Laidlaw Programme Reflective Report

- **The research I have conducted**

In my research titled "AI-Driven Circular Economy Transformation: A More-Than-Human Exploration Through Generative AI Interviews," I addressed the urgent need to transition towards more sustainable and circular economic models. Given the growing environmental challenges such as resource reduction and the increasing accumulation of waste, there is a critical need for innovative solutions that can drive sustainable practices. Generative Artificial Intelligence (GenAI) presents a powerful yet underexplored opportunity in this realm. My research aims to bridge the gap between the AI community and the sustainability sector by investigating how genAI can actively contribute to circular economy principles. By exploring how genAI can optimise resources, reduce waste, and promote sustainable practices, my research provides new insights into how these technologies can revolutionise industries and redefine our approach to responsible consumption.

To conduct this research, I collaborated with three advanced AI tools, including ChatGPT, Copilot, and Gemini. These tools were selected for their ability to generate insightful responses based on complex prompts, making them ideal for this exploratory study. I structured my research around three core principles of the circular economy: resource optimisation, waste reduction, and sustainable consumption. To delve into the potential roles of genAI in these areas, I designed eight specific questions that would elicit responses from each of the generative AIs. The purpose was to understand how these AI tools perceive and can contribute to sustainability efforts, providing a more-than-human perspective on the issues at hand.

Throughout the interviews, I found that despite being distinct systems, these generative AIs provided remarkably similar responses. This consistency suggests that there is a potential consensus within these AI models on how to approach the challenges of sustainability and circular economy practices. The thematic analysis of their responses revealed practical guidelines for integrating genAI into circular economy practices, offering actionable insights for stakeholders. These findings fill a gap in current research by providing a comprehensive understanding of the intersection between genAI and the circular economy. Furthermore, the study offers a roadmap for industries and stakeholders seeking to leverage AI for more responsible consumption and sustainable growth. By highlighting the consistent potential of genAI in driving

the circular economy, my research paves the way for future studies and applications in this crucial field.

- **How the research work I have been undertaking is impactful or important**

	ChatGPT	**CoPilot**	**Gemini**
Promoting recyclability	By predicting the lifecycle of a product, AI can ensure that components are easily separated for recycling, reducing the amount of waste sent to landfills.	Smart bins can display informative messages, statistics, and interactive games on digital screens	AI can create gamified recycling programs, offering rewards, challenges, and leaderboards to foster competition and fun.
Innovative new designs	AI can identify innovative shapes, structures, and functions that use fewer materials and generate less waste, while still meeting consumer needs.	Studying biological materials and their multifunctional properties in nature provides insights into sustainable material design.	AI can suggest alternative materials with a lower environmental impact while maintaining product performance.
Data driven chemical solution	AI can sift through vast chemical databases to identify eco-friendly alternatives to harmful chemicals.	Through **Green Chemistry** principles, AI can guide the development of less-hazardous products	AI can drive the discovery of entirely new materials that do not rely on harmful chemicals

My research project, titled "AI-Driven Circular Economy Transformation: A More-Than-Human Exploration Through Generative AI Interviews," addresses

a critical need in today's world: the transition towards sustainable and circular economic models. With escalating environmental challenges such as resource depletion and waste accumulation, finding innovative solutions to promote sustainability is imperative. This research is particularly impactful as it bridges the gap between advanced artificial intelligence technologies and the principles of the circular economy, offering a novel approach to addressing some of the most pressing environmental issues.

Points of Impact

1. **Advancement of Circular Economy Practices:** My research explores how Generative Artificial Intelligence (GenAI) can contribute to circular economy principles such as resource optimisation, waste reduction, and sustainable consumption. By examining the potential roles of genAI in these areas, the study provides new insights into how AI technologies can enhance the efficiency of resource use, minimise waste, and support sustainable practices. This has significant implications for industries looking to adopt circular economy models, offering practical guidelines for integrating AI into their operations.

2. **Bridging the AI and Sustainability Sectors:** The research is crucial in connecting the AI community with sustainability practices. Generative AIs like ChatGPT, Copilot, and Gemini were used to gather perspectives on how these technologies can contribute to the circular economy. The consistent responses from these AIs reveal a shared understanding of how AI can support sustainability efforts, highlighting the potential for genAI to play a transformative role in this field. This integration of AI with sustainability efforts helps to advance knowledge and practice in both domains.

3. **Filling Gaps in Existing Research:** By focusing on the intersection of genAI and the circular economy, my research fills a gap in current studies. While there is extensive literature on circular economy practices and AI technologies separately, there is limited research on their intersection. The thematic analysis of AI responses offers a comprehensive understanding of how generative AI can be applied to promote circular economy principles, thus contributing valuable knowledge to the academic community and practical guidance for stakeholders.

In conclusion, the impact and importance of my research lie in its innovative approach to addressing environmental challenges through the lens of artificial intelligence. By exploring how genAI can support the principles of the circular economy, this research not only advances the understanding of AI's role in

sustainability but also provides actionable insights for industries and policymakers. The study bridges critical gaps in existing research, paving the way for future exploration and application of AI in fostering sustainable practices. Through this work, I aim to contribute to a more sustainable and responsible approach to economic growth and environmental stewardship.

- **Activities I have been involved in to disseminate your research, including but not limited to attending conferences, producing research posters, and promotion of the programme**

To get the word out about my research, I have been pretty active in several ways. I have been using platforms like the Laidlaw Scholars Network, which has been fantastic for sharing my work with a broader academic audience. It is a great space where I can connect with other scholars and get my research in front of people who are genuinely interested in the intersection of AI and sustainability.

I am in the process of creating a research poster to share my findings with the Laidlaw Scholars community. It has been a fun and creative project, and I am excited about how it will visually showcase my work. Having a poster will make it easier for people to quickly grasp the key points of my research, and I am looking forward to engaging with others in the community through this format. I am also interested in presenting my research at the upcoming Student Sustainability Research Conference at Leeds, which would be a fantastic opportunity to share my insights with a wider audience.

Networking has been a big part of my strategy too. I have been active on LinkedIn and Facebook, where I share updates and insights about my research. These social media platforms have allowed me to reach a wider audience and engage with professionals and peers who might be interested in the topic. It has been great to see conversations and connections grow from these posts.

On top of all that, I have been talking about my research with friends and classmates. It has been really rewarding to explain my work to them, get their thoughts, and see their interest in the subject. It is not just about sharing findings but also about getting others excited about the potential impact of AI on sustainability.

- **What impact conducting research has had on me**

Conducting research has been a transformative experience for me in several ways. On a personal level, it has deepened my understanding of how generative AI can intersect with the principles of the circular economy, broadening my perspective on both technology and sustainability. This exploration has not only enhanced my knowledge but also fuelled my passion for finding innovative solutions to pressing environmental challenges.

I had prior experience with GenAI tools, but for this research, I found that structuring my questions clearly was essential for getting useful responses. The process required a balance between understanding the GenAI's capabilities and evaluating the practicality of its suggestions. While many ideas were creative, some weren't entirely realistic, especially given the resources needed for implementation and the carbon footprint of AI itself. Despite these challenges, interacting with genAI sharpened my analytical and critical thinking skills, helping me to methodically evaluate and synthesise complex information, and contribute to meaningful discussions on sustainability.

Moreover, the experience has strengthened my communication and networking abilities. Preparing and presenting my research, whether through creating posters or engaging with the Laidlaw Scholars community, has helped me articulate my ideas more clearly and confidently. Sharing my work with peers and professionals has not only expanded my professional network but also provided valuable feedback that has enriched my research journey.

Overall, conducting this research has been a deeply fulfilling endeavour that has enhanced my skills, broadened my knowledge, and connected me with a vibrant community of scholars and practitioners. It has reinforced my commitment to pursuing solutions that integrate technology with sustainability and has inspired me to continue exploring innovative approaches to addressing global challenges.

- **Leadership skills I have gained from the research period**

During the research period, I have developed several key leadership skills that have been instrumental in both my academic and personal growth.

Firstly, **project management** has been a significant area of growth. Leading a research project requires careful planning, organisation, and time

management. I have had to coordinate various aspects of the research process, from designing the study to analysing data and preparing presentations. This experience has honed my ability to manage multiple tasks efficiently and keep the project on track, ensuring that deadlines are met, and objectives are achieved.

Secondly, **collaboration and teamwork** have been crucial skills I have developed. Working with different AI tools and engaging with the Laidlaw Scholars community has taught me how to effectively collaborate with others. Whether it is sharing insights, or receiving feedback from my supervisor, I have learned how to foster productive relationships and navigate diverse perspectives, which is essential for successful teamwork.

Additionally, **communication skills** have been greatly enhanced. Presenting my research findings through various formats, including posters and social media, has improved my ability to convey complex ideas clearly and persuasively. Explaining my work to peers, mentors, and the broader community has strengthened my capacity to articulate my thoughts and engage others in meaningful discussions.

Lastly, **problem-solving and adaptability** have been key areas of development. Research often involves unexpected challenges and changes. I have learned to approach problems with a flexible mindset, adapting my strategies as needed and finding creative solutions to overcome obstacles. This skill has been valuable not only in research but also in other areas of my life.

Using Gibbs' Reflective Cycle [1] to structure my reflection has helped me organise the challenges I have faced during my research project and how I navigated them.

1. **Description**:
   I encountered various challenges during my research, including technical issues with GenAI tools and difficulty interpreting complex responses. These obstacles required me to rethink my approach multiple times.

2. **Feelings**:
   At first, I felt a little frustrated by the unpredictability of working with GenAI, which made me doubt my progress. However, as I found

[1] https://www.structural-learning.com/post/gibbs-reflective-cycle

creative solutions, I gained confidence and felt more in control of the process.

3. **Evaluation**:
   The challenges improved my problem-solving skills and adaptability. While I learned a lot, better preparation could have reduced the impact of these issues, particularly in framing questions for the GenAI.

4. **Analysis**:
   The main challenge was getting meaningful data from the GenAI. Flexibility was key when responses were unclear or technical issues arose, but these moments also helped reinforce my problem-solving abilities.

5. **Conclusion**:
   Though difficult, these experiences taught me the value of creativity and adaptability in overcoming research challenges. More preparation could have mitigated some of the frustration.

6. **Action Plan**:
   In future research, I will proactively anticipate challenges and continue honing my problem-solving skills, which have proven useful not only in research but also in broader life situations.

Overall, the research period has significantly enhanced my leadership abilities, equipping me with skills in project management, teamwork, communication, and problem-solving that will benefit me in future endeavours.

- **What my future career, educational plans or continued research plans are**

Looking ahead, I am considering starting my own research blog in the future, possibly leading to a dissertation. This would allow me to share insights on how GenAI can enhance sustainability efforts and explore the intersection of AI and the circular economy in greater depth. Participating in the Leadership in Action (LiA) programme with the Laidlaw Foundation next summer will further enrich my perspective and connections, which I believe will be instrumental in shaping these future projects.

In terms of my career and educational plans, I am passionate about continuing my involvement in research focused on sustainability. I believe that finding innovative solutions to environmental challenges is crucial, and I want to be at the forefront of this work. My goal is to contribute meaningfully to sustainability efforts, leveraging my background in Accounting and Finance along with my interest in technology and AI. I am deeply enthusiastic about using these tools to make a positive impact on both people and the environment.

My drive to help those in need is also inspired by my father, who worked for a Non-Governmental Organisation (NGO) supporting poor communities in Bangladesh. His dedication to making a difference in peoples' lives has always motivated me to pursue a similar path. I aspire to work in an NGO myself, blending my skills and passions to contribute to causes I care deeply about. Combining my expertise in finance with cutting-edge technology allows me to approach problems from a unique angle, and I am excited about the potential to make a difference. The intersection of technology, finance, and sustainability offers endless possibilities, and I am committed to exploring these opportunities to contribute to meaningful change.

Scholar Report

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Title of Scholarship Project:	AI-Driven Circular Economy Transformation: A More-Than-Human Exploration Through Generative AI Interviews

Supervisor

Please comment on your scholar's research period, what you consider to be your scholars' strengths and which leadership attributes you feel your scholar has demonstrated and is particularly skilled in. You could also identify areas which your scholar can develop further.

Rafia has been an outstanding student to collaborate with, demonstrating leadership, dedication, innovative thinking, and a keen interest in exploring an emerging research area with the potential to advance the circular economy. She quickly adapted to this unfamiliar field, acquiring a variety of valuable research skills. After initial guidance, Rafia independently managed her literature review, identified key publications, and developed a comprehensive framework for interviews involving GenAI tools. She then synthesized her findings through thematic analysis.
This process required her to engage deeply with GenAI tools, circular economy frameworks, qualitative research methods (such as interviews), ethical considerations, and thematic analysis techniques. Throughout the project, Rafia has shown strong data analysis skills and produced a high-quality poster to effectively communicate her findings. I believe the insights from her work could contribute significantly to developing guidelines for stakeholders on the application of GenAI tools in promoting a circular economy.

Signature of Scholar  Date: _15_/_09_/_2024_

Signature of Project Leader  Date: _26_/_09_/_2024_