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Collaborative Research and Mapping for Public Transit Anywhere

Application for IRU BUS Excellence Award
July 2015

Vision/Goals

Across the world, cities depend on buses as the critical core of their public transit system. In Africa, Asia, Latin America and elsewhere, transport authorities often do not exist and numerous operators run bus systems under the difficult conditions of high levels of informality. This means little to no information on routes, stops, fares and schedules (if they exist) is usually available. Yet this information is key to improving services, planning and providing basic passenger information important to smoother functioning of the system and higher customer satisfaction. This, in turn, is critical to a more sustainable, cleaner, low carbon future for these cities.

Created to address this problem, Digital Matatus is a key player in the movement to leverage technological innovation, open data and collaborative networks to improve transportation in cities that depend on bus systems with high degrees of informality. We aim to make the bus services in these cities more visible, legible, service oriented, efficient, and open. Our work consists of engaging with operators, government, technology firms and civil society in a collaborative process to develop high quality open data on buses in standardized format that allows access to new tools. Through a collaborative process we support a community of users who can build on the data to generate innovation around transit applications, planning tools and passenger information systems. We support both the development of user-friendly technology for data collection

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and local institutionalization of the knowledge and techniques of data collection to ensure long term, sustained data collection for bus improvements. The idea is to ensure that cities everywhere have access to bus service improvements enabled by data and the growing influence of information and communication technologies like cellphones.

Profile and Partnerships

Started in 2011 as a consortium involving Dan Orwa and Peter Waiganjo (C4D Lab at the University of Nairobi), Jacqueline Klopp (Center for Sustainable Urban Development, Columbia University), Sarah Williams (Civic Data Design Lab, MIT) and Adam White (Groupshot), we received two grants from the Rockefeller Foundation (total $250, 000) to pilot this work in Nairobi where we successfully developed the first high quality open and standardized data on the bus system and a public bus map for the city. In partnership with Google, this data will be launched on Google maps in 2015 literally putting Nairobi's buses (matatus) on the world map. Our partnership with Google will also support an update of the data in collaboration with riders, operators and the city. Recently, given the large demand and invitations to replicate this work and a need for a sustained way to fund this work, Digital Matatus has become a start up company that aims to further refine our technology and process and expand into more cities to scale up this work. We are in active conversations with other cities and partners for expansion.

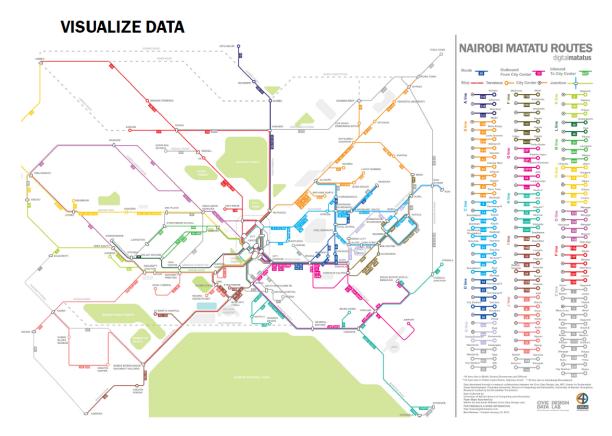**Summary of Overall Achievements**

Digital Matatus has developed and deployed purpose-built mobile phone apps to more efficiently collect location data of buses-their routes and stops. We have piloted our approach to creating standardizing bus data and data tools along with community of users for Nairobi's Matatu system—the city's bus system– making it open and available to the public for the first time.

We produced the first contemporary public bus map for Nairobi, soon to be available on Google maps. This will allow bus riders to more easily navigate the system and give more visibility to the bus system.

We helped create a modified GTFS standard for data on semi-formal bus systems and successfully tested it in Nairobi. This is available on the website http://www.gtfsfortherestofus.net/. This allows data for systems with various degrees of informality to be formatted in a way that allows access to existing tools and easy uploading to maps like Google maps.

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Our work has been widely recognized in the press and we won the 2014 Participatory Architecture award at the Media Architecture Biennale Copenhagen November 21, 2014, and our map is currently on display in Copenhagen at the Louisiana Museum of Modern Art.

Impacts

Improvement or creation of a number of mobile phone apps that provide trip planning for bus users in Nairobi: ma3route, Flashcast sonar, digitalmatatu, matatumap and transit app. Now citizens in Nairobi have bus information!

Our strategy of developing open data for innovation was very successful. A number of software developers including those we included in the early discussions about the project used the data to develop trip planning applications for cell phones. These included the popular trip planning application Ma3route, which also gives traffic alerts and allows

you to rate your matatu driver. FlashCast Sonar is another trip planning application that also gives some real time information for a subset of the matatus in Nairobi. The Digital Matatu trip planning app was created for Windows, named presumably after this research project and another trip planning app focused on buses called Matatu Map was created. More recently a Canadian company used our data to produce Transit App. Soon our data will be available on Google maps. This means bus users in Nairobi now have access to a variety of ways to use cellphones or the internet to get useful information on their service. This supports conductors and drivers who, according to a survey we conducted, usually are expected to give directions, besides doing their regular jobs.

Improved public awareness of the bus system and its network and importance

The stylized matatu map was extremely well received when launched in Nairobi in January 2014 and the city intended to adopt it as its official map. The map was used in a number of transit planning initiatives. Citizens were generally very positive about the map including the 66 undergraduate planning students from the Technical University of Kenya who took a formal survey. The survey sample is helpful to gauge the response of a young better educated male demographic. About two-thirds of respondents were under the age of 22 years of age, and nearly 88 % were males. Most respondents (48 %) had lived in Nairobi for between two and ten years and most rode a bus (matatu) four or more times per week, (42 %). Almost 29 % claimed only to ride a bus a few times per month reflecting the fact that many of the students walk.

More than 80 % of respondents reported never having seen a public transit map like the Digital Matatu map for their city. More than 90 % claimed that they were able to find where they were at the time and also the route they typically rode. Almost all, 86 %, believed the map made it easier to find the way around the city. About 83 % reported that with the map they are more likely to take a new matatu route and 77 % reported that they were more likely to take a matatu to a part of Nairobi they usually did not travel to. In focus group discussions, it was clear that finding information about new areas of the city was a problem with people needing to rely on word of mouth. In addition, respondents agreed that the matatu map would be useful for a variety of users: visitors and tourists (19 %), newcomers to the city (14 %), residents (12 %), and matatu users/passengers (11 %). Nearly 45 % of respondents reported that posting the map at matatu stops would be the most convenient way to access the map, and this corresponded to what we learned in the focus groups with drivers who had a similar request. One respondent suggested posting the map in public places like supermarkets and shops. Overall, the results showed a strong interest in having public bus information in map form.

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It is interesting that almost 50 % of survey respondents claimed that after seeing the map, they believed that Nairobi's matatu system was better than they previously thought. The stylized representation of the map helps give that impression as it copies the style of more formalized systems but also shows the expanse and network structure of the system which was previously hard to understand. About 86 % reported that the Digital Matatu Map was more useful than their available sources of matatu information, the most typical of which for 42 % of respondents was to ask a friend. Nearly two-thirds of respondents claimed that they would be willing to pay between KES 20 (US $0.22) and KES 100 (US $1.10) for the map. These initial results of young primarily male university students suggest that a demand exists for better transit information within this demographic category. In focus group discussions, young women bus riders told us that good information was very important to them for security concerns. They feared getting on the wrong bus especially at night, and they saw this work as very helpful to address this problem. Digital Matatus is thus helping to meet a real demand of passengers. Further work should explore how other ways of disseminating the map data might provide better information for users and the public to understand and relate to their transit system.

Increased use of data by transit planners and academics to better understand, model and plan for bus improvements. The data was critical in planning for new bus rapid transit service for the city.

The release of the data showed the demand for the data by planners and researchers working in Nairobi. The map and the data have been downloaded over seven thousand times from our website. We received many requests for the data from transportation consultants including the Institute for Transportation and Development Policy (ITDP), which was creating a bus service plan for a proposed Bus Rapid Transit (BRT) corridor,

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and required knowledge of existing routes. Providing the data saved the organization much time as a lot of work went into investigating the various matatu routes along the corridor. They used the data and map to select routes and locations on these routes to conduct ridership capacity and frequency surveys. See "New Maps and Open Data Pave Way for Nairobi BRT".

Consultants at Mott MacDonald who are advising the Ministry of Transport and Infrastructure in setting up a new transport authority also found the data valuable for their purposes. Numerous researchers used the data and maps for their work. Providing the data openly allowed the transit community to share ideas from a common knowledge base creating more dialogue, improved trust and enhanced collaboration between various stakeholders supporting improved bus service.

Support of operator participation in planning improvements to existing bus service

We consulted with bus operators throughout the data development process. The matatu owners and drivers instantly saw the potential of the map and used it to demonstrate the logic of new routes that would help improve traffic circulation. They were also proud of the map that showed the extensive bus system as an achievement of their hard work. It also showed how important this system is which was backed up by survey results. A survey we conducted with a representative sample of 400 residents (error +/- 5%) showed that out of a representative sample of Nairobians, 71% use the bus usually/daily and that 82% said that there was no place that the network did not cover (6% did not know, 12% said that there was someplace they could not get to by bus but often they were wrong. They did not have adequate information).

Digital Matatus literally helped put the bus system in Nairobi on the map! With investor interest, we are now refining the data collection technology and approach and expanding to more cities. By building collaborative networks and leveraging ICT, we have shown it is possible to create the basic data to improve bus services, even in places where high levels of informality exist.

For further details and more information see http://www.digitalmatatus.com and our film https://www.youtube.com/watch?v=j_k6PMnmr9E&feature=youtu.be

Contact: Jacqueline M. Klopp

Email: jk2002@columbia.edu Telephone 917-817-4688