

KICK-STARTING A CARGO BIKE INDUSTRY IN LAGOS

An exploration into possible cargo-bike prototypes for more sustainable logistic transportation within Lagos City



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01 INTRODUCTION

Traffic congestion on roads and high levels of emission are the characteristics of city centres and industrialised cities globally. The aforementioned attributes are visible in Lagos, and negatively impacting not just the environment but the health of Lagosians and the economy of the state.

Freight transportation involving trucks and pick-ups are the distribution channels through which large products get to major distributors located in Lagos. On the other hand, movement of small to medium sized goods and services within Lagos are usually executed by commercial vehicles, tri-cycle (popularly known as Keke-Marawa), motorcycles (popularly known as Okada). Not only do these freight transportation modes contribute over-proportionately to air pollution, noise pollution and traffic congestion, they also occupy a sizable portion of the unavailable space in Lagos metropolis.

Last mile delivery of goods to retailers and consumers in market areas is usually done by cart pushers using a customized design pushing cart. Although, this method of goods delivery is meeting a need, especially in the distribution of water, the technological design is rather crude and inefficient as it requires a lot of energy to push the cart, calling for a better solution. Cargo bikes offer a promising possibility to overcome that

challenge for last mile delivery. They can replace cars and other light goods vehicles thus reducing traffic congestions caused when they discharge, especially on smaller inner road. Cargo bikes have the capacity for large enough volumes especially for deliveries to areas that are inaccessible to other land-based transportation modes. In addition, cargo bikes are a zero-emission alternative to light goods vehicles in city centers on one hand, on the other they are an economical alternative to push-carts enabling owners to move faster and to do more rounds.

With the advent of COVID-19 cities restricted movement and access, cycling and walking became paramount and necessary for populations, even in Lagos. Even after lockdowns were eased and people have started to go back to the 'new normal', there has been a visible increase in cycling in Lagos. It also raised more interest from Lagos State Government in walking and cycling initiatives.

With cycling seen to be the future of transportation due to its last mile offer, coast efficiency, climate resilience and health benefits, it is expedient to assess the feasibility of cargo bicycles and the potential for expansion for utilization in other sectors.



**CARGO BIKES
OFFER A PROMISING
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CHALLENGE FOR
LAST MILE DELIVERY.**



02 RELEVANT CUSTOMER GROUPS

The use of cargo bikes is not new in Lagos. You can find examples all over Lagos of different cargo bikes designed for different purposes.

Its earlier use in the mid 1900's was by local businesses such as palm wine tapper and thrift collectors, who converted their bicycles to cargo bikes. In the late 1990's and early 2000's large food and beverage companies deployed locally designed cargo bikes as a solution to selling on the spot closer to people moving in the city. In recent years, the key drivers for the use of cargo bikes (manual and e-bicycles) have been start-ups in the waste management and recycling sector.

Currently, delivery of light goods to retailers and consumers is done by micro entrepreneurs using tricycles or carts.

The carts come in various types; as standard cart, wheel barrow or as an abridged version often locally fabricated varying in size, designs and shapes. They are built to the needs, adaptability of the business and with various metal materials. It often comprises a cylindrical, rectangular or square box, placed on two wheels and controlled by a metal hand bar which acts as a lever.

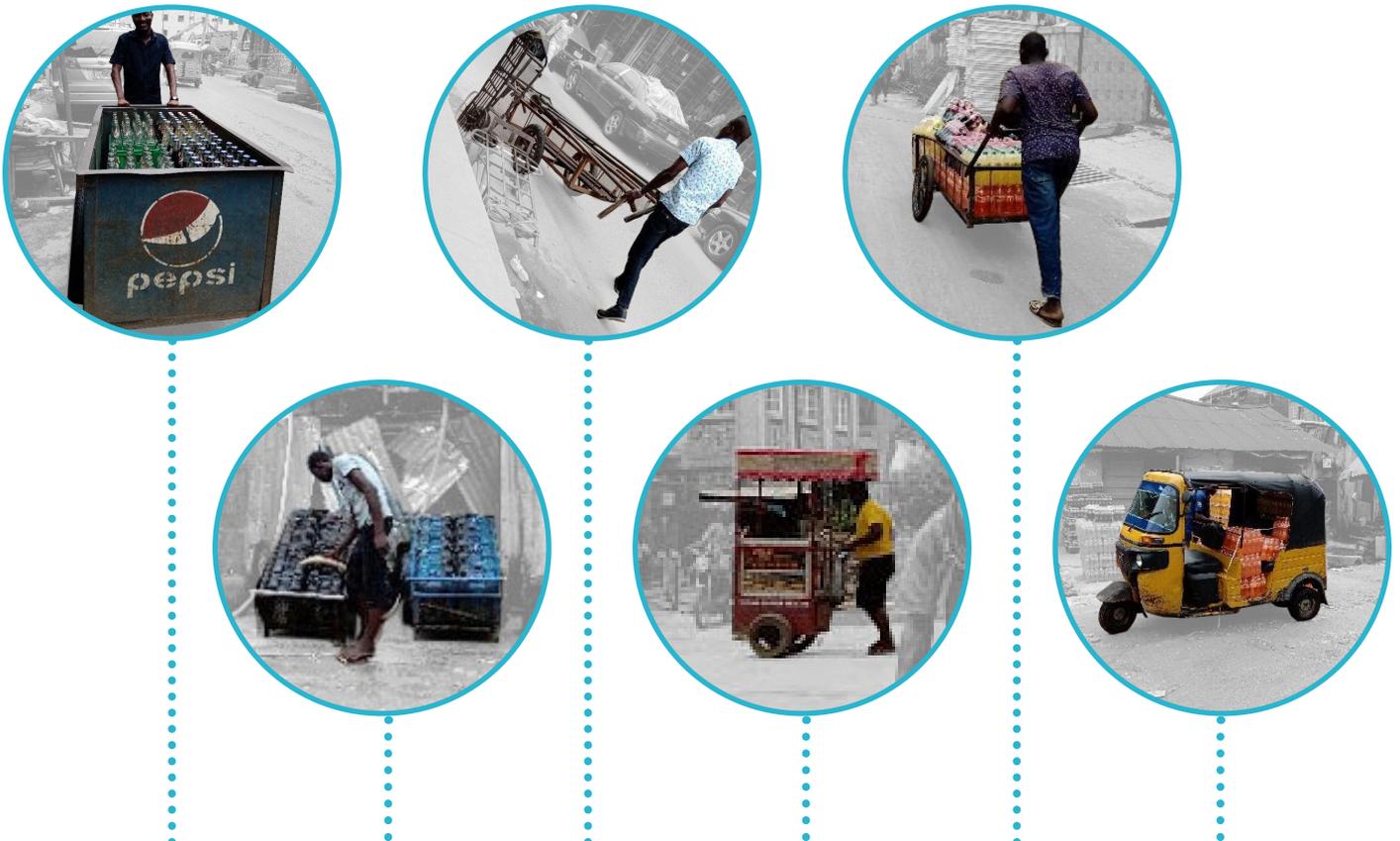


Figure 1:
Cargo types and its application within Campos Square

Table 1 gives a detailed tabular comparison of various types of manual cargo transport used on Lagos Island. The rectangular carts are designed to be sturdy for heavy goods. The carts with just a frame are lighter than those that have fully enclosed bodies. Their weight limits the distance that can be covered as the carts are pushed manually.

The open body cart type is ubiquitous, versatile and multifunctional as it is used in the delivery of so many types of goods including rental chairs, canopy stands and ready to eat meals. When used for water, it contains ten to twelve kegs of 25liters of water. The closed body rectangular cart is customized for beverage distribution on Campos Square but it is also often used by informal waste managers in other communities.

Carts used in the delivery of pastries are square shaped while those for hot beverages are cylindrical. However, the two models are similar by having storage compartment, a hood for shade and sector specific and smaller maximum load capacity. Water merchants or peddlers using carts have a defined target market for service delivery redistributing household water from community boreholes.

The major drawback in goods delivery using manually driven carts is the inability to cover long distances. Also, should the terrain be hilly with an inclination angle of up to 30o, going up the slope becomes impossible as the climbing ability of most carts is between 50 - 150 giving rise to the needs of alternatives.



PARAMETERS	PUSH CART	PUSH CART	PUSH CART	WHEELBARROW	RECYCLE POINT	WECYCLERS
Cargo box dimension	150 x 57 x 35cm	160 x 60 x 45cm	150 x 57 x 35cm	133 x 73cm	120x90x120cm	150x90x150cm
Maximum push distance (km/hr)	0.5 – 2 km/hr	0.5 – 2 km/hr	0.5 – 2 km/hr	1 – 2.5 km/hr	20km/hr	12kmlhr
Maximum load	250-300kg	350kg	250kg	150kg	250kg	150kg
Body type	Open	Closed	Open	Open	Closed	Open
Power	Hand push	Hand push	Hand push	Hand push	Pedal + electric assist	Pedal
Climbing ability	200	200	200	250	200	50 - 80
Body Frame	Steel body	Steel body	Steel body	Steel body	Aluminium frame	Steel frame
Source	Locally made	Locally made	Locally made	Locally made	Imported	Locally made
Design type	Front loader	Front loader	Front loader	Front loader	Back loader	Back loader

Table 1: Comparison of the different last mile delivery mode observed in Campos Square

03 SUITABLE DESIGN & COST

Potential customers raised the following imperatives for a convenient design which would encourage their use of a cargo bike:





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POST AND BILL

PUSH CONCEPT

A wheelbarrow is a small hand-propelled vehicle, usually with just one wheel, designed to be pushed and guided by a single person using two handles at the rear.

The wheelbarrow is designed to distribute the weight of its load between the wheel and the operator, enabling the convenient carriage of heavy and bulky loads. The use of wheelbarrows is common in the construction industry and in gardening.

The typical capacity is approximately 100 liters of material.

A two-wheel type is more stable on level ground, while the almost universal one-wheel type has better maneuverability in small spaces, on planks, in water, or when the uneven ground would throw the load off balance. The use of one wheel also permits greater control of the deposition of the load upon emptying.

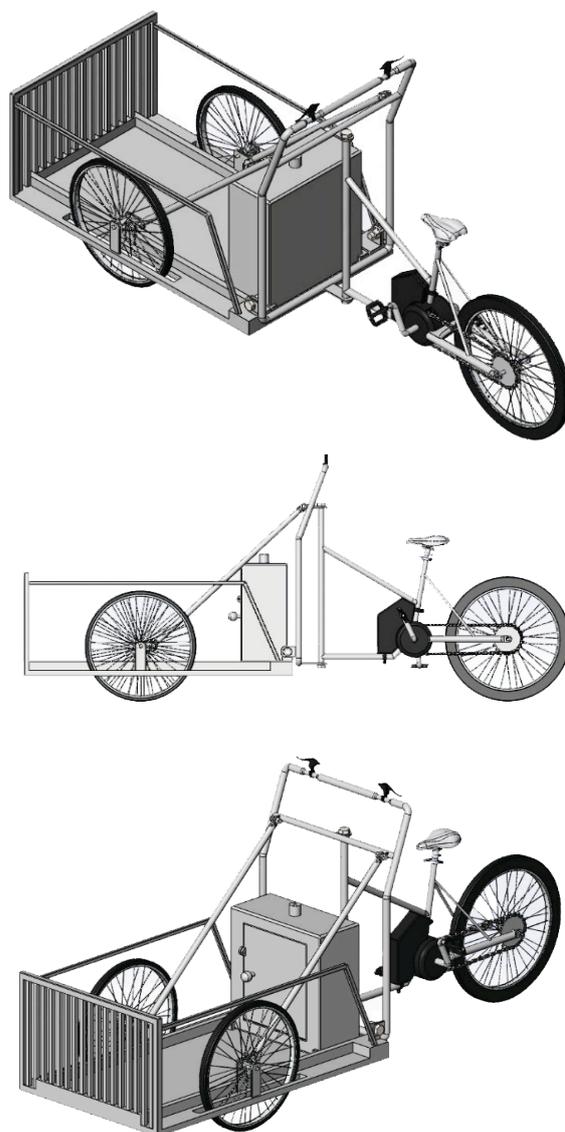


Figure 2:
Push Concept Electric Cargo Bike

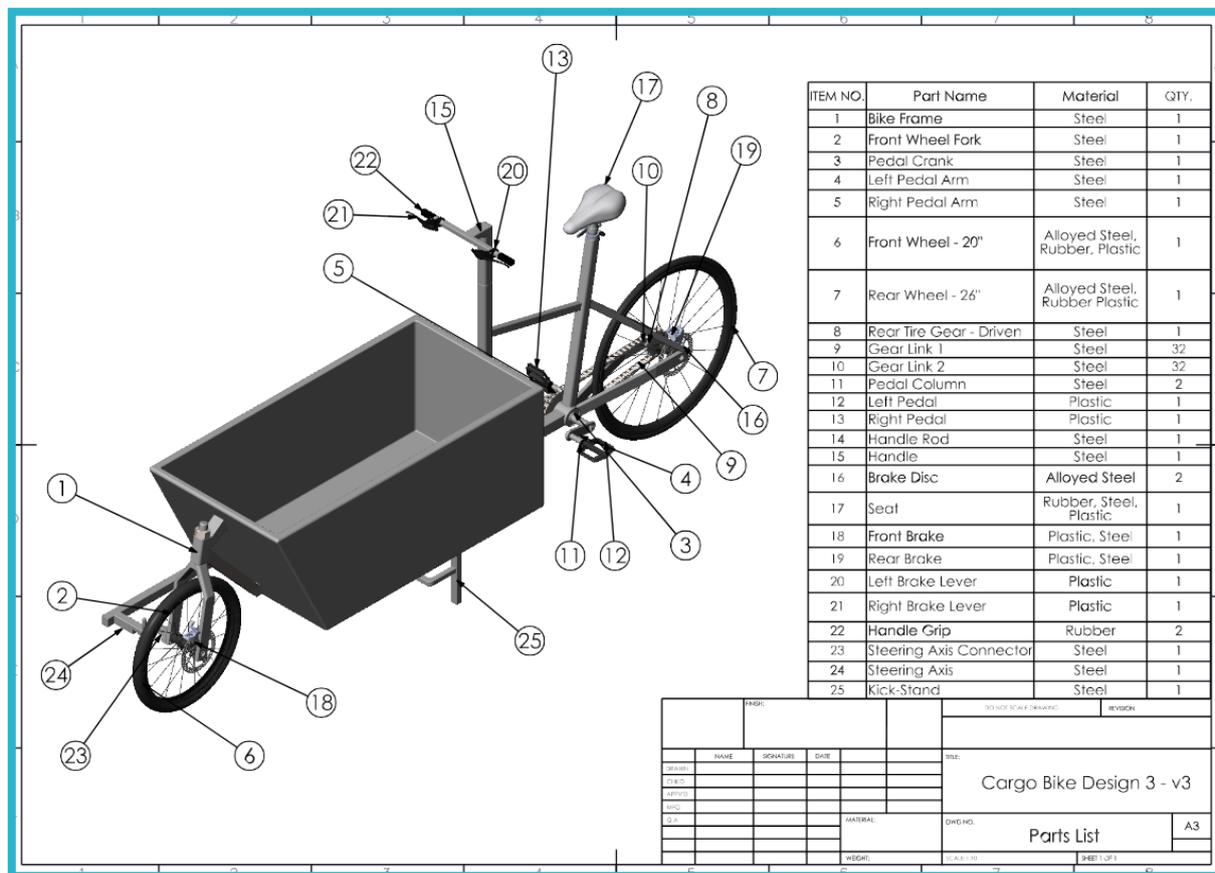
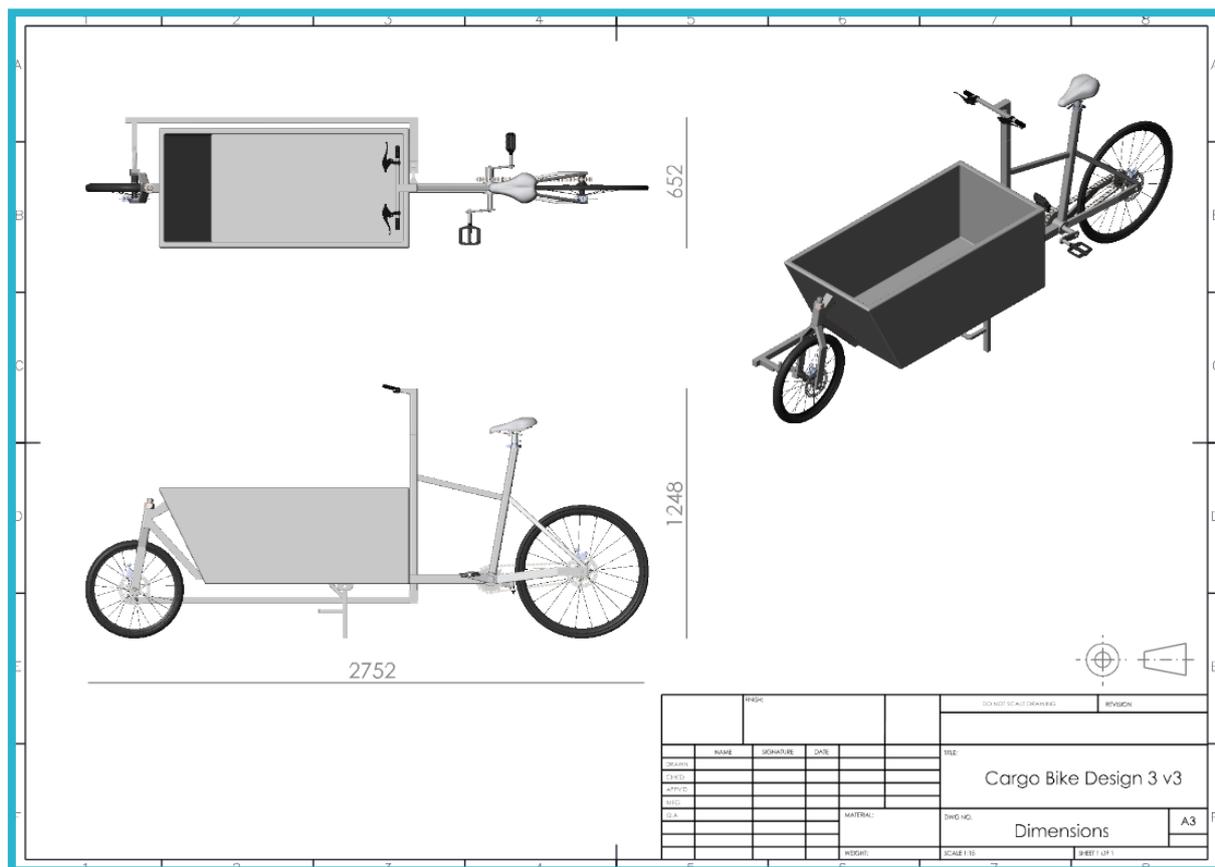


Figure 3: Push Concept Manual Cargo Bike

PULL CONCEPT

A rickshaw is a mode of human-powered transport by which a person draws a two-wheeled cart that is used to carry water or garbage.

Rickshaws have become an inexpensive, popular mode of cargo hauling all over the world since they are a convenient means of travel, able to traverse winding and narrow city streets.

They could be the most affordable and cleanest means of transporting goods across long-distance, through flooded and potholed streets of Lagos.

They have a cargo area consisting of an open or enclosed box, a flat platform, usually mounted over two large parallel wheels. The frame and drive train must be designed in a way that they aid an adult to pull the load.

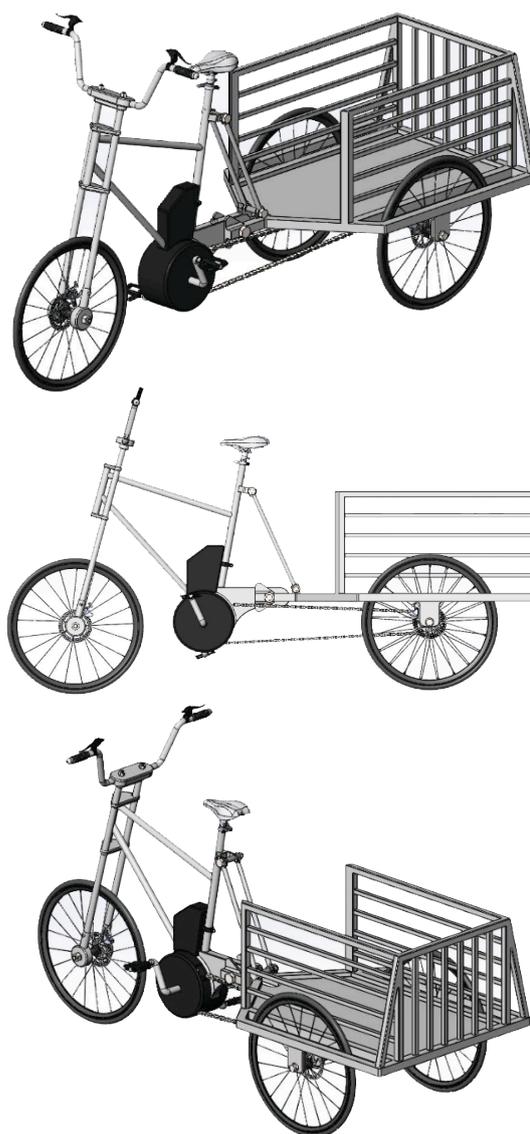


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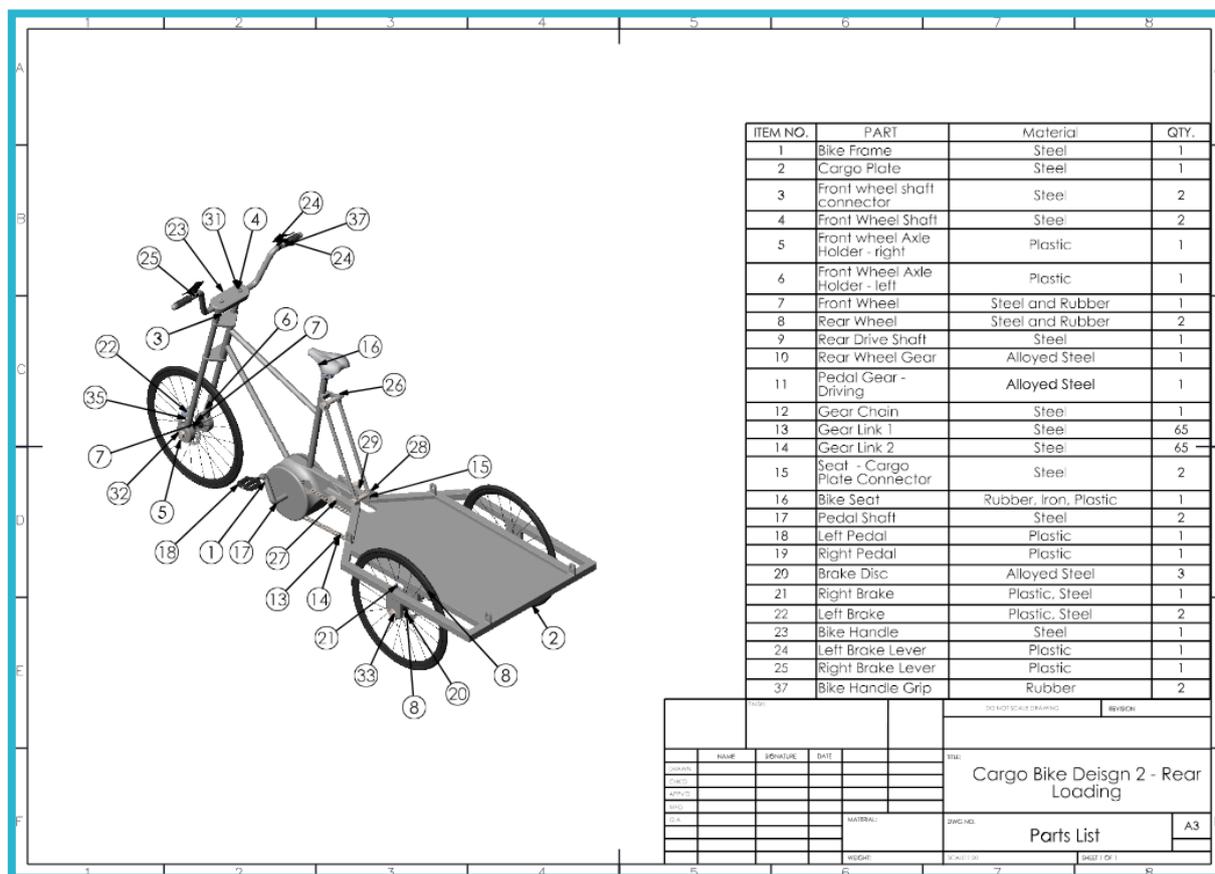
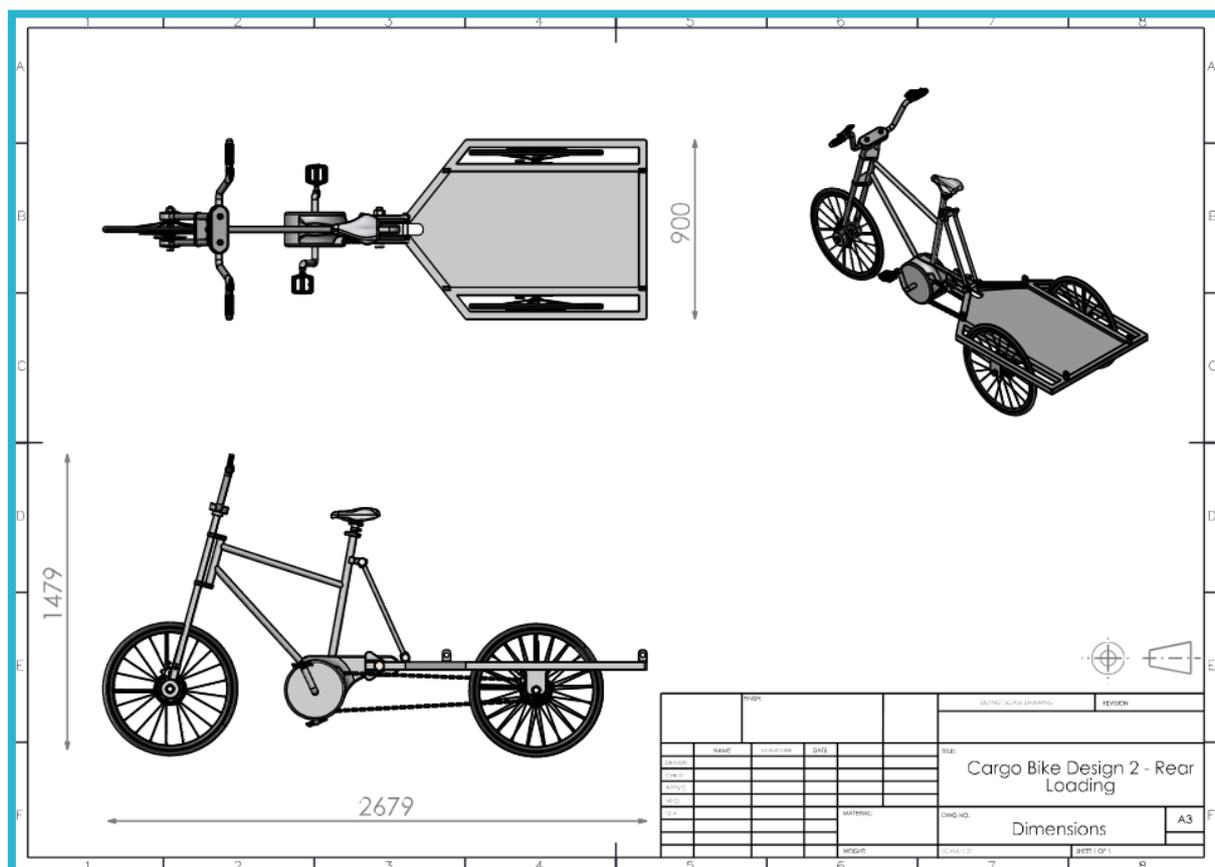


Figure 6: Pull Concept Manual Cargo Bike

ASSESSMENT OF DESIGNS

TONNAGE

The relatively small weight carrying capacity of the bikes is limiting its use to only carrying lightweight materials e.g. collection of plastics by waste pickers, delivery services, food vending, medical wastes, etc.

STABILITY

To increase the stability of the two-wheeler type design the front wheel should be braced or reinforced to make it more stable.

Ease of navigation/maneuverability: this is one of the benefits of the cargo bike over a motorised mode of conveying goods. Hence the need to enhance this feature; the easier it is to maneuver, the better.

PEDALING SUPPORT

This is tied to the tonnage because the heavier the load being carried the more difficult or physically demanding it is to pedal the bike. An electric pedaling device can assist in the process but it might come at the expense of maneuverability.

CONSTRUCTION MATERIALS

Using a lightweight material (steel or aluminum) especially for the construction of the carriage could also help reduce the overall weight of the cargo bike. The strength, durability and cost implications of this should be major considerations.

INNOVATIVE FINANCING

Putting in place an innovative financing system that may be built on the platform of existing trade associations could help interested/ potential users in acquiring the technology.

SIZE OF BIN/ CARRIAGE

For bulky loads, a covered up bin type was suggested made of lightweight, rigid or even, more preferable, expandable material.



FINAL DESIGN

THE PUSH CARGO BIKE IS RATED TO CARRY A TOTAL OF 190KG INCLUDING THE RIDER.

After modeling the bike, it should cope with the load without real trouble. It will not be difficult to ride, and will be quite easy to steer and control once accustomed to the handling characteristics of such a heavy bike. Carrying a maximum load is possible, but not recommended.



Figure 6:
Final Design

04 FUNDING POSSIBILITIES

To start a cargo bikes manufacturing business in Lagos will require funding. However, no one has really been able to articulate how this sort of business can be funded so we have looked at three bicycle businesses in Africa as examples to help start thinking about what model could work locally.

Each funding case study has a different champion: AWA Bike is private sector led, Boomers International is also private sector led but with a social arm and the e-cargo bike project in South Africa is a partnership between public and private entities.

AWA Bike is funded by venture capital in Nigeria, Boomers International has created international partnerships from the public and private sectors. The e-cargo bike pilot project in South Africa was supported by the German BMU (Federal Ministry for Environment, Nature Conservation and Nuclear Safety).

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AWA BIKES

AWA Bike is a bike-sharing platform intended to solve mobility issues in Nigeria. The company's platform links members to available bicycles through an application that can also be used to unlock bikes, enter the destination, and pay for the journey, providing riders

with the forefront to sustainable transport solutions.

The founders initially used their own funds to start the company but later received venture capital. Their financial status is described as venture capital backed.



BOOMERS INTERNATIONAL

Boomers International is a subsidiary social enterprise of the Yonso Project, which produces and markets bamboo bicycles and accessories on both the Ghanaian and international markets.

and blinds to serve the growing hospitality industry in Ghana and beyond.

The company manufactures different types of bamboo bicycles and accessories such as bicycle stands and baskets. The aim is to help improve transportation and youth employment, mitigate climate change issues as well as alleviate poverty, especially in rural communities.

The company was founded in 2014 and the founder took part in the Tony Elumelu Entrepreneurship Programme in 2015 and won the award (including seed funding). The total sales in that year (their first year of full operation) was 400 bicycle frames. In 2016, sales tripled to over 1200 bicycle frames and has continued to grow. They currently make about 120 bicycles a month. They also partner with My Boo, a German company, which buys frames from them and then build the rest of the bike in Germany. They also have partnerships with international development organisations like UNICEF.

Their ultimate goal is to provide the poor in rural Ghana the means to gain economic freedom. In the near future, they plan to use other parts of the bamboo value chain to create additional products such as toothpicks, flooring



E-CARGO BIKE, SHARPEVILLE, S.A.

In 2018 a pilot project was conducted in Sharpeville, South Africa. The project was done in collaboration with Innovation Hub, Council for Scientific and Industrial Research, the German Government and the Sharpeville Kasi Development Project.

Their first micro factory as part of the pilot was set up in 2018 in Sharpeville, Gauteng, South Africa.

The bikes are designed by the German company "Anywhere.berlin". They supply kits and know how to locally owned and managed micro factories for bikes and upcoming vehicles. They franchise these low entry point enterprises. The transport products are made locally, made for local use and the micro factories are locally owned. Maintenance and customization can be performed by the knowledgeable micro factory staff.

Their e-bike has a platform able to carry roughly 160 kg between the two wheels. The bike is powered by a lithium-ion battery to enable the cyclist to carry the load. The maximum speed is 25 km/h. The bike price tag was roughly 1000 Euros but the price could be reduced by replacing the lithium-ion battery with a lead-acid battery.

Currently, there are no policies or laws in Lagos State governing cargo bikes. To ensure that cargo bike companies do not receive the same fate as motorbike hailing companies, there must be implementable policies that can guide a new startup.



05 RECOMMENDATIONS

Identify potential private sector partners who are interested in manufacturing cargo bikes in Lagos State. Link these groups to potential partners locally and internationally.

Continue engagement with all stakeholders (consumers and makers) on the potentials of the industry in Lagos State.

Reach out to Ministry of Transport & LAMATA to ensure there are adequate laws and policies in place for the cargo bike industry to flourish in Lagos.

