

ANALYSIS OF ATTRIBUTES TO CHOOSE AN URBAN FREIGHT VEHICLE

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Motivation

The **decision on the type of freight vehicle** to perform urban deliveries is influenced by the **complexity of the urban freight transport process.**

Narrow Streets

Restrictions (time and weight of vehicle)

Customer requirements

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Research Question

What are the main attributes that influence the choice of an urban freight vehicle?

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Objective

To present the **attributes that influence** the choice of an urban freight vehicle by systematic literature review and **evaluated** them in a survey conducted with logistics operators that perform urban deliveries in some of the biggest cities in Brazil.

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Sistematic Literature Review

- ❑ What are the main attributes that influence the choice of an urban freight vehicle?
- ❑ Scopus database
- ❑ String:
 - “attributes in freight transport mode choice”
- ❑ We found 54 papers and 19 was selected

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Systematic Literature Review

❑ Vehicle attributes

- Vehicle conditions
- Vehicle capacity
- Fleet (own or outsourced)
- Age of vehicle
- Mode of transportation
- Total cost
- Type of fuel
- Operational cost per kilometre
- Customer requirement

❑ Route attributes

❑ Commodity attributes

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Systematic Literature Review

❑ Vehicle attributes

❑ Route attributes

- Total distance
- Number of tours/day
- Origin and Destination
- Accessibility
- Number of stops/tour
- Traffic restrictions
- Load/unloading areas
- Local of delivery (central area, historical, area suburb)

❑ Commodity attributes

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Sistematic Literature Review

- ❑ **Vehicle attributes**
- ❑ **Route attributes**
- ❑ **Commodity attributes**
 - Type of product
 - Weight of products
 - Volume of products
 - Lot size
 - Characteristics of the product
 - Diversity of products

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RESEARCH APPROACH

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Research Approach

□ Data

- Questionnaire with logistics operators in Brazil
- Attributes was evaluated using Likert scale

□ Descriptive statistic

- to describe the characteristics of the companies and spatial tools to identify the location.
- The internal consistency of the attributes was measured using Cronbach' alpha.

- We performed the analysis using software R, v. 1.1.463 through the package: Corrgram), psych, MAAS, FactoMineR, and factoextra.

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Research Approach

- ❑ Spearman correlation
 - to identify the correlation between the attributes
- ❑ Qui-square test
 - to measure the influence between the attributes
- ❑ Principal component analysis
 - to identify dependent variables

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RESULTS

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Results

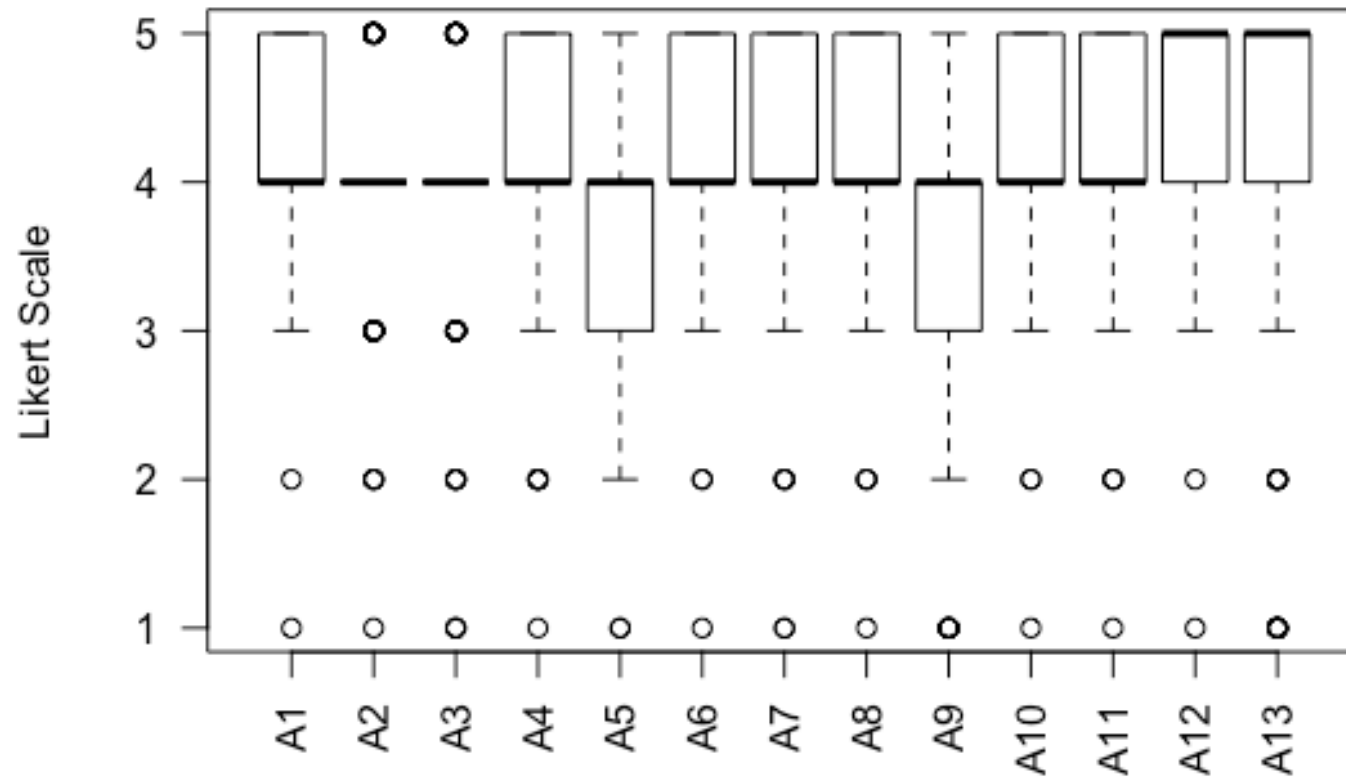
- Data from 202 operators' logistics in Brazil between July-August, 2018 using web-based survey
 - (Thanks to FDC to data!)
- Alpha de Cronbach between 0.71 to 0.8

	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13
alpha	0.79	0.79	0.79	0.79	0.79	0.79	0.78	0.78	0.81	0.79	0.78	0.80	0.82
KMO1	0.80	0.75	0.86	0.81	0.80	0.83	0.84	0.85	0.69	0.77	0.77	0.78	0.60
KMO2	0.86	0.78	0.87	0.83	0.72	0.86	0.83	0.85	-	0.78	0.77	0.79	-

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Results - boxplot



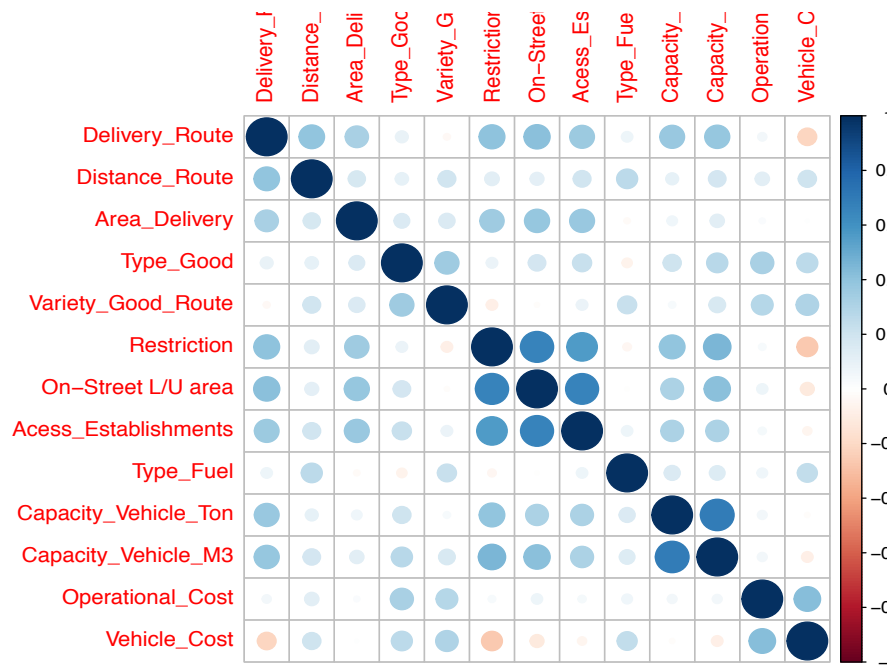
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Results - correlation

- The freight vehicle restriction and conditions of on-street loading/unloading areas;
- Conditions of on-street loading/unloading areas and condition of the access of commercial establishments;
- Capacity of vehicle (m³) and capacity of vehicle (ton).



Results - PCA

- KMO = 0.82 removing “type of fuel” and “vehicle cost”

Component	Eigenvalue	Variance Percentile	Cumulative Variance Percentile
Component 1	4.38	39.83	39.83
Component 2	1.42	12.91	52.74
Component 3	1.10	10.00	62.74
Component 4	0.94	8.57	71.31
Component 5	0.72	6.61	77.92
Component 6	0.57	5.42	83.34
Component 7	0.54	5.04	88.38
Component 8	0.40	3.69	92.07
Component 9	0.36	3.36	95.43
Component 10	0.28	2.54	97.97
Component 11	0.22	2.03	100.00

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Results - PCA

- ❑ Component 1: Delivery route, restriction, on-street loading/unloading areas, access of the establishments, and capacity of the vehicle (m^3). These attributes represent the **route** of the urban delivery;
- ❑ Component 2: type of product and variety of the goods in the route. These attributes represent the **goods delivered in one route**;
- ❑ Component 3: Area of delivery, capacity of the vehicle in ton and m^3 . These attributes represent the **area** that the deliveries are performed, with the size of the vehicle and reflect the restrictions in urban areas;
- ❑ Component 4: Delivery route and distance of the route. These attributes represent the **length of the route** and are associated with the distribution cost.

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Conclusion

- ❑ The type and size of products influence the number of products inside of the freight vehicle and, consequently, influence the number of deliveries by route.
- ❑ Also, the choice of an urban freight vehicle is strongly influenced by operational cost and by the route...
- ❑ The route is influenced by all attributes mentioned early ... as a vicious circle.
- ❑ The Brazilian reality is not different from another countries.



THANK YOU!

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