



**Imperial College  
London**

**Railway and Transport Strategy Centre**

# **The Operator's Story**

## **Appendix:**

## **São Paulo's Story**

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Community of Metros  
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# **The Operator's Story: Notes from São Paulo Case Study Interviews**

*February 2017*

## **Purpose**

The purpose of this document is to provide a permanent record for the researchers of what was said by people interviewed for 'The Operator's Story' in São Paulo. These notes are based upon 11 meetings between 19<sup>th</sup> and 22<sup>nd</sup> October 2015. Although the findings have been arranged and structured by Imperial College London, they remain a collation of thoughts and statements from interviewees, and continue to be the opinions of those interviewed, rather than of Imperial College London. Prefacing the notes are a summary of Imperial College's key findings, which will be drawn out further in the final report for 'The Operator's Story'.

## **Method**

This content is a collation in note form of views expressed in the interviews that were conducted for this study. Comments are not attributed to specific individuals, as agreed with the interviewees and Metro São Paulo (abbreviated to 'MSP' in the notes). However, in some cases it is noted that a comment was made by an individual external not employed by MSP ('external commentator'), where it is appropriate to draw a distinction between views expressed by MSP themselves and those expressed about their organisation.

## **List of interviewees**

Internal Metro São Paulo views:

- Paulo Menezes Figueiredo – Director President
- Mário Fioratti Filho – Operations Director
- José Carlos B. Do Nascimento – Finance Director
- Paulo Sérgio Amalfi Meca – Engineering and Construction Director
- Alberto Epifani – Director, Metropolitan Transport Planning and Expansion
- Luiz Antonio Cortez Ferreira – Manager, Metropolitan Transportation Planning and Integration
- Walter F. De Castro Filho – Director Assistant, Engineering and Construction
- Luiz Carlos – Engineering Directorate
- Alexandra Leonello Granado – Head of Legal Affairs
- Roque de Lazaro Rosa – Director Assistant

External views:

- Paulo Shibuya – CMCP – Concession and Permission Monitoring Committee
- Celso Jorge Caldeira – CMCP – Concession and Permission Monitoring Committee
- Rui Stevanelli – STM (Secretaria de Estado dos Transportes Metropolitanos – State government department responsible for planning; owner of Metro São Paulo) – Urban Planning Coordinator
- Renato Viégas – STM – Consultant
- Harald Zwetkoff – ViaQuatro (PPP operator of Line 4-Yellow) – President
- Maurício Dimitrov – ViaQuatro (PPP operator of Line 4-Yellow) – President

# General Summary of Metro São Paulo

GENERAL SUMMARY	
Relevance to international learning about Metro Operators	<p>This case study illustrates the following international lessons:</p> <ul style="list-style-type: none"> <li>▪ A truly integrated metro system requires integrated service planning and integrated ticketing, even in a system with multiple operators.</li> <li>▪ An independent, system-wide regulator may be able to mitigate the effects of an unsupportive enabling environment in areas such as contract design, funding, labour relations and planning.</li> <li>▪ The metro should be considered as an essential public entity by its authority and government, rather than considering it as a business-as-usual commercial enterprise. This may help reduce taxation spend for the operator.</li> <li>▪ The use of a Public Private Partnership (PPP) in São Paulo allowed for the creation of Metro São Paulo-designed new capacity, overcoming the challenge of limited public funding for metro investment. This provided Metro São Paulo with greater certainty over network development. The contract with the private sector operator is managed through a comprehensive set of service, quality and financial indicators. A PPP framework is also being used for Line 6 – Orange.</li> <li>▪ An annualised funding regime with separate budgets for operations and renewals hinders the Operator from developing a whole-life, long or medium-term view of asset management.</li> <li>▪ Incorporate design elements from the outset that favour high capacity operations in the long-term, for example, sufficiently large stations with double-sided platforms, moving block signalling, high-capacity terminals which allow for simultaneous train turnaround, long trains, etc. Metro São Paulo designed the system in this way and are also able to operate it to a world-class standard, using relatively high train speeds and achieving high passenger densities.</li> <li>▪ Create a standard and processes for major project benefits realisation to guide future investment objectively, for example adopting benefit/cost ratio methodology, alternative analyses, benefits prioritisation and project success criteria. This will provide certainty to the authority as to what major projects benefits will be, and will also help guide the authority when it is the decision-maker on major projects. Although monorail technology in São Paulo is as yet unproven in terms of its benefits, new projects are being approved by the city.</li> <li>▪ A lack of integrated land-use, development and metro planning risks capacity optimisation and potentially concentrates land uses rather than distributing them throughout a network.</li> </ul>
Background and history	<ul style="list-style-type: none"> <li>▪ First line opened in 1974: Line 1 (Blue), originally called the North-South Line. Subsequent new line openings took place in 1979, 1991, 2002 and 2010.</li> <li>▪ All lines have been developed, implemented and operated by Metro São Paulo apart from Line 4 which is the first PPP line delivered in Brazil's history under a 30 year contract. Metro São Paulo designed Line 4 and ViaQuatro were responsible for fitting out stations and operating the line.</li> <li>▪ Metro São Paulo is owned by the State of São Paulo, with no political, administrative or regulatory level between the Metro and government.</li> </ul>

Key dates and why they matter	1920s	Plan of the Avenues implemented in São Paulo, proposing an integrated transport and city plan with highways and public transport development. This urban plan proposed large boulevards connecting the city centre with its surroundings and marked areas for urban regeneration to attract investment. The plan also led to the expansion of São Paulo's bus network and the outwards urban growth of the city. Although the highway element of the plan was progressed, the public transport elements were not.
	1965	The population is recorded at approximately 5.5 million <sup>1</sup> .
	1968	São Paulo Metropolitan Company (Metro São Paulo) founded in April as a joint venture between three existing companies. Construction begins for Metro São Paulo Line 1 (Blue) in September.  The tram network, insufficient in terms of capacity for the city, closes.
	1970	The population is recorded at approximately 7.6 million people.
	1972	Construction begins for Metro São Paulo Line 3 (Red).  Zoning areas adopted in São Paulo creating suburban growth in the city and creating new travel patterns of outer to inner city commutes.
	1974	Line 1 of Metro São Paulo opens in September linking Tucuruvi to Vila Mariana. This comprised 7km of metro rail.
	1975	The population is recorded at approximately 9.6 million.
	1979	Line 3 of Metro São Paulo opens in March between Sé and Brás. Sé provided an interchange between Line 1. Line 3 currently operates a 103 second headway.
	1980	The population is recorded at approximately 12 million people.
	1980s	Land regulation and prices increased throughout the 1980s as a result of zoning law, driving the lowest-income population in the metropolitan area to build unregulated housing on brownfield land, particularly on the city's periphery.  The population in 1980 is recorded at approximately 12 million people. This has grown by 1990 to approximately 14.7 million people.
	1991	Line 2 (Green) of Metro São Paulo opens in January.
	1992	São Paulo Metropolitan Train Company created, responsible for suburban rail in São Paulo. The company incorporated railway lines managed by previous private and state railway entities. The suburban railway system now comprises six high capacity lines in the Greater São Paulo area and handles freight as well as passenger trains.  Carandiru Massacre in São Paulo takes place in October following inmate revolt, a major human rights abuse in Brazil's history.

<sup>1</sup> Population data extracted from World Bank World Development Indicators, 2015 dataset.

1993	It is estimated that 19.8% of São Paulo's population lives in favelas, largely concentrated on the outskirts of the city.
1995	The population is recorded at approximately 16 million people.
1997	Construction commences on the Expresso Tiradentes, a Bus Rapid Transit (BRT) system. A fully-segregated BRT system is never fully implemented, although high-capacity bus corridors with boarding platforms are implemented instead. The eastern extent of the original Expresso Tiradentes BRT plan formed the basis for the future Line 15 Monorail.
2000	Mayor Celso Pitta is ousted following accusations of corruption and Mayor Marta Suplicy is elected. Mayor Suplicy's transport policy focus was on improving the bus network in the city, in particular by proposing integrated ticketing and expanding the system.  The population of São Paulo is approximately 17 million people.
2002	Line 5 (Lilac) of Metro São Paulo opens, constructed from the outskirts of the city into the city centre.
2004	Contactless ticketing "Bilhete Único" is accepted on the bus network in São Paulo allowing two hours of travel on buses. As of 2015, customers pay R\$3.50 for up for four bus trips within a three-hour period.
2005	Mayor Jose Serra elected in São Paulo having campaigned to prioritise the metro over bus development. Single public transport ticket introduced covering buses, metro and suburban rail, further integrating public transport in São Paulo.

2006	<p>Contactless ticketing, “Bilhete Único”, is accepted on the rail system in São Paulo creating higher-quality passenger data and increasing passenger throughput across the metro’s stations. A flat fare system was also implemented, cross-subsidising the cost of long-distance suburban trips with short-distance core trips. Overall, this reduced the cost of travelling on public transport at a time of strong economic growth, increasing ridership by approximately 30% up to 2008. This caused major challenges for the metro in terms of capacity and revenue sustainability.</p> <p>Opening of new stations on Line 2 (Green), completing full 9.9km extent of Line 2.</p> <p>PITU 2020, the Integrated Urban Transport Plan for São Paulo, is updated. This plan covers new lines and bus routes, expansion and infrastructure, as well as creating some wider policy objectives focused on accessibility, equity, economic development and quality of life. The plan proposes developing 284km of metro, which would create a metro system approximately five times the current network size.</p> <p>Violence breaks out in São Paulo in May sparked by police-gang interactions. Public transport was widely suspended to avoid being targeted.</p>
2007	<p>Access tunnel collapses at the Pinheiros station construction site in January, the most serious accident on the network to date. This collapse created an 80m sinkhole absorbing houses and vehicles. Seven people died in the accident and all works were halted for two years while investigations took place.</p>
2008	<p>Record demand recorded on Line 3 (Red) at 1,468,935 passengers.</p> <p>Record demand recorded on Line 2 (Green) at 428,056 passengers.</p>
2009	<p>Line 15 (Silver) begins construction in December. This is the first monorail project in São Paulo.</p>
2010	<p>First stretch of Line 4 (Yellow) opens on São Paulo Metro in May. Line 4 is the first PPP line to be implemented in Brazil and is operated by ViaQuatro under a 30 year contract.</p> <p>Platform screen doors begin installation on Line 3.</p> <p>The population in 2010 is approximately 19.6 million people.</p>
2013	<p>In June and early July, organised protests take place across Brazil against increases in bus, train and metro fare prices in Brazilian cities. This issue expanded to become a protests against public services and infrastructure and government corruption. The São Paulo State Government had increased the fare price from R\$3 to R\$3.20, following two years of fare increases across buses, metro and suburban rail.</p>

	2014	<p>2014 FIFA World Cup held in Brazil. São Paulo was a host city for 6 matches at the Arena de São Paulo, which was opened in 2014. The tournament had been a topic for national protests against the use of public funds for this purpose. It is estimated that US\$14 billion were spent on the tournament.</p> <p>Line 15 (Silver) of the São Paulo Metro opens. This is a monorail line that will eventually form 27 kilometres with 18 stations, although as of 2015 only 2.9km over 2 stations is operational.</p>
	2016	<p>Olympic Games held in Brazil in June and July without incident following several national issues. This included the impeachment of the Brazilian President owing to alleged corruption and budgetary mishandling and the Zika virus epidemic across South America.</p> <p>The current population of São Paulo is approximately 21 million people (2015)</p>
Current ownership and oversight		<ul style="list-style-type: none"> <li>▪ Metro São Paulo is a division of the São Paulo State Secretariat for Metropolitan Transport (STM). The Secretariat for Metropolitan Transport is responsible for planning new lines and extensions, although this responsibility is largely conferred upon Metro São Paulo.</li> <li>▪ Line 4 operated by ViaQuatro under a 30 year contract, the operation of which is subject to regulation by the Commission for Monitoring Concessions and Permissions for Public Services of Passenger Transport Systems (CMCP). ViaQuatro are responsible for operation of the service and maintaining systems, while Metro São Paulo remain responsible for infrastructure and auxiliary systems.</li> </ul>
Complementary public transport and non-motorized transport services		<ul style="list-style-type: none"> <li>▪ Buses: Bus services are widespread in São Paulo with approximately 112km of bus lanes throughout the city, as well as approximately 8km of city Bus Rapid Transit (BRT). There is also a 33km inter-city BRT line connecting São Paulo to three surrounding cities. Trolleybuses are independently operated by two companies: SPTrans and Metropolitan Company of Urban Transport (EMTU). Buses are under the control of the Metropolitan Mayor, compared to Metro which is controlled by the State. Approximately 9.7 million daily passenger journeys are made on the bus network. Overall, buses take the greatest mode share out of all public transport modes in São Paulo.</li> <li>▪ Surface trains: Companhia Paulista de Trens Metropolitanos (CPTM) run commuter rail services in the city along 6 lines, with two new line extensions currently under construction. Approximately 2.9 million daily passenger journeys are made on the CPTM network.</li> <li>▪ Cycling: Cycle use is currently low but the Municipal Government have a target of implementing 400km of cycle paths by 2016.</li> <li>▪ Walking and pedestrian infrastructure is considered under the city's Strategic Master Plan, which maps and directs growth until 2030. The Plan considers reducing private car use and parking controls to create better conditions for walking.</li> <li>▪ Taxis and other ride sharing schemes: Taxis are privately run in São Paulo and include Guarucoop, 99Taxis and Taxijá, all of which have a mobile interface. Ride sharing and on-demand taxi journeys are also available through Uber and Cabify. Uber drivers pay an administrative fee to the city for using its roadspace.</li> </ul>

<p>Technical and operational summary as of 2015</p>	<ul style="list-style-type: none"> <li>▪ 68.5 km under management – 57.4% underground, 21.4% elevated, 21.2% at grade</li> <li>▪ 23km of new lines under development (Line 6 – Orange, which will be a PPP line, and the Gold Monorail line)</li> <li>▪ 61 stations</li> <li>▪ 928 train cars</li> <li>▪ 0 km of feeder bus routes managed directly</li> <li>▪ 889 million passenger journeys</li> <li>▪ 1,934 million Brazilian real (USD 1,143 million equ.) in annual farebox revenues</li> <li>▪ 2,269 million Brazilian real (USD 1,341 million equ.) in total rev. / yr</li> <li>▪ 9156 employees</li> <li>▪ 23.7km of network length opened between 2005-2015</li> </ul>
<p>Regulatory, oversight, and policy bodies:</p>	<p><u>State of São Paulo</u>: Responsible for metropolitan public transportation, but constitutional constraints hinder the creation of a Metropolitan Transport Authority under State Government control. Metro São Paulo is not subsidised by the government. Establishing a regulator for non-PPP lines requires a State Law to be passed. The State Government sets metro fares through the Secretariat of Metropolitan Transport.</p> <p><u>Secretariat of Metropolitan Transport</u>: A State Government office that oversees public transport networks within the metropolitan areas in Sao Paolo, including Metro São Paulo.</p> <p><u>Institutional Relations Co-ordination (CRI)</u>: Responsible for co-ordination between State municipalities and companies who liaise with them, particularly relating to communications and marketing.</p> <p><u>CMCP (Commission for Monitoring Concessions and Permissions for Public Services of Passenger Transport Systems)</u>: There is a nascent regulator (CMCP) which regulates the PPP lines only. Otherwise, as a government division, Metro São Paulo operates in an unregulated environment.</p> <p><u>Metro Ombudsman</u>: Established and 1999 and linked to the Metro Board, this body receives, handles and responds to customer communications to Metro São Paulo, including complaints. The Ombudsman can initiate audit proceedings if necessary.</p> <p><u>Security</u>: There is a police station for the metro system (Delegacie de Policia do Metropolitanano de São Paulo) and metro agents have police powers if necessary.</p>

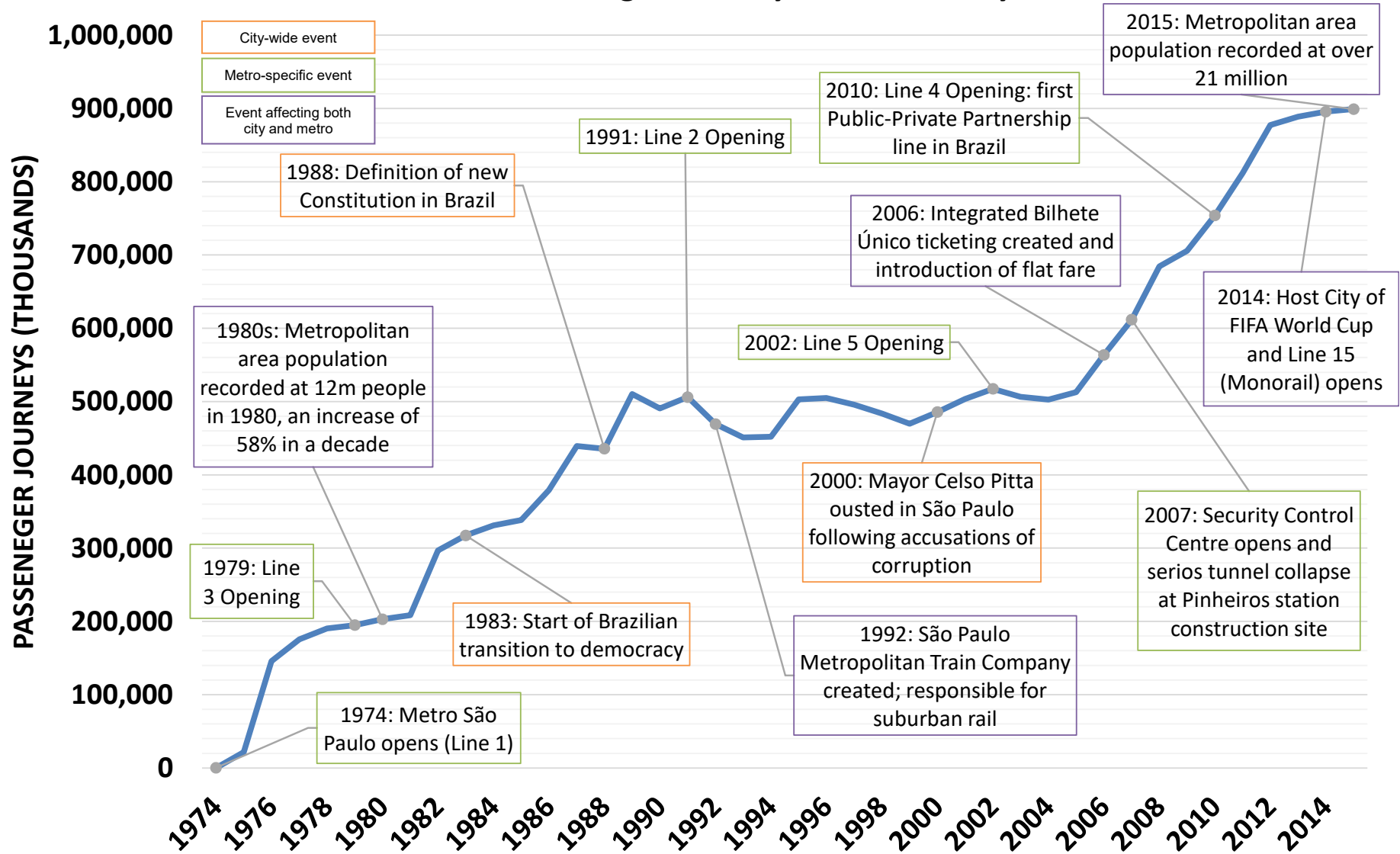


<p>Summary of legal and policy framework:</p>	<p><u>Federal Constitution (1998)</u>: devolves responsibility to municipalities to legislate for public transport, which is considered to be an essential public service. The Constitution has provisions for national legislation and policy for urban and interstate transport. City Statutes require that Integrated Transport Plans are prepared for cities in Brazil to guide the development of this essential service.</p> <p><u>PITU 2020 (Integrated Urban Transport Plan)</u>: This plan is a breakdown of investments and policies for public transport in São Paulo until 2020.</p> <p><u>CTC (Co-ordination of Collective Transportation)</u>: Policymaker for metropolitan passenger transport within the São Paulo State Secretariat for Metropolitan Transport.</p> <p><u>Co-ordinator of Planning and Management (CPG)</u>: Responsible for the Integrated Urban Transport Plan (PITU 2020) in São Paulo.</p>
<p>Key stakeholders:</p>	<ul style="list-style-type: none"> <li>▪ São Paulo State and associated bodies described above.</li> <li>▪ Metro Workers' Union: primary union for Metro São Paulo's labour force.</li> <li>▪ São Paulo Transporte (SPTrans) manages the concessionaires who operate bus routes in São Paulo and are responsible for managing the trolleybus network, bus lanes and terminals, business planning, route definition, hours and fleet requirements. SP Trans also manages the Bilhete Único contactless fare payment system. SPTrans are controlled by the Municipal Government.</li> <li>▪ Metropolitan Company of Urban Transport (EMTU) manages low and medium-capacity systems, operates a trolleybus system, and plans and oversees inter-regional transport between the regions in São Paulo state.</li> <li>▪ Paulista Company of Metropolitan Trains (CPTM) manages and operates the suburban railway in São Paulo.</li> </ul>

## Growth in Passenger Journeys and Key Events in São Paulo

The following graph demonstrates Metro São Paulo's growth in passenger journeys from 1974 to 2015, since the metro system opened. The graph includes selected key surrounding events that took place in São Paulo or nationally in Brazil, and selected events in the history of Metro São Paulo.

## Metro São Paulo: Passenger Journey Profile and Key Events



## Summary of Key Views Derived from Interviews

### Design, Planning and Integration

In many respects, Metro São Paulo (MSP) is a world-class operator. Line 3 trains are amongst the most loaded in the world. They operate at 2 minute intervals and more than 30 trains per hour – a world-class level of service – and describe doing so as “easy.” This success is underpinned by the metro’s high capacity design, including 3.2m wide trains, wide platforms, and separate boarding and alighting platforms at key destinations and interchanges. They are innovative – for example, MSP was the first metro in the world to use computer relay-based signalling and high capacity line turnaround in the 1980s.

MSP is in the rare position of being both the operator and also the planning body for the metro system (Transport for London is another example). They are able to accurately predict demand using regularly updated transportation planning models, and they can design optimally for high capacity, telling the government, for example: *“I need this design to build the capacity that you need.”*

MSP’s staff emphasised that integration requires both integrated ticketing *and* integrated service planning. Without both, a city’s public transport cannot be considered to be truly integrated. A smartcard system is difficult with multiple operators, but essential to achieve the necessary level of integration from a customer perspective.

### Governance

The state is using MSP as an instrument of social policy with insufficient consideration for the impact on the metro’s financial sustainability. The city relies so heavily on the metro, one would expect the city government to be fully supportive – yet many policies and actions work against MSP and are unsupportive: in respect of funding, labour relations, and planning.

MSP interviewees believe that they need both a regulator and a city-wide multimodal transport authority (like Transport for London). Currently there is a nascent regulator (CMCP) which employs 30 people, but it regulates the Public Private Partnership (PPP) lines only. MSP would like regulation such that MSP would be treated the same way the private concessionaires are. For example, a political requirement to operate very late nights for football games leads to additional maintenance cost (due to shorter maintenance time) and unpredictability for the future, but this is not addressed or compensated through any contractual process. Metro’s management is influenced by external control entities that may lead it to deliver less efficient service, whereas the private concessionaires can manage their organizations in an independent way.

MSP’s effectiveness is compromised by their constraints, regardless of how efficient they are. Both in London and São Paulo we found that it is very hard to know how efficient a metro is, but one can tell how effective it is by looking at the successes and how problems are addressed.

### Fares Policy; Control of Revenue and Costs

Fares are particularly political. Metro Sao Paulo belongs to the state governor and buses belong to the municipality mayor, so the two political entities compete to be seen to keep fares down – with the result that fares can only be raised by both modes simultaneously, and only in years with neither state nor municipality elections.

MSP illustrates the power of organised labour to disrupt and create a cost burden. MSP staff salaries go up at inflation +1% (inflation averaging ~6% over the last 10 years), compared with fares which, at the time of writing, are frozen in nominal terms. In addition, MSP staff receive

pay for length of service. In comparison, ViaQuatro pay for the job role, not for length of service.

MSP pays 38 taxes – together 30% of operating costs. If the company was considered a ‘federal public entity’ it would be exempt, but it is currently considered a regular company. If they paid no taxes they could fund all asset replacement. The tax burden on MSP is unusually high compared with other metros worldwide.

A key question MSP raised is the philosophical issue of whether metro is an essential public service like the fire and police? If so, it should have similar safeguards against staff strikes.

### **Major Project Development and Private Sector Participation**

MSP’s is a story of imposed constraints with unintended consequences. To overcome these, MSP is using coping strategies (in the form of PPPs) which they believe will ultimately hurt them (via preferential fare allocation to PPP operators) just to keep up with the service obligation. PPPs have been used to extend the network when there are no available government resources.

ViaQuatro’s PPP comes at a higher price in the long term than for MSP to build a line, but it can be achieved more quickly (due to lower restrictions on private companies) and it ensures the project actually happens. There are some queries over how asset management will work in the long run – but the key point is to create the reality that the line exists. MSP recognises that once the line exists, inertia works in favour of metro lines – even if the line is poorly maintained and not very good, at least it is there and can be upgraded when the money is available. Thus pragmatism is a key driver of PPP in São Paulo.

A key issue with public sector participation in construction is interface risk, particularly in the Line 4 model where MSP built the civil works and ViaQuatro built the systems. This is why an integrated model whereby the operator designs the civils and the systems will be implemented for Line 6 PPP.

ViaQuatro, the PPP operator of Line 4, is willing to “*do it and sort the paperwork later*” because they are looking for long term strategic gains (being awarded future lines), so value having a good relationship with MSP and the State. ViaQuatro’s operations – for example their customer behaviour education campaigns and their high-value non-fare revenue illustrates that the opportunities for private sector operators to innovate are large.

The other alternative to using PPP to fund lines where financing is constrained, is to build lines in very small sections as funding becomes available. Building new lines incrementally is currently the most realistic option for MSP within the constraints, but costs more than building the line all at once so is not ideal.

### **Risks**

MSP’s strategic challenges are:

- The increasing need to use PPPs to get projects built – and the fact that each PPP line reduces the proportion of fare revenue available to MSP, because PPPs have a contract specifying a shadow fare increasing with inflation, whilst MSP is exposed to reducing fares in real terms, and is simply allocated the revenue left over after the PPPs have been paid.
- Monorails – the technology is unproven, yet new projects are being approved by the city before the pilot is up and running
- Lack of proactive development planning – this means that metro planning and capacity optimisation is more difficult to achieve.

## Structure of Notes from Interviews

<b>1 Context</b>	1.1 Context is of central importance
	1.2 Metropolitan administration
	1.3 Public transport in São Paulo
	1.4 Metro São Paulo
	1.5 Outlook for Brazil - political/ economic
<b>2 Metro São Paulo</b>	2.1 Role
	2.2 Rail Planning
	2.3 MSP performance
	2.4 Finances
	2.5 Regulation
	2.6 Labour Relations
	2.7 Attitudes within and towards Metro
<b>3 MSP Operations</b>	3.1 Capacity and crowding
	3.2 Integration
	3.3 Operating hours
<b>4 Management processes</b>	4.1 Asset management
	4.2 Stakeholder management
	4.3 Risk management
	4.4 Benchmarking
<b>5 Major Project development</b>	5.1 Planning
	5.2 Design
	5.3 Project development
	5.4 Financing and Procurement
	5.5 Monorail?
<b>6 Private sector role</b>	6.1 Context
	6.2 Line 4-Yellow ViaQuatro – BOT
	6.3 Line 4-Yellow ViaQuatro's perspective
	6.4 Line 4 – service quality and reimbursement
	6.5 Lines 6, 17, 18 – full DBOT
	6.6 PPP comparison
	6.7 PPP Risks
	6.8 Future prospects
<b>7 Summary of Constraints placed upon Metro</b>	7.1 MSP is severely handicapped by legal issues
	7.2 MSP cannot procure projects efficiently because of procurement/ contracting issues
	7.3 MSP cannot control its Revenues
	7.4 MSP cannot control its Costs
	7.5 Bus integration should be better
	7.6 Major projects are developed under an enormous handicap
	7.7 Summary
<b>8 Strategic impacts</b>	8.1 MSP's coping strategies
	8.2 Outlook for Metro
	8.3 Conclusions
<b>9. Misc. Lessons</b>	9.1 Key words that keep recurring
	9.2 Key Suggestions by interviewees

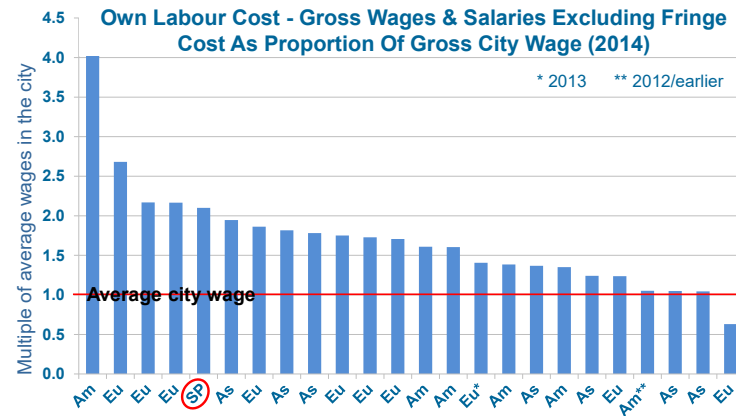
<p><b>1</b> <b>Context</b></p>	<p><b>1.1</b> <b>Context is of central importance</b></p>	<ul style="list-style-type: none"> <li>• Brazil is a relatively new (1983) democracy, with a new Constitution (1988) that places power with Municipalities <b>and has far-reaching unintended consequences</b></li> <li>• São Paulo is Latin America's No.1 commercial centre – a metropolitan region population 20.3mn. The macro-metropolitan area of São Paulo comprises 20% of the state, and accounts for 83% of São Paulo State's GDP and 30% of Brazil's GDP.</li> <li>• The 3 largest budgets in Brazil are: 1 - Federal gov't, 2- SP State, 3-SP city. Hence the importance of São Paulo.</li> <li>• Policy is strongly influenced by the metropolitan area's land use and population distribution. <b>Large numbers of poor people live around the periphery</b>, and a central transport imperative is to provide affordable transport for them to work</li> <li>• SP State is responsible for metropolitan public transportation, but constitutional constraints hinder the creation of a Metropolitan Transport Authority under State Government control.</li> <li>• Metro São Paulo (MSP) is impacted by 3 levels of Government – Federal, State and Municipal governments. The politics of the State differs from those of the Nation and City, but this does not materially impact what happens.</li> <li>• MSP is <b>95% owned by the State, which constrains what MSP can do</b> to manage the company</li> <li>• Transport competes with other sectors (health, education, justice etc.) for State funding. <b>The last 10 years have seen good times</b> – the combination of a 'money bubble' and a supportive State Secretary for Transport.</li> </ul>
	<p><b>1.2</b> <b>Metropolitan administration</b></p>	<p>There is the Federal Government; and the State to which 5 metropolitan areas report; and 39 Municipalities that are autonomous from the State yet have limited financial capability – although a 2014 law allows municipalities to sell construction rights to fund infrastructure.</p> <p>The 1988 Constitution places all legal powers over planning, including municipal buses with the municipalities. So there are <b>problems of integrating bus and rail planning</b> (the latter being state-controlled). <b>There is no Transport Authority, creating a dysfunctional form of government.</b> For example changes to the buses, cutting short bus routes at metro stations to save money for the Municipalities, without reference to MSP caused 800K ppd to switch to metro. To create an integrated transport authority, EITHER all 39 mayors would have to form a cities consortium alongside the state, which would require the mayors to voluntarily cede some of their powers to the consortium, OR it would be necessary to change the Brazilian constitution to make it possible to have a transport authority jointly run by the municipalities and the state. Of the two options, changing the constitution is probably simpler as politicians won't voluntarily give up their powers. Both the STM and MSP said that a unified metropolitan planning/transport authority is needed (like TFL in London).</p> <p>There is <b>no Development Plan for the State</b>. A first attempt was produced in 2014 looking ahead to 2030-2040 and prioritising investment in infrastructure. It estimated BRL 1bn pa would be required to implement this, rising to BRL 5bn pa by 2025. But recommendation for a Metropolitan Development Council to implement/monitor/ update the Plan does not exist, neither is it likely. So in practice there is no proactive plan to manage the State's growth. <i>"We have no authority on urban planning so it's very hard to achieve a balance"</i> – as a consequence, <i>"We decide where the metro goes so we are planning the city of São Paulo"</i></p> <p><u>Role of the State</u> Inter-city buses, rail – responsible for 1/3<sup>rd</sup> of trips</p> <p><u>Role of the City Government</u> Local buses within own borders – responsible for 2/3<sup>rd</sup> of trips</p> <p>MSP is owned 95% by the state, represented by the Metropolitan Transport Secretary (STM), 3% by the municipality of São Paulo City, and 2% by others. STM is the owner, not the authority. However, STM establishes significant limitations – MSP is not free to hire senior staff without</p>

		<p>seeking STM's permission (even when opening new lines), and STM determine ticket prices. STM itself answers to the Governor of São Paulo state, and so is politically influenced – e.g. fares are determined politically.</p> <p>There is significant micro-management: in addition to hire/fire restrictions, the Planning &amp; Finance Secretaries of the State Government have to approve all international travel, even if MSP is paying for it.</p> <p>A key administrative figure is the State Court of Accounts (Tribunal de Contas do Estado). This Tribunal has as main duties to preventing, investigating and sanctioning corruption and malpractice of public funds, with state jurisdiction (there are also national and municipal equivalents). This Court of Accounts creates significant difficulties in implementation of new projects. Every bidding process MSP has done has experienced problems with the Court of Accounts. These include the Court of Accounts requiring MSP to change the method of bidding. In particular, they view any technical specification as driving bids to a specific supplier, so although MSP is an informed client they cannot provide technical specifications at the level of detail that they would like. Overall, it can take 1-2 years to complete a single procurement process. <i>“It's very difficult to do procurement now in Brazil.”</i></p>
	<b>1.3 Public transport in São Paulo</b>	<ul style="list-style-type: none"> <li>• In 2012 all modes: 43.7mn trips/day, of which 14mn are NMT (non-motorised transport).</li> <li>• In 2015 metro + suburban rail + Line 4 = 7.4mn/day, on 11 lines, covering 334km and 155 stations</li> <li>• 6 lines and extensions are under construction (Line 4 phase II, Line 5 ext., Line 6 , Line 13 airport, Line 15, and Line 17); 2 other lines are at design stage (Line 2 ext. and Line 18). Line 13 is developed by CPTM; lines 6 and 18 are PPP DBOT concessions.</li> </ul>
	<b>1.4 Metro São Paulo</b>	<p>MSP is established as a public corporation (that requires regulating). It commenced operations in 1974.</p> <p>MSP is <b>not 'just' an Operator but also the Planning Agency</b> for metropolitan rail for the State <b>and the developer of major Modernisation and Extension projects</b></p> <p>Its <b>challenges include providing service under conditions of extreme overloading</b>, and modernising the system, and extending it - in some cases under PPP.</p>
	<b>1.5 Outlook for Brazil - political/ economic</b>	<p>The economy has had good periods (2008-10, 2013-4) and not-so-good periods. The <b>financial environment is not stable</b>, and this impacts major project development.</p> <p>This is in large part <b>a political crisis</b>, of widespread corruption at the heart of government and business, combines with an ineffective economic policy and low worldwide commodity prices. .</p> <p>Already:</p> <ul style="list-style-type: none"> <li>• Half of all 2013 projects have stalled as a result of the economic crisis</li> <li>• The 2016 budget for major projects was cut by the State from 2.0bn to 0.4 billion Rs</li> </ul>
<b>2 Metro São Paulo</b>	<b>2.1 Role</b>	<p>MSP's effectiveness may be summarised as: <b><i>“working mightily and effectively in the face of daunting challenges”</i></b>.</p> <ul style="list-style-type: none"> <li>• It is a hugely experienced Operator that also plans the rail system in SP State's 5 metropolitan areas, as part of an integrated public transport system</li> <li>• Operating a system carrying a mass ridership, often at capacity, effectively</li> <li>• Simultaneously modernising the system</li> <li>• And extending it</li> <li>• Currently all within SP City</li> </ul> <p>It has always been a technology innovator, 'learning by doing'. Today this applies to the rebuilding of rolling stock (at 60% of the cost of new), PPPs and Monorail projects</p> <p>By both planning the system and developing new lines, MSP adapts projects to changing circumstances until late.</p>

	<p><b>2.2</b> <b>Rail Planning</b></p>	<p>The context is set by: “<i>There is no culture of strategic long-term planning in Brazil at all</i>”</p> <p><b>Transport planning may be of necessity reactive</b> - because urban development planning is almost non-existent. So transport strategy is in practice a major determinant of development.</p> <p><b>MSP is very effective within this constraint.</b> Since the 1960’s there has been a process that first produced a Transport Strategy in 1968 – setting out the metro fundamentals, and this has been updated systematically every 10 years. Individual project decisions generally follow the Strategy, albeit sometimes changing phasing.</p> <p><b>Major effort is invested transport planning</b> - in OD and other surveys as a basis for the Strategy review. Forecasts are prepared for different scenarios. The <b>competence and effectiveness of MSP is widely recognised</b> - as a transport planning agency for the State, responsible for all rail planning in metropolitan areas.</p> <p><b>Its forecasts</b> for Line 4, 20 years before operations started of 700Kppd proved to be spot on. There is considerable confidence in its forecasts – that are expected to be within +/- 10%, these being written into contracts.</p> <p><u>Challenges as the Network has grown</u></p> <p><b>Inter-connectivity</b> is increasingly important, to reduce line loads and improve accessibility.</p> <ul style="list-style-type: none"> <li>• There are advantages in having a large and quite dense network: “<i>The network is like spaghetti – throw a line down anywhere and it will attract 600Kppd (CMCP)</i>”.</li> <li>• But developing this dense network poses problems at stations that are now required to perform a transfer role, but were not designed for this purpose.</li> </ul> <p>It is <b>essential to plan the public transport system as a whole</b> – but this does not happen for institutional reasons.</p>
	<p><b>2.3</b> <b>MSP performance</b></p>	<p>How does MSP perform given this challenging environment?</p> <ul style="list-style-type: none"> <li>• <b>Operations</b> are generally good or very good. <b>MSP is one of the world’s most overcrowded metros</b>, operating some of the world’s highest-frequency services.</li> <li>• Labour productivity is low and operating costs for reasons given – of huge overloading at stations and union demands not being resisted</li> <li>• MSP is within the considerable constraints it operates under an experienced effective developer and innovator of <b>major projects</b>. This does not mean the projects are delivered to time and budget. This is not possible in this environment for the many reasons explained.</li> <li>• MSP had a high level of <b>customer satisfaction</b> until politicians decided fares must be low and this triggered huge overcrowding, since which MSP has suffered.</li> </ul>
	<p><b>2.4</b> <b>Finances</b></p>	<p><u>Mandate</u> - MSP is required to meet its operating costs from revenues. The cost of Modernisation and Extension projects is provided separately by the State.</p> <p>Budgets are agreed for 5 years ahead, reviewed annually.</p> <p><u>Revenues</u> comprise:</p> <ul style="list-style-type: none"> <li>• Fare revenues. These comprise <ul style="list-style-type: none"> <li>➢ Fares from its own magnetic tickets (10% of rides) – single or discount cards for multiple rides, or</li> <li>➢ Allocated revenues from the clearing house for smartcards (70% of all rides) operated since 2006 by the City. The first 60% of revenues go to the bus operations. The remaining 40% is split between metro (including PPP operators) and CPTM. <b>MSP receives what is left</b> after ViaQuatro is paid in full. This is inequitable, as ViaQuatro’s shadow fare is higher and inflation-linked, whereas real fares are not – leaving a deficit that falls on MSP. “<i>It’s a deal that was done to benefit the government, not the metro.</i>” “<i>MSP pays the government’s debts.</i>”</li> </ul> </li> </ul>



		<ul style="list-style-type: none"> <li>➢ Reimbursements for concessions (&gt;60yr, disabled, unemployed for 3month, poor students, military), which comprise 20% of all rides. State government requires the concessions and provides BRL300m to fund them – an amount decided annually and paid monthly. However the actual cost of the concessions is BRL400m/year – leaving MSP with a BRL100m deficit. MSP has accurate records showing exactly how many journeys were made by these concession types; the government always pays less than actual costs. The gap is increasing – in 2015 MSP expects a revenue loss equivalent to 8-9% of total. <i>“[the State] concedes new free fares on our system without consulting us or analysing it.”</i></li> <li>• Non-fare revenues – at about 10% these are good. In part because of major shopping developments on land owned by MSP. MSP charges a fee for the land use and collects a percentage of the revenue. Other sources include adverts, small shops in stations, and mobile phone companies using their tunnels to transmit data. <ul style="list-style-type: none"> <li>➢ The same legislation as applies for contracting assets applies to NFR business – i.e. no detailed specifications etc. This loses MSP many opportunities.</li> </ul> </li> <li>• Capex funding is also provided by the State, to fund modernisation (new trains, resignalling) and expansion. <ul style="list-style-type: none"> <li>➢ If budgets overrun, MSP has to ask the state and justify why more is needed. This can then be provided in a future year of the 5-year rolling budget.</li> <li>➢ If funding is not available, MSP reduces the speed of implementation and renegotiates speed of delivery with suppliers.</li> </ul> </li> </ul> <p><u>Fares</u></p> <p>The flat fare is R3.50 for all modes, with free transfer between metro and suburban rail, and discounted transfer between rail and bus. A journey involving the rail system (metro/suburban) and up to 3 buses costs BRL5.65. The flat fare is in place because the lowest-income people live on the outskirts of the city.</p> <p><b>Fares are very political</b> – major demonstrations organised by protest group ‘Zero Fares’. Metro and bus always have the same fare because metro belongs to the state governor, and buses belong to the municipality mayor – and neither wants to set a higher fare than the other. So they do a deal to match fares and only raise at the same time. There are elections every 2 years (alternating between mayor and governor) and there is usually no fare increase in an election year.</p> <p>MSP recommends a new fare to STM annually, based on latest cost data. They do not always get what they ask for. In theory MSP operates without operational subsidy, whereas CPTM is subsidised.</p> <p><u>Operating costs</u> comprise:</p> <ul style="list-style-type: none"> <li>• Labour (75%) – MSP considers <b>these are far too high</b> – too many staff and over-generous conditions (and every improvement benefits management too). <i>“If we could control our manpower costs, we would have a good control on costs. We have many people who we don’t need, but we can’t fire”</i></li> </ul>
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- Energy – the federal government **doubled prices** last year
- Materials
- **MSP pays 58 taxes – together 30% of operating costs.** A ‘federal public entity’ is exempt from municipal and state taxes, but MSP is currently considered a regular company so pays normal taxes. MSP is currently fighting to change this.
  - 38% of the cost of an asset is tax. **If MSP paid no taxes they could fund all asset replacement**
  - Municipal tax on revenue was reduced to zero in 2013.
  - The city still charges real estate land tax on stations

MSP is now cutting costs due to the fare income deficit. However they can only cut labour costs through voluntary retirement so it is likely that service may suffer: *“I am worried that the need to cut costs will drive the quality of service down.”* They will pursue savings through eliminating manual magstripe ticket sales.

*“At the same time we are charged for our inefficiency, and told to do things that create inefficiencies”*

## 2.5 Regulation

MSP is established as a public corporation. There is at present **no regulator**. *“This allows Government to say that MSP is inefficient”*. *“We would very much like to have [a regulator] to show how efficient we are”*

At the encouragement of financing groups, the State Government in 2006 established:

- An ‘interim regulator’ in the Commission for Monitoring Concession Permits **CMCP**. Its role is to act as an Agency to regulate PPP operators.
- **A full Regulatory Agency is expected to be implemented within 18-24 months. Its role will be to regulate both PPPs and public sector corporations such as MSP.** This requires a State Law.

### CMCP

Context: *“We are all on a (regulatory) learning curve now (CMCP)”*.

CMCP has about 35 staff and is led by an experienced public administrator who gives power to the work of its good technocrats.

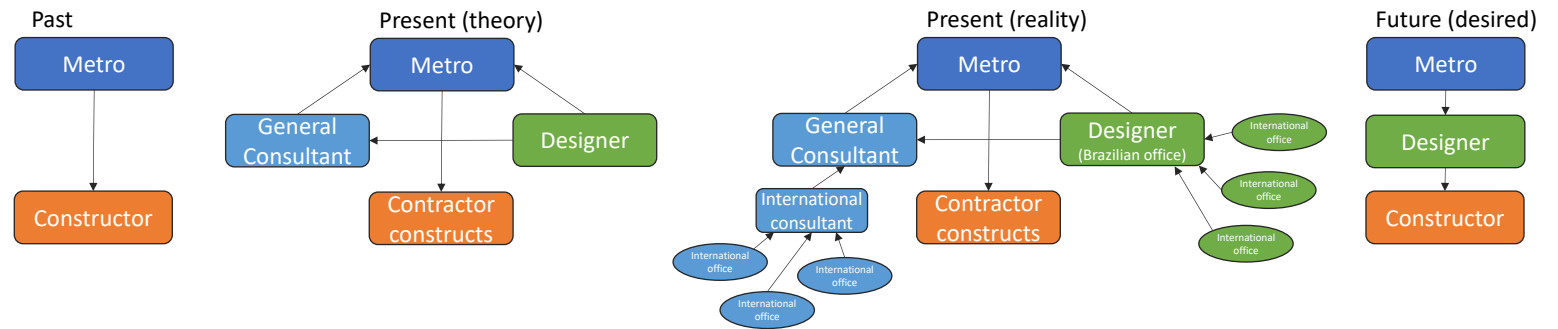
		<p>It is <b>neither 'light-touch' nor a fully independent regulator</b>. This may be because MSP fully developed Line 4 in the expectation that it would be a public sector project, and now there is a need to ensure implementation accords with the plans – considerable technical checks are required, both during construction and maintenance during operations. The contract defines KPIs that the regulator checks.</p> <p>There is a problem in a city where everyone who knows about metros has worked for Metro/ CPTM. This poses the risk of regulatory capture - challenges for the regulator to keep its distance when performing its role.</p> <p>The history of regulation is:</p> <ul style="list-style-type: none"> <li>• Line 4 – there were major interface issues between the public and private contracts. These often concerned timing and had consequences for suppliers (Live 4 trains are arriving in January but \Phase 2 will not be open and there is nowhere to store them). There was reliance on MSP for detailed technical/ administrative matters.</li> <li>• Lines 6 and 18 – an independent consultant group will perform MSP's role</li> </ul> <p><u>Which PPP model – Line 4 or Lines 6 and 18?</u></p> <p><b>The Line 4 approach</b> incurs serious interface risks.</p> <p><b>Lines 6/18 are BOT's</b> with responsibility for implementation and O&amp;M with the concessionaire. The assets will revert to MSP. Here the challenge is to:</p> <ul style="list-style-type: none"> <li>• Ensure operational influence throughout the project development period so that decisions are taken on a whole-life basis</li> <li>• Ensure adequate maintenance leaves the assets in a satisfactory condition for future operations.</li> </ul> <p><u>Incentives and penalties</u></p> <ul style="list-style-type: none"> <li>• CMCP expects, based on MSP's transport planning expertise, demand to be forecast within +/- 5 or 10%, and this to be used as a basis for defining demand risk</li> <li>• Line 4 – KPI's are used to monitor performance – operational/ maintenance and customer satisfaction</li> </ul>
	<p><b>2.6</b> <b>Labour Relations</b></p>	<p>Labour benefits are a particular cost, with annual salary increases always greater than inflation, and social security plus benefits meaning the actual cost of employment is 2.4x the gross salary.</p> <p>Labour relations are the greatest financial constraint – the union is very strong and a major political power. <b>STM asks MSP to reduce costs, but will not let MSP risk a strike</b> so then tells them to do anything necessary to avert one – so they always end up at a tribunal, which always judges in favour of the workers. <i>“At the same time we are charged for our inefficiency, and told to do things that create inefficiencies”</i></p> <p>Labour relations also constrain staffing. Since 2000, MSP has to have a public hearing to approve all hirings except managers – at staff level, they have to take anyone who passes the test. They can only fire staff for wrongdoing – there is no opportunity to downsize.</p>
	<p><b>2.7</b> <b>Attitudes within and towards Metro</b></p>	<p><b>Within MSP</b> there is a strong public service culture. Everyone we met was a professional committed to doing their level best to provide good service for the public.</p> <p><b>Attitudes towards MSP are shaped by other actors.</b> For example: The context: <i>“Does the State understand the metro business? No!”</i></p> <p>MSP has tried hard to engage with e.g. the Financial Secretary of State, bringing him to CoMET to help develop a partnership, but no sooner do senior politicians start to understand metro than a new person is in post. <b>Not understanding metro is a product of circumstance – not just attitude.</b></p>

		<p>There is also a wider assumption in Brazil that public officials are likely to be guilty of corruption (and the Petrobras scandal will make this worse). Processes set up to address this present difficulties to honest managers: <i>“The law already assumes the administrator is corrupt.”</i></p> <p>In the past, the metro’s approval rating was even higher than the fire department – well-liked by the public.</p> <ul style="list-style-type: none"> <li>• The unclear powers over the transport system have 2 consequences: they cause conflicts and the public is unclear who is responsible for what. Both can impact adversely on MSP.</li> <li>• The metro’s past approval rating was 95%- so politicians wanted to be associated with it. Now the media is now more critical <u>because</u> the politicians are associated with the metro – metro is a way of getting at politicians. They encourage passengers to send pictures of problems for publication. Today the rating has dropped to 66%.</li> <li>• Following the low fares policy, when demand and overcrowding increased, with the travelling experience declining – so MSP’s public approval rating fell from 95% to 66%. This is a major problem created by others and not readily addressed.</li> </ul>
<p><b>3</b> <b>MSP Operations</b></p>	<p><b>3.1</b> <b>Capacity and crowding</b></p>	<p>MSP’s success is underpinned by its high-capacity design. When Line 1 was designed, the military government was in place and MSP was left alone to <i>“do whatever you want.”</i> This enabled the operator to design and build what was optimal, without interference. <i>“Operationally, I am free to do anything I want”</i></p> <p>MSP considers operating trains at 2min intervals “easy,” even with passengers holding doors. This is a world-class level of service.</p> <p>Line 3 trains are likely to be amongst the most loaded in the world. New and modernised trains have fewer seats to allow more standing space.</p> <p>MSP is being asked to provide a women-only car. They do not want to do this for social and operational reasons. Socially, they do not believe women should have to travel in a particular car to be safe. Operationally, segregating the train would mean less efficient use of capacity – which would be disastrous in one of the world’s most crowded metros.</p>
	<p><b>3.2</b> <b>Integration</b></p>	<ul style="list-style-type: none"> <li>• There are two smart card systems that are used in the São Paulo metropolitan area (39 municipalities). Both smart cards can be used in the railway network (metro and CPTM, Line 4 included) as well in buses.</li> <li>• The first is the BU (Bilhete Unico), smart card that is managed by the Secretariat of Transport and Transit of City of São Paulo Municipality Government <ul style="list-style-type: none"> <li>○ This smart card’s use is segregated to the City of São Paulo and cannot be used in other municipalities</li> <li>○ This smart card allows physical and fare integration with financial benefits for the customer (bus/railway integration fare &lt; bus fare + railway fare)</li> </ul> </li> <li>• The second is the BOM (Bilhete do Onibus Metropolitano) that is managed by the intercity bus operators and regulated by EMTU that acts as public transport authority related to buses and that belongs to the same State Secretariat as metro and CPTM do. <ul style="list-style-type: none"> <li>○ This smart card allows physical integration between the metropolitan buses that run connecting the cities of the Metropolitan Region of São Paulo (39 municipalities)</li> <li>○ There is no financial benefit for the customers out of this integration</li> </ul> </li> <li>• Note: besides that there are local bus networks within each municipality that do not integrate with the railways.</li> </ul> <p>There is no charge for interchange within the railway system (Metro, Line 4, and CPTM). The first free integration was between L3-red and the parallel CPTM line 11 at Bras and Luz, in early 2000s. This immediately caused such an increase in demand that MSP had to establish operational holding patterns to cope with all the people interchanging. <i>“Actions that are not thought through can drive you into problems.”</i></p>

		<p>When the bus-rail integration fare was introduced, MSP proposed a fare of BRL4.2, but government decided BRL3. This was a significant reduction from the pre-integration fare. As a result, demand rocketed by 10% per year, and “<i>there was no time to consolidate fare and demand growth with network growth,</i>” leading to MSP’s extreme overcrowding.</p> <p>Because there is no single integrating authority, it is in bus operators’ interests to divert crowds onto the metro wherever possible (to reduce costs). So whenever a new line opens, the bus lines are rerouted as feeders to the metro, without consulting MSP at all. “They don’t have any obligation to ask us.” Some stations have immediate 10% passenger number increases.</p> <p>The metro lines are planned to form part of an integrated transport system, but in reality the system is not managed in an integrated way. This results in a high cost to the public purse, as there is lots of competition between locally-sponsored services, resulting in high inefficiency.</p> <p>MSP believes an authority is needed to control routes, be responsible for balancing capacity between modes. Constitutionally, the municipality is responsible for transport, but does not have regulatory powers over the whole system. If an authority was established, the mayors of the 39 municipalities would lose power. The mayors’ election campaigns are funded by the owners of private bus operators, so they would risk losing election funding.</p> <p>Lack of cross-institutional planning also creates higher project build costs. MSP has to make urban adjustments outside its remit just to get projects done – e.g. new roads, viaducts, bridges, canalization of rivers, population relocation...</p> <p>Interchange stations are becoming more problematic. Often the best place to integrate a new line with an old one is not feasible within the dimensions of the existing station. Additionally, if government interference changes the phasing of projects, it can cause a temporary passenger overload at one place because the design assumed that an alternative route would already exist at the time of opening.</p>
	<p><b>3.3</b> <b>Operating hours</b></p>	<p>Operating hours are defined as 0440-1200.</p> <p>MSP bowed to STM pressure to operate until 2430 after football games during the World Cup. Now they have been pressurised to do this after all late football games, and to guarantee connections throughout the network. So although the last entries may be at 2430, they need to keep running trains until approx. 0130 to provide connections throughout the system. These operations happen every 2 weeks on average.</p> <p>Late operations after football games transport 15,000 people and are loss-making, as well as preventing maintenance taking place. The main loss is that maintainers are being paid but cannot do any work. The L4 PPP operator also expressed concern that when running late there is not enough time for maintenance.</p> <p>MSP is also under some stakeholders’ pressure to provide 24 hour operations.</p>
<p><b>4</b> <b>Management processes</b></p>	<p><b>4.1</b> <b>Asset management</b></p>	<p><b>The last 10 years has seen good times</b> – a ‘money bubble’ and a supportive State Secretary for Transport. During this time <b>MSP has been opportunistic</b>, implementing major Modernisation Projects including a signalling upgrade. All stations are now fully accessible, and several had been upgraded (cleaned, toilets added etc.).</p> <p>MSP has a plan for asset reinvestment, but it is only achieved if the government has and provides the money. For the next year, MSP asked for BRL 2Bn but received BRL 0.4Bn</p> <p>98 trains are being modernised, being stripped back to the bare shell and rebuilt with air conditioning, new power and braking systems. This costs 60% of the price of a new train. The technology update will mean the trains last for another 20-30 years.</p> <p>MSP believe that contracted-out maintenance is more expensive and less effective than doing it in house, partly because of procurement laws. For example: Electronic equipment needs specific software to do maintenance. The law prevents a supplier contract that lasts &gt;5 years so they would constantly have to re-contract. Thus they decided to maintain in-house and reduce dependence on suppliers.</p> <p>Generally, inadequate attention is given to Asset Management in PPPs. For example for Line 4 PPP, the contract requires all assets at the end of the 30-year period to be fit for a further 5 years’ service (during which MSP would decide future policy). This is clearly inadequate.</p>

	<b>4.2 Stakeholder management</b>	MSP is prominent in wanting to interface with all stakeholders. But their efforts are sometimes thwarted – by the State providing neither understanding of its business nor staffing continuity that would allow this to be gained; and by Municipalities acting without reference to MSP in the case of bus integration and major projects.
	<b>4.3 Risk management</b>	<b>‘Risk’ is a word rarely encountered in this case study</b> , and yet should be central to just about everything. Because MSP can control little, there may be an acceptance that some risks (project risks in particular) will always end in downside outturns.
	<b>4.4 Benchmarking</b>	MSP places considerable importance on its CoMET benchmarking, in driving many of its decisions.
<b>5 Major Project development</b>	<b>5.1 Planning</b>	<p><b>MSP creates the Transit Rail Strategy, identifies priority projects and develops them right up to the ‘go’ decision and procurement.</b> Having said this the State intervenes extensively on priorities, phasing and technology. All technology innovation decisions are taken to the STM for approval – this includes the use of monorail for new lines, for example.</p> <p><b>MSP carries out all capital expansion planning</b> from inception/concept planning, to integration planning and systems planning</p> <p><b>Project planning adapts well to changes</b> – because MSP both plans and develops projects it is able to change project development late in the day as circumstances change. <i>“A big benefit of integrating planning with implementation/ operations is ensuring decisions are based on understanding the totality of the project rationale”.</i></p> <p><b>Planning and Implementation must be coordinated</b> – when there is heavy overcrowding on the existing system it is important to plan project implementation with great care.</p> <p>The original network was designed in 1968 by estimating demand for every possible link and OD pair, and then building the metro network to maximise capacity along the most congested corridors: <i>“all the connections should support a high number of passengers.”</i> São Paulo is a sufficiently dense and populous city that if it was possible to build a metro line offering 140Kpphpd, they could fill it. <i>“Put a map on the table and throw a piece of spaghetti. In São Paulo, wherever it falls you can build a metro line with 600,000 riders per day”</i></p> <p>There is a future network plan for the next 20 years, approved by STM. This is followed spatially but not temporally – <i>“we don’t change the location of the lines”</i>, but the State Governors change the sequence of implementation according to the location of their political patronage within the city. E.g. planning technicians recommended L19 before the L2 extension, but the L2 extension will be done first because the governor has political patronage in the L2 extension area. The plan is formally reviewed every 10 years, so whilst providing geographical stability is also flexible to new realities. E.g. in 1980s the SP metropolitan area population increased from 11 →22m. This couldn’t have been predicted, so original network plan had to be expanded – but now means some transfer stations weren’t originally designed for this and are too small.</p> <p>Certainty over the locations of the lines comes because the routes are based on OD research, so planners know where the line needs to be. Sometimes the detailed location may change slightly (e.g. moves one avenue across) but this would be due to technical obstacles, not political ones.</p> <p>The planning process is built on Origin-Destination data from a mobility survey undertaken every 10 years with ~30,000 households. Demand is forecasted using a generalised cost model, updated and re-simulated 1-3 times per year with new projections based on planned investment, e.g. if the government planned a major investment near a metro station.</p> <p>Transport planning in São Paulo is state of the art: The ridership forecasts for Line 4 were made 20 years before operations started, and were correct to within 5%.</p> <p>Having 180km of metro by 2025 would halve average trip times in the city – a huge quality of life improvement. An aspirational total of 350km is sometimes proposed, but it is the 180km that will make the difference.</p>

	<p><b>5.2 Design</b></p>	<p>MSP designs its network for high capacity, and presents projects to the State in the context of <i>“I need THIS design to offer the capacity YOU need.”</i> By doing this, they have somewhat avoided the problems experienced by other metros in terms of original design not offering sufficient capacity for the future. The key to this approach is getting the maths right – knowing what capacity will be needed, and knowing what design best suits that capacity. For example, they decided on 6-car 132m trains because this train length would best enable high frequency operations.</p> <p>Efforts were made in the 1970s to standardise architecture wherever possible, whilst recognising that there cannot be a ‘one size fits all’ approach to stations to allow for passenger loadings. Newer standard designs maximise use of natural light, even down to platform level.</p> <p>MSP designs all projects up to the ‘basic project’ stage, which includes enough details about systems and subsystems for detailed cost estimates, and to get all environmental permits. This includes a basic specification for civils, electric, systems, signalling and “good insertion in the urban fabric”</p> <p>Innovations in metro operational design include being the first metro in the world to have computer relay-based signalling in the early 1980s, and having GoA2 ‘hands free driver’ where the train driving, and door open/close happens automatically unless the driver intervenes – the only thing the driver must do is terminal turnaround.</p>
	<p><b>5.3 Project development</b></p>	<p><u>Brief history of network:</u></p> <ul style="list-style-type: none"> <li>• <u>Lines 1-3</u> were developed in the 1970s-1990s, Lines 1+3 as whole lines, Line 2 in phases.</li> <li>• <b>Then there was a gap</b>....until <b>2008 when a major expansion strategy was developed</b>. By this time <b>MSP had lost expertise/ manpower – and had to rebuild</b></li> <li>• <u>Line 4</u> – being built in 2 phases. Phase 1 complete (6 stations), 1 station of 5 in Phase 2 complete so far</li> <li>• <u>Line 5 Lilac</u> – is being extended</li> </ul> <p>Time is the key driver of decisions – if a project can’t be done within a 4 year political term, it probably won’t happen. <i>“We don’t do whole lines like Chinese metros, we do many small sections.”</i></p> <p><u>Organisation for project development</u></p> <p>Because MSP cannot build up its Projects Department (it cannot later cut staff when workload reduces), it contracts out the role of Project Manager to a General Consultant, and who in turn contracts out the Detailed Design. MSP retains concept design and is the Client for GC and DD. MSP then lets the implementation contracts. In reality, MSP remains involved in detailed design as the general consultant and the contractors often have different technical opinions and call in MSP to arbitrate. This means MSP retains some ownership, but the need for constant involvement is inefficient. The problem is that it’s easy for a GC to supervise/analyse numbers, but less easy for them to own concepts (design). Ultimately, <b>the people reviewing the design should be the people who will ultimately own what is being built</b>. Additionally, the whole of Brazil suffered the same dip in construction so the consultants are lacking expertise for the same reasons as the metro.</p> <p>MSP also provides construction supervision. They currently have 10 people supervising construction on Line 4. After a construction incident, the Justice said that the contractor AND MSP’s supervisors were guilty.</p> <p>MSP has mixed experiences of using <b>foreign companies</b>:</p> <ul style="list-style-type: none"> <li>• Foreign companies bring global expertise by sub-contracting work around the world. The local presence is minimal and the ‘brain function’ is elsewhere. It is essential the local entity has to be effective at coordinating everything – but this is not always the case.</li> <li>• There is not adequate knowledge of what MSP wants, or local conditions (e.g. soil conditions or local equipment available). Often foreign companies bring designs requiring kit that is available in EU but not Brazil.</li> </ul> <p>The main outcome of the above is project delays. MSP would like to revert to the old model where it did more in-house...but it does not at present have the expertise to undertake the GC/Project Manager role because it is constrained in its staff hiring/ firing policy.</p>



Growing importance of Environmental/ Social impacts

There is no balance between consideration of immediate direct costs and long-term overall benefits. Regulators act on immediate adverse impacts, not long-term benefits.

- “Constructing a metro is an environmental and social benefit”
- “If I make an application to build a metro line, or Volkswagen to construct a plant, it’s seen the same way”
- “It took 2 years to remove one tree with a lone parrot in it ...”
- “if we remove a tree we have to give compensation by planting others in other locations”
- Underground construction is one response. **Elevated metros are considered unacceptable.** It took considerable time to get an Environmental License for Monorail Line 15, and this required meeting the many objections/ requests imposed e.g. to build a bicycle route
- MSP negotiates with all stakeholders to secure rights-of-way and relocate those whose land is acquired. This is challenging. It is essential to obtain an Environmental Permit before a project can be bid.
- Expropriation is problematic, especially with squatters who are re-housed, and the land invaded again. This requires agreement with the land owner and alternative housing provided for those relocated. Finding the land owner can also be a problem. In one recent example it took 2 years to relocate 60 families. Sometimes more families re-invade the cleared land because it is known that if they are on the land, MSP has to build them housing. When land is contaminated this also adds time.
  - For the new PPP lines, the private sector won’t accept the risk of expropriations, so the State takes on the cost but the PPP contractor does the work.
- Often City and State imperatives are different. MSP adds value by designing-in bus interchanges, but although it consults with everyone, Municipalities often act without advising MSP.

There is a conflict between the environmental benefits of doing the work quickly and getting the metro working, vs taking care of all the social and other environmental issues. “Each line we construct brings environmental benefits”

- The law facilitates delay and stakeholders seeking to gain from the project by ‘gold-plating’ remedial works, requiring complementary works unrelated to the metro (water and power companies, new roads for the municipality etc. “We believe that the laws should be written to help us build public transport as quickly as possible”
- Of course all these delays conflict with the politicians’ time pressures...



		<p><i>"In Brazil time is the driving force – with 4 years (the electoral period) maximum. We start our projects without money...build the first 2-3kms and then see..... Projects are never stopped, just slowed down....however bad the project". "The absence of political support for implementation means there is delay.....and delay means that ....Metro fails!"</i></p>
	<p><b>5.4 Financing and Procurement</b></p>	<p>MSP expects bids to be +/- 10% of its estimate. The criteria it would like to apply in evaluating bids are the following:</p> <ul style="list-style-type: none"> <li>• Company experience</li> <li>• Method of construction</li> <li>• Manpower and equipment</li> <li>• Duration</li> <li>• Planning of construction</li> </ul> <p><u>But Law 8666</u> makes price the only criterion. The assessment of other criteria it is argued could be seen to be subjective. Bidders are required to certify minimum technical expertise by providing certification of having completed similar projects, but many times this minimum technical expertise has not been enough for the execution of the contracted project. MSP provides a reference price, and all bids must be below this. Performance incentives are not possible in the contracts, although they can include penalties.</p> <p>The latest contract awards represented average 20% discount to MSP estimates. Brazilian law allows a bid to be discounted up to 50% below the average price of the proposals. Line 4 had 2 lots, one 42% and one 38% below the reference price, but this was under World Bank procurement so they had to take the lowest cost bid. This winning company had no structure in Brazil, only 1 director and 1 engineer, but MSP had to hire them because they were the cheapest. Eventually, MSP unilaterally broke this contract due to the contractor's non-performance. This partly stemmed from them not having sufficient local staff to understand Brazilian conditions – e.g. they wanted to pay subcontractors 60-90 days after the work was done, which is not normal practice in Brazil.</p> <p><i>"Brazil is such a bureaucratic nation. A formal failure can make administrators guilty."</i> Managers can be personally fined values that can reach 1 month salary for each formal failure. Most senior managers have been fined; one was fined 4 times in the last year. These fines are not covered either by the Organisation or by professional indemnity insurance. <i>"It impacts because you are afraid to take a decision" so "managers take the least risky decisions."</i></p> <p>Sometimes MSP only gets one bid, and MSP is fined for 'not writing a good bid document.' But they are not permitted to take draft TOR (terms of reference) to potential suppliers to assess whether the bid document is well written, as it would be seen to be giving those suppliers an unfair advantage. Equally MSP cannot consult a tribunal before issuing bid documents to check if the tribunal considers them OK – instead of acting to prevent problems, they have to wait to fail. The system continues because it looks good to the public to have these controls and show that MSP (and other public companies) are constantly being scrutinised – but actually the only benefits are to lawyers and to contractors, who can sue if they do not win a contract.</p> <p>This problem is not just for MSP: <i>"In the last eight years, because of problems from environment licensing and other legal questionings, the State of São Paulo invested fewer resources than the ones potentially available".</i></p> <p>PPP has not been used as substitute to Law 8666. But it rather has been used due the lack of financial resources from the State Treasury and additionally the constraints imposed by the Fiscal Responsibility Law that establishes limits on the State taking loans and thus the private partner provides financial resources to cover this lack of resources in the short and long terms.</p>

		<p><b>IFI financing</b> can add considerable value, in addition to the loan, in assisting MSP to avoid procurement difficulties – e.g. <b>World Bank rules require shortlisting of good suppliers</b>, whereas it is too bureaucratic to even exclude bad suppliers under Brazilian law.</p> <p>PPP is supposed to make it easier for federal government to participate in funding, because IFIs need federal authorisation. Because MSP is State-led, this means that the State and Federal governments have to agree.</p> <p>Difficulties in procurement is predisposing MSP towards privatisation to exempt themselves from public procurement difficulties: “<i>we should privatise everything, because it’s not possible to administrate like this.</i>” This could be achieved by the State selling part of its share of Metro, or concessioning individual lines. “<i>If there was any participation of private sector, corporate governance would be better.</i>” A minority private shareholding would mean the company has to follow stock market governance rules and have less state interference. A shareholder agreement would give MSP some of the same protection from stakeholders that the PPP contractors have (e.g. fares assurance).</p> <p>The federal government is considering creating a new infrastructure ministry which would join transport and other relevant ministries, and unify laws on infrastructure. This may include a new law on bids for big infrastructure projects to get around the existing issues Suppliers must be made responsible for quality as well as price.</p>															
	<p><b>5.5 Monorail?</b></p>	<p><b>Line 15 (part operational)</b></p> <p>Originally to be a BRT project, the State decided its forecast demand required a Monorail – that would also be cheaper than an underground MSP. This was to be a Demonstration Project with a capacity of 30+Kpphpd (c.f. normal monorails in operation have capacities of 15-20Kpphpd). MSP was responsible for developing this project, bidding and bringing it to operations. There are only 3 suppliers worldwide – SCOMI (KL), Hitachi and Bombardier. Bombardier was the winning bidder for this pioneering project concept. But it experienced extensive problems with CBTC that did not work, and they did not have good staff to solve problems. “<i>When you sign a contract you are married to that supplier – for the duration (including spares)</i>”. Michelin are the only supplier of the specific rubber tyres mandated by Bombardier, at unknown future cost. Even the tyre lifespan and disposal cost is unknown. Conventional metros are completely different with many competing suppliers.</p> <p>Currently operations are between 2 stations, and ridership is just 8Kppd so far. There is a problem with ride quality relating to the pre-tensioned beams that provide a bumpy ride. This is expected to be rectified.</p> <p>Monorail and underground are compared as follows, using MSP’s experience:</p> <table border="1" data-bbox="725 995 1944 1347"> <thead> <tr> <th>Criterion</th> <th>Monorail Line 15</th> <th>Metro underground</th> </tr> </thead> <tbody> <tr> <td>Time to implement</td> <td>Expected to be much quicker – but in reality not, as main delay is land acquisition and supplier delays (Bombardier CBTC issues), not line construction</td> <td>Many difficulties</td> </tr> <tr> <td>Initial Cost</td> <td>Expected: 40-50% of underground metro Actual: 60-65%. BRL6.4Bn for 26km</td> <td>100%</td> </tr> <tr> <td>Operating cost</td> <td>similar</td> <td></td> </tr> <tr> <td>Capacity pphpd ‘000’s</td> <td>Practically: 30 trains/ hour * 1000/ train (@6pax/m<sup>2</sup>) = 30K</td> <td>60-80 proven</td> </tr> </tbody> </table>	Criterion	Monorail Line 15	Metro underground	Time to implement	Expected to be much quicker – but in reality not, as main delay is land acquisition and supplier delays (Bombardier CBTC issues), not line construction	Many difficulties	Initial Cost	Expected: 40-50% of underground metro Actual: 60-65%. BRL6.4Bn for 26km	100%	Operating cost	similar		Capacity pphpd ‘000’s	Practically: 30 trains/ hour * 1000/ train (@6pax/m <sup>2</sup> ) = 30K	60-80 proven
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	(Supplier says 45K, with 90s headways but believe 120s is realistic. Train supports 8pax/m <sup>2</sup> )	
Ride quality	Currently poor but should be good	Good
Procurement and asset replacement	3 suppliers worldwide 1 tyre supplier <i>“When you go to monorail, you are attached to that supplier forever”</i> – likely that maintenance / replacement costs may be higher than metro, although beams thought to require less lifetime maintenance/replacement than rails	Many suppliers competing incl. new low-cost Chinese
Alignment	Curvature fits well into the environment	Less amenable to fit with constraints
Role	To replace BRT But capacity of BRT is 20-25K, at a fraction of the cost, and can be developed incrementally	High capacity corridor
Summary	Monorail looks to have similar construction time, and is likely to provide 40-50% of the capacity of underground metro at 60-65% of the build cost, similar operating cost, and potentially higher maintenance/renewal costs. <b>In São Paulo’s specific conditions, monorail does not currently appear to be a good alternative to metro, although operational experience may change this picture.</b>	

*“If you have a huge population, don’t do anything less than a heavy conventional metro.” “Monorail replaces BRT projects, we will never use it to replace metro.”*

Although L15 was agreed as a proof of concept and is not yet open, a second monorail – L17 – is already under construction. The build decision was taken in 2010 to link to Congonhas airport ahead of the 2014 world cup. However the line is not yet open (2016). Currently, only a short section of the original whole line is being constructed. *“The problem here in Brazil is that we start our projects without money.”*

Although the monorail was actually an upgrade from BRT, the public see it as a downgrade from metro – there was an outcry, and public prosecutors are now asking MSP why they’re building monorail not metro. The public says they want metro – but what they mean is ‘transport of metro quality.’ People on outskirts have suburban rail, which is more appropriate, but say they want metro – because the service quality is better.

<b>6</b> <b>Private sector</b> <b>role</b>	<b>6.1</b> <b>Context</b>	One person at MSP defined PPP as “A partnership with a private operator, when the fare is not sufficient to cover the capital investment”  <u>Brief history</u>
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		<p>In the 1990's, after an IFC Study in 1996 to establish how to finance Line 4, Brazil negotiated with the World Bank for a loan with private sector financing. <i>"This was a new way of thinking... a blank sheet of paper."</i> But at that time the fare would not support repayment of the State + WB + private loans</p> <p>In 2001 Congress commissioned studies of how PPP could work. This led to the <u>2004 PPP Law</u>. Line 4 was then rapidly bid, with a contract signed in 2006. <i>"We are all on a learning curve now"</i>.</p> <p><u>Why PPP?</u></p> <p>Whilst <i>"PPP is more expensive"</i>, the Line 4 PPP was justified on the basis of</p> <ul style="list-style-type: none"> <li>• For line 4: Least upfront capital cost – State did not have the money available upfront. This remains the formal reason for using PPPs.</li> <li>• A secondary benefit of PPPs is that they overcome procurement constraints – PPP bidding can include a more stringent pre-qualification process than regular procurements, and PPP contracts can include performance penalties (although not incentives). Moreover, once the PPP contract is assigned, the PPP contractor can then procure all sub-contracts directly, circumventing the public procurement process and associated roadblocks posed by the State Court of Accounts.</li> <li>• Rapid/predictable delivery time – partly because of less interference by State Court of Accounts</li> <li>• Least operating cost</li> </ul> <p><i>Inter alia</i> because</p> <ul style="list-style-type: none"> <li>• Public sector bidding constraints could be avoided, and</li> <li>• The risk of cost overrun could be better managed</li> </ul> <p>To incentivise effective delivery, capital repayments were concentrated in the early years of operations.</p> <p><u>Equity</u></p> <p>The Operator does not have to take equity – because these companies do not have deep balance sheets and are often not risk-takers</p> <p><u>Risk allocation</u></p> <ul style="list-style-type: none"> <li>• Capital cost – varies. For BOT mainly private sector</li> <li>• Operating risks – private</li> <li>• Fare – for Line 4 a 'remuneration fare ' is defined, and the State covers the difference between this and actual fare</li> <li>• Demand – a central demand forecast is defined. For the first 6 years of operations the concessionaire carries all risk within +/- 10%. Above this and &lt;+40% the State receives 90%, and below 10% private receives 90%.</li> </ul> <p><i>"Concessions are a learning process"</i> – each one fixes issues that occurred previously and produces new problems</p>
	<p><b>6.2</b> <b>Line 4 Yellow</b> <b>ViaQuatro –</b> <b>BOT</b></p>	<p>Line 4 is a short high-density line, today carrying 700Kppd on a 10-km line.</p> <p>It was developed by MSP as a public sector project. It defined the functional project, performance parameters, and expected to implement it itself. As the Government did not have all financial resources to implement the line itself, it was decided for a private partner to be contracted under PPP. Under this concept:</p> <ul style="list-style-type: none"> <li>• The civil works, track-work and rails were contracted by MSP as a public sector project using its Basic Design</li> <li>• The rolling stock, signalling, communications, and O+M were then bid as a PPP.</li> </ul> <p>This division was based on MSP funding everything it could afford with the funding available, and packaging the rest into a PPP. Because of this, the concession's operating concept follows MSP's requirements laid down in the bidding documents.</p>

		<p><b>ViaQuatro</b> – is the JV led by CCR (60%) - with Mitsui, Montgomery (incl. Oderbrecht) and RATP. It won the 30 year O+M concession. By law it the JV cannot work elsewhere or enter new businesses; although its constituent members such as CCR can and do - CCR is a powerful local group operating transport concessions in Brazil, including the Salvador metro and Rio trams.</p> <ul style="list-style-type: none"> <li>• Work started in 2004 and operations between 2 stations commenced in 2010.</li> <li>• The trains are Siemens/ Hyundai-ROTEM. The headway capacity is realistically 90-120 secs, and the train capacity 1900 passengers. PSD's are installed.</li> <li>• VQ employed good people who used to work for Metro, at higher wages. MSP is worried about a brain drain of staff moving to future concessions. VQ's staff are generally young (compared with MSP's average 30-40 age range)</li> <li>• VQs labour costs are lower. Wages started lower, the union is newer, smaller, and weaker than MSP's, and there are no annual pay rises for length of service (cf 1% at MSP) – if staff are not promoted, there is no wage increase.</li> <li>• It receives R1.9 per passenger (average of 10% exclusive riders to Line 4 and 90% who pay integrated fares). This is fixed as a shadow fare. Thus the concessionaire holds demand risk, but not fare risk.</li> <li>• Demand risk is capped and collared at <math>\pm 10\%</math> of original estimates. This value was chosen because it was the error margin of the demand forecasting model. This adjustment mechanism lasts 6 years after the final stretch of the line is open, intended to cover the approx. length of debt payment. After 6 years there is no more demand mitigation.</li> <li>• Line 4 is a short line with very dense ridership. Their passenger density is higher than MSP's as there are no comparatively peripheral parts of the line with lower ridership.</li> <li>• 20% of shadow fare income is adjusted based on KPIs. 30% of the Quality KPI represents customer satisfaction.</li> <li>• Non fare revenues are 7% of VQ's total income</li> </ul> <p>Comments on the concession:</p> <ul style="list-style-type: none"> <li>• Bus integration is Government's responsibility. VQ faces competition from some State-controlled bus routes</li> <li>• Flexible attitudes are necessary – 'fix urgent problems now and make the case for compensation later'</li> <li>• Responsiveness and innovation to changing circumstances are necessary – e.g. to doubling of energy costs (focus on off-peak), and water shortages (treatment/ collection facilities). VQ is clearly quick on its feet</li> </ul>
	<p><b>6.3</b> <b>Line 4-Yellow</b> <b>ViaQuatro's</b> <b>perspective</b></p>	<p>When necessary, VQ is happy to work with MSP to just get things done and sort out the paperwork later. E.g. when a construction company walked out in phase 2 and took away their security agents, VQ called CMCP and arranged for MSP security to replace them temporarily. This indicates a good working relationship – yet this trust-based approach to getting things done is precisely the type of scenario where senior staff are at risk of being prosecuted for irregularities by the Court of Accounts. When MSP's fibre-optic supplier went bankrupt during construction, VQ offered to do the work.</p> <p>As concessions are 30-40 years but not forever, all project criteria including procedures and calculation of major specifications should still belong to the metro: <i>"MSP has to hold procedures, performance specifications, technical specifications, all criteria to maintain"</i> – but whilst maintaining a judge and auditor role, MSP should not slip into doing the O&amp;M themselves on PPP lines: <i>"If there is a concession, the public authority has to have a 'let it go' feeling."</i> In one case, VQ were fined for making what CMCP thought was the wrong operational decision – VQ believes this type of decision should be delegated to the private partner: <i>"you don't enter into day to day discussion of minor things"</i></p> <p>A model where concession and state-run lines coexist in the same city can promote healthy competition, e.g. over customer satisfaction scores – although <i>"There is jealousy about what MSP gives the concessions to do, and if they do it better than Metro"</i></p> <p>Innovations include energy saving projects addressing train acceleration, air conditioning, tunnel lighting and building lights; rainwater collection and treatment. They benchmark costs internally against previous years. Other innovations include a lawyer in the operations control centre to advise on what is permissible for security during big events; user education campaigns to avoid cellphone use in stations as it slows down</p>

		<p>passenger flow. They are also focusing on higher-end retail and higher-technology visual advertising, as they believe this will enhance customer loyalty through enjoyment of the station environment.</p> <p>It is inevitable that equipment and infrastructure lifecycles will become tailored to the length of a concession: <i>“the operator will tend to build infrastructure that lasts the length of the contract and not a day later.”</i> VQ is contractually required to hand back everything with at least 5 years’ life and spare parts. They suggested that instead concessionaires could be required to refurbish everything in the last year of the concession and hand back in as-new condition.</p> <p>Brazilian law has some assets bound to the concession, which the concessionaire can’t sell – if replaced, they have to give the old one back to the government or sell and use the proceeds for upgrades. Other assets, such as computers, are ‘not bound’ and the concessionaire can do what they like with them. All the equipment is audited every 5 years.</p> <p>The maintenance program is set by VQ and approved by CMCP. Once approved, VQ has to stick exactly to their own plan - they would be penalised even for doing extra maintenance.</p>
	<p><b>6.4</b> <b>Line 4 – service quality and reimbursement</b></p>	<p>The remuneration tariff (TR) is calculated as follows:  <math>TR = [(Pe \times Tr) + (Pi \times 50\%Tr)] \times [80\% + (10\% \times Iqs) + (10\% \times Iqm)]</math>  Where Pe = passengers exclusively on Line 4, Pi = passengers who interchange, Iqs = Service Quality Indicator (between 0 and 1), Iqm = Maintenance Quality Indicator (between 0 and 1)  <i>“It doesn’t matter what the government wants to do in terms of politics and integration, we receive our tariff”</i>  The specifications for the Service Quality and Maintenance indicators were written by MSP based on what it is achieving itself – an advantage of being an informed client.</p> <p>The Service Quality Indicator is calculated monthly as follows:  <b><math>IQS = 0,20 \times INT + 0,15 \times TMP + 0,05 \times ICO + 0,10 \times IAL + 0,10 \times ICL + 0,05 \times IVA + 0,05 \times IRG + 0,30 \times ISU</math></b></p> <p>Where  INT = Interval between trains on the peaks (monthly average of the ratio between Scheduled and Performed)  Objective: Monitor the regularity and amount of offered places  TMP = Average time path (monthly average of the ratio between Scheduled and Performed)  Objective: Monitor the speed of movement of users  ICO = Compliance with the Scheduled Offering (monthly average of the ratio between Scheduled and Performed)  Objective: Monitor the compliance with the daily planning of supply  IAL = Accidents with users on Line 4 (No. of accidents / Passengers carried in the month in millions)  Objective: Monitor the safety level of Line 4.  ICL = Crimes with users on Line 4 (No. Crimes / Passengers carried in the month in millions)  Objective: Monitor the public security level of Line 4  IVA = Access Validation (ratio between the number of measurements in which the user spent more than three minutes in the line of turnstiles and the total number of measurements on the peaks - monthly average)  Objective: Monitor the time spent in access to paid area  IRG = General Complaints on Line 4 (Number of complaints / Passengers carried in the month in millions)  Objective: Monitor the manifestations of the users of dissatisfaction with the service provided  ISU = User Satisfaction Index - calculated every six months (satisfaction survey – CSS). A multi-year average is used to mitigate fluctuations due to external reasons (e.g. protests, strikes, World Cup). There is some concern that CSS could be adversely affected by long-term external issues</p>

(recession, unemployment) – but “*It’s not a worry yet because the contract threshold is 70% and we have 89.*” VQ plan to compensate for any external fluctuations with customer service, e.g. having drinking water available during delays.

The Maintenance Quality Indicator is calculated monthly as follows:

$$IQM = (0,30 \times MRO + 0,30 \times EST + 0,30 \times VIA + 0,10 \times MON) \times FC$$

Where:

MRO = Maintenance Quality of Rolling Stock

Objective: Monitor the performance (MKBO) and availability of trains during peak hours

EST = Maintenance Quality of Stations

Objective: Monitor the conservation / civil maintenance of stations (including equipment and systems)

VIA = Maintenance Quality of Track, Signalling System and Main Ventilation

Objective: Monitor the conservation and availability of route for train circulation (equipment and systems)

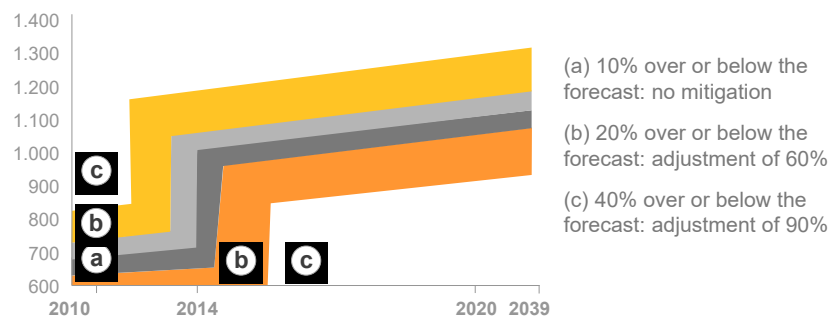
MON = Availability Index Monitoring of Terminal in OCC (Operational Control Centre) Metrô/SP

Objective: Monitor the availability of Line 4 operating information for the OCC Metrô/SP

FC = Multiplicative Factor of the data reliability

Objective: Measure the reliability of the data obtained in the scheduled preventive maintenance management and occurrences

There is also a demand mitigation mechanism, should demand fall outside the ±10% margin of error on the ridership predictions. In reality, ridership has been within 5%: “*we had 40 years of OD data which is a tremendous advantage.*”



The performance regime for Line 6-Orange will also include performance incentives, for the first time.

**6.5  
Lines 6, 18 –  
full DBOT**

Line 6 Orange

This is in implementation, and is the first full DBOT in Brazil. The private concessionaire does everything and carries demand (not fares) risk. Learning from Line 4, MSP is about to sign an agreement with the State that the State will cover any discrepancy between the agreed ‘remuneration fare’ and the actual fare set by the state – in theory resolving the deficit experienced as a result of this discrepancy on Line 4. However, the State will take the money to fund this from MSP’s capital investment budget – so MSP still loses.

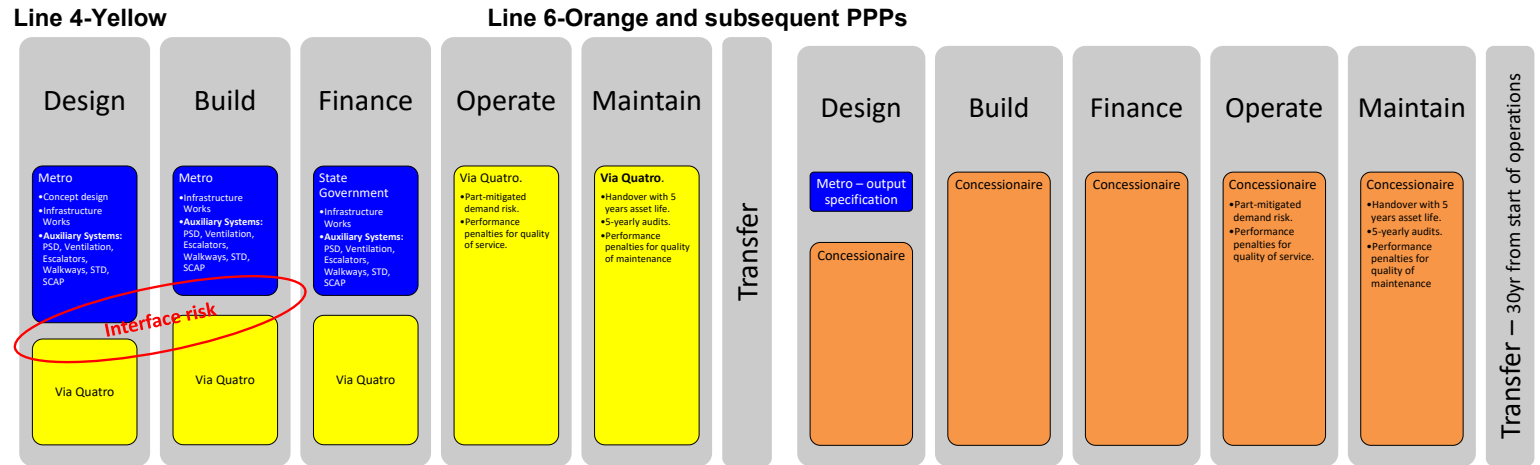
Line 18 Monorail

This line will go outside SP City. The federal gov't has undertaken to assist with this project....but has no funds at present! To be a PPP and currently awaiting funding.

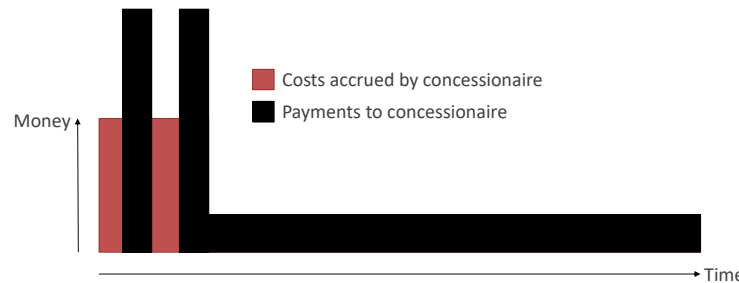
For this model, MSP is not legally allowed to specify the 'basic project' as it did for Line 4 – only a functional specification is required. However, L6 had the basic project ready. Doing this restricted slightly the gains on investment cost, but not much. The payments to the concessionaire are based on the most efficient operating solution, i.e. driverless trains. However the operator can choose to put drivers on the trains if they want – but the finances would be their problem, not MSP's.

To ensure operations are considered at the bid stage, “we require the assistance of a nominated operator” – this operator has to participate in the bid team, but does not have to have equity in the JV. This is because operators aren't risk-taking companies: many of the best are public-owned, so are not allowed to take risks. So operators are exempted from holding equity to ensure as many qualified organisations as possible can compete. For Line 4, RATP Dev helped develop operating procedures, and was bought out after 5 years.

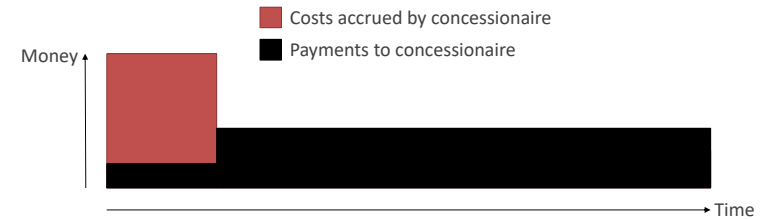
**6.6  
PPP  
comparison**



Line 4 involved milestone payments during construction, then ongoing operational payments



Line 6 involves a small capital grant, but the majority of construction costs are paid back in higher payments throughout the operating period





**6.7  
PPP Risks**

There are **2 broad models**. Their main attributes are as follows:

	<b>Line 4 approach</b>	<b>Line 6 approach (BOT)</b>
<b>Interface risk</b> (between public and private sector contracts)	High	n.a. Integration with private concessionaire
<b>Operator involvement during development</b>	Largely assured by Metro	Responsibility of regulator CMCP
<b>Phasing of operations</b>	None assumed (bad practice)	Yes (up to concessionaire subject to Operating Permit)
<b>Cost to Government</b>	Higher than expected due to ridership compensation during phased opening	Maybe higher than Line 4 baseline (excluding compensation) because later repayment means higher cost of interest

The Line 4 approach has Government with a hands-on role, and faces **potential interface problems**. These were raised by many and were:

- Timing slippage between the public sector civil works D+C 'infrastructure-ready role' and the concessionaire's 'equipment supply-ready' and O&M contract. VQ is taking delivery of trains for its Phase 2 extension in January 2016 - by which time there will be no track to run them, nor anywhere to store them!
- A Contractor's accident – resulted in the Justices suing them - and also finding MSP guilty!
- The contractor responsible for laying a fibre-optic cable along the route went bankrupt, disrupting the whole timetable. The Court of Accounts ruled that MSP must implement this and sued it!

The Line 6 approach has Government with a high-level role, construction risk being entirely with the private concessionaire. Here Government must try to ensure **Operator influence takes place throughout project development**, focused on whole-life costs.

CMCP's role is to ensure Operator influence is effective during project development:

- They define the operator's role, operating requirements, system specifications , and
- Before construction can start a Design Review is undertaken

Full operations from Day 1

This was planned for Line 4, but this is not how metros open – usually by phases for good reason, with operations building up to full operations (4 phases over 2 years for Line 4). This cost the State money, as when operations started with 2 stations instead of 6, ridership was low and so demand-compensatory payments were required

For Line 6 this requirement is removed. L6 is required to be fully-operational in 6 years, and any early opening will be pure benefit to the contractor. Government has to issue a Permit to Operate in order to commence operations, which can be applied for any time once ready. The

		<p>performance index only comes in after 6 months of full line operation, so any partial early opening is operationally beneficial as it allows 'test running' without performance penalties.</p> <p>It is easier for concessions to push back against political whims: <i>"If you have a contract, you are prepared to follow that contract"</i></p>	
	<b>6.8 Future prospects</b>	<p>There are said to be market limits on extending the PPP approach. Therefore:</p> <ul style="list-style-type: none"> <li>Line 5 will adopt the 'old model' of an operating concession</li> <li>Line 18 a contract is signed with KOMI (KL) the winner</li> </ul>	
<b>7 Summary of Constraints placed upon Metro</b>	<b>7.1 MSP is severely handicapped by legal issues</b>	<p><b>The 1988 Constitution has had widespread unintended consequences that hugely impact MSP adversely.</b></p> <p>Created to tackle corruption, the 1988 laws appear to have perversely facilitated this end, by shackling public administrators in their proper role and requiring award of contracts at impossible-to-realise prices or to unqualified tenderers.</p> <p><b>This subjects the public sector to invasive interventions that markedly reduce its effectiveness.</b></p> <p>Administrators are personally sued for not following procedures and processes to the letter.</p>	<p>The result is that:</p> <ul style="list-style-type: none"> <li>Administrators are afraid to make decisions, that could lead to their being sued (including retrospectively). Mario is said to be being sued by 65 people who tripped and fell!</li> <li>Instead they take the line of least resistance</li> </ul>
	<b>7.2 MSP cannot procure projects efficiently .... because of procurement/contracting issues</b>	<p>There are always problems with procurement/ bidding, from the State Court of Accounts and sometimes the National or State Prosecutor.</p> <p><b>The following are not allowed:</b></p> <ul style="list-style-type: none"> <li>Detailed specifications</li> <li>Market testing bid options to assess the appetite to take risk.</li> <li>Shortlisting of companies before bidding</li> <li>Appointing on other than lowest cost to the public sector</li> </ul>	<ul style="list-style-type: none"> <li><b>This is a major drag on project development, causing often large delays.</b> Multiple bids are often required - one bidding took 2 years. One PPP bid resulted in a single bid being received.</li> <li>MSP is an informed client, but Law 8666 <b>stops MSP's engineering sense prevailing</b></li> <li>Law 8666 <b>constrains MSP's ability to procure the best contractor or best project.</b> Performance specifications are required, nothing more detailed – despite MSP's expert knowledge of what is required, and 'the private sector's' often limited knowledge of what MSP needs.</li> <li>Subsequent contract problems, arising from the contractor's actions may lead to the <b>administrator being sued individually</b> and MSP being found guilty!</li> <li>A consequence is that <b>foreign companies are deterred from bidding</b> because "they don't know what is going to happen"</li> <li></li> </ul>
	<b>7.3 MSP cannot control its Revenues</b>	<p><u>Fares, ticketing and revenues</u></p> <ul style="list-style-type: none"> <li>Fares are set by the State.</li> <li>MSP makes a proposal annually based on its cost increases.</li> <li>MSP recommended the fares increased to R4.5, with a 10%pa increase to manage overcrowding. But the decision was R3 and not a cent more.</li> </ul>	<ul style="list-style-type: none"> <li>Low fares have led to <b>large demand increases, metro overcrowding</b> and discomfort for passengers.</li> <li>MSP suffers a significant revenue loss from the <b>non-reimbursement for some concessions</b></li> <li>MSP's high <b>approval rating has plummeted</b> 95% &gt;&gt; 65%</li> <li>These financial arrangements are <b>not financially sustainable</b></li> </ul>

		<ul style="list-style-type: none"> <li>Fares are set low for political reasons.</li> <li>MSP does not receive an equitable allocation from the City's smartcard system</li> <li>MSP is not fully reimbursed for the many concessions</li> </ul>	<ul style="list-style-type: none"> <li>There <b>are and will be pressures for future operating cutbacks</b></li> </ul>
7.4 <b>MSP cannot control its Costs</b>	<p><u>Staff numbers, conditions and recruitment</u></p> <ul style="list-style-type: none"> <li>Staff numbers and costs are high.</li> <li>Costs are high because of large benefits - staff costs are 2.4 * salary.</li> <li>Salaries always increase ahead of inflation. And salaries increase with time served</li> <li>To recruit key staff MSP needs State approval + Public Hearings may be required</li> <li>MSP cannot cut staff. This means its Projects Department does not recruit, because it could not then adapt to reducing project demand</li> </ul> <p>Also:</p> <ul style="list-style-type: none"> <li>Federal taxes last year increased energy costs by 2</li> <li>MSP pays 58 separate taxes that represent 30% of its operational costs, and could if not paid fund all asset replacement</li> </ul>	<ul style="list-style-type: none"> <li><b>Operating costs are high</b> (labour is 75%)</li> <li><b>Union demands are not resisted, because the State will not back attempts by MSP to do so</b> "MSP can bring the city to a halt...I don't want any strikes". "We have many people we don't need and cannot make redundant" - MSP.</li> <li><b>MSP Projects Department staff cannot be built to meet the need for Extensions</b>—because it is unable subsequently to cut staff if necessary</li> <li><b>MSP outsource some Major Project work, not because it considers it the right strategy but because it has no alternative</b></li> <li><b>The State created a money-go-round:</b> MSP pays government large taxes that allows State gov't to keep fares down....that then fails to reimburse all concessions, and creates unsustainable finances that require operating cutbacks..... PS - Is there an age succession planning issue arising?</li> </ul>	
7.5 <b>Bus integration should be better managed</b>	<p>Apart from metropolitan buses, bus service decisions are taken by individual Municipalities, without reference to MSP.</p> <p>Bus and rail planning decisions should be coordinated but are not. SP Metropolitan Region lacks a Metropolitan Transit Authority.</p>	<ul style="list-style-type: none"> <li>These <b>ad hoc decisions can impact MSP hugely when it is already running at capacity.</b> E.g. when the municipality wishes to cut costs and bus routes are terminated at MSP stations</li> <li></li> </ul>	
7.6 <b>Major projects are developed under an enormous handicap</b>	<p>MSP makes projects happen despite many environmental/ social/ legal problems</p> <ul style="list-style-type: none"> <li>Environmental Permits are difficult to obtain but essential</li> <li>Expropriation is always difficult</li> <li>Municipalities and others look to MSP to fund their own 'like to have' ancillary projects</li> <li>MSP has to negotiate with multiple stakeholders</li> <li>Government funded projects are started without full funding. They are often built in short sections as funding allows</li> <li>The State decided Monorail Line 15 should be developed as a demonstration project. It then rapidly committed several other monorail lines, without waiting for lessons from the demonstration project</li> </ul>	<ul style="list-style-type: none"> <li><b>Good projects are developed</b>, integrated into their environment and with the public transport system</li> <li><b>But at considerable cost and after large delays</b></li> <li><b>Monorail may or may not prove to be an important innovation</b> – it is too early to tell. <b>But there are concerns it is distorting the overall metro strategy, and diverting MSP from its core purpose.</b></li> </ul>	
7.7 <b>Summary</b>			

		<p><i>"The State provokes inefficiency in the company. It fosters bureaucracy. New concessions are selected rather following known existing good practices. The State is critical whilst making things worse"</i></p> <p><b>Taken together these constraints mean MSP cannot proactively manage the company</b> (e.g. it cannot manage its costs or revenues, or staff recruitment, or procure contracts efficiently). <b>It therefore cannot deliver expected predictable success. Time and again actions by others frustrate this, these same actors highlighting MSP's 'failings'.</b></p> <p><b>At the very least this is a highly ineffective form of rail sector management, one from which MSP emerges with considerable credit.</b> MSP's effectiveness may be summarised as: <b><i>"working mightily and effectively in the face of daunting challenges"</i></b>.</p>	
8 Strategic impacts	8.1 MSP's coping strategies	Takes conservative decisions	Play safe by not taking difficult decisions
		Use IFI financing	Avoids some issues because IFI guidelines need to be followed (ICB etc.)
		Adopt PPP	That avoids public up-front funding and avoids public sector procurement problems
		"Privatise everything?"	Even Metro? At least create a listed company with a small private shareholding
	8.2 Outlook for Metro	MSP always struggles mightily and wins through, but unfortunately not effectively. The combination of managing extreme overcrowding and demand growth, with less funding due to the pending political and economic crisis and maybe less political support makes the outlook uncertain.	
	8.3 Conclusions	Problem No1 agreed by everyone: there is no Authority. This is hugely problematical to rectify. The majority of the constraints on MSP are within the government's power to address.	
9. Misc. Lessons	9.1 Key words that keep recurring	<ul style="list-style-type: none"> <li>• Politics</li> <li>• 4-year electoral cycle</li> <li>• Court of Accounts + national/ state prosecutors</li> <li>• PPP</li> <li>• Monorail</li> </ul>	
	9.2 Key Suggestions by interviewees	<b>A Transport Authority is essential</b> (or alternatively existing authorities should work together). It should define MSP's objectives/ targets. There are 2 broad approaches: change the federal constitution that allows power and responsibility by an Authority – and requires power to be taken away from municipalities; or (unlikely) secure the agreement of every municipality to cede some of their powers voluntarily.	
		<b>A Regulatory Agency is required</b> , with power (not a Committee as now that relies on its head to project power) It to use an independent consulting group (not Metro) to provide technical advice – as done with Lines 6 and 18.	
		<b>Establish a sustainable fare</b>	
		<b>The State to provide support</b> (not jump to criticise) <b>MSP</b> . MSP needs their understanding and support to be able to cut costs (esp. labour)	
		<b>Transparency is required always</b> , of what is to be done when	

	<p><b>Continuity in major projects is essential:</b> expertise lost is not rapidly regained. Project Department staff should be built to support the anticipated future project pipeline</p>
	<p><b>Extensions</b> should be where they are needed, with the right technology. <b>Alignment decisions</b> should be taken on both short-term costs (the existing situation) and long-term benefits.</p>
	<p><b>Environmental legislation</b> should look at environmental and social benefits of a scheme, not just construction issues – and enable speedier construction when benefits are significant.</p>
	<p><b>Beware Monorails</b> until the Line 15 'demonstration project' implications are understood.</p>
	<p><b>Beware interface problems on PPP projects</b> (as in Line 4)</p>
	<p>There should be extensive <b>engagement with all stakeholders</b> for major projects – then the design/ spec should be 'frozen' and no further changes made.</p>
	<p><b>Modernisation Projects</b> should apply the best modern technology</p>
	<p><b>Procurement</b> should be on the basis of both price (existing situation) and quality. And incentives (not just penalties) should be provided.</p>
	<p>Severe overcrowding requires <b>new projects to be planned with implementation/ operational issues in mind</b></p>
	<p><b>A comprehensive Asset Investment Plan is required</b> (this does not exist) looking ahead 10-15 years, to guide future decision-making.</p>
	<p><b>Changing taxation</b> to exempt MSP could alone reduce costs by 30%.</p>

## Authorship

Written by (Imperial College)	Approved by (Imperial College)	Client (World Bank)
<p><i>Priya Floyd, Research Associate</i>  <i>Judith Cohen, Senior Research Associate</i>  <i>Roger Allport, Honorary Senior Research Fellow</i>  <i>Richard Anderson, RTSC Managing Director</i></p>	<p><i>Richard Anderson, RTSC Managing Director</i></p>	<p><i>Dominic Patella, Senior Transport Specialist</i>  <i>Atul Agarwal, Senior Transport Specialist</i></p>