

CHARACTERIZATION AND ANALYSIS OF ECONOMIC VIABILITY OF CYCLE LOGISTICS TRANSPORT IN BRAZIL

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INTRODUCTION AND BACKGROUND



INTRODUCTION

- Urban Population in Brazil – 86%
- Current growth in the demand for goods increases congestion, air and noise pollution and decreases the quality of life in inner cities.
- How can we transport more efficiently and with fewer pollutants?



INTRODUCTION

- Importance of using more sustainable modes of transport throughout the city;
- Challenge: link the development of more sustainable and liveable cities with efficient UFT – sustainable development;
- One possible contributor and interesting possibility to configure a sustainable urban goods distribution: the use of bicycles, especially cargo bikes;



BACKGROUND

- Van remains the standard solution for last mile delivery of small goods in dense areas – not an optimal solution as they get stuck in traffic, suffer with the lack of parking spaces and restrictions of weight and time.
- 61.1% of all cargo logistics in Brazil is made by road transport (notably trucks, vans, etc.) and the use of bicycles, tricycles or cargo bikes is not very widespread;



BACKGROUND

- Comparative studies between diesel vans, electric vans and cargo bikes in the urban context. The models considered both the competitive advantage and the economic advantage of this substitution.

Tipagornwong e Figliozzi (2014)

Choubassi *et al.* (2016)

Heinrich *et al.* (2016)

Conway *et al.* (2017)

Heinrich *et al.* (2016)



BACKGROUND

- Hagen et al. (2013): Copacabana district in Rio de Janeiro. 372 establishments using a total of 732 bicycles;
- Aliança Bike and the LabMob (2018): district of Bom Retiro, São Paulo. 2,349 deliveries per day by bicycle and tricycle;
- Marujo et al. (2018): Rio de Janeiro. Combined use of mobile depots and tricycles.

BACKGROUND

- Main barriers:
 - difficulty of accepting it as an adequate transport mode for deliveries,
 - the perception of the population, and
 - the doubt of the economy viability for logistics companies.



OBJECTIVE

- We intend to overcome barriers that are still related to information, investments and decision making by verifying the actual potential for modal shift and by identifying the main motivators and challenges faced when using cargo bike to make deliveries for the Brazilian reality;
- We use an approach that goes from existing companies and how the system works in some cities in Brazil advantages, difficulties faced and how this can be overcome.



METHODOLOGY AND RESULTS



METHODOLOGY

- Identified a total of 44 companies in operation and obtained 17 valid answers;
- The data was collected via web-based questionnaire and via presential interview from August to October, 2018;
- We obtain data from the characteristics of the company, delivery, challenges and opportunities for delivery using the bicycle and operational costs.

METHODOLOGY

- We used descriptive statistics to compile the data;
- Economic analysis was made considering the operational delivery costs by bicycle using data from a pilot test by conventional freight vehicles from GASMIG in 2013
 - only study with economic data in Brazil



CHARACTERIZATION OF COMPANIES

City	Start Year	Number of Employees	Number of Deliveres
Belo Horizonte/MG	1996	2	2
Porto Alegre/RS	2009	9	9
São Paulo/SP	2010	50	170
Curitiba/PR	2011	1	20
Guarulhos/SP	2012	3	3
Rio de Janeiro/RJ	2012	7	6
Rio de Janeiro/RJ	2015	10	9
Vila Velha/ES	2015	3	2
Blumenau/SC	2016	6	6
Joinville/SC	2016	8	7
Niterói/RJ	2016	2	1
São Paulo/SP	2017	2	12
Belo Horizonte/MG	2018	16	16
Niterói/RJ	2018	4	4
Recife/PE	2018	3	11
São Paulo/SP	2018	1	1
São Paulo/SP	2013	52	174



CHARACTERIZATION OF COMPANIES

- Starting motivator: to join the passion for cycling with an ecologically correct, practical and fast logistic solution, working with something they love.
- Concerning billing, most of the companies are small, with 56% of them having annual sales of up to BRL 25,000 and 13% over BRL 2.5 million

1 EURO = 4.5 BRL



CHARACTERIZATION OF DELIVERIES

- Common bicycles for deliveries and courier services;
- Only two companies have electric bikes, being these cargo bikes and common bikes, but in small scale;
- The cargo bike is present in nine companies and is used mostly for e-commerce deliveries;
- Main products delivered are documents, food, packages, books and e-commerce products.



CHARACTERIZATION OF DELIVERIES



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CHARACTERIZATION OF DELIVERIES

- 2,000 daily deliveries - average of 6 deliveries per deliveryman;
- Average weight of products: between 200g and 25 kg;
- Average delivery distance: from 3 to 5km;
- Average delivery time: 15 to 30min.



DIFFICULTIES RELATED TO DELIVERIES USING BICYCLE IN BRAZIL

Difficulties	Minimum	1st quartile	Median	3rd quartile	Maximum
Topography	1	2	3	4	5
Theft	1	2	2	3	5
Rick of accidents	2	3	4	4	5
Lack of cycling infrastructure	2	4	4	5	5
High cost of the adapted bicycle	1	1	2	3	5
Congestion	1	1	2	2	4
Weather conditions	1	2	2	4	5
Lack of education and respect from other drivers	1	4	4	5	5

ECONOMIC ANALYSIS



ECONOMIC ANALYSIS

Cost	Cooperative companies (self-employees)	Conventional companies (registered employees)
Fleet of deliveryman/bicycles (un.)	7	172
Number of Deliveries	26	2000
Price of the bicycle	1,168.75	1,750.00 ¹
Depreciation of the bicycle (p.y.)	233.75 ²	350.00 ²
Maintenance of the bicycle (p.y.)	843.33	2040.00
Insurance of the package	200.00 ³	0.40 ⁴
Hourly payload	7.55	20.25
Cost by delivery	17.09	22.00

1. The cost of a Cargo Bike can achieve BRL 6,000.00 in Brazil.
2. We considered an annual depreciation of 20% (BRASIL, 2018).
3. The insurance is calculated by year.
4. The insurance is calculated by package

ECONOMIC ANALYSIS

Company fleet	Iveco Daily	Fiorino
Type of fuel	Diesel	Gasoline
Cost of fuel (BRL/litre)	3.704	5.00
Consumption (km/litre)	7.9	10.0
Travelled distance (km/month)	2,567	2,000
Cost with Fuel (BRL/month)	1,203.57	1,000.00
Number of vehicles	14	2

- Parameters:
 - Investment: 172 bicycles for BRL 1,750.00 each – total of BRL 301,000.00
 - New fleet of bicycles would make the local deliveries that were once made using the Iveco Daily or Fiorino.
- Limitation
 - 16 vehicles doing 256 deliveries per day. Each delivery weights an average 31,2kg – total of 7987,2kg per month.
 - 172 bicycles doing 2000 deliveries per day. Each delivery weights and average 4kg – total of 8000kg per month.

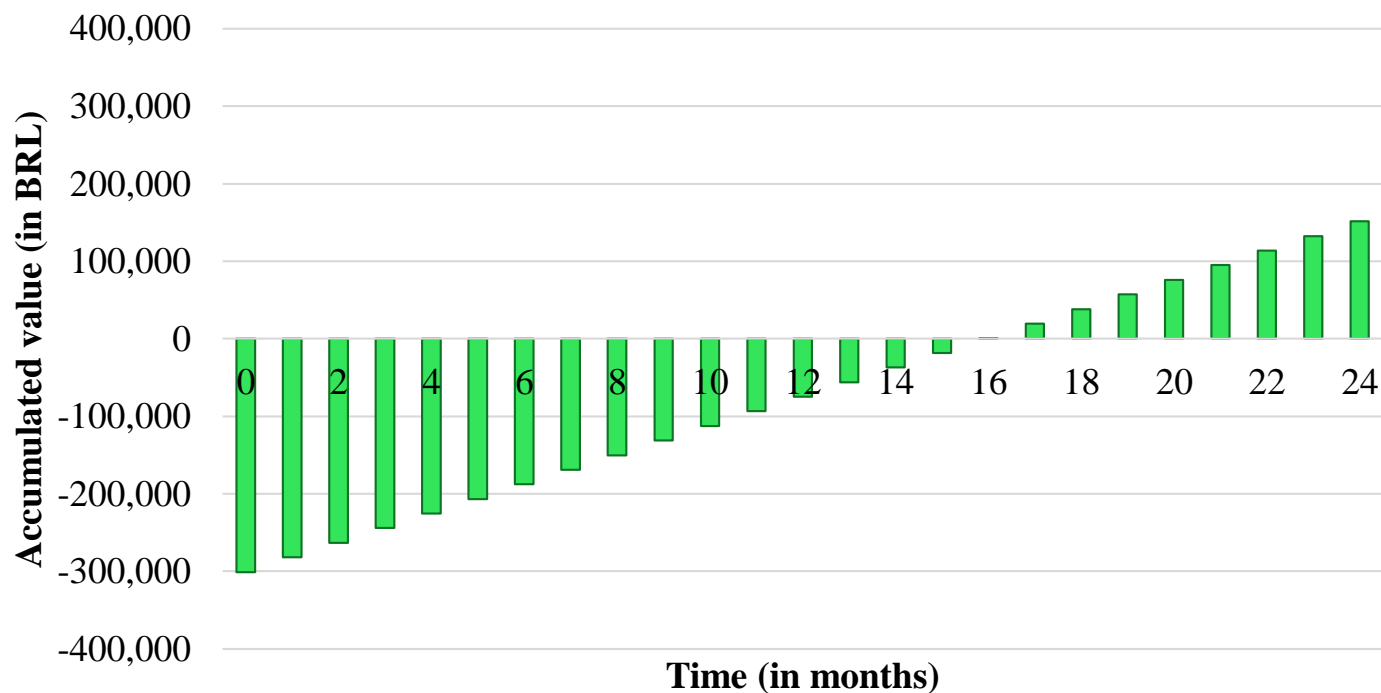


ECONOMIC ANALYSIS

NPV (BRL) of two simulated years	BRL 123,360.10
IRR p.m.	3.55%
IRR p.y.	52.05%
Payback Time (month)	15

↓ ≈ 18,800 BRL/month with fuel

IRR is positive, indicating that the investment is profitable and with a high annual rate of return, so that it presents itself as a good investment in the short term, which improves with the passage of time and becomes compensatory after a period from 15 months.



CONCLUSION



CONCLUSIONS

- Main outstanding difficulties were risks of robberies and traffic accidents, preconception in relation to topography, informal market, costs linked to the artisanal adaptation of bicycles.
- Most of the companies are cooperatives, with relatively low turnover and working in densely populated urban centres. Most deliveries and services are with low weight and short distances, mainly of documents and e-commerce products.



CONCLUSIONS

- IRR is positive, indicating that the investment is profitable and with a high annual rate of return, so that it presents itself as a good investment in the short term.
- We expect that this paper may serve as inspiration and encourage research in this field in the Brazilian reality.



THANK YOU!
ANY QUESTIONS?

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