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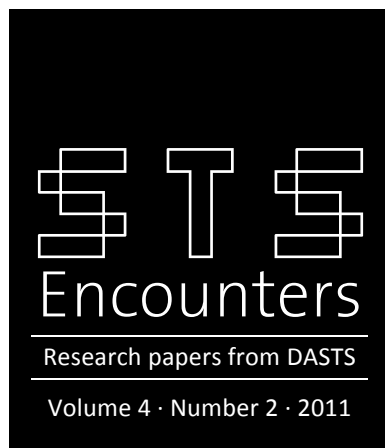
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The Map of Transmilenio Representation, System, and City

Andrés Felipe Valderrama Pineda

DASTS er en faglig forening for STS i Danmark med det formål at stimulere kvaliteten, bredden og samarbejdet inden for dansk STS-forskning samt at markere dansk STS tydeligere i nationale og internationale sammenhænge.

The Map of Transmilenio

Representation, System, and City

Andrés Felipe Valderrama Pineda

In this paper, I address the following questions: What do experts negotiate when they discuss the contents of a map of a transportation system? Is it a negotiation of a purely representational tool or is the negotiation also about what the transportation system is and how it should evolve? What implications does this have for the development of the city of Bogotá? Departing from Peirce's triad of index, symbol and icon, I trace the discussions surrounding the evolution of the map of the urban transportation system Transmilenio in the city of Bogotá. I find that the experts involved were not only negotiating the representational contents (symbol and interpretant), but also the system itself (object and index). I also suggest how a map as an icon can have consequences for the city. Therefore, I propose to analyse the map as a screening device to avoid the limitations of a purely representational analysis.

Introduction

In this paper I address the following questions: How do urban transportation maps and urban transportation systems inform each other? What are experts negotiating when they discuss the contents of the map of the transportation system? Is the negotiation about a purely representational tool or is it also about what the system is and how it should evolve? What implications does this have for the development of the city of Bogotá? In what follows I show how the success of maps as screening devices depends on the outcome of the process of production.

Karin Knorr-Cetina and Urs Bruegger (2002) claim that contemporary stock-markets are *apresentational* in the sense that the information displayed on screens does not represent a market 'out

there': the market exists in the screens. Removing the screens would mean shutting down the market. Conversely, one could think that urban transportation maps aim at representing a system that exists out-there. In that sense, maps would be representational. After all, maps are used in principle to communicate how the transportation system is so that users can navigate it. However, things are more complicated than that. As I will show in this analysis, maps are more than stable representations of something out there: they are precarious and unstable agreements among actors in a system, they are provisional representations and they also constitute the system itself. I will also argue that they constitute the city as well.

To show all these multiple roles, I will depart from Peirce's (1991) triad. Peirce proposed that any given sign is constituted by three different elements intimately related to what the sign is and how it performs. A sign is:

- 1) An index: it points to something else.
- 2) A symbol: it presents a set of relationships.
- 3) An icon: it has meaning in itself.

Peirce's basic semiotic is a rejection of the classical conception of knowledge as a set of ideas that are pure and meaningful in themselves. For Peirce an idea is different from a sign. It is the act of interpretation that makes a sign meaningful. Therefore representation in Peirce's thought system is the action of relating the sign to an object. This action produces an *interpretant*, which can further be transformed by thought and action. Therefore, Peirce's semiotic provides the basis to claim that a map is much more than representational: it also constitutes the object it aims at representing. To capture this duality between representation and constitution I propose to treat the map of Transmilenio as a *screening device*.

A screening device is a special configuration of materials, actors, inscriptions and knowledge, the very nature of which is dynamic. It both circulates and facilitates circulation. It changes over time and it

produces changes in the collective to which it belongs. It is also organized and it organizes. This paper discusses the nature of these processes in the case of the map of the urban transportation system Transmilenio in Bogotá, Colombia.

A key issue in Science and Technology Studies (STS) is understanding such a screening device and the dynamics of its production. For more than four decades STS scholars have been engaged in analysing the dynamics of new knowledge in scientific and technological fields with a preference for those areas where huge investments are made and where particular forms of knowledge achieve a high degree of codification (Martin, 1993; Turnbull, 2003). However, the majority of the world's population lives, works, enjoys and moves around using a wide variety of technological systems produced by different forms of knowledge, different actors and different locations. Understanding how such systems are produced, function and constitute the very texture of the social fabric is paramount. As we develop the third wave of STS research projects further (Collins and Evans, 2002), it is pertinent to ask how different forms of expertise and knowledge come together to produce our daily technologies, including urban transportation maps. Many fields of inquiry refer to knowledge in the singular as if it was one thing. In this article however I want to stress the fact that there are many co-existing knowledges and this analysis deals with the problem of what happens when they meet and must work together.

This article is part of a doctoral research project to understand the socio-technical dynamics of the production of urban systems and the city (Valderrama, 2010). This contribution is the result of a post-mortem analysis of the change in the visual representation strategy and the general signage of Transmilenio undertaken in 2006. The study is based on unstructured interviews with members of two involved expert communities: the operations experts and the communications experts of both Transmilenio S.A. and Steer Davies and Gleeve. The former is the public coordinating agency of the Transmilenio system in Bogotá and the latter is one of the main consulting

companies for the system. The interviews were carried out in 2009 and were also supplemented with observations of how the system worked. I also consulted several documents in the archives of Transmilenio S.A. in Bogotá to reconstruct the evolution of the maps in use as the system expanded.

The next section provides an introduction to the Transmilenio system. It presents how the map was created and changed over time. Then, I analyse how experts negotiated the map as a screening device to show how it changed as the system grew. This forms the basis for a discussion of the relationship between representing a transport system and the city. I conclude by summarizing the findings and indicating future lines of enquiry.

The Case Study: The Evolution Of The Map Of Transmilenio

On the 29th of April 2006, the growing system of Transmilenio¹ began operating with a new map and signage. The confusion among users was so great that passengers began filling the narrow stations without taking a bus because they simply could not understand which bus would take them to their destination. At some key stations the overcrowding reached critical levels and the police had to intervene to avoid rioting. In the control room of Transmilenio operators quickly set up a crisis center where the managers could openly discuss the situation and take action. It was the worst crisis experienced by Transmilenio staff.

Why did the Transmilenio staff change the map overnight? Why did they have to face such confusion among passengers? A detailed analysis of the design of the Transmilenio system is available elsewhere (Ardila-Gomez, 2004; Valderrama, 2010). Here I want to concentrate on the elements that make the map issue relevant.

¹ The first phase of Transmilenio was designed and constructed between 1998 and 2000. In December 2000, it began delivering service. The second phase began operation in April 2006.

Transmilenio is the first bus rapid transit system (BRT) to achieve mass transit performance. This means that it is the first bus system that can compete in capacity with heavy rail systems. When the first bus line came into operation in 2000, the system carried 790,000 passengers a day. By April 29th 2006 it was carrying 1.2 million passengers. Today, it moves over 1.5 million passengers a day.² The basic principle of operation of a BRT like Transmilenio is that it uses high capacity buses, dedicated lanes (known as trunk lines) and bus stations with level access. In addition the combination of regular and express routes allows the system to reach mass transit capacity.



Fig.1: Transmilenio Avenida Jiménez Station.

² The London Underground moves 3.4 million passengers daily, the Metro in Santiago de Chile, 2.5 million and the Metro in Washington about 800,000. In comparison, Copenhagen's whole S-train network and its metro moves only 415,000 passengers daily.

Figure 1 shows Avenida Jiménez Station in central Bogotá. The station is composed of three wagons.³ In each wagon one or two buses can stop at the same time. The picture shows two of the three wagons this station has in the Avenida Caracas. In this station up to four buses can stop and exchange passengers with the station at one time in each direction while another four or five buses are overtaking in each direction. Because the buses have four sets of doors on the left side passengers can move quickly in and out of the bus. Each bus can carry up to 160 passengers, which they often do. The combination of regular and express services accounts for the high capacity of the system. If the system had only regular service, buses that stop at all stations, it could not achieve mass transit capacities (i.e. more than 20,000 passengers per hour in the most loaded direction). However the combination of regular and express service poses a communication problem because any given route has multiple services. Therefore, a 'traditional' train or underground map does not work for Transmilenio (Garland, 1994). In this paper I explain why and how different experts and users tried to solve this problem.

³ The word 'wagon' is an old term sometimes used in train systems to refer to part of a train. However, for Transmilenio, this word defines the different sections of the bus station. Some trains separate along the way so passengers board a specific wagon to come to a certain destination. I have experienced this in intercity trains in Holland and in Denmark. In Transmilenio, the wagon is also related to the destination, but instead of being part of the mobile units (the buses), it is part of the fixed units (the stations). I explain later in the analysis how this arrangement came about.



Fig.2: One of the First Maps of Transmilenio 2001.

Figure 2 shows one of the first maps of Transmilenio. The engineers and planners, who developed and initiated the operation of the system, designed this map. It resembles any other transportation map but it has additional information in the squares and circles. The squares containing '1' indicate that route number 1 stops at all the stations indicated. The circles with numbers 10, 20, 30 and 40 designate the express routes that stop only at a few stations. The routes are symmetrical, as they are in the majority of train systems, meaning that they stop at the same stations in both directions. This map already simplifies the shape of the city but it still tries to preserve two salient city features. First, the top of the map points East, which is traditional for many Colombian city maps.⁴ Second it tries to show the curvature of the Avenida Caracas towards South (right).

⁴ David Turnbull indicates that "(...)the very word *orient*-ation comes from 'East' being the direction of the rising sun, and hence it was once common practice to put it at the top of the map. North, whilst being one end of the Earth's axis rotation, is not a privileged direction in space. (...) That North is traditionally 'up' on maps is the result of a historical process, closely connected with the global rise and economic dominance of northern Europe" (1994: 8). In Bogotá, this tradition might have been reinforced by the fact that the region is constituted by a chain of mountains running from south to north. As the city grew towards the west, the mountains in the east became a significant visible edge (Lynch,

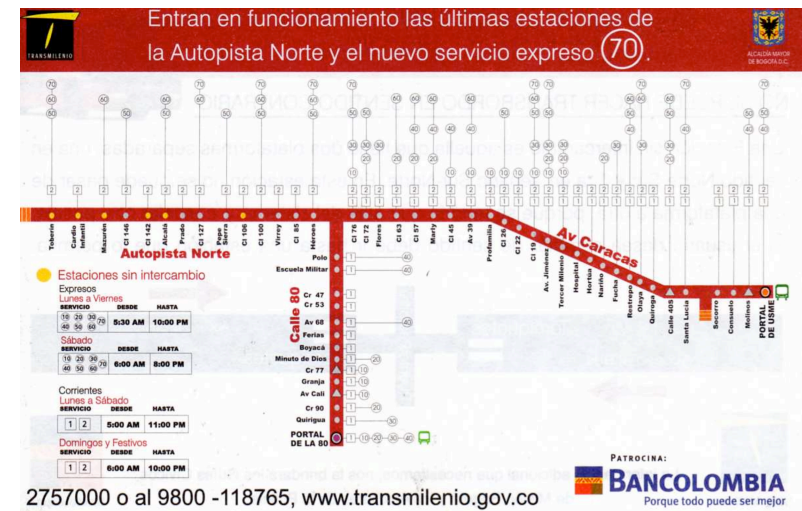


Fig.3: Map of Transmilenio once the Autopista Norte was opened.

Figure 3 shows how the map and the system changed when the extension of Avenida Caracas to the North, the Autopista Norte, was opened in 2001. The Transmilenio experts preserved the principles of the previous map but they also specified a new schedule for the express routes which were restricted to weekdays and Saturdays and to a schedule covering peak periods. The aim of restricting the schedule is to maximize management of the bus fleet and to avoid low capacity late at night and on Sundays. At this stage maximization was quite tentative but as time went by operators emphasized this optimization strategy for an economic reason. Transmilenio is a public-private partnership. Planning and management of operations are performed by a public entity, Transmilenio S.A. but private firms own and operate the fleet of buses. The private companies' income

1960). The Spanish built a church up in the mountains in 1640, which might have emphasized the importance of orienting maps and representations of the region toward the east.

depends on the number of passengers they carry in their buses and the number of kilometres their buses travel. The companies are also heavily fined every month if they fail to comply with a certain quantity and quality of service. Therefore they have an incentive to pursue maximal exploitation of the fleet while minimizing costs. The operational experts of the coordinating agency were also just as keen to pursue maximization because this is the one feature that makes a BRT competitive. Nevertheless this requires a good deal of transport engineering and computer modelling and the operation was refined as the system grew.



Fig.4: Map of Transmilenio, circa 2004.

Figure 4 shows a later map (around 2003) with even more express services. Some of these services were restricted only to peak hours on weekdays (yellow and blue stripe) and a few new express services were designed only for Sundays. The map was turned into a geometrically simplified representation of the main corridors. The experts also introduced some colours to differentiate between the

different routes of the system. This is recognizable as a modified route-based transport map.

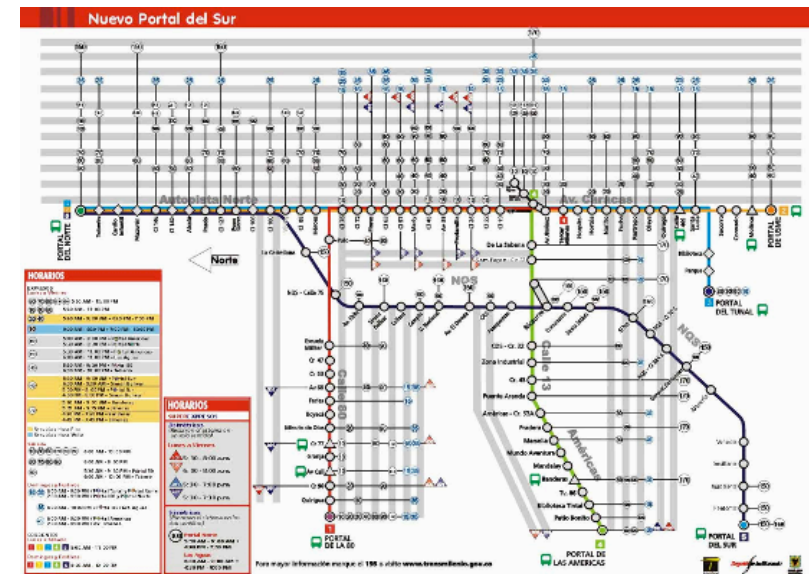


Fig.5: Pilot map for Transmilenio when the Second Phase started Operation.

In 2004, the operation and communication experts of Transmilenio S.A. already foresaw that with further growth of the system the map would be insufficient especially when the second phase of the system began operating in 2006. Although users assessed the communication strategy of the system positively, Transmilenio S.A. hired Steer Davies and Gleeve (SDG) to perform an assessment of the signage of the whole system. Since 1998, SDG has been a very close consultant partner to Transmilenio. The current head of SDG in Colombia, Germán Lleras, is one of the former designers of the system. However their local expertise was primarily in the areas of operation and transportation. Therefore communications' consultants from SDG's headquarters in London were invited to Bogotá to perform the signage assessment. These experts assessed the system to have a

very poor signage strategy. From a communication point of view it was too complicated for the user, which would become worse with the growth of the system. Figure 5 shows one of the last maps used with the former visual paradigm. For many it simply did not work. Too much information was put into one single visual representation. Furthermore it was next to impossible to highlight the different express routes that included stations for shared by two or more lines. Both communications and operations experts within Transmilenio and SDG understood clearly by this time that with further growth of the system a completely new visual strategy was needed.

Negotiating The Map Is Negotiating The System: Maps, Wagons And Users

During the process of defining the appropriate signage and communication strategies for Transmilenio tension emerged between two groups of experts and types of expertise. This tension was related to what both the map and the system itself should be. I claim that it makes sense to analyse the map as a screening device: because negotiating the representation is also negotiating the constitution of the system.

The communications experts (CEs) at both SDG and Transmilenio based their analyses and recommendations on a long tradition of information and visual design and on the principles of way-finding (Gibson, 2009; Lynch, 1960; Mollerup, 2005; Passini, 1996; Smitshuijzen, 2007) whereas the operations experts (OEs) at Transmilenio and also at SDG were mainly trained in transportation engineering. This group had led the refinement of Transmilenio's operations and fleet management for years and had the merit of making the system operate at minimum cost (Transmilenio's operation is not subsidized by the city), while also maximizing savings in average travel time for passengers. They achieved this through careful measurements of the travel patterns of passengers using transportation-engineering tools like origin-destination matrixes and

developed computing algorithms to model the best combination of express routes at different times.

The OEs were also proud of the “completeness” of the previous map as expressed in one interview:

You saw the old map. It showed the trunk lines and the services, all of them. Everything was there. It was very easy to read. But we were planning the second phase of the system. The system was becoming very complex and also its representation, although the principles were the same. But opening for more trunk lines made the map very crowded and complicated. Suddenly, the “linearity” of the map made crises. It couldn't represent the shape of the city and at the same time present the information about all the services. Especially in the stations where several trunk lines met, it was impossible to indicate the services.

During 2004 and 2005, OEs and CEs worked together to assess the system and devise a new strategy for Transmilenio. CEs noted, for example, that the signage of the system was very poor. There was no colour differentiation of the different signs. Visually the exit sign was very similar to the sign intended to indicate the bus services that stopped at a given wagon. User assessment of the system was however positive; both OEs and CEs explained that this was because the main user of Transmilenio was a commuter who used the same services regularly. This characterization of the user was used several times, especially by the OEs, as an argument to resist many of the proposals made by the CEs. The CEs, on the other hand, on the basis of interviews and user focus groups, defined an alternative signage and representation of the system (Steer Davies and Gleeve, 2005). In this sense, the map of the system was just one part of a larger effort to improve ways of navigating in it. This effort included modifications in the signage at the stations, inside the buses, and in all the

communication media, especially the printed maps and map displays at stations.

The CEs aimed to apply the principles of way-finding. As a CE told me, they assumed that the user (pedestrian, chauffeur, public transport passenger) normally feels comfortable and safe using just a few routes – no more than four or five – to reach the intended destination. If forced to use a different route the user feels insecure and unsafe. Therefore, from a way-finding point of view, the user should be provided with the simplest and clearest information possible. Because all movement is complicated way-finding experts have developed the principle of “progressive disclosure” which basically means breaking up information in order to provide it to the user where necessary (Gibson, 2009; Mollerup, 2005; Smitshuijzen, 2007).⁵

A CE explained to me that progressive disclosure consists of the following. When someone needs to go from one place to another in Bogotá (or any other city that has a transportation system) she first needs to know where the closest station is. When she arrives at the entrance to that station the user needs to be able to clearly identify which station it is. Once inside the station she needs to be informed which wagon and door she should choose to find the service that takes her to her destination. When she arrives at the door she needs to be able to identify which service is fastest. The CEs' proposal for Transmilenio was thus to extract all the different information provided in the over-complicated engineering map (Figure 5) and provide it to the passengers at different places inside the station; i.e. progressive disclosure (Steer Davies and Gleeve, 2005).

Applying progressive disclosure, however, had implications not only for the design of the map, but also for the re-design of the system: wagons and route assignment. One CE told me:

Another thing is that not all services going to one zone stop at the same wagon. Part of our recommendations was that the routes to destinations were rationalized to assign zones to wagons. As soon as you depart from this idea, you start creating inconsistencies in the system. The intention was that zones and wagons would be in correspondence.

In other words, the CEs proposed to reassign the wagons and doors inside the stations to correspond to the different parts of the city so that at any given station in the centre of Bogotá, for example, a specific wagon would be assigned only to buses heading to Suba and another wagon for those going to Autopista Norte, etcetera. Applying the principles of progressive disclosure therefore meant dividing the information map and distributing it inside the different parts of the stations but this also required reconfiguring the stations.

The OEs accepted the general recommendation and implemented it to a certain extent. Therefore, today, most wagons at a given station correspond more or less with destinations in the city. But this feature could not be implemented consistently because some destinations have more services than others. If too many services are assigned to only one door the risk exists that too many buses will queue at that door and thus interfere with the other doors or even block the trunk line. The CEs therefore recommended simplifying the operation with fewer services per destination in order to secure wagon-destination correspondence.

The OEs found it difficult to accept this recommendation because what makes Transmilenio so effective is precisely the possibility of optimizing the balance between regular and express routes per destination. For phase two, in order to further optimize the system, they even introduced asymmetrical routing. This means that a route does not have the same stops in both directions – actually, some routes

⁵ These references are to books published after the events I am analysing in this paper. However they are representative of the kind of knowledge people in the signage and way-finding communities draw for their designs. The references were provided by one of the interviewees, Phil Berczuk, from SDG.

only exist in one direction. For example, service 10 in the first phase of Transmilenio stopped at the same stations in both directions and was scheduled for the whole day. Conversely, route B61 in phase 2 only travels from Suba to Autopista Norte on weekdays from 4:30 to 7:30 pm. The whole system is therefore composed of a total of 78 different services.

So in April 2006, Transmilenio's OEs did three things in the same month: they changed the signage and the map; they re-assigned the wagons at all stations; and they introduced asymmetrical routing. This became a real challenge for users. A CE explained to me the consequences in these terms:

The transition was problematic and incomplete. So the people at Transmilenio introduced pieces of information to fill in the gaps. The index (Figure 7) was developed to cater for what Transmilenio thought was a gap, rather than waiting for the system to deliver. Transmilenio thinks it gives more information to the users, but I think it produces more confusion. This index departs from the original recommendations.

Figure 6 shows the Mapa General of Transmilenio. This is a very minimal representation of the system that features only the main trunk lines which are divided into coloured and tagged zones. In the previous map (Figure 5), the user could find the exact combination of services in order to reach her destination but the new map does not provide this possibility. According to the CEs it was not meant to be sufficient: the rest of the information was supposed to be provided along the way, inside the station, at the wagon, at the door, in the bus, according to the principles of progressive disclosure.

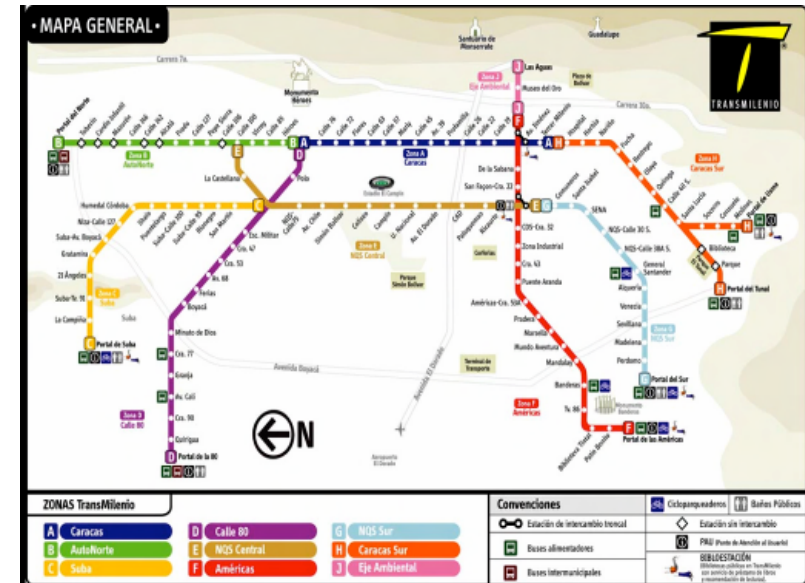


Fig.6: Mapa General of Transmilenio.

But OEs in Transmilenio thought differently. They thought that users should have access to a complete index of the system and so they developed the index presented in Figure 7. This display is really complicated and passengers need training to be able to read it. In this display it is possible to find information on all Transmilenio's services for weekdays, Saturdays and Sundays. From the point of view of the OEs this is an achievement since it provides any given passenger with an overview of the system. For the CEs this is not an achievement because the display is very confusing. Although it does not betray the general spirit of the communication and signage strategy it does overload the passenger with too much information.

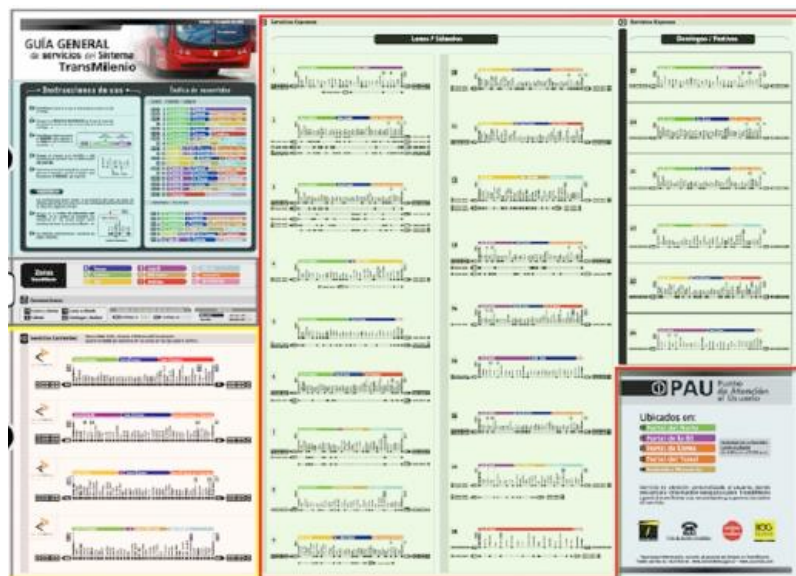


Fig.7: Guia General of Transmilenio.

The above discussion presents evidence of the existing tension between OEs and CEs in their conceptions of what a user is and should be in relation to representational tools. For CEs, users are characterized by their cognitive capacities and the purposes of their trips. Users do not intend to know how a system works. They just want to get from one place in the city to another and they normally know the few routes they use regularly. Therefore, for the CEs, a simple system is also desirable from the user point of view.

For the OEs, users are and should be able to comprehend the complexities of the system in order to use it effectively. An OE told me:

My analysis is that in the end the change that Transmilenio is providing is only for the generation that was born with Transmilenio. Not for those of us who were born earlier, who went out in the streets to waive at

the old bus and to ask the driver for information. People prefer to ask instead of reading. The problem with the new system is that they have to read and because there is a table (the index shown in Figure 7) they think it is complex. They have access through Internet but that is a technology and a language that only the new generations can understand.

Therefore, while the CEs think of a user as a person that should be serviced by a system that is easy to read, the OEs think users should accommodate to the complex management of the system which in their opinion is what makes Transmilenio so efficient. In addition to the classical STS point about the dilemma of adjusting technologies to people instead of adjusting people to technologies, what we see in this case is that in deciding what a user is, major decisions are made about how the screening device should be configured: what should be changed in the map and what should be changed elsewhere in the rest of the system.

In this section, I have analysed how the communications and operations experts in Transmilenio discussed what the map of Transmilenio as a screening device. Rather than only being a discussion of the map as a symbol or representation, I have shown that it was also a discussion about the object of representation, the index, the symbol and its *interpretant* (Peirce, 1991). I claim, therefore, that the design of the map of Transmilenio might be seen as a process where much more is at stake than a mere representation of an urban transportation system. In this sense, the map acted as a screening device, organizing information, work and relationships both inside and outside the representation.

Does this have any consequences for the city of Bogotá? In the following section I present some reflections about the relationship between the representation of the system and the city with specific attention to how the map may become an icon.

Representation: Maps, System And The City

The main purpose of an urban transportation map is to provide users with a tool to find their way through the transportation system. Maps help any given passenger to move from one place in the city to another and thus help them use the transportation system for travelling. However, as I have illustrated above, urban transportation maps have many more effects. In this section I describe the ways in which a transportation map may also constitute the city.

In his detailed history of the Metro in Washington, Zachary M. Schrag (2006) describes how the opening of the system in 1975 produced a whole new experience for the inhabitants of the city. Schrag states that the: "Metro encompasses the vital core of the Washington area, yet its layout is simple enough to be taken in at a single glance (...). [It] becomes a way to get around Washington not only physically but mentally. (...) It makes the city familiar again." Lance Wyman designed the map of the Washington Metro following many of the features of the iconic London Underground system map developed by Henry Beck in the 1930s. Schrag claims that the Washington Metro map "is easily one of the most frequently seen representations of the metropolitan area: it appears not only in Metro cars and stations, but on orientation signs in D.C. and Arlington, in the phone book, and in every tourist guide book" (Schrag, 2006: 251). The author provides several other details about how the names of many stations were intensely negotiated by different institutions and interest groups to refer to places that were in their vicinity (both close to the stations and in some cases not so close) to enhance their visibility within the urban fabric.

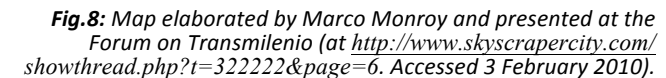
I suggest that similarly, the map of Transmilenio also constitutes the city of Bogotá. First, the map of Transmilenio is becoming the most used representation of the city as a whole. Second, its very constitution brings together an integrated view of the city, which previously did not exist as a normalized circulating screening device. Third, the names of the Transmilenio stations have also been negotiated. In Bogotá, however, this emergent screening device has to be

understood against the backdrop of the pre-existing organization of the city which is unique among the national capitals of the world: Bogotá has numeric nomenclature.

At the end of the 19th century, the city administration adopted a numerical nomenclature to organize the city. The streets of Bogotá that run parallel to the mountains were called carreras, and those that were perpendicular to the mountains were called calles. Thus, the address Calle 118 # 52-40 is located in calle 118 North (if it were South, there would be an S after 118), with carrera 52 more or less 40 meters away from the corner. This is not a simple system but it has enabled the city to function without a map. London and Copenhagen need maps and books with pages and pages of indexed street names. These special devices are compiled to help people find their way around the city. As a resident or visitor in these cities, I need to use the AZ in London or the Krak in Copenhagen in order to get around especially if I change my routines or go somewhere I have never been before or do not visit regularly. In Bogotá, people just needed the address and maybe the neighbourhood or district to orient themselves and find their way to a new place. Therefore, throughout the 20th century, residents of Bogotá did not use maps. They were not important in everyday life in the city. With the numerical nomenclature (literally a Cartesian grid system) and the mountains as a visible reference edge people could find their way around. Some nodes, landmarks and districts were also used but all these elements were second-level devices for orientation (Lynch, 1960).

Since its introduction in 2006 the map has become the single integrated and most used screening device of the city in everyday life. Transmilenio stations are becoming as important as street numbers for making sense of the city, of distances, and of the location of places. During the design phase, various planners suggested that the station names should be in accordance to the nomenclature of the city; thus, the station should be named after its address. But other planners and stakeholders suggested that the stations should be

Although Transmilenio is not the most commonly used mode of public transportation, and although ambitions that Transmilenio should cover the whole city have been lowered, I claim that the system still has the potential of becoming the most important structuring element of the city second to the mountains. This is happening because Transmilenio has been overtaking the main trunk lines of the city, playing the role underground systems play in other cities. Statistically it may not be the most used mode of transport but its configuration in the current arena of development of the city makes it a powerful actor (Valderrama, 2010). Therefore, just as in London, the Transmilenio map has the potential of establishing the transportation station and the trunk lines as the main organizing principle of the city. In this sense the Cartesian grid may be replaced by a combination of paths and nodes as is characteristic of cities like London and Copenhagen. In this sense the map may be surpassing its initial purpose of representing the transportation system and end up also representing the city (Vertesi, 2006: 25).



Following David Turnbull's (2003) suggestive discussion of cartography the case of Bogotá reveals that maps are lies. They are the outcomes of processes of selection, compilation, classification and composition of geographical data. I claim that their success as screening devices depends on the outcome of the process of production as I have described in the case of Transmilenio. The processes of assembling knowledges to produce a specific representation also imply a process of re-configuration of the transportation system. This is reflected also in the way the map works as a screen. I propose that the map has two roles: It can vanish or be present, just like is the case with computer screens (see Schull, 2005 and Ziewitz, this issue). The map as a 'vanished screen' implies that the representation comes to the foreground and the map fulfils its role of providing guidance to navigate the city. But it can also come to the foreground, be present, be meaningful in itself, become an icon and perform the city.

Janet Vertesi's study of the London Underground map is a fascinating analysis of how maps perform. Her contention is that apart from being produced in a contingent way, these screens act in various ways, "mediating between the user and the complex socio-technological system of the city" (2008: 25). Her main argument is that

(...) when following an immutable mobile from its site of production to its site of mass use, we notice that the mutability is not necessarily in the image's physical form or delineation, as Adrian Johns has famously critiqued. Rather, the mutability lies in the representational referent, the image's indexicality, which changes in an appropriated (but still expert) context of use. In what we might call a 'visual language game', the visual language of the map is sensically interpreted such that the image comes to represent not just the subway network, but also London itself. (2008: 25)

In Peirce's terms, it is the use of the image – the *interpretant*, in this case the use of the map – which defines whether it is an index, a symbol or an icon. When used as an icon, as something that exists in itself or an abstraction that performs, the map becomes active in defining the system and the city.

A significant tradition in urban studies and urban history shows that the city is much more than physical conglomerates, economic units or cultural formations (e.g. Farias and Bender, 2009). The city also exists in discourse, in events, in travel catalogues, as global examples of achievements, tragedies or miseries. Cities exist as statistics and as images (Lynch, 1960). They also exist as circulating references or immutable-mobiles that make up the city as they move. Bruno Latour (1990) has argued that the accumulation of knowledge of distant peoples and places is only possible through the circulation of inscriptions – inscriptions that register details about the world and that both lose and gain something as they move: They lose proximity with the observed, the amount of detail they can convey; and they gain relationality with other inscriptions. Therefore, those accumulating inscriptions achieve power in centres of calculation (Latour, 1987, 1990). Furthermore, Latour has argued that cities exist because a multitude of images and screens make possible the distributed coordination of the heterogeneous elements that constitute the city: traversing, proportioning, distributing and allowing. Images and screens can do this because they are dockets: dynamic images that alternate constantly between what they represent and what they do (Latour and Hermant, 2006). In line with these conceptual developments, I claim that urban transportation maps are screening devices that both represent and constitute the urban transportation system itself and the city.

Conclusion

I have analysed the map of Transmilenio as a screening device. I have analysed the map as a dynamic inscription where information about the system is displayed for various actors to coordinate their actions. One of the effects is that the Transmilenio system works as a guidance for traveling citizens, but one that is constantly being negotiated. Another effect is that map acquires its status as an icon and performs as such *vis-à-vis* a broader audience.

An example of the negotiations of the map as representation was the discussion about what should be included in the map and what should be left out. While the operations experts advocated including every detail in the map, the communications experts proposed applying the principles of progressive disclosure. Thus they proposed to develop a map with very little information, while spreading more detailed information all over the stations and the buses in order to provide it to the user on the spot, which in turn implied simplifying the system itself.

An example showing how the discussion was also a discussion of how the system itself should be configured relates to the coordination between the wagons in the stations and the destination zones in the city. For the communication experts, a one-to-one correspondence between wagons and destinations would simplify the structure of the system and make it more accessible to users. On the other hand, the operations experts were committed to maximizing the operation capacity of the system as a whole, which implied providing more services per destination. Since some destinations had more services than others it became impossible not to distribute the services to the most demanded destinations in several wagons in the same station. Therefore, from an operational point of view, it was not possible to have one-to-one correspondence between wagons and destinations.

In short, the operations experts demanded that the map and the accompanying displays should have the capacity to reflect the complexities of the system which they wanted to radicalize in order to

achieve the most efficient bus rapid transit system in the world. Conversely, the communication experts proposed a simplification of the operation of the system to make it more accessible in cognitive terms to passengers. It is therefore clear that they were not only discussing the representation but also the configuration of the system itself and how it should evolve.

The tensions between the experts were also reflected in their different definitions of the normal user. For the communication experts the user is defined by a long tradition of design studies including way-finding and signage as well as information and the cognitive limitations of the human brain. Thus, for CEs the normal user does not attempt to understand how the system works but bases her knowledge of the system on her understanding of the few routes she uses regularly. In contrast the operations experts expected the user to become more and more capable of understanding how the system works as a whole. Therefore they advocated delivering as much information as possible to the user.

As many other studies have shown, a map is not only a representation (Schrage, 2006; Vertesi, 2008). Maps perform in various ways. They re-organize the images residents have of the city (Lynch, 1960; Schrage, 2006). And they may become part of what the city is (Vertesi, 2008). It would be interesting in future research to investigate how the map as a screening device has changed the ways the inhabitants of Bogotá make sense of their own city.

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Interviewees

Phil Berczuk, Steer Davies and Gleeve, London, 4 March 2009 and 21 October 2009.

German Lleras, Steer Davies and Gleeve Colombia, 20 February 2009, Bogotá, Colombia.

Orlando Santiago, Transmilenio S.A., 2 March 2009, Bogotá, Colombia.

Note on images

The images of the Map of Transmilenio used in this paper and a complete historical register of all the main maps are available at <http://sites.google.com/site/juliomb179/historicomapastm>

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