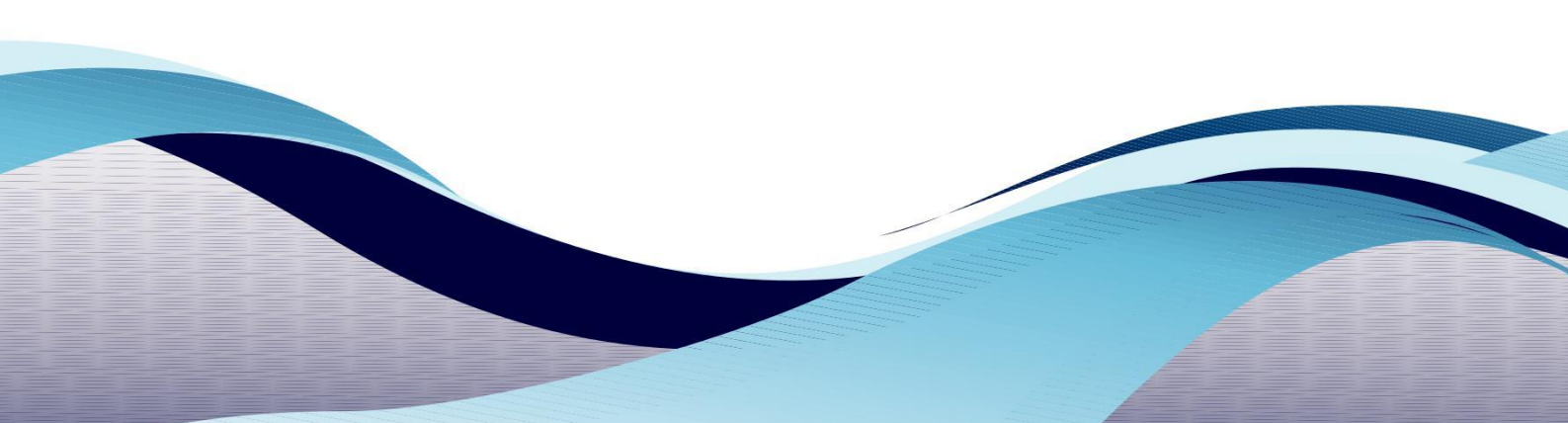
Agreed: (Name) (Date)

Comments and agreement from project proposal checker (if applicable)

Comments (optional):

I confirm that the project is appropriate.

Agreed: (Name) (Date)



Research Ethics Approval Form

All students conducting research activity that involves human participants or the use of data collected from human participants are required to gain ethical approval before commencing their research. Please answer all relevant questions and note that your form may be returned if incomplete.

For further support and guidance please see your respective Unit Tutor.

Before completing this form, we advise that you discuss your proposed research fully with your Unit Tutor. Please complete this form in good time before your research project is due to commence.

Section One: Basic details

Project title: E-waste sorting project

Student name: Pham Minh Khanh

Student number: GCH200087

Programme: Computing Research Project

School: University of Greenwich

Intended research start date: 2 October, 2022

Intended research end date: 22 November. 22

Section Two: Project summary

Please select all research methods that you plan to use as part of your project:

- Interviews ☒
- Questionnaires ☒
- Observations ☐
- Use of personal records ☐
- Data analysis ☒
- Action research ☒
- Focus groups ☐
- Other (please specify): Survey

Section Three: Participants

Please answer the following questions, giving full details where necessary.

Will your research involve human participants?

Who are the participants? Tick all that apply:

Children aged 12–16: ☐ Young people aged 17–18: ☒ Adults: ☒

How will participants be recruited (identified and approached)?

- Participants are those who fit the research criteria including: have different ages, different working positions, different working environment, have certain knowledge and understanding about electric waste death and environmental pollution.

Describe the processes you will use to inform participants about what you are doing:

- I will write the project summary on the survey so that users can understand before the interview

How will you obtain consent from participants? Will this be written? How will it be made clear to participants that they may withdraw consent to participate at any time?

- I use survey to interview participants so they can agree, or disagree, if they want to withdraw their consent, they can contact the project manager

Studies involving questionnaires:

Will participants be given the option of omitting questions they do not wish to answer?

Yes: ☒ No: ☐

If No please explain why below and ensure that you cover any ethical issues arising from this:

Studies involving observation:

Confirm whether participants will be asked for their informed consent to be observed.

Yes: ☒ No: ☐

Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)?

Yes: ☒ No: ☐

Will participants be given information about the findings of your study? (This could be a brief summary of your findings in general.)

Yes: ☒ No: ☐

Section Four: Data storage and security

Confirm that all personal data will be stored and processed in compliance with the Data Protection Act (1998):

Yes: ☒ No: ☐

Who will have access to the data and personal information?

- Project Manager

During the research:

Where will the data be stored?

- Data will be stored in online database, which be managed by the project manager

Will mobile devices (such as USB storage and laptops) be used?

Yes: ☒ No: ☐

If yes, please provide further details:

- Mobile devices will be used in order to research, analysis the data, write the report, and it only be used by the project team member.

After the research:

Where will the data be stored?

- Data will be stored in online database, which be managed by the project manager

How long will the data and records be kept for and in what format?

- Data will not be deleted or removed
- It will be keep as digital, number and PDF.

Will data be kept for use by other researchers?

Yes: ☒ No: ☐

If yes, please provide further details:

- It will be used for other research in the future.

Section Five: Ethical issues

Are there any particular features of your proposed work which may raise ethical concerns? If so, please outline how you will deal with these:

It is important that you demonstrate your awareness of potential risks that may arise as a result of your research. Please consider/address all issues that may apply. Ethical concerns may include, but are not limited to the following: No

- Informed consent.
- Potentially vulnerable participants.
- Sensitive topics.
- Risks to participants and/or researchers.
- Confidentiality/anonymity.
- Disclosures/limits to confidentiality.
- Data storage and security, both during and after the research (including transfer, sharing, encryption, protection).
- Reporting.
- Dissemination and use of your findings.

Section Six: Declaration

I have read, understood and will abide by *[insert centre name]* Research Ethics Policy:

Yes: ☒ No: ☐

I have discussed the ethical issues relating to my research with my Unit Tutor:

Yes: ☒ No: ☐

I confirm that to the best of my knowledge:

The above information is correct and that this is a full description of the ethics issues that may arise in the course of my research.

Name: Pham Minh Khanh

Date: 22 November. 2022

Please submit your completed form to:



Bibliography

Bhandari, P., 2022. *Scribbr*. [Online]

Available at: <https://www.scribbr.com/methodology/qualitative-research/>

[Accessed 15 December 2022].

Bouchrika, I., 2022. *Research.com*. [Online]

Available at: <https://research.com/research/primary-research-vs-secondary-research>

[Accessed 15 December 2022].

David Coghlan, M. B.-M., 2014. *The Sage Encyclopaedia of Action Research*. 2nd ed. Los Angerles, London, New Delhi, Washington DC: SAGE.

Forti, V. B. C. P. K. R. B. G., 2020 . *The Global E-waste Monitor 2020: Quantities, flows and the circular economy potential*. 5nd ed. Bonn, Geneva, Rotterdam: United Nations University/United Nations Institute for Training and Research, International Telecommunication Union, and International Solid Waste Association.

Herat, S., 2007. *Sustainable Management of Electronic Waste (e-Waste)*. 2nd ed. Carolina: WILEY.

Kai Zhang, J. L. S. E. Y. Z., 2012. E-Waste Recycling: Where Does It Go from Here?. In: 3nd, ed. *Environmental Science & Technology* . China: Americal Chemical Society, pp. 10861-10867.

O. Osibanjo, I. N., 2007. *Waste Management & Research*. 2nd ed. Uturu, Ibadan: ISWA.

