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Innovative Approach to Teaching Sustainable Development at Teacher Training College Through Project for Secondary Use of Recycled Electrical Materials †

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Abstract

Higher education is increasingly emphasizing sustainable development due to the growing awareness of environmental issues. Educators must be able to integrate sustainability principles into teaching, inspire students to behave responsibly, and promote environmental protection. In this article, we present an innovative approach through the secondary use of recycled electronic components to reduce electronic waste and practically teach students about sustainability. The project of making clocks from E-waste included stages from design to testing, providing students with practical skills and emphasizing the importance of recycling in technical education.

Keywords: environmental education; recycled materials; teacher training

1. Introduction

Recently, there has been an increasing emphasis on teaching sustainable development in higher education. Growing awareness of environmental issues such as climate change, air pollution, and biodiversity loss requires that future educators be informed about the principles of sustainability. This includes theoretical knowledge and practical skills, and the ability to integrate these principles into teaching [1–10]. Higher education educators must be able to inspire their students to behave environmentally responsibly and support initiatives that contribute to environmental protection.

Society is increasingly demanding sustainable solutions in various areas, including education, which is leading educational faculties to integrate sustainability into their curricula [11–15]. It is important to prepare educational faculty students for a future where they need knowledge and skills for sustainable development. Educators play a key role in shaping future generations, and they must be able to convey this important information in the best possible way. Integrating sustainability into education also fosters creativity and innovation, which can lead to new and effective teaching methods.

In this study, we focused on an innovative approach to this issue through the secondary use of recycled materials, such as electronic components and printed circuit boards (PCBs), which are removed from various electronic devices at the end of their life. Secondary use of materials is important in terms of reducing E-waste [16–20] and teaching students about sustainability and recycling.

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2. Theories and Methodology

Sustainable development is a concept that needs a balanced approach to economic growth, social inclusion, and environmental protection. The theoretical foundations of this concept include principles such as intergenerational justice, where the needs of the present are met without compromising the ability of future generations to meet their needs. Key concepts include the integration of environmental, economic, and social dimensions, leading to long-term sustainability and resilience of systems. Integrating sustainable development into educational programs is crucial to preparing future generations for the challenges of global environmental and social problems. Education for sustainability promotes critical thinking, awareness of global issues, and the ability to make informed decisions. In this way, students learn the values and skills needed to promote sustainable development in their communities and professional lives.

2.1. Creative Use of Recycled Electrical Materials in Student Project

For the experiment, necessary materials were prepared, such as recycled PCBs, epoxy resin with hardener, a round silicone mold, and a purchased clock movement (Figure 1). The PCBs were thoroughly cleaned and possibly cut into smaller pieces to fit the casting mold (a diameter of 28 cm and a height of 5 cm). The round silicone casting mold was cleaned and dried, and then the PCBs were arranged in the mold according to the design. The epoxy resin (CB RESIN ECO, Component A) was mixed with the hardener (CB RESIN ECO, Component B) according to the manufacturer's instructions and mixed thoroughly. The resin was slowly poured into the mold so that it evenly covered all the PCBs until no air bubbles formed. A heat gun was used to remove the bubbles. The resin was allowed to cure according to the manufacturer's instructions, which took several hours to days (curing time according to the manufacturer's instructions was from 12 to 48 h). The clock was removed from the mold. The surface was sanded with sandpaper to make it smooth. A hole in the center of the clock was drilled for the clock movement, which was mounted according to the manufacturer's instructions. Finally, the hands were added and the time was set. The last step was to introduce and present the unique clock made from recycled PCBs to students and teachers.

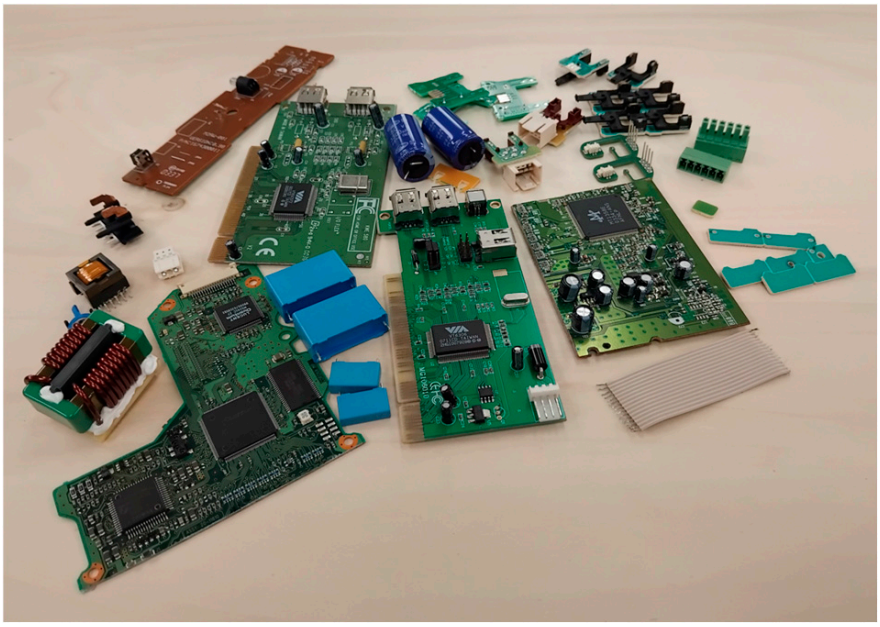


Figure 1. Electronic waste and recycled PCB.

At the beginning of the project, the students were previously presented with a general diagram of the production process, which is based on the concept of the product life cycle [21–25]. This cycle does not begin with production but with obtaining raw materials and materials. It continues with their transportation, processing in production, and packaging, and transportation and distribution of the final product. In most cases, the life cycle ends with the disposal of the product at the end of its service life while the process of manufacturing the clock begins with the sorting of electronic waste to obtain PCBs and wash them (Figure 2).

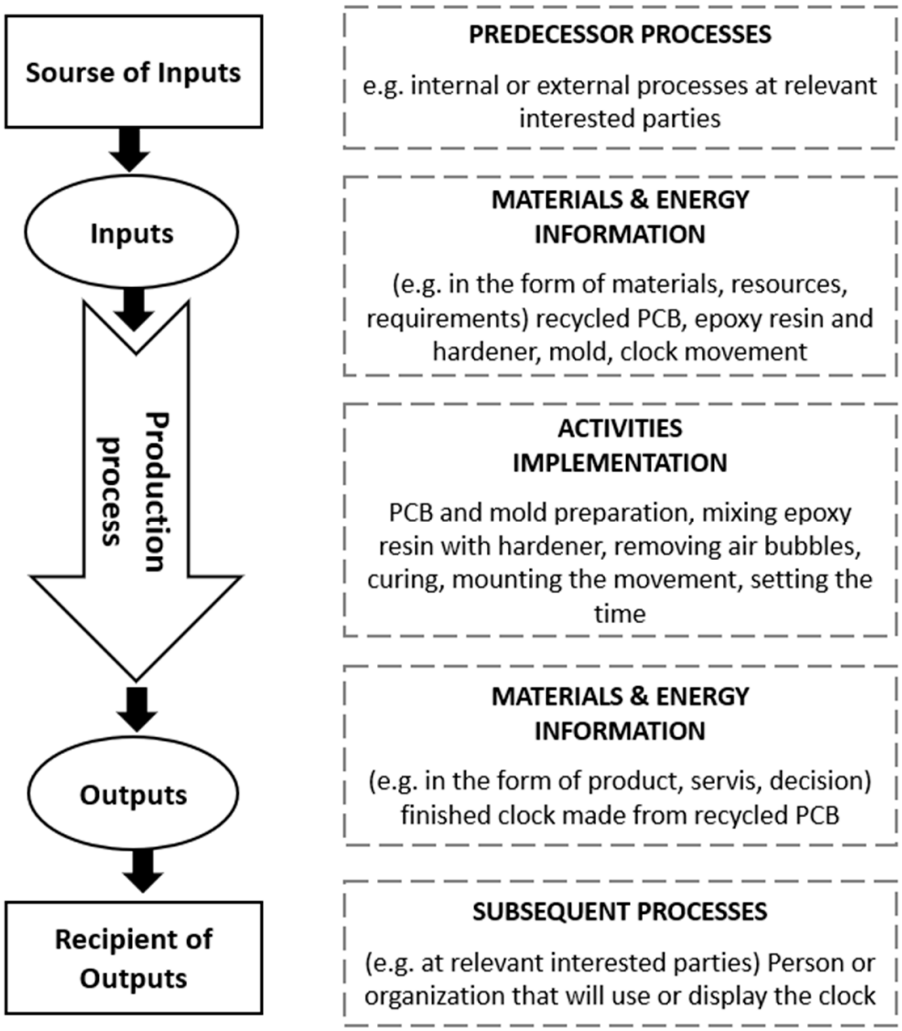


Figure 2. Schematic diagram of manufacturing process of clock from recycled PCBs.

In addition to the training on work safety in the laboratory, the use of protective equipment was necessary for students. Specifically, when making clocks from recycled PCBs cast in epoxy resin, students need to use protective equipment. Protective gloves protect students from chemicals and the sharp edges of PCBs, while safety glasses prevent resin or dust from entering the students' eyes. A respirator protects students' respiratory tract from resin fumes and dust from grinding. Protective clothing and an apron protect students' clothing from resin and dirt. A work mat or cover protects students' work surface from resin and makes clean-up easier. Ventilation or extraction is also important to ensure sufficient ventilation of the area where students work with resin. Using this protective gear protects students and helps them work safely and comfortably, leading to successful and efficient lesson production.

2.2. Description of Project Phases

Currently, the emphasis is on managing one-off work in the form of projects, even in the school environment. Projects are a key element in the organization and planning of school activities. They are short-term or long-term projects with various activities, such as the development of new software, the creation of a new product, changes in the organization of school events, and many others. The goal of school projects is to obtain results at different times at varying degrees of involvement of students and teachers. Project management is a strategy and philosophy that helps us achieve precisely defined goals concerning time, cost, and quality.

A project is a set of activities leading to the achievement of a specific goal, which has a beginning and an end. Everything is carried out within set and limited times. Predetermined and limited resources are used in the entire project, coordinated by a team of experts. There are different types of projects according to content or purpose. These are projects related to construction, research and development, technological, or organizational.

The goal of a project is to achieve a desired goal at a certain cost (given budget), within a certain time, and in precise execution. In professional terms, these parameters that determine the achievement of the project goal are called the "Iron Triangle" (time, cost, and scope) [26]. The key requirement that the "Iron Triangle" summarizes is the need to achieve all three independent goals simultaneously. These three basic quantities are interdependent, which leads to a change in the other two project quantities when changing one of them. Project management usually consists of the following phases.

- The pre-production phase includes project planning and preparation, selection of materials and technologies, including market analysis, concept development, and product design, and preparation of production processes.
- The production phase includes prototype production and testing to verify the functionality and quality of the product, and subsequent mass production according to the specified specifications and based on approved documents.
- The post-production phase includes logistics, marketing, distribution, and sales after production is completed.
- The project closure phase includes project closure, evaluation of results, and feedback for future projects, including identification of areas for improvement.

A large part of the work with students was devoted to the pre-production of projects, which was associated with a timetable and a breakdown of individual steps, operations, and tasks that need to be completed with a given project at a certain stage. The pre-production phase is a broad area of planning before entering the production phase of the project. In the plan, a line chart, also known as a Gantt chart [27], is often used to present the logical sequence of project activities. The lengths are proportional to the duration of the activity they represent. Table 1 shows the detailed stages of the project of manufacturing watches from recycled PCBs.

Table 1. Process of making clocks with students in the context of project management.

Project Phase	Description	Application for Clock Production
Project initiation	Defining Goals	To create a functional clock from recycled PCBs
	Obtaining Approval	Obtaining approval from the school management and teachers for the implementation of the project
Project planning	Strategic Planning	Using experience from previous projects and creating a detailed plan
	Detailed Analysis	Analyzing the required materials, time, costs, resources, and technologies
	Output	Creating a detailed and binding plan for the production of the clock
Implementation	Material Preparation	Prepare all the necessary materials, such as recycled PCBs, epoxy resin with hardener, silicone mold, and clock movement
	Cleaning	Thoroughly clean the PCB and cut them into smaller pieces if necessary
	Resin Mixing	Mix the epoxy resin with hardener according to the manufacturer's instructions
	Resin Casting	Slowly pour the resin into the mold so that it evenly covers all the PCBs and does not create air bubbles
	Bubble Removal	Using a heat gun to remove bubbles
Monitoring and control	Curing Control	Monitoring the resin curing process according to the manufacturer's instructions
	Quality Control	Ensuring that the surface of the clock is smooth and free of defects
Project closure	Completing	Removing the clock from the mold, sanding the surface, drilling the hole for the clock movement, and assembling it
	Presentation	Presenting the finished clock to classmates and teachers
	Evaluation	Comparing the results with the original goals and obtaining feedback

2.3. Risk Management of Project

Risk management [28–31] is a key part of any project for student projects, such as making a clock from recycled PCBs. Identifying and managing risks has several important benefits. The first benefit is safety. Working with chemicals such as epoxy resin and tools is dangerous. Identifying potential risks and managing them helps ensure a safe working environment for students. Another benefit is the quality of the final product. Risk management enables the prevention of problems that might affect the quality of the clock. For example, improper mixing of resin or the formation of air bubbles leads to defects in the product. The third benefit is efficiency and schedule. Identifying risks, such as delays in individual production steps, leads to a better plan and coordinated activities and a more efficient use of time and resources. Risk management also has significant educational value. It teaches students important skills such as critical thinking, planning, and problem-solving. These skills are valuable for this project and their future careers. Finally, risk management increases the likelihood of successful project completion. Preventing problems and resolving them promptly, the project is completed according to plan and expectations. For these reasons, students need to learn to identify and manage risks in their project to make a clock from recycled PCBs. This process increases the chances of the project being successful and provides valuable experience and skills that will be useful in their future professional lives.

A risk assessment matrix is useful for identifying and evaluating potential risks in a project (Table 2).

Table 2. Risk assessment matrix.

Risk	Probability (P)	Impact (I)	P × I	Category
Material quality	3	4	12	Medium
Incorrect resin ratio	2	2	10	Medium
Formation of air bubbles	4	3	12	Medium
Safety		25	10	Medium
Delays in production steps	3	4	12	Medium
Mold height	3	3	9	Low
Short curing time	2	4	8	Low
Movement of components during pouring	4	4	16	High
Problems with clock mechanism installation	3	4	12	Medium
Small hole for clock mechanism	2	3	6	Low
Large hole for clock mechanism	3	5	15	High
Clock hands moving in the wrong direction	1	5	5	Low

The first step was to identify all possible risks, such as material quality, incorrect resin ratio, air bubbles, safety hazards, delays in individual production steps, mold height, short cure time, component movement during pouring, problems with movement assembly, incorrect size of the clock movement hole, and incorrect direction of clockwise rotation.

The second step was a risk assessment, where we rated each risk according to its probability and impact on the project. We used a scale of 1–5, with 1 being the lowest and 5 being the highest. Based on this assessment, we determined which risks were high, medium, or low.

The third step was to create a risk matrix, where probability was on one axis and impact on the other. We placed each risk in the matrix according to its rating, which helped us visualize and better understand which risks were the most critical.

The fourth step was to create an action plan for risks with a high or medium rating. This plan included specific steps to minimize or eliminate the risk, such as thoroughly cleaning the PCBs, following precise resin mixing instructions, and using a heat gun to remove air bubbles.

The risk category was determined based on the value we obtained by multiplying the probability (P) and the impact (I) of each risk.

1. High category: If the PI value was 15 or higher, the risk was classified as high. These risks have the greatest potential impact on the project and require the most attention and action to minimize or eliminate them.
2. Medium category: If the PI value was between 10 and 14, the risk was classified as medium. These risks are significant, but not as critical as risks in the high category. However, they still require careful management and monitoring.
3. Low category: If the PI value was less than 10, the risk was classified as low. These risks have less impact on the project and usually do not require as intensive action as risks in the medium or high categories.

The competencies and experience of the teacher are important for the implementation of risk analysis, and they complement their skills with knowledge in the field of quality and project management (Figure 3).

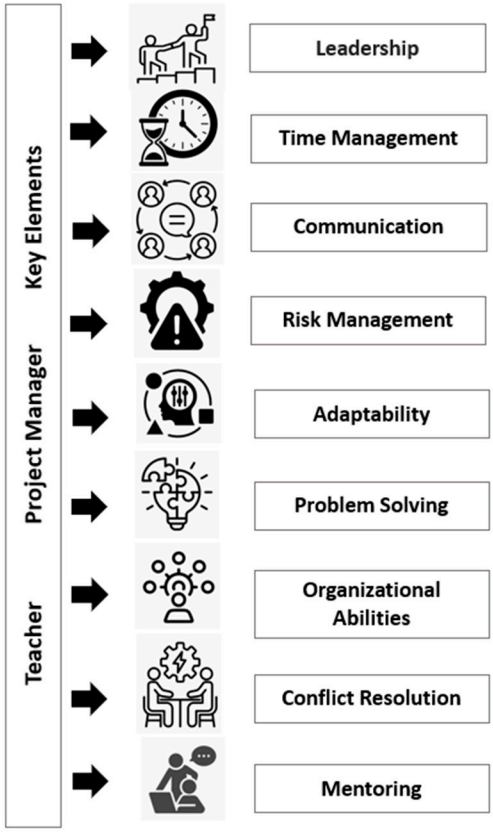


Figure 3. Competencies and experience of teacher.

3. Results and Discussion

Significant outcomes were obtained through the student project of making clocks from recycled PCBs. The students successfully created functional clocks that not only met aesthetic requirements but were also fully functional (Figure 4).

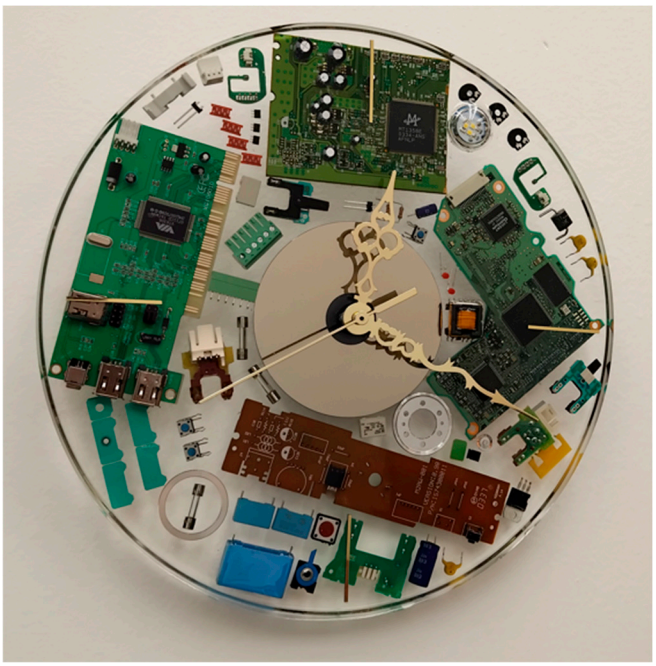


Figure 4. Functional clock made from recycled PCBs as a result of the project.

Each student designed and produced unique clocks, which led to the creation of diverse and creative products. The project results were evaluated based on several criteria, including the quality of workmanship, functionality of the clocks, and aesthetic appearance. The clocks were tested for accuracy and durability of materials. Most of the clocks met expectations and were rated as high quality. The students also received feedback from teachers and classmates, which helped them identify strengths and areas for improvement.

The project had wider impacts on teaching sustainability. Students learned how to effectively use recycled materials and how to minimize waste. This project provided them with practical experience with sustainable practices and showed how they can contribute to protecting the environment. In addition, students learned important skills such as planning, risk management, teamwork, communication, time management, financial analysis, occupational health and safety (OHS), legislation, and ISO 9001 [32] and ISO 14000 standards [33], which are key for their future careers.

4. Conclusions

The student project to make clocks from recycled PCBs produced significant outputs. The students successfully created functional and aesthetically appealing clocks, resulting in diverse and creative products. The project results were assessed based on workmanship, functionality, and aesthetic appearance, with the majority of clocks meeting high standards. The project had a wider impact on teaching sustainable development, as students learned how to use recycled materials effectively. They also gained important skills in planning, risk management, teamwork, communication, time management, financial analysis, health and safety, legislation, and ISO 9001 and ISO 14000 standards.

The project contributed to the pedagogical development of students' critical thinking and practical skills. Students learned how to apply theoretical knowledge in practice, which strengthened their ability to solve problems and adapt to new situations. The project also promoted active learning and collaboration among students, which led to better understanding and knowledge sharing. During the project, various challenges were identified and addressed, such as material quality, resin mixing and casting, and clockwork assembly. These challenges provided students with the opportunity to develop project management and critical thinking skills. Despite these challenges, the students completed the project and gained valuable experience that will help them in their further education and professional lives. The project not only contributed to the development of the students' technical and practical skills but also strengthened their awareness of sustainable development and environmental protection. Therefore, the project contributed to the learning process and prepared the students for future challenges in their professional lives.

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References

1. Wals, A.E.J. Sustainability in higher education in the context of the UN DESD: A review of learning and institutionalization processes. *J. Clean. Prod.* **2014**, *62*, 8–15. [CrossRef]
2. Fisher, D.H.; Bian, Z.; Chen, S. Incorporating sustainability into computing education. *IEEE Intell. Syst.* **2016**, *31*, 93–96. [CrossRef]
3. Smith, A.M. Innovative approaches to teaching sustainable development. In *Encyclopedia of Sustainability in Higher Education*; Leal Filho, W., Ed.; Springer: Cham, Switzerland, 2019. [CrossRef]
4. Fischer, D.; King, J.; Rieckmann, M.; Barth, M.; Büssing, A.; Hemmer, I.; Lindau-Bank, D. Teacher education for sustainable development: A review of an emerging research field. *J. Teach. Educ.* **2022**, *73*, 509–524. [CrossRef]
5. Leal Filho, W.; Lange Salvia, A.; Pires Eustachio, J.H.P. An overview of the engagement of higher education institutions in the implementation of the UN Sustainable Development Goals. *J. Clean. Prod.* **2023**, *386*, 135694. [CrossRef]
6. Alam, M.J.; Hassan, R.; Ogawa, K. Digitalization of higher education to achieve sustainability: Investigating students' attitudes toward digitalization in Bangladesh. *Int. J. Educ. Res. Open* **2023**, *5*, 100273. [CrossRef]
7. Mashroofa, M.M.; Haleem, A.; Nawaz, N.; Saldeen, M.A. E-learning adoption for sustainable higher education. *Heliyon* **2023**, *9*, e17505. [CrossRef] [PubMed]
8. Maulidevi, N.U.; Aji, B.S.K.; Hikmawati, E.; Surendro, K. Modeling integrated sustainability monitoring system for carbon footprint in higher education buildings. *IEEE Access* **2023**, *11*, 135365–135376. [CrossRef]
9. Al-Filali, I.Y.; Abdulaal, R.M.S.; Alawi, S.M.; Makki, A.A. Modification of strategic planning tools for planning financial sustainability in higher education institutions. *J. Eng. Res.* **2024**, *12*, 192–203. [CrossRef]
10. Abo-Khalil, A.G. Integrating sustainability into higher education: Challenges and opportunities for universities worldwide. *Heliyon* **2024**, *10*, e29946. [CrossRef] [PubMed]
11. Stek, K.; Picaud-Bello, K.; Koch, V.; Johnsen, T. Rethinking purchasing and supply management education for sustainability and innovation challenges: Crafting a future-ready competency-based curriculum design. *J. Purch. Supply Manag.* **2025**, *31*, 100974. [CrossRef]
12. Akhtar, P.; Moazzam, M.; Ashraf, A.; Khan, M.N. The interdisciplinary curriculum alignment to enhance graduates' employability and universities' sustainability. *Int. J. Manag. Educ.* **2024**, *22*, 101037. [CrossRef]
13. Sengupta, D.; El-Halwagi, M.M. Incorporating systems thinking in the engineering design curriculum: Path forward for sustainability education. In *Encyclopedia of Sustainable Technologies*, 2nd ed.; Abraham, M.A., Ed.; Elsevier: Amsterdam, The Netherlands, 2024; pp. 487–499. [CrossRef]
14. Perpignan, C.; Baouch, Y.; Robin, V.; Eynard, B. A competency-based model to integrate sustainability in curricula in French universities and engineering schools. In Proceedings of the 2021 World Engineering Education Forum/Global Engineering Deans Council (WEEF/GEDC), Madrid, Spain, 15–18 November 2021; pp. 405–411. [CrossRef]
15. Ahmed, A. Developing strategy for integrating sustainability in UAE higher education institutions towards UAE Strategic Initiative Net Zero 2050. In Proceedings of the 2023 International Conference on Computational Intelligence and Knowledge Economy (ICCIKE), Dubai, United Arab Emirates, 9–10 March 2023; pp. 370–375. [CrossRef]
16. Alfatmi, K.; Shinde, F.S.; Shahade, M.; Sharma, S.S.; Aruja, S.S.; Chaudhari, T.Y. E-Safe: An e-waste management and awareness application using YOLO object detection. In Proceedings of the 2023 7th International Conference on Intelligent Computing and Control Systems (ICICCS), Madurai, India, 17–19 May 2023; pp. 1061–1066. [CrossRef]
17. Roy, M.S.; Lusan, M.N.I.; Khan, M.A.R.; Khan, M.P.; Ahmed, A.; Zishan, M.S.R. Design and development of e-waste monitoring, segregation and recycling system. In Proceedings of the 2023 3rd International Conference on Robotics, Electrical and Signal Processing Techniques (ICREST), Dhaka, Bangladesh, 7–8 January 2023; pp. 363–367. [CrossRef]
18. Shelke, P.; Waghmare, A.; Yelgire, S.; Vavhal, V.; Shirurkar, M. E-wasteHub: Revolutionizing e-waste management. In Proceedings of the 2024 IEEE International Conference for Women in Innovation, Technology & Entrepreneurship (ICWITE), Bangalore, India, 16–17 February 2024; pp. 717–721. [CrossRef]
19. Bhoi, N.K. Advancements in e-waste recycling technologies: A comprehensive overview of strategies and mechatronics integration for future development. *Sustain. Mater. Technol.* **2024**, *42*, e01182. [CrossRef]
20. Ogunyemi, M.O.; Oluseyi, T.O.; Oyeyiola, A.O.; Abdallah, M.A.-E.; Harrad, S. Global review of PCBs and chemical flame retardants in e-waste recycling sites: Addressing geographic imbalances. *Emerg. Contam.* **2025**, *11*, 100426. [CrossRef]
21. Vaskić, L.; Paetzold, K. The system life cycle turbine: A proposal for a universal system life cycle model in aerospace and defense. In Proceedings of the 2019 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC), Valbonne, France, 17–19 June 2019; pp. 1–9. [CrossRef]
22. Fattakhov, K.I.; Silenov, M.A.; Brusakova, I.A. Life cycle of products and services in digital technology enterprises. In Proceedings of the 2021 International Conference on Quality Management, Transport and Information Security, Information Technologies (IT&QM&IS), Yaroslavl, Russia, 6–10 September 2021; pp. 31–34. [CrossRef]
23. Jürgens, E.; Hartmann, K.; Endres, H.-J.; Spierling, S. Life cycle assessment of higher education institutions—Method and case study. *J. Clean. Prod.* **2023**, *430*, 139649. [CrossRef]

24. Vital, X.; Krishnan, A.; Wyman, H. Pushing the boundaries of LCA with AI integration and advanced life cycle inventories for semiconductor production. In Proceedings of the Electronics Goes Green 2024+ (EGG), Berlin, Germany, 18–20 June 2024; pp. 1–4. [CrossRef]
25. Tomášková, T.; Duda, D.; Krotký, J.; Honzíková, J. Ecodesign as a new possibility in teaching technical subjects in secondary schools. In *Education and New Developments 2024*; inScience Press: Lisboa, Portugal, 2024; pp. 199–203. [CrossRef]
26. Pollack, J.; Helm, J.; Adler, D. What is the iron triangle, and how has it changed? *Int. J. Manag. Proj. Bus.* **2018**, *11*, 527–547. [CrossRef]
27. Wadhwa, K. Sustainable Fashion: A Study on Consumer Perception and Behavior. 2023. Available online: https://www.theseus.fi/bitstream/handle/10024/865913/Wadhwa_Kanika.pdf (accessed on 12 January 2025).
28. Mandrakov, E.S.; Dudina, D.A.; Vasiliev, V.A.; Aleksandrov, M.N. Risk management process in the digital environment. In Proceedings of the 2022 International Conference on Quality Management, Transport and Information Security, Information Technologies (IT&QM&IS), Saint Petersburg, Russia, 26–30 September 2022; pp. 108–111. [CrossRef]
29. Jiang, W.; Shi, A.; Liu, H. Enterprise risk management model based on artificial intelligence algorithms and digital transformation. In Proceedings of the 2024 Second International Conference on Data Science and Information System (ICDSIS), Hassan, India, 17–18 May 2024; pp. 1–5. [CrossRef]
30. Kholimtaeva, I.; Shamshieva, B. Analysis on risk management methods and tools. In Proceedings of the 2024 5th International Conference on Image Processing and Capsule Networks (ICIPCN), Dhulikhel, Nepal, 3–4 July 2024; pp. 276–279. [CrossRef]
31. Masár, M.; Hudáková, M.; Šimák, L.; Brezina, D. The current state of project risk management in the transport sector. *Transp. Res. Procedia* **2019**, *40*, 1119–1126. [CrossRef]
32. *ISO 9001:2015*; Quality Management Systems—Requirements. International Organization for Standardization: Geneva, Switzerland, 2015.
33. *ISO 14001:2015*; Environmental Management Systems—Requirements with Guidance for Use. International Organization for Standardization: Geneva, Switzerland, 2015.

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