Laidlaw Impact Report

Introduction

For my Leadership-in-Action project, I had the pleasure of travelling to Zimbabwe to work with a social enterprise called Mobility for Africa. Zimbabwe poses a challenging economic climate for any company to operate in and I learned a huge amount during my time there.

Mobility for Africa provides sustainable transport in the form of electric tricycles (called 'Hambas') powered using off-grid renewables. These tricycles are distributed primarily to women in rural and farming families to provide increased economic opportunities. During my six week Leadership-in-action experience I worked within the technology team, responsible for solving technical issues and advancing the technology used in the Hambas.

Impacts

The body of this impact report is divided into four sections, representing the four major impacts that I have identified.

Battery Technology:

On my first day in Mobility for Africa, it was outlined to me that the battery management system was failing at a spectacularly high rate (greater than 45%). While Mobility for Africa will typically have 1.5 times the amount of batteries than Hambas to account for battery swaps, this number meant that a large number of vehicles were unable to be used. In my first week, I examined the battery and battery management system and outlined a number of potential architecture and specification issues with the circuit. I then developed a series of experiments that could be performed in the factory to identify the failure cause. After one of the experiments agreed with my previous observation, I wrote a report for the Chief Technical Officer (CTO) outlining how this issue could be rectified through an architecture redesign.

I was very lucky analogue circuit design and battery management systems were an area I had previously learned about during my time at Formula Trinity, as otherwise I would not have had the necessary knowledge to solve this particular problem. Using components with a total cost of 3.75 USD per battery the failure mode was removed. To date (10 weeks from the introduction of the components) there have been no BMS failures which has brought a 45% failure rate to 0%. Of course more long term analysis will be required to see if this number will hold long-term, but the initial results seem promising.

Data Collection Using LoRaWAN:

One of the huge problems for Mobility for Africa was data collection. Rural Zimbabwe has incredibly poor cellular reception and this means that the team has no visibility on where the

Hambas are at any point in time, how far they have travelled or if there are any outstanding battery issues. To combat this I helped build a novel data collection network using the LoRa communication standard: LoRa, a communication standard that uses licence-free sub-gigahertz radio frequencies and cheap hardware can allow an individual to legally create their own wide-area wireless network, with a range of up to 30 km. This is the first time that LoRa technology has been used for this purpose (from our research) so we faced many engineering challenges.

My role included aiding technicians in installing LoRa antennas and their accompanying hardware across Mobility for Africa's four major rural sites. I then developed software to translate the information collected from the LoRa network to their existing database and documented my code so it can be maintained in the future. I used the Python programming language for this task, which I had previously learned working in another start-up.

Mobility for Africa uses ODK (Open Data Kit), an open-source toolkit for data collection, for all their data collection and storage. A typical ODK system comprises a database and a number of users, who engage with the database through the ODK Collect App. This app (available on Android and iOS) allows the user to fill out and send forms back to a central database. The research team then analyses this data to make business decisions and report back to investors.

In order for the ODK Collect App to integrate with the LoRaWAN communication network, I modified the source code of the ODK Collect App to create my own version. This version could detect if an external LoRa Antenna was connected through the charging port of the mobile device and if there was no mobile data or wifi connection. The form information could then be parsed into a transmissible format and sent through the LoRa network. Additionally, I designed and 3D printed a rugged case that would keep the LoRa antenna safe in the harsh conditions of rural Zimbabwe.

App development was something I had never done before, so I had to take a course on Udemy during the evenings to learn the necessary programming languages and background knowledge. This is knowledge that hopefully will come in very useful during my career.

Technician Training:

Zimbabwe's rainy season begins in October and the team were keen to introduce a waterproof cover on the Hamba so that the driver and passengers could remain dry. This required the technicians to design and specify the components they would need to complete this task.

In order to speed up the design process, I trained the Mobility for Africa technicians in the use of Computer-Aided-Design software. Specifically, we worked through examples in both Fusion 360 and AutoCAD, both computer modelling tools, so they could prototype designs for a cover to fit over the Hamb. After multiple iterations, the design was then passed on to a local workshop who constructed the cover to our specification. This cover will be fitted to all

the Hambas as Zimbabwe enters the rainy season, allowing rural women to continue transporting goods and people - and earning a living during this difficult time of year.

Community Engagement:

Throughout my six weeks, I travelled out to the various Mobility for Africa sites. These sites are located all across Zimbabwe and represent the vastly different terrains, climates and communities that Mobility for Africa operates in. The Chipinge site, just two kilometres from the Mozambique border, represents some of the harshest terrain, climate conditions and communication barriers that Mobility for Africa faces. This is in contrast to the Domboshawa site, located just one hour from Harare, the capital, that displays how the Hambas are used in more densely populated areas with semi-paved roads and at least a semblance of communication infrastructure.

During my visit to each of these sites, I engaged with local community leaders to discuss improvements that could be made to the Hamba and to the data collection system. I acted upon some of this information myself, designing modifications to the steering and braking systems. Anything I did not have time to implement during my six weeks was documented in detail for the rest of the engineering team to follow for when they have the opportunity to implement it.

Conclusion

In conclusion, I was very lucky that I was able to align my LiA experience so closely with my technical skills. I believe this is what allowed me to have such a large impact in such a short space of time. The technical and leadership skills I developed on my LiA will stay with me long after I graduate the Laidlaw programme.

Reflective Report

My journey as a Laidlaw Scholar has been nothing short of transformative. This program, designed to nurture young leaders, has been a profound learning experience, shaping my perspective on leadership and honing my own leadership skills. In this reflective essay, I will explore how my view of leadership has evolved and how I have grown as a leader throughout this program as well as reflecting on some key moments.

When I first embarked on this journey, my understanding of leadership was relatively conventional. I associated leadership with authority and charisma - A tool for bringing a team together to complete a task. However, the Laidlaw Scholarship challenged these preconceptions. It encouraged me to see leadership as a multifaceted concept that extended far beyond a title or position. Leadership, I soon realised, was nothing to do with authority, but much more about collaboration, communication, resilience and a commitment to positive change.

Initially, the heart of the Laidlaw Scholarship lies in research and mentorship. My research project forced me to dig deep into a topic I was passionate about. It involved countless hours of data analysis, literature review, and experimentation. Through this process, I developed the ability to think critically and problem-solve, which are essential leadership skills. My academic mentor played a pivotal role in guiding me through this journey. Their insights and support not only enriched my research but also imparted invaluable life lessons about perseverance, resilience, and the importance of collaboration. Asking for help is something I always found challenging, but my research project showed me that, when solving challenging problems, a team will always outmatch an individual, no matter how intelligent or hard working they may be.

The LEAD training sessions provided through the Laidlaw program were a revelation. I learned that leadership is not only about guiding others but also about self-awareness and personal growth. Emotional intelligence, effective communication, and adaptability were emphasised as critical attributes of a successful leader. Through various workshops and seminars, I discovered the power of empathy and the art of motivating and empowering others.

Two key moments stood out for me during the LEAD sessions. Firstly, the speaking workshop with the Lir Academy. When talking about soft skills such as communication and charisma I think it can be quite challenging to provide actionable directions, however leaving the workshop I felt as if my public speaking ability had increased tenfold compared with just a few hours earlier. The workshop shed a new light on vocal communication and completely changed my opinion on public speaking - I would be far more comfortable to get up and present now than I was at the start of the program.

Secondly, I really enjoyed the Laidlaw Residential. The team building activities allowed us to implement the leadership skills that we had learned throughout the first part of the program and also allowed us to get to know our fellow scholars better. Learning about communication, empathy and collaboration in a classroom setting is one thing, but being able to put it into practice was invaluable.

During my Leadership-in-Action experience, I came across various leadership styles, some of which I enjoyed and will attempt to add to a repertoire, some of which I found challenging and difficult to interact with. I was very fortunate that since my technical knowledge lined up very well with the requirements of my LiA host, It gave me the opportunity to use some of my leadership skills to achieve some of the goals outlined in the first section. My Leadership-in-Action experience was an eye-opening experience, not just allowing me to develop my leadership skills but also to see the inequalities and problems that exist in the world today.

One of the most significant shifts in my view of leadership was the recognition that leadership is not an end in itself; it's a means to create a positive impact. The Laidlaw Scholarship has instilled in me a sense of responsibility to share the knowledge and skills I

have acquired. I now understand that true leadership is about giving back to one's community and working towards a more equitable and just world.

In conclusion, my journey as a Laidlaw Scholar has profoundly transformed my understanding of leadership. It has taught me that leadership is not confined to titles or positions but is a continuous journey of personal growth, self-awareness, and making a positive impact. I have emerged from this program with a broader perspective on leadership, a stronger set of skills, and a renewed commitment to effecting change. The Laidlaw Scholarship has not only been a program but a life-changing experience that has prepared me to be a more effective, empathetic, and responsible leader in the world.

My experience as a Laidlaw Scholar has been a journey of self-discovery, growth, and a deepening commitment to the principles of leadership that extend far beyond what I initially imagined. It is a journey I will carry with me throughout my life, using the knowledge and skills gained to make a meaningful difference in the world.