

Pedaling with Solar Power

GLOBAL IMPACT ARTICLE SERIES

Last summer, Tim Yuan found himself alone in Ghana, and often unable to communicate with those around him. Although English is the official language of Ghana, in villages and some interior cities like Kumasi, Ghanaian Twi dialects are commonly spoken. Yuan, a student at the University of Michigan Ross School of Business, had been tasked with discovering whether Ghanaians in the cities of Accra and Kumasi would be interested in a solar-powered bike cart. The verdict? They are interested, but prototype improvements to the bike cart are necessary, and there are additional markets to explore. Yuan and his Dow Distinguished Awards team will use the \$30,000 they received from the Distinguished Awards competition toward these next steps.

Yuan's trip to Ghana centered on market research for the Solar-Powered Mini Electric Vehicle (EV) Project. The project originated as a collaboration between a start-up driven by MIT adjunct professor Dr. Christopher Borroni Bird (Afreecar), and the University of Michigan School of Engineering. The overall goal is to a) create a solar electric bike trailer to be used for transportation and as a charging station, and b) demonstrate that such a vehicle can improve quality of life for urban and rural populations in developing countries and impoverished communities.

Yuan started working on the project as part of an internship through the William Davidson Institute. It is a great learning experience, he says, because he is planning to transition into start-ups from a previous career and wanted work experience in Africa. Because the company was small, though, his internship lacked structure and support; it has been very self-driven, independent work.

"I learned a lot about how to get something done (e.g., on-the-ground work in a challenging environment)," Yuan says. For his interviews with potential Ghanaian customers, Yuan went into local markets and simply started talking to people on the streets. In comparison, he says, when

working with a large company you might learn more technical skills and company culture. This is something to keep in mind for students looking at companies for internships or as project partners: small and large companies provide very different experiences.

The rest of the project team came on as part of a Dow Distinguished Award in 2017, which included a \$5,000 seed-grant to catalyze the effort. The team used the initial funding to create a prototype of the bike trailer, collaborating with Pratt & Miller Engineering, and conducting preliminary testing. The funding also supported Yuan's



market research in Kumasi. Yuan worked with Kwame Nkrumah University of Science and Technology (KNUST), and with two university affiliates, Dr. Emmanuel Ramde, at the KNUST Energy Center, and Mr. Isaac Duodu at the Center for Business Development.

Through his research in Ghana, Yuan found that Ghanaians were interested in the vehicle and that the price of the solar bike cars was competitive. However, he also discovered that the original plan to market the cart to rural populations was infeasible, because a lack of capital in rural regions makes it difficult to launch a product. This is compounded by the varying dialects spoken amongst rural Ghanaian villages, meaning marketing and sales strategies would need to be unique for each community. Yuan also noticed that product trends in Ghana typically start in cities and then spread to rural areas. Both of these factors mean the project is pivoting to focus more on urban areas going forward. The team will also be exploring other marketing strategies.

The team will use the majority of the additional funding to test and modify the prototype to determine the functionality under different weather conditions, driving range, efficiency tests, and more. The team is also planning to create a smartphone app to connect the vehicle to networks, measure vehicle range and record trip logs (e.g., for business purposes). Based on Yuan's research, the team will also be designing the second generation prototype with urban usage in mind. They hope to find additional sources of funding to perform pilot studies in Accra, Ghana, and continue collaborating with their Ghanaian partners. Ultimately, the team expects to pave the way for sustainable transportation options in Ghana and provide great benefit for its people.

COLLABORATORS

- Duanxiang Zhang (COE, alumni)
- Jiahong Min (COE, alumni)
- Gary Latham (Pratt & Miller Engineering)
- Steve Hechtman (Pratt & Miller Engineering)
- Christopher Borroni-Bird (Qualcomm, retired)
- Dr. Emmanuel Ramde, Energy Center, Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana
- Mr. Isaac Duodu, Center for Business Development, KNUST, Kumasi, Ghana



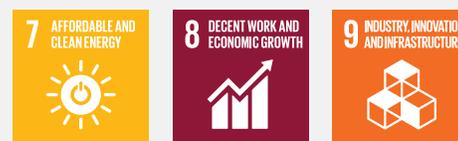
PROJECT TEAM

- Sydney Forrester, School for Environment and Sustainability
- Yide Gu, College of Engineering (COE)
- Usmaan Jafer, Research Assistant for Solar-Powered Electric Bicycle Trailer
- Tim Yuan, School of Business
- Ziyang Zhong, COE

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