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BIXI: When a Public, Social, and Collective Innovation Transports Us

Case[1] prepared by **Patrick PELLETIER**[2] and **Marina FRANGIONI**[3]

Since May 2009, the streets of Montreal had been home to thousands of identical grey bikes – part of a successful bike share system known as BIXI.

Figure 1 – ***BIXI Station***
© Radio-Canada/Benoît Chapdelaine

Enjoying healthy exercise in the great outdoors, saving money, avoiding traffic jams, and reducing greenhouse gas emissions: so many reasons for the residents of Montreal, Laval, and Longueuil to participate in the great BIXI adventure![4] In summer 2008, more than 8,896 names had been suggested for the bike, and after more than 16,000 votes had been tallied, the name coined by Michel Gourdeau had been chosen: BIXI, short for BIcycle TaXI.[5] His prize: a BIXI pass for life!

BIXI in 2023:[6]

- 10,000 bikes, including 2,600 electric bikes, distributed among 830 stations on the Island of Montreal and in Laval and Longueuil
- More than 50 million trips
- More than 118 million kilometres travelled, or 3,000 trips around the earth
- 35,028 members
- 248,520 occasional users
- The equivalent of 900 fewer cars on the road

[1] Translation from the French by Debbie Blythe of case #9 40 2024 001 "BIXI, lorsque l'innovation publique, sociale et collective nous transporte".

[2] Patrick Pelletier is a professor in the School of Business Administration at TÉLUQ University.

[3] Marina Frangioni is a professor in the School of Business Administration at TÉLUQ University.

[4] https://www.pbsc.com/blog/2022/01/what-is-a-bike-share-program-and-how-does-it-work

[5] https://bixi.com/en/who-we-are/

[6] https://bixi.com/en/open-data/

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Bike sharing

Distributed in suitable urban areas throughout the city, BIXI bikes could be picked up at drop-off stations and used for short periods by most users, who could choose to buy either one-way passes (one ride at a time) or season passes. In 2023, prices were as follows: season pass, $99, or monthly pass, $20, for 45-minute rides. After that, 0.11 cents per minute for a regular bike or 0.13 cents per minute for an electric bike. For one-way passes, the unlocking fee was $1.25, followed by 0.13 cents per minute for a regular bike and 0.30 cents per minute for an electric bike.

All bike-sharing systems required regular or ad hoc maintenance, and most were designed to automatically detect problems. For example, the Vélo à la Carte system in Rennes, France, the first real smart bike system, could detect the smallest defects. This centralized system signalled when a bike had been taken and immediately returned so a mechanic could inspect it. In newer systems such as Vélib' in Paris, Vélo'v in Lyon, and Bicing in Barcelona, other detection mechanisms were being tested, such as tire pressure sensors with data relayed to a central control system. Most public bike systems relied on mobile mechanics who made minor repairs on the spot.

The history of bike sharing

In 1965, when the Netherlands was undergoing a profound social transformation, Amsterdam decided to collect bicycles, paint them white, and place them on the streets for free public use. Many of those bikes were quickly damaged or stolen, bringing the project to a halt, but the idea was not abandoned and reappeared in another form in 1997.

Bike sharing was also attempted in Copenhagen. In 1988, after their bikes were stolen, Morten Sadolin and Wessung Ole created Bycyklen, or City Bikes. In 1991, a public-private partnership with several stakeholders was founded. It was officially launched in 1995.

In 1996, the concept was tested again at Portsmouth University in the UK, but it was abandoned for lack of funding.

For forty years, the bike-sharing concept evolved with the help of technological innovations. While the integration of IT made the use of telephones and padlocks redundant, many companies saw this as a good business opportunity.

In 1998, Clear Channel, the owner of several U.S.-based radio and television companies, revolutionized the concept of bike sharing with self-serve bike hire, first deployed in Rennes, France, that year.

In 2000, the system was exported to Germany, Finland, and Singapore, followed by Austria in 2002. This breakthrough marked the beginning of a series of exports of the concept of paid automated bike sharing worldwide.

JCDecaux, a French advertising firm active throughout Europe and known for its street furniture, transport advertising, and billboard advertising, was Clear Channel's main competitor. In 2003, it launched Cyclocity, a self-service bicycle scheme, in Vienna, Austria, and then Spain. Improving on this system, it installed

Vélo'v in Lyon in 2005. In 2007, Vélib'[7] boasted 20,000 bikes at 1,500 stations in Paris. In 2020, the same system had 400,000 subscribers.[8]

Cities such as Paris and Lyon that relied on the urban advertising of JCDecaux or Clear Channel generally negotiated financing agreements based on advertising. Advertisers would fund the project in exchange for free advertising space in the city, which they resold. For other projects, such as the one in Copenhagen, ads were affixed to bikes or even tires.

Sources: DeMaio, Paul (2009). "Bike-sharing: History, impacts, models of provision, and future", *Journal of Public Transportation*, Vol. 12, No. 4, pp. 41–56; Vélos en libre-service – Wikipedia (wikipedia.org)

BIXI: History, context, and stakeholders

The BIXI project evolved in several stages, as shown below:

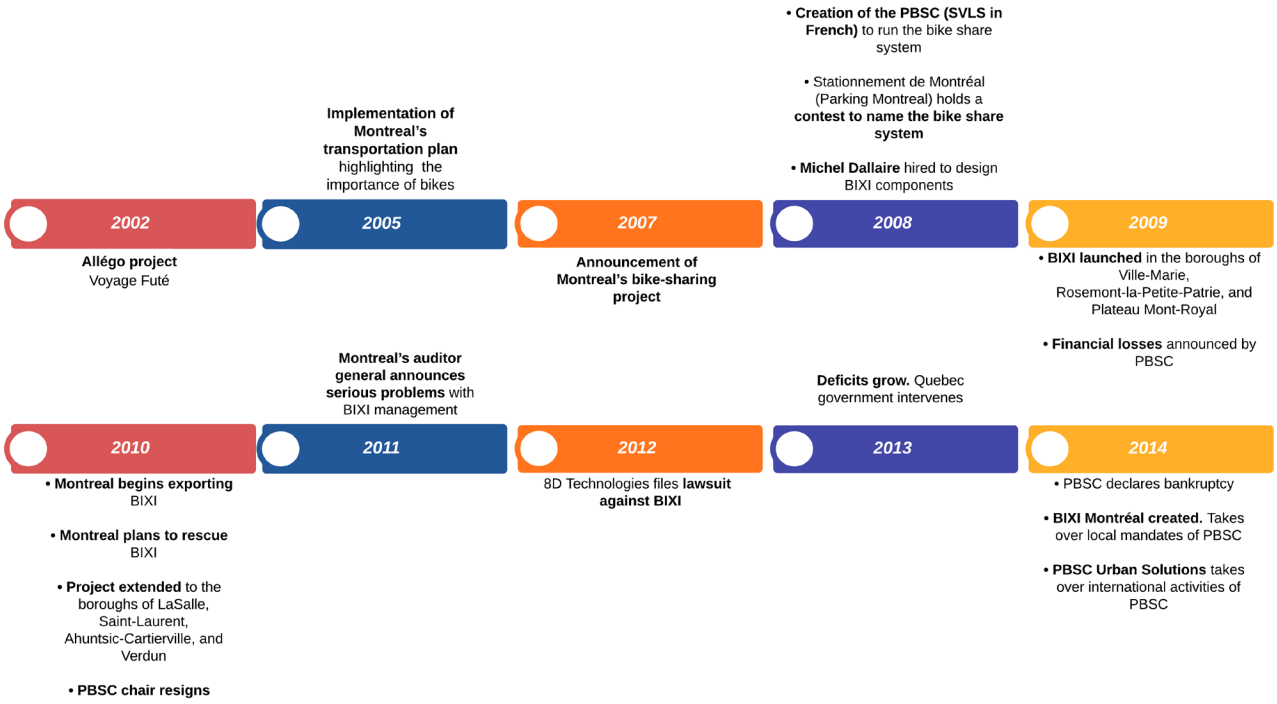

Figure 2 – ***History of bike share systems in Montreal and the BIXI project***

BIXI was not the first bike share system in Montreal. The first was Voyagez Futé (English: Travel Smart), an NPO with public and private partners working to discourage solo driving in downtown Montreal. This organization had launched the Allégo project – a collaboration between the Agence métropolitaine de transport and Alfid, a real estate firm. In 2002, during business hours, a dozen bikes were placed at the disposal of employees at Place d'Armes, a square in the Old Montreal quarter of Montreal associated with both business and tourism. Three years later, 117 bikes were distributed among 22 stations and used for 4,000 trips. About 70% of the bikes were used during the noon hour.

[7] In 2017, Paris City Hall did not renew its contract with Decaux for the management of Vélib'. Source: Jean-Gabriel Bontinck, "Le marché des Vélib' est attribué à Smoove: comment JCDecaux a perdu la bataille", *Le Parisien*, April 12, 2017.

[8] Sébastian Compagnon, "Le cap des 400 000 abonnés franchi: Vélib bat des records dans le Grand Paris", *Le Parisien*, September 8, 2017.

Delighted with the success of Allégo and knowing that bike-sharing projects had already been established in various cities around the world, Montreal decided to implement a new type of bike share system.

In April 2005, Montreal launched its transportation plan, Réinventer Montréal (Reinventing Montreal), highlighting measures to improve air quality and traffic flow. Its primary objective was to encourage citizens to reduce their dependence on the automobile through investments in public transit and active mobility, highlighting bikes as an essential component of the existing transportation system.

The transportation plan was approved in September 2005 following a public consultation, and in October 2007, Montreal announced its plan to develop a new bike-sharing system.

For this purpose, the city needed to expand its cycling network, and it set about creating a 4 km bicycle lane along De Maisonneuve Boulevard, traversing the entire length of Montreal's downtown area and linking the cycle network from east to west. In May 2008, the Association québécoise du transport et des routes (AQTR) awarded the new bicycle path the Environment Prize. In 2022, thanks to the addition of the Express Bike Network (EBN), Montreal had more than 889 km of bicycle paths – most accessible year-round – separated from traffic and boasting safety features such as road markings and signs.

Earlier bike-sharing systems had been cumbersome and difficult to install. They used Microsoft Windows operating systems and required an Internet connection. Once installed, the stations could not be moved and became integral to the urban landscape. Although those automated systems accepted credit card payments and could be monitored from a distance, their installation required extensive planning, causing disruption and generating pollution – precisely what they were meant to eliminate.

The stations and automated systems installed in other cities, such as Paris's Vélib', would have been useless in Montreal, with its harsh winters, snowstorms, and freezing temperatures. A new system would have to be developed to meet local constraints, and the bikes would have to be entirely portable, requiring no permanent infrastructure.

The system would have to be solar-powered to avoid greenhouse gas emissions and the use of non-renewable energy. Since it would not rely on the community's energy network, excavation costs and installation times would be drastically reduced. It would use wireless communication technology, so it would not have to be connected to the community's telecommunication network, resulting in significant time and cost savings.

A partner would be needed to guide and oversee the project, and Parking Montreal was the obvious choice. The Board of Trade of Metropolitan Montreal was the limited partner of Parking Montreal, which was responsible for managing paid on- and off-street public parking to promote the city's economic development. It would benefit from the collaboration of the city of Montreal and of Montreal's nine economic community development corporations (CDECs) along with la Société de développement économique Ville-Marie (SDE) and Équiterre.

The above-mentioned group would be responsible for managing the maintenance and distribution of the bikes, with employment offered to people excluded from the labour market.

Under the umbrella of Parking Montreal, the city created an independent non-profit organization called the Société de vélo en libre-service (PBSC) or the Public Bike System Company. This system would require no ongoing public financing and would neither be owned nor operated by the city but by Parking Montreal.

Parking Montreal invested $15 million in the project and signed a sponsorship agreement with Rio Tinto Alcan, a giant aluminum producer. Under the terms of that agreement, RTA would supply the aluminum needed to manufacture the bikes along with the necessary funds to operate the system. In return, its logo would appear on every bike, including those exported, should contracts be signed with other cities worldwide.

Following the example set by JCDecaux and Clear Channel, a sponsorship agreement was also signed with Astral Media Affichage (AMA), a media conglomerate that had already been posting ads on the streets of Montreal. According to this agreement, AMA's ads would appear on the outer side of 200 of the 300 BIXI stations, providing a significant source of income to the city.

Three economic models for bike share systems

A report by TransportShaker (2017)[9] outlined three economic models for bike share systems:

- Model 1: managing a bike share system in exchange for advertising space, such as when a municipality makes a major investment in the implementation of a complete bike share system in exchange for free advertising space. This is what happened in Paris and Lyon. In this situation, the operating costs have a low impact on users.
- Model 2: The municipality entrusts the implementation of the bike share system to a transport operator that it subsidizes and that operates the system as part of a multimodal transport network. The transport operator generally assumes deficits in the bike share system.
- Model 3: A third-party supplier of a bike share system offers a complete solution but does not operate the system and collaborates with the municipality and the transport operator. The generally profitable third-party company relies on technological breakthroughs to maintain and consolidate its market position.

Initially, BIXI was similar to model 2, but no transport operator was involved.

[9] https://www.transportshaker-wavestone.com/modele-economique-vls/

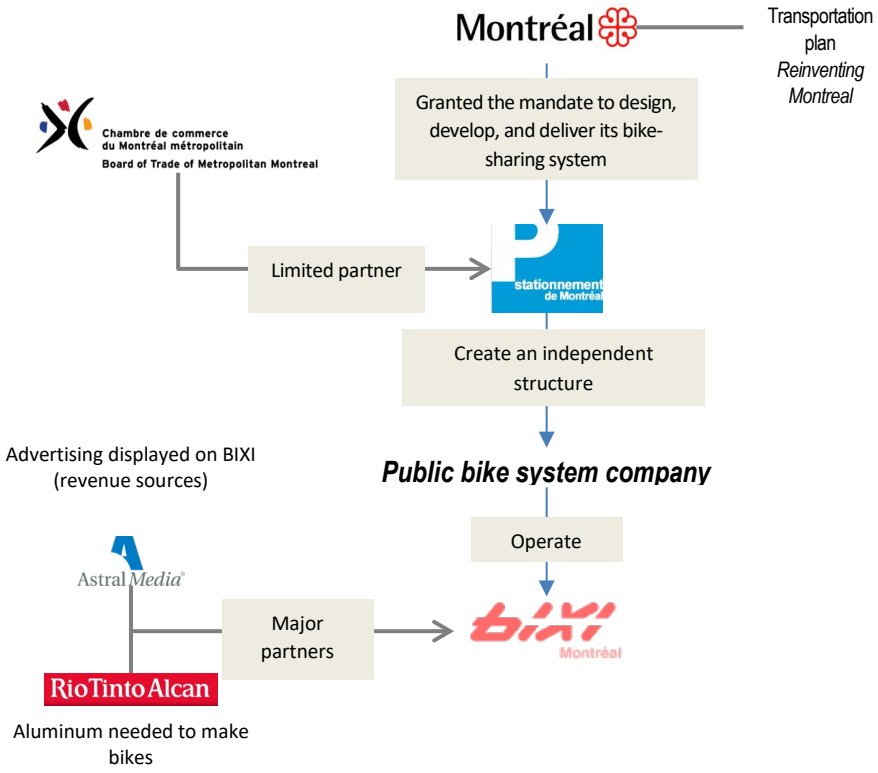

Figure 3 – The *BIXI project*
Source: case authors

Designing BIXI: partners and subcontractors

BIXI was designed from the ground up to achieve a perfect balance between practicality and aesthetics. A multidisciplinary team was assembled, and Michel Dallaire,[10] a renowned industrial designer, won the bid for proposals. In June 2006, Montreal had been officially designated a UNESCO City of Design, joining the UNESCO Creative Cities Network, so great design was naturally a priority.[11]

Dallaire came up with a safe and sturdy bike made of high-end aluminum alloys that blended harmoniously with the urban environment. Neither a racing bike nor a limo, it was just a fun, fast, and comfortable utility bike.[12] In 2010, while addressing a meeting organized by Mosaic, a multidisciplinary platform for research and training in the field of creativity and innovation management at HEC Montréal, Dallaire explained that the project's goal was to "change the city

[10] Michel Dallaire was an internationally renowned industrial designer. One of his first creations was the 1976 Olympic flame torch. He contributed to Montreal urbanism and was a pioneer in industrial design in Quebec and Canada. Whether in the Old Port, the business district, schools such as HEC Montreal, or the Grande Bibliothèque de Montréal, each object designed by Dallaire oscillated between tradition and modernity. See "Michel Dallaire, le designer industriel qui rend le beau fonctionnel et intemporal": https://ici.radio-canada.ca/nouvelle/1109297/michel-dallaire-design-industriel-bixi-quebec-archives.

[11] See https://designmontreal.com/en/node/507

[12] Le vélo communautaire en libre-service à Montréal: regard sur une technologie de pointe", episode of *Découverte*, Radio-Canada, 2009.

one bike at a time," adding that the bikes would have to meet a real need with a coherent and harmonious design. The same design elements could be found in the bike docks, the docking stations, and the automated pay stations (Figure 4).

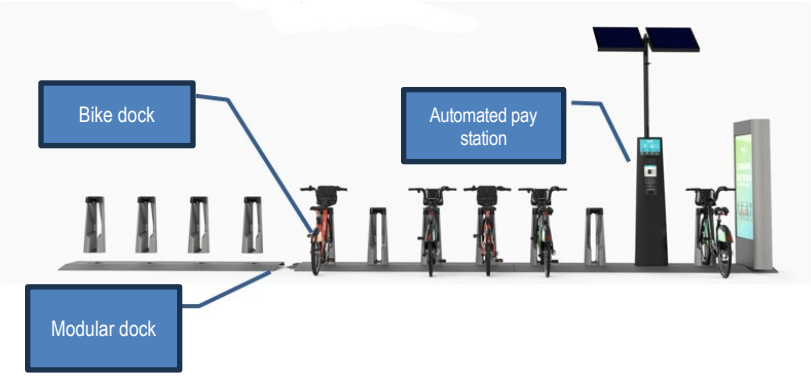

Figure 4 – *BIXI station*
source: https://www.pbsc.com/products

Forty percent of the design time would be devoted to the bike, with the remaining time dedicated to the drop-off stations. The partners would have to work fast: they'd have just nine months to design and build 45 prototypes, then nine more to perfect them and produce the first 3,000 bikes. But Dallaire wouldn't stop there. BIXI would continue improving its product, reducing production costs and optimizing user safety. In 2018, BIXI launched a pilot project to increase user safety by equipping bikes with a high-performance lighting system that would make them more visible to cars at night.[13]

To better understand the design process, Dallaire travelled to Paris to study Vélib', taking it apart, piece by piece, to see how it could be improved. Quebec researchers at the National Research Council of Canada's Aluminium Technology Centre (NRCC) designed an aluminum bike with a solid frame weighing less than 20 kg. The aluminum was corrosion-resistant and infinitely recyclable, meaning it could be recycled again and again without any decrease in quality. Aluminum recycling saved 95% of the energy needed to produce primary metal. BIXI components were designed exclusively for BIXI bikes, reducing theft risk. The heavy-duty tires were designed to be puncture-resistant and filled with nitrogen gas to maintain proper pressure for longer. The designer's main concern was protecting the bikes from vandalism.

Ahead of Procycle and Raleigh, Chicoutimi-based Devinci was chosen to manufacture the bikes. Devinci had been building aluminum frames since 1987, and its numerous innovations had earned it a reputation for excellence in the world of high-end bicycles. It had invested $400,000 in phase 1 of the construction and installation of BIXI bikes and did the same for phase 2 of the expansion project.

Devinci subcontracted work to other Quebec firms, such as Falpaco, in Granby. A manufacturer of rubber and plastic, Falpaco, made injection moulds for plastics, rubber, and silicone, and made

[13]Pierre-André Normandin, "Des lasers pour protéger BIXI la nuit", *La Presse*, July 25, 2018.

plastic parts for BIXI. The new products it created, including flame-retardant plastic used in public transit, enhanced its reputation.[14]

8D Technologies, a Canadian company that developed intelligent wireless, machine-to-machine (M2M), multi-function point of sale (POS) solutions, was awarded the contract for the BIXI payment terminals. 8D's unique green urban transportation management and payment solutions included the award-winning city parking system (8D APMS™). This solution featured 100% solar-powered wireless terminals that could easily be linked to public transport systems, meeting a growing need for integrated green solutions to reduce road traffic and pollution. 8D's solution featured real-time secure wireless payment and remote control as well as management of all terminal functions, from payment to enforcement – and full monitoring of terminals and sensors – in wired and wireless environments. For 8D Technologies, "Terminals were just the beginning."[15]

Full details about the bike stations, bike availability, and docking points were accessible online in real time. Depending on their membership type, users would have access to a personal space, enabling them to keep track of their billing and usage data.

The availability of bikes and docking points could easily be found with Google Maps. Bixou, the original paid iPhone app, was replaced with a free BIXI app, available on both Android and i0S.[16] With this app, users could locate BIXI stations, check the exact rental time, and much more.

Seven of the parts were patented to ensure the bike's profitability: four for bike innovations, one for the system's modularity, one for its use of solar energy, and one for its locking mechanism.

The launch

In spring 2009, following an advertising and marketing blitz, the first BIXIs made their appearance: 300 stations were installed in the boroughs of Ville-Marie, Plateau-Mont-Royal, Outremont, Rosemont-La Petite-Patrie, Villeray-Saint-Michel, and Sud-Ouest.

A few months prior to the official launch, a blog about the shared passion of a group of bikers appeared online, generating enthusiasm for the sport. However, it was soon learned that the blog was false. This was a form of astroturfing: the deceptive tactic of simulating grassroots support for a product or cause by people or organizations with an interest in shaping public opinion. When the ruse was discovered, the public was furious.[17]

The first season was a resounding success, however, and just five months after the official launch, BIXI announced that its popularity had surpassed all expectations, with one million trips to date. Phase 2 of the launch was moved forward, with the installation of 100 more stations and 2,000

[14] Stéphane Champagne, "L'innovation comme source de motivation", *La Voix de l'Est*, May 10, 2010.

[15] Following its success with BIXI, 8D Technologies enjoyed strong growth. In 2017, it merged with Motivate International, the owner of bike share systems such as Citi Bike in New York.

[16] https://bixi.com/en/mobile-application/

[17] Martine Turenne, "Jusqu'où fallait-il aller pour vendre Bixi ?", *Les Affaires*, May 23, 2009.

more bikes in July 2009.[18] Montrealers quickly threw their support behind the new system and waited impatiently for the start of the next season.

Rebalancing stations

Since many users picked up their BIXIs on the city's outskirts for their morning commute downtown, the peripheral stations were soon empty, while the downtown stations were packed. During the evening rush hour, the situation was reversed. Trucks loaded with bikes crisscrossed the city to rebalance the stations, but this thwarted BIXI's goal of reducing greenhouse gas emissions.

The AMI BIXI program was an eco-friendly way to rebalance the BIXI network by increasing bike and dock availability without having trucks transporting bikes between stations. Seasonal or monthly members could earn points and rewards by taking bikes from full stations and returning them to empty ones![19]

Maintenance

CycloChrome was a social economy enterprise created in collaboration with Père-Marquette, a local high school, to maintain and repair the thousands of BIXI bikes.[20] Since its founding in 2009 by the CDEC de Rosemont-La Petite-Patrie, it had specialized in bike mechanics, taking care of all of BIXI Montréal's self-service bike repair needs.

The idea behind CycloChrome was to encourage potential dropouts to graduate, training them in bike mechanics while offering them an opportunity to complete high school.[21] By 2023, 213 trainees had taken the course, and 27% of permanent employees were former trainees. CycloChrome had carried out 29,000 repairs annually, and the Ministère de l'Emploi et de la Solidarité sociale (Employment and Social Solidarity) had recognized 375 hours of training.

Exporting bikes

Following its 2009 launch, BIXI signed contracts with Ottawa, Gatineau, and Toronto in Canada, Melbourne in Australia, Minneapolis, Boston, and Washington in the US, and London in the UK. In 2013, New York City's version of Montreal's Bixi bike share system hit the streets, named Citi Bank after its sponsor.[22]

Yet despite the bike's resounding national and international success, the service so beloved by Montrealers was in serious financial trouble.

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[18] La Presse Canadienne, "Le BIXI a été utilisé un million de fois", *La Presse*, September 22, 2010.

[19] Become an Ami BIXI: https://bixi.com/en/ami-bixi/

[20] A social economy enterprise serves members of a community rather than just generating profits. Social enterprises seek to maximize profits while maximizing benefits to society and the environment, and the profits are principally used to fund social programs. https://www.investopedia.com/terms/s/social-enterprise.asp

[21] https://www.cyclochrome.com/equipe/

[22] Thomas Gerbet, "Le vélo québécois BIXI poursuit sa conquête du monde", Radio-Canada, April 11, 2016.

From bankruptcy to success

In 2009, despite fairly encouraging revenues, the PBSC posted losses of $5.5 million. For it to achieve profitability, its subscription numbers would have to increase five-fold, from 10,000 to 50,000! Currently, there was one bike for every two subscribers, and this ratio would have to increase to one bike for every ten subscribers. In Paris, the ratio was one bike for every thirteen subscribers; in Barcelona, it was one bike for every twenty-four subscribers.

In 2011, the auditor general's report highlighted serious problems with BIXI's financial management.[23] After just two years of operation, it had racked up $37 million in debt. In fact, the fast-tracked implementation of the BIXI system had been poorly planned, with no feasibility studies, no market research, no cost-benefit analysis, and little risk analysis of any kind. Moreover, BIXI could not participate in commercial, for-profit ventures under the *Cities and Towns Act*. In addition to its financial difficulties, the auditor general cited the lack of transparency in the management of a public asset and the passivity of elected officials.

BIXI was in such dire straits that Montreal's city council approved a $108-million bailout package that included a $37-million loan to cover BIXI's deficit and another $71 million in loan guarantees to export and develop the system abroad.

Although BIXI had started exports, it was not yet out of the woods. In June 2011, news came that deliveries to Boson and London had been slow and that the Melbourne bike share system had been disastrous!

By September, things had begun looking up. BIXI landed the New York City contract, beating out B-Cycle, a U.S. company and its top competitor. The contract was for 600 stations and 10,000 bikes.

But just two months later, following a Quebec government announcement related to Montreal's ability to finance the PBSC, Roger Plamondon, chair, and twelve employees had been shown the door. At a company board meeting, Plamondon had announced his plans to step down, explaining that the uncertainty created by the organization's status had caused it to lose several international contracts. According to Plamondon, "BIXI would cost Montrealers nothing. But Minister Lessard's recent order to sell off the part of the company that was in charge of its international expansion made it impossible to carry out that mandate."[24]

And things just kept getting worse. In 2012, 8D Technologies, the firm that had developed the core technological solution that powered the BIXI bike-sharing system, filed a $26 million lawsuit against PBSC, accusing it of prematurely ending their business relationship. According to the plaintiff, PBSC had justified its decision by citing the "non-competitiveness" of its products, yet 8D would continue to be the technology supplier for the existing BIXI-based system. At the same

[23] https://www.bvgmtl.ca/wp-content/uploads/2020/11/RAPPSPEC_JUIN2011_FR.pdf

[24] Améli Pineda/Agence QMI, "Le patron de BIXI se fait montrer la porte", *Le Journal de Montréal*, February 32, 2014 ; " Le patron de BIXI démissionne", Radio-Canada, November 11, 2011.

time, PBSC would develop its own platform to be included in submissions for two major projects, one in New York and one in Chattanooga.[25]

In 2012, PBSC's accumulated debt was $42 million, and its operating deficit was $6.5 million.[26] The city had approved a $37-million loan to cover BIXI's deficit and another $71 million in loan guarantees to export and develop the system abroad.[27]

In 2013, the deficit was still a concern, but $6.5 million was now needed to save PBSC from bankruptcy and continue offering the hugely popular service. Believing the current difficulty was simply a cash flow problem, the Quebec government agreed to lend the company $5 million.

In late 2013, things were still going badly, and in early 2014, PBSC declared bankruptcy. Denis Coderre, the mayor of Montreal, nevertheless promised that there would be a 2014 BIXI season.[28]

BIXI Montréal, a new non-profit organization, was created to oversee the city's bike-sharing system, but it was required to sell its international division. It was purchased by PBSC Urban Solutions for $4 million.[29]

For the first season of BIXI Montréal, the City gave the new non-profit a start-up subsidy of $165,000. Under new management with a new board of directors, the organization took drastic measures to ensure its long-term survival. It streamlined its structure, slashed salaries, internalized some tasks, such as bike redistribution, and outsourced others, such as repairs. The BIXI location management software was reviewed, resulting in a significant reduction in complaints. As a result of improved service, the number of BIXI subscriptions grew. In 2014, BIXI posted a surplus of $818,275 – the first surplus in the history of the bike-sharing system!

In the following years, BIXI Montréal continued to grow. Even the COVID-19 pandemic did not force the company into the red. On the contrary, the number of subscriptions and occasional users grew.

In September 2022, PBSC Urban Solutions was purchased by Lyft, a California-based company, for $215 million – proof, if proof was needed, that urban mobility had become a booming market. With 7,500 stations and 95,000 bikes and activities in fifty cities in fifteen countries, the Quebec company was now a subsidiary of a publicly traded U.S. firm specializing in ridesharing services and renting cars, electric scooters, and bikes. In the words of Louis Hébert, professor of strategy at HEC Montréal, "Luc Sabbatini, president and CEO of PBSC, expanded the formula into several different countries and created value, partly explaining the price. But it was also a question of

[25] Jeanne Corriveau, "Poursuite de 26 millions contre Bixi", *Le Devoir*, April 28, 2012.

[26] Karim Benessaieh, "BIXI: dette de 42 millions et aide de Québec", *La Presse*, September 24, 2013.

[27] André Noël, "BIXI était prêt à mettre les clés sous la porte", *La Presse*, May 14, 2011.

[28] "Bixi se place sous la protection de la loi sur la faillite", Radio-Canada, January 2014.

[29] https://www.pbsc.com/fr

timing. At the time of the sale, the market for urban mobility was booming, and you could name your price."[30]

A major innovation

In 2023, the fleet available for year-round bike rentals consisted of 1,500 regular BIXIs with studded tires and non-slip pedals, the only self-service bikes in North America to be modified for winter use.[31] This was the first time a bike-sharing system was available for use during a North American winter. Keeping bike baths and BIXI stations clear of snow became a new challenge for BIXI in its ongoing efforts to improve urban mobility.

2024-05-06

[30] *Ibid.*

[31] Henri Ouellette-Vézina, "BIXI Montréal dévoile son plan pour son premier hiver", *La Presse*, October 12, 2012.