CHALLENGES OF IMPLEMENTING "A LA MODE" TRANSPORT PROJECTS: CASE STUDIES OF BRT AND CABLE CARS IN COLOMBIAN CITIES

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ABSTRACT

Politicians, consultants and researchers often look at successful transport and urban transformation projects in cities in developing countries and assume that these may also be an appropriate solution for similar cities. In reality, "customising" such projects for a city-specific context is difficult challenge that not always ends well. We have reviewed the experience of implementing BRT systems in 3 cities in Colombia that followed the steps of the successful Transmilenio in Bogota. We also review the experience of a cable car, the new "à la mode" project, that is promoted in a number of developing cities after the success of the Metrocable in Medellin.

Keywords: BRT, Cable cars, customisation, project evaluation, institutional

INTRODUCTION

Our aim is to identify and analyse those important elements that should include a successful "customisation", by reviewing how specific projects are performing. BRT and cable car projects in Colombia are used as case studies to illustrate some of the difficulties that might arise (Bocarejo & Velasquez, 2012).

In 2001, Bogota, Colombia, opened the first line of Transmilenio, a high capacity BRT system with bus lanes where vehicles run completely segregated from mixed traffic. Bus services were tendered to private operators through a competitive bid, requiring better working conditions for drivers, including a fixed salary and working schedules complying with legal

labour regulations (Bocarejo et al, 2012a). Transmilenio represents the largest investment in public transport for Colombia in the last decade. Its impacts are very wide, from reducing travel times, transportation costs, environmental emissions, road traffic accidents to improving the urban built environment (Hidalgo et al, 2010), (Hook et al, 2010).

Transmilenio is now very well known internationally by transport planners as a fast and affordable way to improve mass transit services. "Bus Rapid Transit (BRT) has been found to be one of the most cost-effective mechanisms for cities to rapidly develop a public transport system that can achieve a full network as well as deliver a rapid and high-quality service. While still in its early years of application, the BRT concept offers the potential to revolutionize the manner of urban transport" (Wright et. al., 2007). Its benefits in delivering a high-capacity system at a relatively affordable cost and short construction times are very well documented (Bocarejo et al, 2012a), and they inspired the Colombian national government's policy to actively promote and fund the construction of similar systems in other Colombian cities. At time of writing six cities have implemented BRT systems and two more are under construction.

Similarly, the city of Medellin, Colombia opened a cable car transport system (Metrocable) in 2004 to serve low-income settlements in steep areas with difficult access. It has been found that it was successful at reducing monetary transport costs and improving the poorest people's accessibility to city services and employment opportunities (Bocarejo et al, 2012b). The project also enabled major improvements to the local built environment (Brand & Dávila, 2011). Other cities in Colombia and Latin America, including Bogota, Rio de Janeiro and Caracas have since followed suit, developing similar systems.

We have reviewed ex ante and ex post evaluations from the BRT systems in three cities, Bogotá, Pereira and Cali, as well as the case of one implemented and one planned cable car project. The data comes from the initial planning processes, the so-called CONPES[1] documents and, when available, initial ex post appraisals carried out by independent consultants hired by the national government. We identify specific issues for the different projects and compare their performance. This paper will also review the experience of Soacha, a municipality adjacent to Bogota where a cable car project is being planned.

We have found that BRT projects have different performances, in terms of efficient infrastructure construction, demand and financial sustainability, institutional strengthening, integration with land use and public space improvement among others. "Customisation" processes have been different in each city and some of them have been very difficult. In the case of cable car systems, aimed at low-income population with poor accessibility, research underlines the importance of including transport projects in a wider urban development/social plan, as well of the need for institutional strengthening.

[1] CONPES are public policy documents issued by the National Council on Economic and Social Policy. In this case we refer to the documents by which the investments in BRT systems were approved.

Significant resources may be not used efficiently if transport projects are not approached with proper consideration to local contexts. Trying to implement a project with a "top-bottom" strategy without building technical strength at the local level or integration with the urban development can lead to failure. Our paper is a contribution for transport planners and for those in charge of promoting transport improvement projects in developing cities, in order to review and reinforce the importance of "customisation" of projects.

1. THE CASE OF BRT AND CABLE CARS IN COLOMBIA

1.1 Colombian BRTs

As it was noted before, Bogota and Medellin implemented successful BRT and cable car projects. The case of Bogota was particularly attractive as Transmilenio showed that it was possible to provide high-capacity mass transit at relatively low cost and short construction periods when compared to metro systems. It also provided a good opportunity to strengthen the institutions that plan and supervise the operation of public transport. This inspired the national government and a new mass transit programme was started where cities were required to pay at least 30% of the infrastructure costs and the rest would be borne by the national government, just as it was for Transmilenio.

Several cities applied for funds from this programme and so far the cities of Pereira, Bucaramanga, Cali, Barranquilla and Medellín have implemented BRT corridors, and a few other cities have systems under construction, some of them with significant delays and cost overruns.

Table I – Projected vs. Actual Demand in Colombian BRT systems

City	Population (millions)	Length (km)	Projected Demand (pax/day)	Real Demand (pax/day)	Difference in Demand (%)
Pereira	0,8	16	140.000	106.000	-24,3%
Bucaramanga	1	9	380.000	57.000	-85,0%
Cali	2,5	28	442.000	288.000	-34,8%
Barranquilla	1,9	13	305.000	54.000	-82,3%

Source – Colombian Chamber of Infrastructure, 2011.

One of the first indications that the systems were having problems was the fact that demand projections were not being met. In the cases of Barranquilla and Bucaramanga, some cases actual demand met less than 20% of the original projection. In the least alarming cases demand was still only 75% of the original plans, probably because the systems in the cities of Pereira and Cali where the first ones to be built and have had time to make some adjustments.

In order to asses if the investments had met their targets, the Colombian National Planning Department contracted out ex post evaluations of the BRT investments throughout the

country. At the time of writing, information had been made public for just three cities, Bogota, Pereira and Cali. The evaluations show that with the exception of Transmilenio, all the other projects have not achieved their goals in terms of the benefits and the rate of return. This is even more likely to be the case in cities not yet evaluated. This is mainly due to the fact that some projects cost more than initially planned, full implementation was not achieved and because demand projections were off by large.

Table II – Evaluated Colombian BRT systems

City	Cali	Pereira	Bogotá
Population	2.5 M	0.8 M	7.5 M
Projected Demand	441,600	150,800	3,319,385[1]
Real Demand	238,785	108,294	1,600,000
Occupation (pax/m2)	Unavailable	6.5	7.0
Maximum Load (pax/hour-direction)	21,000	11,000	48,800
Passenger-kilometres Index	3.0	6.6	5.1
Benefits/Cost	1.2	1.7	2.5
IRR	15%	45%	24%

Source – Colombian National Planning Department.

[1] Includes projected demand for corridors that were not built. Actual demand for the built corridors exceeded projections.

Another reason why the projects did not meet their targets in terms of costs and benefits were significant cost underestimations. In all the systems, actual investment costs were higher than originally planned. Flyvbjerg (2005) found that cost underestimation and demand overestimation is a common problem across the world of transportation infrastructure projects. Analysing the Colombian BRT experience is therefore an important issue to better understand how to improve project planning.

Table III – Cost Overruns in Evaluated Colombian BRT systems

City	Cali	Pereira	Bogotá
Projected Public Investment Cost (Million USD-2010)	355	40	1,298
Real Public Investment Cost (Million USD-2010)	1,010	130	2,520
Difference in Public Investment Costs (%)	185%	225%	94%

Source – Colombian National Planning Department.

As shown in Table III, cost overruns in BRT infrastructure have been significant. However it is important to point out that initial designs had a heavy focus on transport infrastructure, whilst the final projects included important improvements in public spaces such as relocation or laying public utilities underground. The BRT was considered an opportunity to modernise

parts of the cities. Important resources were also allocated to rebuild road infrastructure for private cars.

Challenges for the implementation of those projects were similar in each city: poor technical and financial capacity of transport institutions, scarce information on travel demand behaviour during the planning stage and private companies operating routes with a certain degree of informality.

Transmilenio in Bogota had shown that all those complex issues could be overcome (Ardila, 2004). The creation of a new institution in charge of the new system, a new regulatory framework based on bids and well structured contracts aiming for strong bus companies, demand and design studies for the new system were the effective answers provided. Thus, a similar strategy was adopted for every city involved in the mass transit programme lead by the national government. However, the performance of the BRT systems in other cities has been quite different. Lack of customisation to each city's characteristics was probably one of the main causes.

Poor adaptation to the local context can be observed in specific aspects in the Colombian BRT experience. For instance, in terms of the type of system planned, small cities reproduced the feeder-trunk system developed for Bogotá, increasing transfers without offering substantial improvement in mobility, proposing the same type of vehicle, very similar contracts with the operators and the same fare structure.

As it happened with metro systems in Latin American cities in the 70s and 80s, the projects were developed as single transit corridors, providing efficient transportation for a minority part of the commuters, but poorly connected to the rest of the public transport network. In Bogota, the local authority was successful in having some impact in the rest of the transport network by reducing the operation of the previous public transport system. It promoted a scrapping program that was ultimately funded with the fare-box. In some other cities authorities have been unable to adapt the existing system to the start of the BRT lines, generating redundancy and excess supply. The result is that expected ridership and revenues are still not met. It has been usual to have cost overruns and delays that have also affected financing performance of the projects.

1.2 The cable cars of Medellin and Soacha

Metrocable in Medellín started operations in 2004, after a short and efficient planning process led by Metro Medellín Company. This 2,4 km system has 3 stations and carries 30,000 daily trips. Benefits in transportation such as travel time reductions and a decrease in users' monetary costs (Bocarejo et al, 2012b) and social equity (Brand & Dávila, 2011) have been important and well documented. The difference between the before/after situation in a low income and previously dangerous area has produced enthusiasm among urban planners and city officials.

However, what seems to have driven social progress is an ambitious urban plan that was developed simultaneously with the Metrocable, improving public spaces and local facilities, promoting small business development and integrating this former ghetto to the main productive areas of the city (Brand & Dávila, 2011). Interviews with key institutional actors and stakeholders allowed the authors to give an accurate report on the project genesis, planning process and key decision-making.

The project originated within the Medellin transport planning authorities and was strongly supported by the mayor of the city. It was then included in the city's medium and long term plans, so that it was not anymore a single transport project promoted by a politician, but rather a piece well integrated into the plans. This enabled the future stages to happen, where technical and financial plans were developed. Innovation by the Metro de Medellin Company, a city-owned company that operates the city's metro, included adapting a technology that had not been used in this context before.

As part of the plans, technicians were very careful to consider the wider social impacts of a transportation project, developing a plan to majorly upgrade the built environment in the violence-ridden area. This meant that major investments were directed towards improving social spaces, ensuring proper road and walking connectivity from the neighbourhood to the cable car stations and building high-quality spaces for the enjoyment of the community. This included sports facilities, community centres and a major public library. This part of the project was in fact the most expensive, and required separate funding from non-transport authorities and even international donors. From the beginning, the project was completely financed and no important cost overrun occurred. Transport authorities interacted smoothly with housing, land-use and security agencies in order to plan the project.

The Metro de Medellin Company, that lead the plan to develop the cable car, now provides consultancy services to cities around Latin America looking to implement similar projects. Its institutional capacity was key to the success of the project during the planning, construction and operation.

Similarly, other authorities in Medellin have strong technical capacities, allowing them to properly coordinate policies across different agencies. Medellin also has healthy finances due to a very good capacity to collect taxes from local businesses and from the large profits received yearly by the city-owned public utilities multinational company. This gave the city the necessary funds to invest in the project, and the right institutions to spend the money properly.

After this successful project, the city of Manizales (0.6 M inhabitants) built a cable that has been in operation since 2007, although patronage has not been lower than originally expected. The city of Cali (2.2 M inhabitants) also developed a project in order to improve accessibility to one of their poorest area. However, difficulties in the bidding and contracting of the project have slowed the process. Similarly, Bogota developed a plan for a network of cable cars in mountainous neighbourhoods, and is planning to start the construction of the first line within the next year with World Bank financing.

The municipality of Soacha (0.5 Million inhabitants) started the planning of a similar project, but institutional and political obstacles have stopped the plan from moving forward. With a new mayor elected in 2012, there is no certainty that the project will be implemented. The national government offered the city to build this project, with assistance from the Metro de Medellin Company, but poor financial and technical capacity at the local level means that the project is very unlikely to be implemented in the near future. The government's proposal to build this project has no consideration for the local context and is not conceived within a wider programme of urban renewal in the area where it is planned. The transport solution by itself was extracted from the Medellin experience and forced into Soacha, a city in financial trouble happy to receive a hand-out (Bocarejo, et al, 2012c).

2. CONDITIONS FOR SUCCESS

In the case of Medellin's cable car the project went through a very different process. First, the project was strongly supported by the mayor of the city. It was born from a local context, introduced in the metropolitan development plan and the transport plan. Thus, the project was not seen as an isolated piece but rather as part of a future transport network and a local urban plan.

Similarly, Transmilenio was planned and implemented during mayor Peñalosa's government, who had a strong decision to replicate Curitiba´s BRT in Bogotá. Ardila (2004) has described in detail the managerial decisions taken to create a strong institutional framework, under the leadership of the mayor.

This has been difficult to replicate. Mayors in most of the other cities did not have the initiative to develop BRT systems. They were invited by the national government to develop a project they did not know in detail. Having the possibility to receive up to 70% of the investment amount from the national government was a major appeal. However local governments were not willing to accept the political challenges that the new system required, in particular forcing the exit of a number of traditional bus companies.

Second, in Medellin technical and financial studies were dully developed. The technical difficulties of introducing a cable as a daily public transport system and connecting it to the metro station and the building of massive stations in the built areas were properly addressed. It included social plans that provided employment in this poor area during construction and operation phases. From the beginning, the project was completely financed and no important over cost occurred.

The case of Bogota´s BRT is very similar. Even though transport related institutions were very weak at the beginning of the planning phase a good mixture of technical, financial and managerial studies contributed to an innovative project. New institutions were created, with very capable technicians and managers who gave Transmilenio enough capacity to operate the growing BRT system.

Third, the cable system was developed as the centre of a comprehensive urban and social plan that included public space improvement, road and walking connectivity strategies, construction of social infrastructure such as a high design library and sport facilities. It was also accompanied with social plans that promoted private entrepreneurship in the area.

Transmilenio's case slowly evolved as more components of urban renovation were introduced in the final corridors of phase 1 and in phase 2. Construction works in these cases included the renewal of pedestrian and bicycle infrastructure along the corridors, which helped increase public acceptance of the project. It was also part of a strategy to discourage car use with licence plate restrictions, reduction of car parking supply and provision of a vast cycling network. However, significant opportunities to capture land value increments were foregone and land use regulations were not changed to support public transport.

Fourth, these plans were lead by competent institutions. The Metro Medellin Company has a high credibility among the population and has been able to create a "culture" of respect and good behaviour around the metro facilities. Its citizens usually rate it as the best institution of the metropolitan area. Daily operation of the cable is adequate and efficient. Similarly, the initial team in Transmilenio was a cadre of well renowned professionals who were able to successfully implement one of the most complex changes the city of Bogota has undertaken. Transmilenio's technicians are well respected among all other agencies in the city,

3. CONCLUSIONS

Transferring successful transportation projects to new areas or other cities is an important challenge. Key success factors must be considered to be able to implement transport solutions to different contexts.

When these projects are aimed to improve low-income population mobility, as it is usually the case for public transport projects, and more specifically for cable cars, it is necessary to approach the solution as an overall urban project that should consider public space, land use changes and provision of public facilities. Even if financial resources are not immediately available, it is important to optimise the potential of transport system to integrate the territory in medium term plans.

The integration is also related to the rest of the transport system. For decades, large mass transit projects in developing cities, such as metro lines, stood isolated from the rest of the public transport network, limiting their impact. Cable cars have been essentially used as a feeder of the main mass transit lines but their potential will be limited by the connectivity of the network and the capacity of the technology. This also requires that financing institutions like multilateral agencies and national governments make it viable to finance such comprehensive projects.

The project must be included in the priorities of the local governments. In some countries national plans of transportation propose projects such as BRT or LRT to be developed in a number of cities whose success indicators tend to be the number of kilometres. It is

important to create follow-up mechanisms that ensure that a broader set of goals is achieved. In some cases, local authorities are more interested in a handout from central governments that in delivering a sustainable transport solution.

Carefully studying the travel patterns and characteristics of the population is necessary to have an adequate solution. Developing adequate local connectivity to stations is essential. Income information is a key aspect to be considered in order to give real accessibility in areas where affordability is the central issue. Demand forecasts are not only affected by the way the project is implemented, but also by linking good technical skills with enough knowledge of local contexts.

Local authorities will have to deal with the construction and operation challenges. A bad understanding of the project will be costly. It is important that before the design process begins, there is a local technical and financial team involved in the project conception and trained to manage the project. Institutional strengthening is thus an essential element for the success of these projects.

Considering a priori that the project has to be developed may be missing the larger picture. In the case of cable cars, trying to force accessibility to a zone with high-risk of natural disasters or prioritising the project over more basic infrastructure may not be suitable. Promoting better and more secure living conditions may include relocating communities instead of providing them with better transport systems.

Concerning the appraisal of impacts that transportation projects generate, equity is especially relevant for developing cities. Traditional cost-benefit analysis has limitations in this respect. One way of complementing it is by analysing accessibility, which is key in building equity in low-income areas. The results for the case of Metrocable in Medellin show that there was a significant improvement on the access to CBD and other areas that offer high employment, producing potential benefits to the population. As a consequence, the project has a positive influence on the social development of the poor communities that it serves, despite its limited capacity. Likewise, Bocarejo & Oviedo (2012) show that Transmilenio had a positive impact in enabling access to employment for low-income areas.

In terms of transferability, this comparison allows us to state that an appropriate technical design is not enough to ensure the development of a successful project. The promotion of "à la mode" transport projects needs to go hand in hand with institutional strengthening and urban planning. Local authorities need to be involved with the development of the project, but this is often difficult to achieve if local institutions are very weak. Additionally, when the projects are aimed to impact low-income communities, a wider project that also includes basic public utilities, public space improvement, and construction of community spaces will significantly increase the benefits of the project. Involving the communities throughout the planning process can be very helpful in the design successful projects.

Cable cars in Medellin have had a measurable impact on equity, allowing access to CBD and other employment areas to low income communities, but it is also the improvement of local

conditions that has contributed to a better quality of life for the poor. Integrating urban development projects and transportation projects needs efficient governance but that is not always easy to find in developing cities. When multilateral agencies promote transport projects in the developing world, institutional capacity and integration with urban development are important aspects to be considered.

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