Promoting Sustainable Transport through Improving Nonmotorized Transport
TA - 8168-REG

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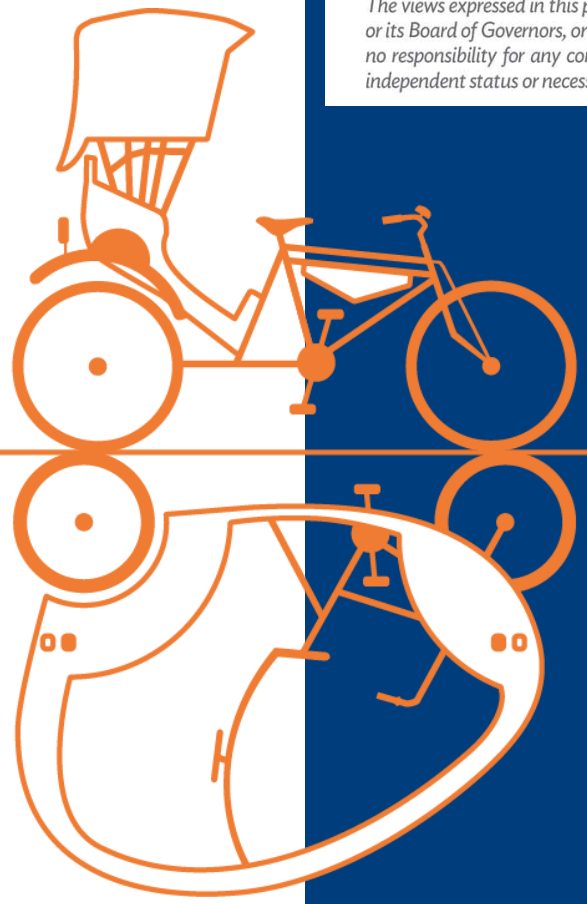

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CATAPULTDESIGN.ORG

Dhaka rickshaw in 1964

Dhaka 50 years later, in 2014

Delta

Tadpole

Sidecar

Current Design limitations:

Safety:

- Braking
- Seat angle
- Bamboo canopy
- Unprotected wheels
- Protruding wheel hubs
- Wooden or plastic pedals
- No lighting

Comfort

- Forward facing seat
- No functional suspension
- Small customer area

Gearing

- Single speed

Weight

- Often times greater than 70kg

Aesthetics

- ‘romantically’ traditional

The rickshaw’s springs serve no actual purpose once braced

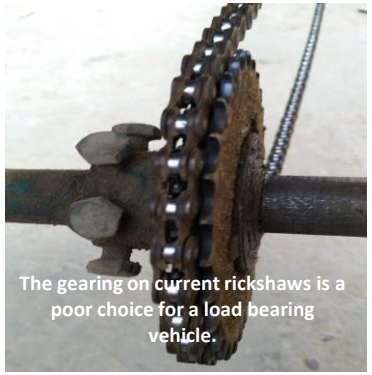
Without adequate brakes, collisions become a hazard

The seat puts passengers centre of gravity forwards, making them less secure

Many Dhaka rickshaws have this footrest adaptation outside the seating area.

Rickshaws need lights

Clothing does occasionally tangle in rickshaw wheels


The gearing on current rickshaws is a poor choice for a load bearing vehicle.

Protruding hub nuts are a hazard to pedestrians and other rickshaws’ spokes.

Wooden pedals: slippery when wet

ADB Pedicab

Pedicab Western Delta Pedicab

City-Bike London	Maxpro	Cycles Maximus	As Yet Unknown Company	Main Street
City Bike London Fenix Pedicab	Maxpro EcoPromo	Cycles Maximus Cabtrike	Unknown	Main Street Classic Pedicab..
City Bike London Ibiza Pedicab	Maxpro Street Flyer	Cycles Maximus Cabtrike (Advertising)	Unknown	Main Street Broadway Pedicab

ADB Pedicab

Pedicab Enclosed Canopy

Lambretta Helicak

Treecycle Tricycle/Pedicab

Treecycle Tricycle/Pedicab

Human Powered Mini

Veloform City Cruiser 2

Veloform City Cruiser 1

TRIBIX Pedicab

Velocabs Pedicabs

Cyclotaxi 2011

Cyclotaxi 2010

Meguru Electric Rickshaw

ADB Pedicab

Pedicab Conceptual

Cobonpue Rickshaw	...	Organic Transits Elf Bike	Meguru Electric Rickshaw	H3T Bike Sauna
...	...	...	...	...
...	...		...	...

ADB Pedicab

Pedicab
Other Influential Vehicles

Lambretta

Lambretta Helicak

...

Human Powered Mini

...

tribix

TRIBIX Pedicab

...

...

Velocab Pedicabs

...

...

Trimobil

Fahrgemeinschaft-3.0

...

...

ADB Pedicab

Pedicab Classic Rickshaws

Nepalese Rickshaw

Classic Indonesian Rickshaw

...

Phillipine Pedicab

Air Mac Chinese Pedicab

...

Classic Indian/ / Bangladesh Rickshaw

ADB Pedicab

Pedicab Prior Art Collection

...	...	Cyclopolitain	Vrachtfiets Transport	Euro Rickshaw
Veloscout	...	Cyclotaxi 2011	...	Standard Cab Seating
Velocruiser	...	Cyclotaxi 2010	...	Troop Style Seating

ADB Pedicab

Pedicab Prior Art Collection

VIP Pedicabs

...

....

Radkutsche

...

Pelkey & Crouch Pedicab Project

Zox Bikes

Zox Rikscha Single

Zox Rikscha Double

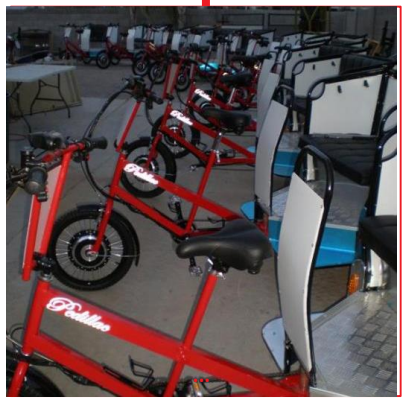
Olaf Lange

Model 'ROM'

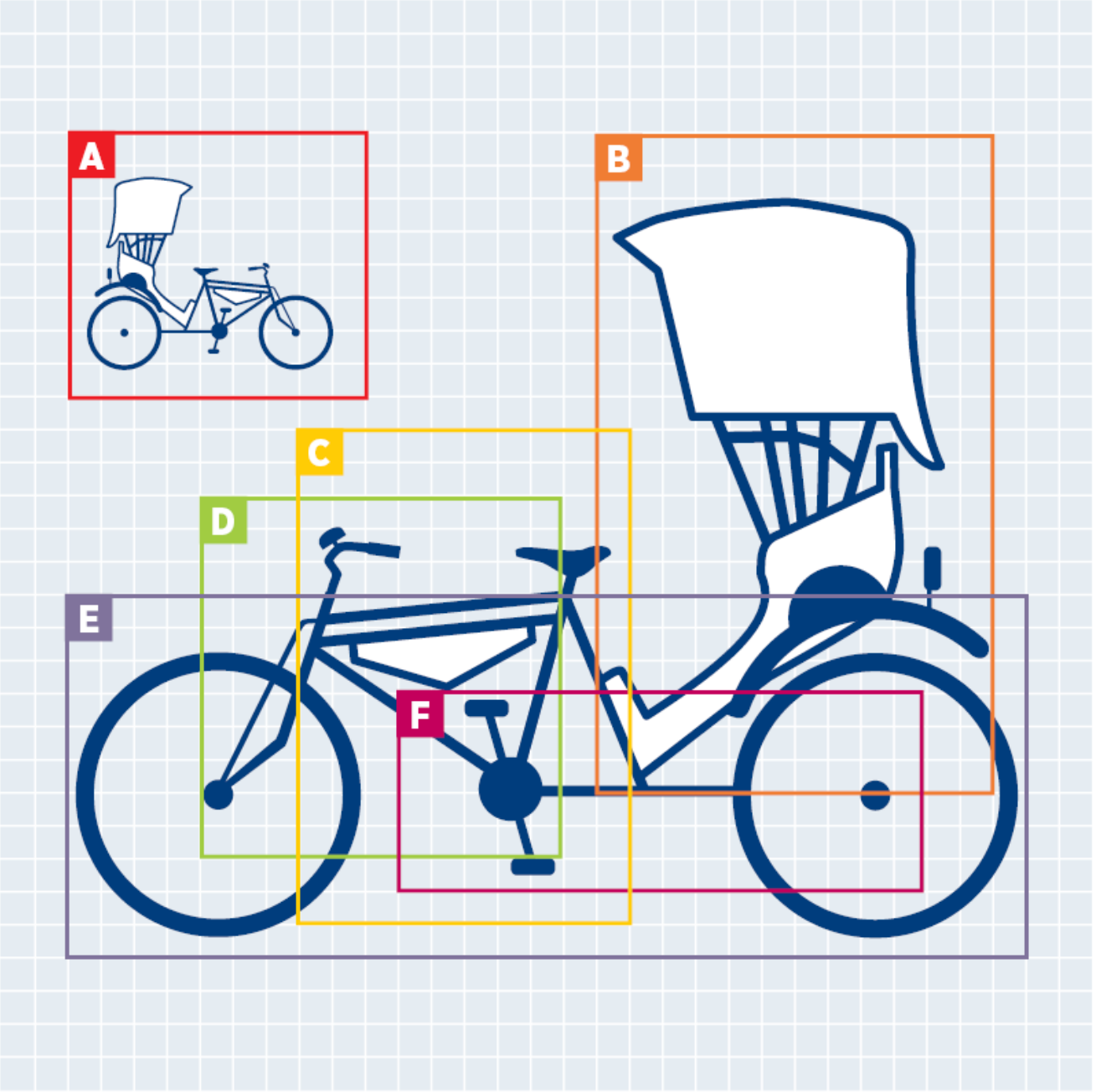
Model Berlin

ADB Pedicab

Pedicab Prior Art Collection

Pedillac.Pedicabs	Work Bike	Pedalhelden	Luther & Luther	Draisin
	Hydrogen Fuel Cell Pedicab	Ricksha- Mobil	...	Draisin Taxi
	Work Bikes Taxi		...	

A. Aesthetics and ICT
B. Customer Zone
C. Control Center
D. Wheels and Frame
E. Drivetrain

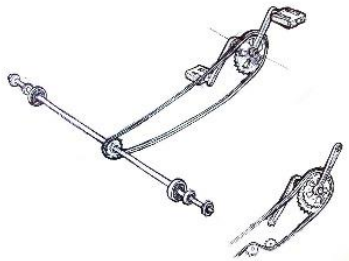


ADB Pedicab

Drive Train Concept Direction Recommendations

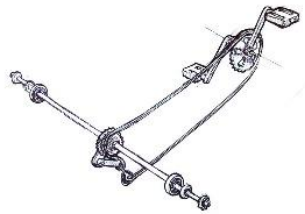
Drive Train
initial prototyping & testing.

Concept Direction #1



By retaining the current simplicity and minimal parts of the single speed drive, this direction allows us to test the impact of improved componentry without added trade-offs that come with gearing. We can also easily test a manual shift second cog on the chainset, along with a simple chain tensioner to achieve the very simplest of gearing options.

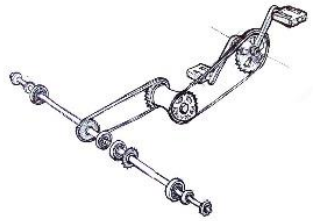
Concept Direction #2



Including this direction in our testing allows us to offer an upgrade step not too far removed from the current set up, with significant performance improvement for a relatively small rise in cost.

If we can explore making each vehicle adaptable to a range of gearing options this could teach us how to instill upgradability into the final design.

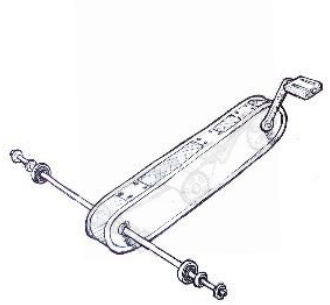
Concept Direction #3



A Jackshaft with internal hub gives us the next gearing upgrade to test. This mid-mounted drive allows modern internal gearing technology to be plugged in to the vehicle while maintaining the backup of the single speed option.

Splitting the axle lets us test plug and play electric assist options that that don't interfere with the manual drive.

Concept Direction #6



A structural casing for the drive could reduce maintenance and wear and enforce a rigidity and maximum power transfer between the Driver and the road. It also offers a solid backbone to build a vehicle around. By testing this direction we can discover the trade offs and bonuses to having a neat modular drive mechanism that hides the messier mechanical elements away.

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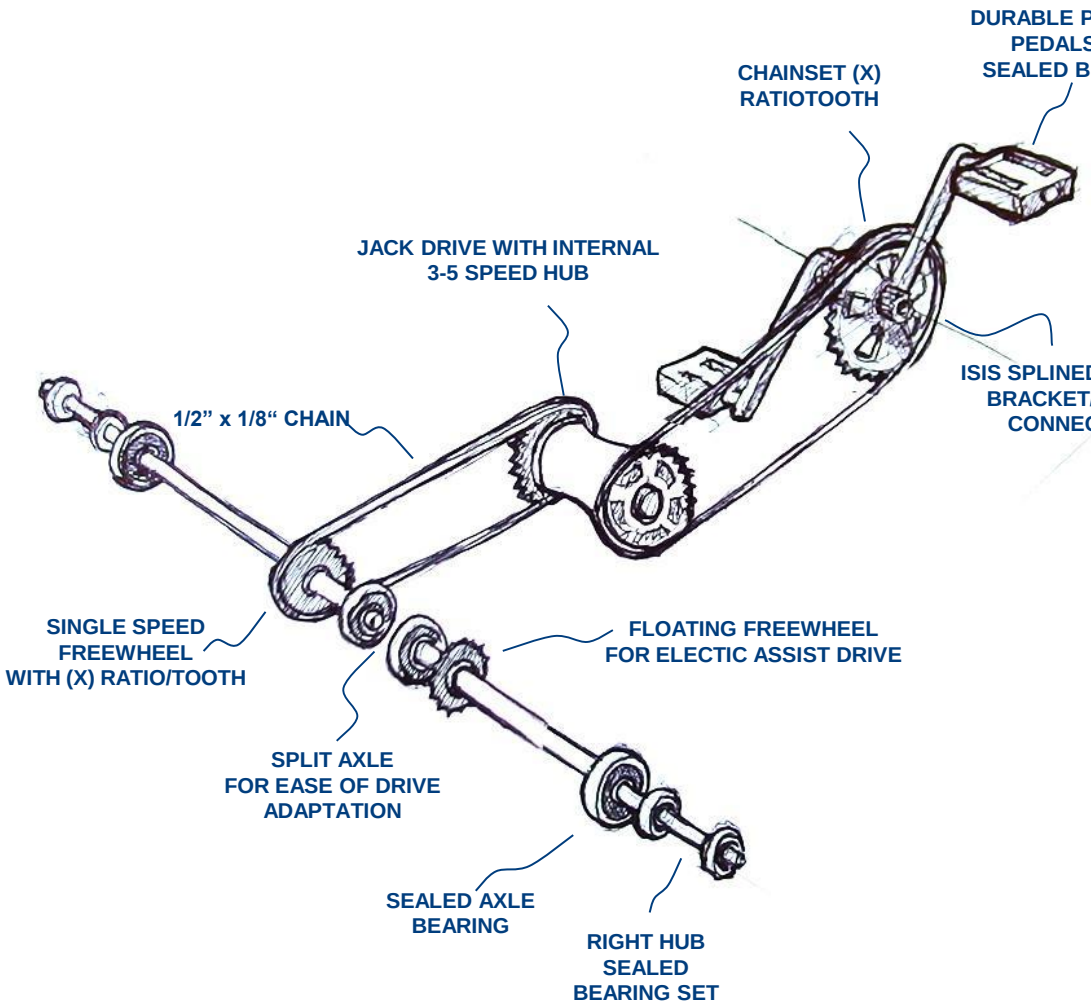
Drive Train Concept Direction #3

DESIGN CUES:

BELINKY JACK SHAFT

BICYCLE DESIGN TRIKE KIT

DELTA TRIKE SPLIT AXLE



Drive Train Concept Direction #3

A Jackshaft with internal 3-5 speed hub allows modern internal gearing technology to be plugged in and out of the vehicle while maintaining the backup of the single speed option. Splitting the axle creates an easy platform for incorporating electric assist options that that don't interfere with the mounting of the manual drive.

PROS

- No sensitive components hanging below chainline
- Upgradable/downgradable
- Simple electric assist plug in
- Improved range of operable terrain
- Plug and play/easily replaced during service time to keep vehicle on the road/operable.

CONS

- Harder to repair hub drive failures.
- Additional axle bearings required
- Increase in cost
- Requires a more rigid frame

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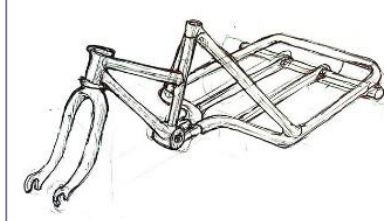
Frame Concept Direction Recommendations

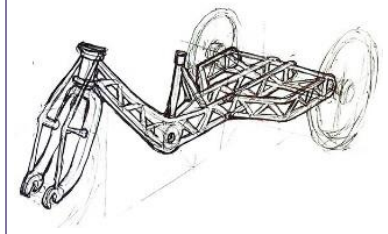
4 concept frame designs carried through initial prototyping & testing.

Concept Direction #1



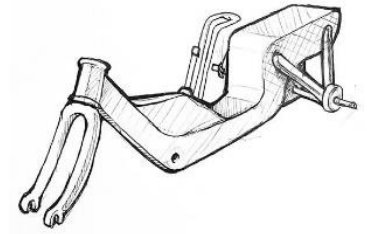
Prototyping this frame will allow us to compare a conservative approach to our other frame prototypes, while continuing to learn more about the current cycle rickshaws and their mechanics/garages. It also provides us with a gentle start to gleaning user response rather than offering up purely radical approaches.

Concept Direction #3



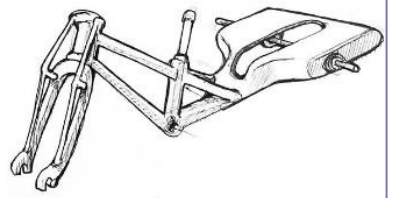
This frame may end up being an exercise in over-engineering, but it could also put Tata out of business. Like the monocoque frame trussed construction has proven itself in the motorbike and scooter industry. This direction also has the strongest sense of modularity.

Concept Direction #5



A monocoque frame could provide just the game changing aesthetic and speedy manufacturing that we need to succeed at scale. It defies the associations that tubular construction carries and gives us a different set of forms to explore alongside the other concept directions.

Concept Direction #6



Aluminum is struggling to get past the sensibilities of steel in the teams mind but gauging stakeholder response and performance against the other frame prototypes will help us determine whether trade off of weight savings and corrosion resistance in exchange for repairability & price is justified.

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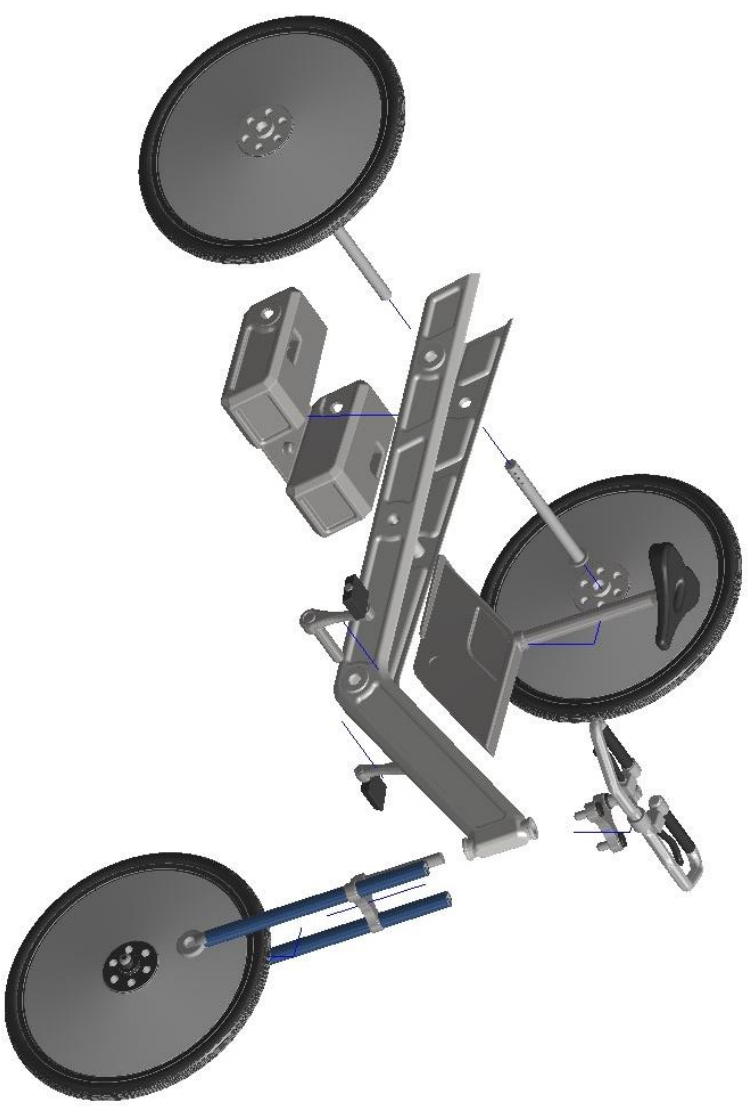
Frame Concept Direction Recommendations



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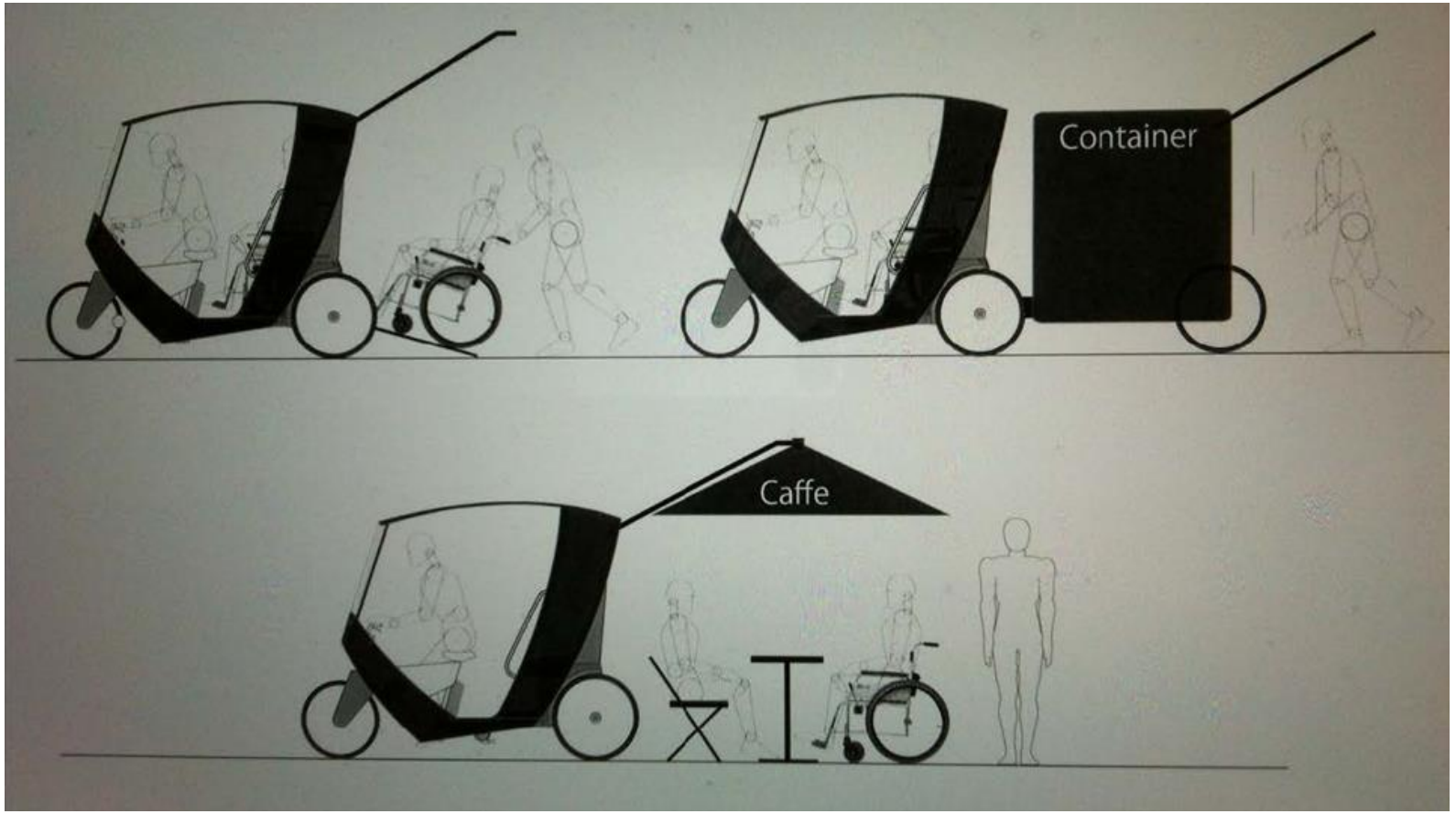
Customer Zone Concept Direction Recommendations

Concept Directions for the Customer Zone

ADB Pedicab

Customer Zone Concept Direction Recommendations

Concept Directions for the Customer Zone



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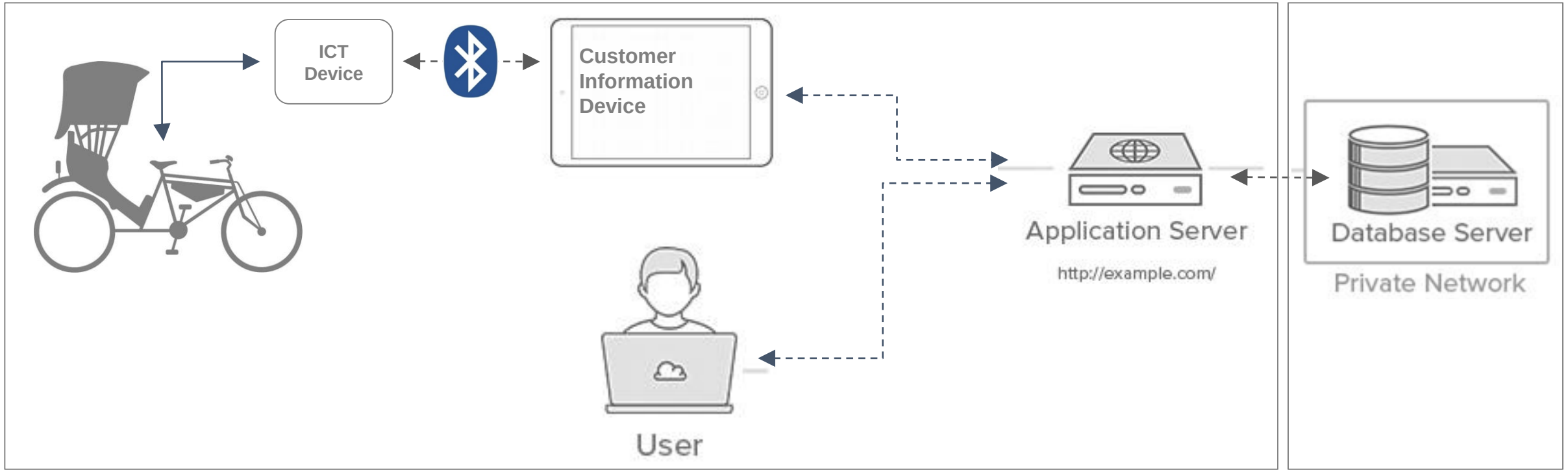
G7. Backend Management

Backend management systems requires computation resources, e.g. CPU, Memory, I/O and etc… Therefore in order to achieve a better performance and scalability at a lower cost but yet still remain ease of management, the backend management architecture for the pedicab fleet management system should be divided into two different layers, an application server and a database server. Separating the database management system (DBMS) from the rest of the environment help to eliminate the resource contention between the application and the database.

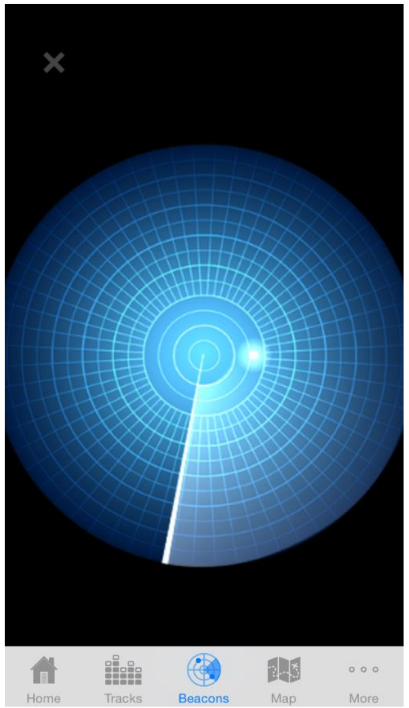
The diagram below shows the overall connectivity of the pedicab system. The user refers to web user and the user who is waiting for the pedicab on the street. Both kind of users can check the status and the availability of the pedicab by accessing into the application server. When a pickup request is made, the application server will check with the database server and assign the closest pedicab available to answer this request.



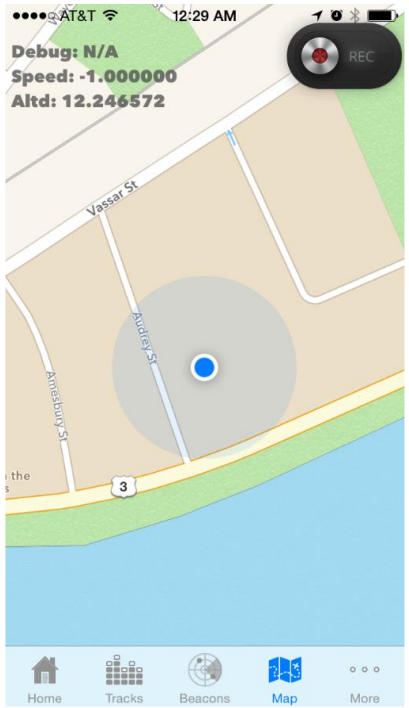
ADB Pedicab
Smartphone Apps

Smartphone Apps

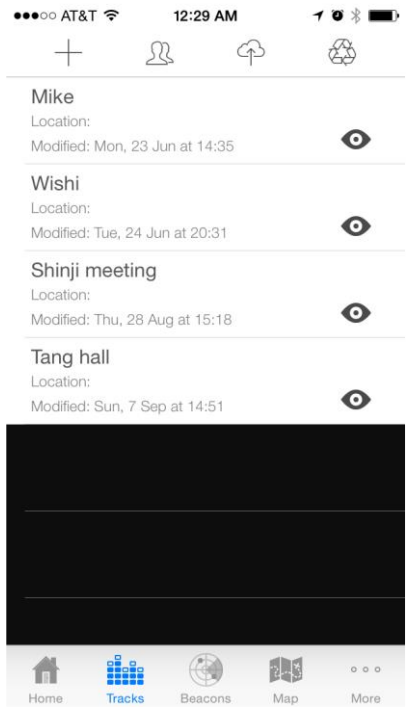
The Pedicab Smartphone app could provide the following core functions: 1. Pickup request. 2. Scanning of the nearby Pedicab. 3. Real time map 4. Real-time route Tracking	5. Payment 6. Driver evaluations 7. Trip tours



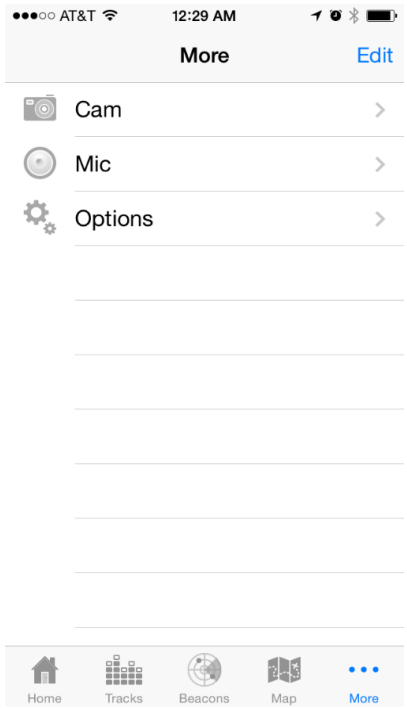
Radar



Real time map

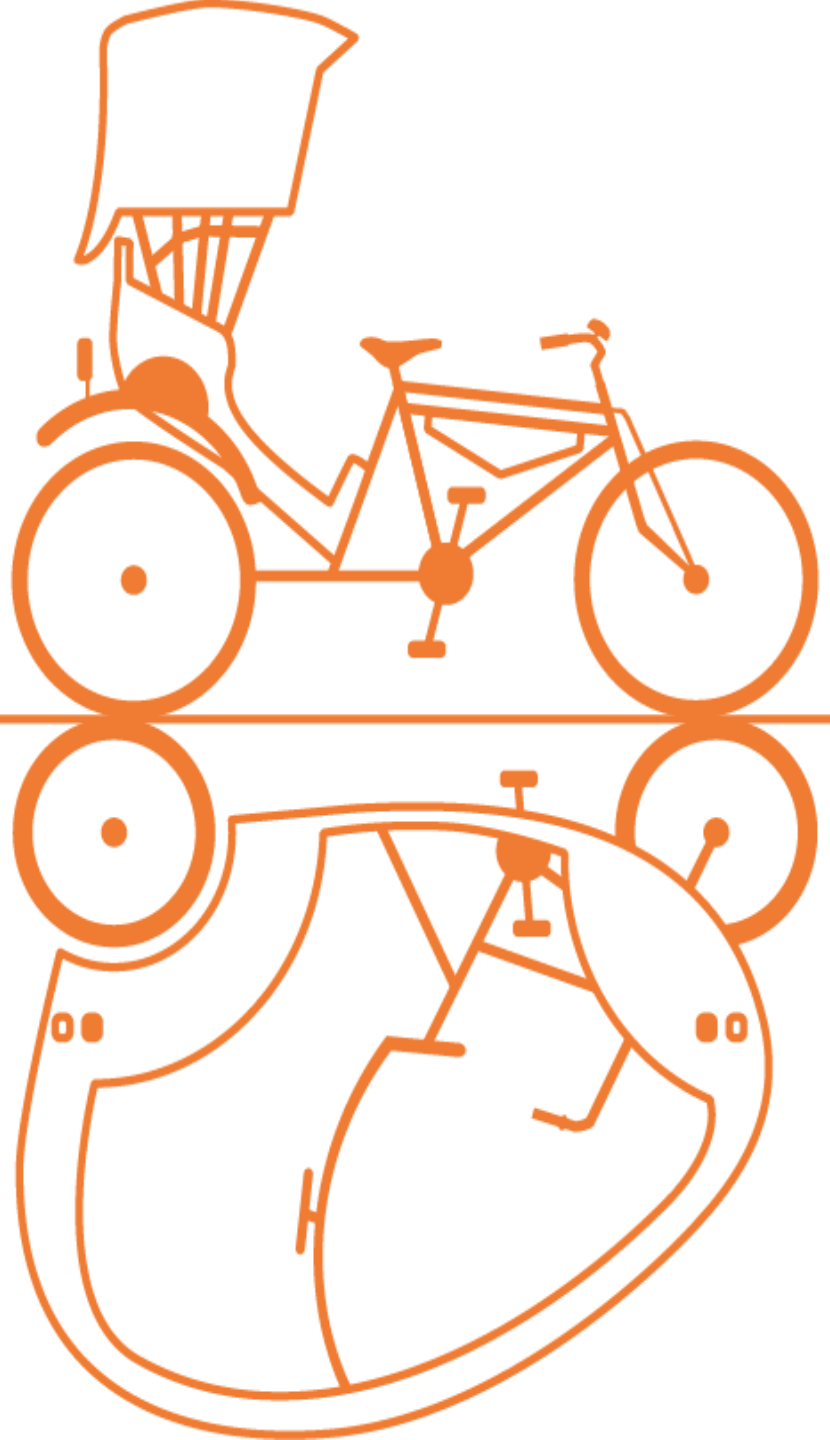


Tracking



Extra Function

Thank you



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