



**EDITAL Nº. 01/2020: SELEÇÃO DE CANDIDATOS ÀS VAGAS DO PROGRAMA DE PÓS-GRADUAÇÃO EM TRANSPORTES PARA O CURSO DE MESTRADO PARA O PRIMEIRO PERÍODO LETIVO DE 2021**

**RETIFICAÇÃO**

# PROVA DE MÚLTIPLA ESCOLHA

**Leia com atenção as instruções abaixo:**

1. A prova terá a duração total de **1h30min (uma hora e trinta minutos)**, sendo realizada em 3 (três) etapas subsequentes de 30 (trinta) minutos para cada etapa, já incluído o tempo de preenchimento dos respectivos formulários de respostas no *Google Forms*.
2. Ao final de cada etapa, o respectivo formulário será fechado ao recebimento de respostas.
3. A resolução da prova será acompanhada por um responsável do PPGT por meio de chamada de vídeo realizada via *Microsoft Teams*.
4. Durante a realização da prova, o candidato deverá manter a câmera ligada e direcionada para si, de tal modo que o responsável pela aplicação da prova possa visualizá-lo.
5. Cabe ao candidato buscar a infraestrutura de acesso a internet que seja segura para a realização da prova. O Programa não se responsabiliza por problemas de ordem técnica que possam ocorrer com cada candidato.
6. O candidato receberá, no e-mail declarado no momento da inscrição no processo seletivo, os cadernos de questões de múltipla escolha e o link de acesso aos formulários eletrônicos para o preenchimento das respostas.
7. Cada caderno de questões e o respectivo formulário serão compostos por 10 (dez) questões de múltipla escolha. Para que ocorra o registro das respostas é necessário clicar no botão “enviar” após finalizar o preenchimento das respostas de cada formulário.
8. Será eliminado o candidato que não tiver finalizado e enviado pelo menos um dos três formulários.
9. Não será permitida a interferência e/ou a participação de outras pessoas, salvo em caso de candidato que tenha solicitado condição especial, em função de deficiência que impossibilite a realização da prova pelo próprio candidato.
10. Durante a realização da prova, o candidato não deverá se comunicar com outros candidatos nem sair da frente da câmera sem a autorização do responsável pela aplicação da prova.
11. A desobediência de qualquer uma das determinações constantes nas instruções acima e no edital implicará na eliminação do candidato.

## Identificação do Candidato

Nome completo:

Inscrição:

ID:



## AVISO

Durante a realização da prova, tanto as questões quanto as opções de resposta foram disponibilizadas de forma aleatória para cada candidato. Por isso, as questões e as opções de resposta do presente gabarito não estão numeradas. Para fazer a verificação das respostas, busque o enunciado correspondente.

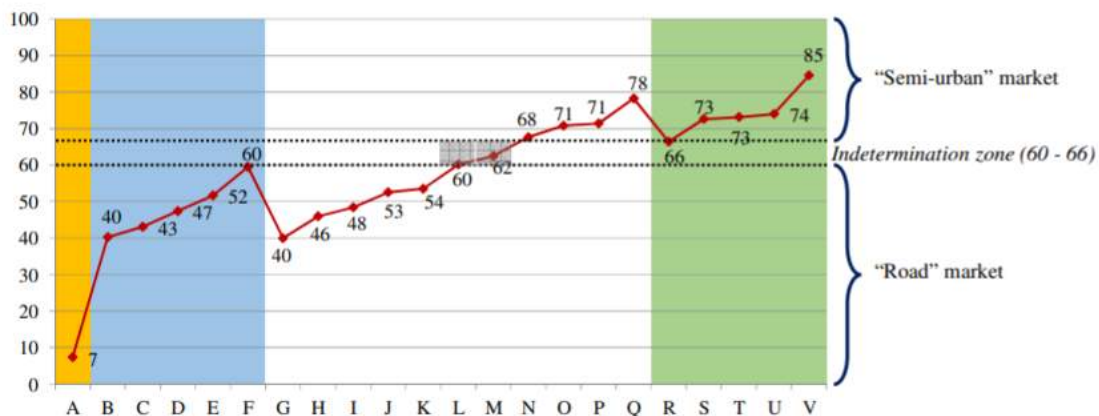
### QUESTÃO

Based on the manuscript of Ribeiro *et al.* (2019), weighting is an important phase of the Multi-Criteria Decision Analysis (MCDA) analysis. Why is it necessary normalizing the weights?

- Because they do not have variance 1.
- Because the weights should sum to the unity or 100%.
- Because the weights were determined according to the decision makers' choices.
- Because the weight should have zero mean.
- Actually, there is no required necessary normalizing the weights.

### QUESTÃO

According to the figure below (Ribeiro *et al.* , 2019), where the letters "A, B, C, ..., V" are the market (cities), we can conclude that:



- Less than 20% of the market (cities) were classified as "Indetermination zone".
- Only 32% of the market (cities) were classified as "Semi-urban" market.
- Less than 20% of the market (cities) were classified in the blue area.
- More than 23% of the market (cities) were classified in the green area.
- Half of the market (cities) were classified in the white and orange areas.

### QUESTÃO

According to Obelheiro *et al.* (2020), the GWNBR model was selected to that modeling because:



- Crash data are representing continuous data.
- It is the spatial version of Poisson regression.
- It is able to consider the overdispersion of the crash data.
- It is the only model capable to fit the data.
- Crash data are discrete and asymmetric to the left.

## QUESTÃO

Table below show the goodness of fit measurements of the models presented in Obelheiro *et al.* (2020). It is possible to conclude that the worst model is:

Goodness of fit measurements of the models.

Zonal system	# of explanatory variables	Model	Bandwidth	#Parameters	AICc	RMSE	SAD	PMAD
TAZs	4	Negative Binomial	–	5	1138.77	92.7	6663	0.34
		GWPR	13 <sup>a</sup>	67.08	1792.95	38.1	2459	0.13
		GWNBR	67 <sup>a</sup>	16.18	1113.91	74.3	5168	0.26
TSAZs	7	Negative Binomial	–	8	1264.15	52.9	4610	0.25
		GWPR	1399.19 <sup>b</sup>	65.90	1461.33	19.7	1692	0.09
		GWNBR	86 <sup>a</sup>	23.53	1243.36	41.0	3695	0.20

- GWNBR model because it has the smallest AICc value.
- Negative Binomial because it has the smallest number of parameters.
- GWPR model for TAZs with 4 explanatory variables and GWPR model for TAZs with 7 explanatory variables, based on the number of parameters.
- Negative binomial, considering AICc and RMSE.
- GWPR model according to the RMSE, SAD and PMAD.

## QUESTÃO (ANULADA)

The main contribution of the paper “A new zone system to analyze the spatial relationships between the built environment and traffic safety” was:

- Create a new crash-related zone system.
- Create a large zone system because they are easy to analyze.
- Create a zone system smaller than the traffic zone and census units, usually used in crash data studies.
- Show that the relationships between injury crashes and individual built environment features vary over space.
- Show the best model that fits the crash data.

## QUESTÃO

From the paper “Impact of the electricity mix and use profile in the life-cycle assessment of electric vehicles”, based on the values presented in the table and figure below, it is correct to say that:

**Table 1**  
Characteristics of the vehicles considered for each category.

Characteristics	ICEV				PHEV		BEV	
	VW Golf 1.6 TDI	VW Golf 1.4 TSI	Smart CDI	Smart	Chevrolet Volt	Nissan Leaf	Smart ED	Peugeot iOn
Emissions (gCO <sub>2</sub> /km)	118	144	98	86	0(ED) 160(GD) 91(MD)	-	-	-
Fuel consumption (l/100 km)	4.2	6.2	3.3	4.2	-(ED) 6.9(GD) 3.9(MD)	-	-	-
Electricity consumption (Wh/km)	-	-	-	-	140	140	110	120
Combustion engine (cc)	1600	1400	800	1000	1400	-	-	-
Electric motor (kW)	-	-	-	-	111	80	30	47
Battery capacity (kWh)	-	-	-	-	16	24	16.5	16
Battery weight (kg)	-	-	-	-	197	300	140	200
Battery type	-	-	-	-	Li-Ion	Li-Ion	Li-Ion	Li-Ion
Range (km)	700+	700+	500+	500+	580 (80ED + 500ER)	160	135	120
Curb weight (kg)	1240	1290	770	750	1715	1521	870	1080

Note: For the PHEV were considered three driving scenarios: only gasoline drive (GD), only electric drive (ED) and mixed drive (MD). The fuel consumption is given for the vehicle running with the battery depleted.

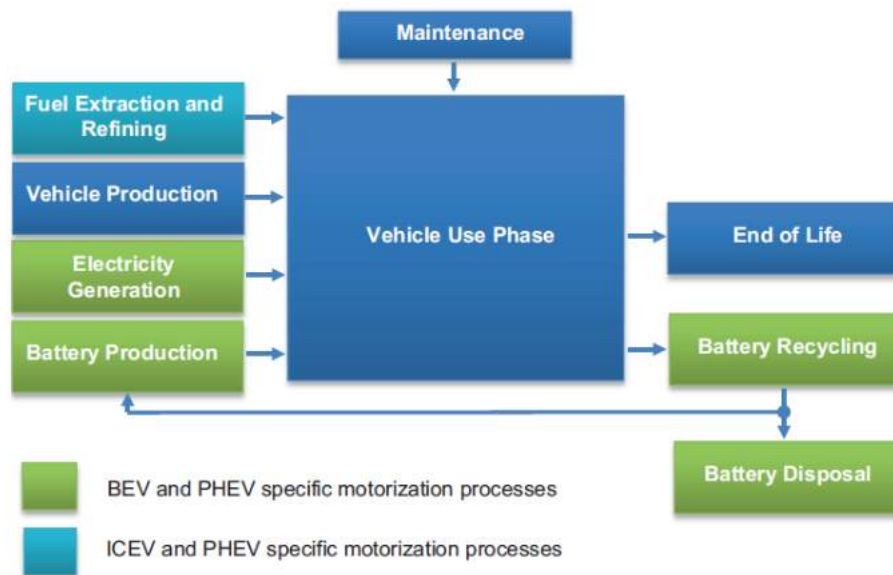


Fig. 1. Model and system boundaries for the three vehicle technologies.

- The CO<sub>2</sub> emissions of the vehicle use phase of Battery Electric Vehicles (BEV) are almost the same as the Internal Combustion Engine Vehicles (ICEV) emissions.
- The electric consumption of Internal Combustion Engine Vehicles is in the same order of magnitude of the Plug-in Hybrid Vehicles.
- For the vehicle use phase of the same model (SMART), the emissions are 86 g CO<sub>2</sub>/km of ICEV compared to 0 g CO<sub>2</sub>/km of BEV.
- For the same model (SMART), the ICEV version is heavier than the BEV version.
- In average, it is noticeable that the electric propulsion increases the range of vehicles, where the values of the BEV's range are higher than the ICEV's.

## QUESTÃO

From the paper “Impact of the electricity mix and use profile in the life-cycle assessment of electric vehicles”, energy losses are presented in the table and figure below. Which of the following options is correct?

**Table 2**

WTW system efficiency for the electric powertrain, considering the power losses along the electricity path, using a DC fast charger (DC) and a standard 240 VAC charger (L2), with Lithium-Ion batteries as energy storage. It should be noted that for the overall system efficiency the battery efficiency was accounted twice due to the charge and discharge cycles.

System components	Global system efficiency (%)	
	Minimum	Maximum
Transmission	98	99
Distribution	91	93
L2 Charger (L2)	95	97
DC Fast Charge (DC)	91	94
Battery	90	95
Inverter	90	98
Electric Motor	85	96
Drivetrain	87	93
WTT (w/L2)	76.2	84.8
WTT (w/DC)	73.0	82.2
TTW	59.9	83.1

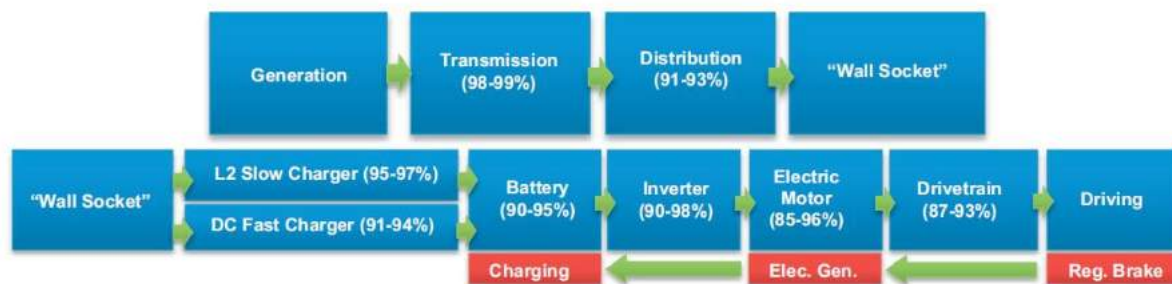
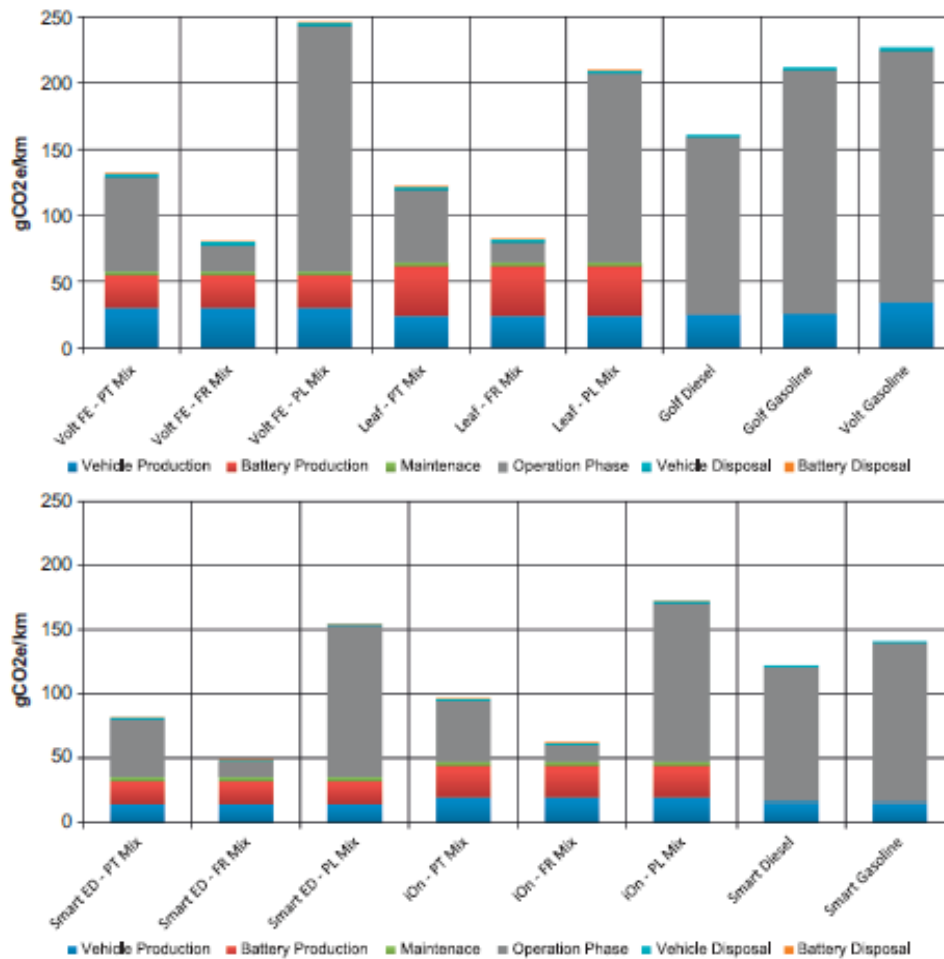


Fig. 2. Range of efficiency of the different components in the energy path of an EV.

- The electric motor and drive train together are the least efficient systems.
- In average, Slow Chargers of electric vehicles are less efficient than the Batteries.
- The Transmission and Distribution of energy are less efficient than the electric motor system.
- The Inverter system has 10% of efficiency.
- In average, DC Fast Chargers of electric vehicles are more efficient than the Slow Chargers.

## QUESTÃO

From the paper “Impact of the electricity mix and use profile in the life-cycle assessment of electric vehicles”, the Well-To-Wheel Life Cycle emissions of Green House Gases (GHG) are presented in the figure below. It is correct to say that:

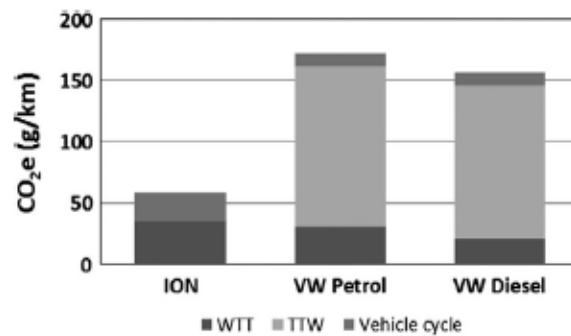


- The ICEV emissions of GHG are always greater than BEV and Plug-in Hybrid Vehicle (PHEV) emissions.
- The Polish electric Mix (PL) resulted consistently in lower emissions for BEV's compared to BEV's for the Portuguese and French mix.
- The GHG emissions of the Smart running with gasoline are higher than the Electric version of Smart for the Polish mix.
- The GHG emissions of BEV's are zero for the operation phase.
- The French mix minimized the GHG emissions for the operation phase of BEV's while the vehicle and battery production emissions were kept almost constant.

## QUESTÃO

From the paper "Impacts of electricity mix, charging profile, and driving behavior on the emissions performance of battery electric vehicles: A Belgian case study", in the figure below, it is correct to say that:





- The Well-To-Tank (WTT) emissions of CO<sub>2</sub>e of BEV is lower than ICEV's.
- The total Life Cycle emissions of CO<sub>2</sub>e of BEV resulted in lowest values near 50 g/km.
- The BEV emissions of CO<sub>2</sub>e for the Tank-To-Wheel (TTW) phase are the highest.
- The ICEV's Life Cycle emissions of CO<sub>2</sub>e are higher due to the vehicle cycle.
- The ICEV running with gasoline resulted in total Life Cycle emissions of CO<sub>2</sub>e lower than an equivalent vehicle running with diesel.

## QUESTÃO

From the paper "Impacts of electricity mix, charging profile, and driving behavior on the emissions performance of battery electric vehicles: A Belgian case study.", in the figure below, it is correct to say that:

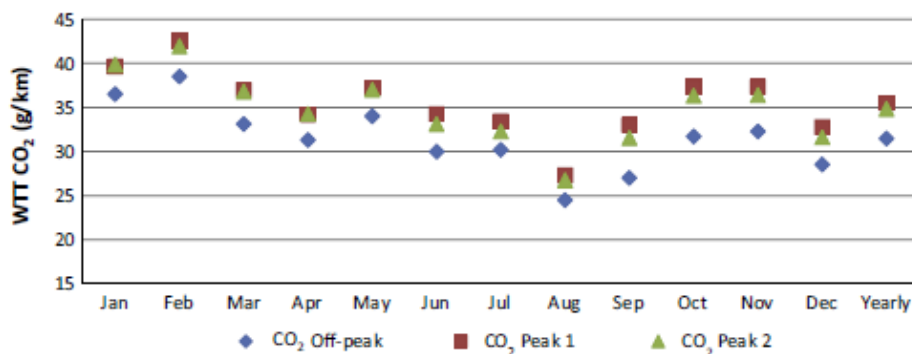


Fig. 9. Effect of different charging profiles and electricity mix on the well-to-tank CO<sub>2e</sub> emissions of BEV.

- The CO<sub>2</sub>e emissions of the Well-To-Tank (WTT) phase for charging BEV's resulted in lowest values near 30 g/km on July.
- The CO<sub>2</sub>e emissions of the Well-To-Tank (WTT) phase for charging BEV's resulted in highest values near 35 g/km on November.
- The CO<sub>2</sub>e emissions of the Well-To-Tank (WTT) phase for charging BEV's resulted in minimum values during peak hour for the entire year.
- The CO<sub>2</sub>e emissions of the Well-To-Tank (WTT) phase for charging BEV's resulted in the least value during off-peak hour on August.



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- The CO<sub>2</sub>e emissions of the Well-To-Tank (WTT) phase for charging BEV's resulted in a highest value during off-peak hour on February.

### QUESTÃO

According to the Gupta (2018), the worldwide trend is for non-flight revenue to have a greater share than flight-related revenue in total airport revenue. Non-flight revenue is estimated to be between:

- 30% and 40%.
- 60% and 70%.
- 20% and 30%.
- 50% and 55%.
- 10% and 15%.

### QUESTÃO

According to the Olariaga and Álvarez (2015), the use of air transportation in Colombia is relatively intense because of:

- Its topography.
- The hijackings on the roads.
- The high maritime tariffs.
- Passenger preferences.
- Price.

### QUESTÃO

The paper "Evolution of the airport and air transport industry in Colombia and its impact on the economy" gives how many public agencies are in the Colombian air transportation structure?

- 5 institutions.
- 3 institutions.
- 2 institutions.
- 1 institution.
- 0 institution.

### QUESTÃO

According to the paper "Recent applications of big data analytics in railway transportation systems: A survey", Big Data Analytics (BDA) has increasingly attracted a strong attention of analysts, researchers and practitioners in railway transportation and engineering. Therefore, based on the analysis of this paper, they used the following three main areas to classify the main published papers in Railway Transportation Systems (RTS).

- Scenario analysis, predictive, maintenance.





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- Bayesian network, decision tree and regression.
  - Prescriptive, Predictive and Numeric Prediction.
  - Semantic analysis, test analysis, clustering.
  - **Maintenance, operations and safety.**

### QUESTÃO

There have been some papers related to the role of Operations Research (OR) in logistics including the one by of The Role of Operations Research towards Advanced Logistic (Takai, 2009). Some of issues are important challenges toward the advanced logistics and the role of OR. Let us say that one has mentioned the following sentences:

- I) Response to wider area, more complex supply chain networks.
- II) Issues in which development of new methodologies for model construction and optimization are expected.
- III) Dynamic delivery planning optimization for agile response to demand.
- IV) Modal shifting and multi-modal transportation.

Select the right sentence below, where there are important challenges toward the advanced logistics and there is a role of OR in it, according to Takai (2009):

- Only Issues I, II and IV are important.
- Only issues I, III, and IV are important.
- Only issues II and III are important.
- Only issues II, III, and IV are important.
- **All issues (I, II, III and IV) are important.**

### QUESTÃO

There have been many issues related to the use of Big data in transportation including in the Railway Transportation Systems (RTS). According to the paper "Recent applications of big data analytics in railway transportation systems: A survey", some issues are important. Select which of the sentences below can be classified as true according to this paper:

- **In most cases, the data collected in the RTS systems suffers from heterogeneity, inconsistency and incompleteness.**
- Even though there is a huge amount of generated data in RTS, it does not necessitate the application of newer technologies/tools with capabilities in handling this data.
- Collecting track data in real time for RTS systems especially for maintenance purposes does not have a time limit, since for maintenance, for instance, it does not require real-time data analytic techniques.
- Fortunately, different from other transportation systems, privacy and data ownership is not an important issue of Big Data Analytics (BDA) for RTS.
- Since the application of Big Data Analytics (BDA) for RTS is a very specific issue, where only very specialized engineers are able to understand the whole system, it does not



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require dedicated collaboration projects between railway engineers, scientists, information technologists and software developers.

### QUESTÃO

Some authors have classified the Railway Transportation Systems (RTS) components systems in order to better evaluate the RTS and, among the authors we can mention the paper of Ghofrani *et al.* (2018). Therefore, according to this paper, what are the main components in RTS?

- Train, wheel and seats.
- Axles, trucks, and locomotives.
- Traction, structure and seats.
- Signaling equipment, vehicle and track.
- Geometry, seats, locomotives.

### QUESTÃO

The field of Operations Research has been applied in many real-world problems including the Supply Chain Management (SCM) one. The paper “The Role of Operations Research towards Advanced Logistic” has outlined some of the costs associated with the SCM field. According to this paper, one can affirm that:

- Due to the efficiency of the Japanese industry, the total amount of logistics costs in Japan’s domestic industries was only 2% of this country’s gross domestic product (GDP).
- It is possible to say that the transportation system in Japan is quite developed, but, even with all this development, 70% of the logistics costs in the Japanese domestic industries is associated with transportation costs.
- By the time of 2005, one can say that the supply chain of the Japanese industry was not facing major turning points, since, by that time, the issue of international logistics was not an important one yet.
- Even though the supply chain is an important issue for the industries, any changes in the logistics sector do not affect other sectors like the energy sector or the financial services.
- Since the transportation systems in Japan are quite well developed, only 20% of the logistics costs in the Japanese domestic industries are associated with transportation costs.

### QUESTÃO

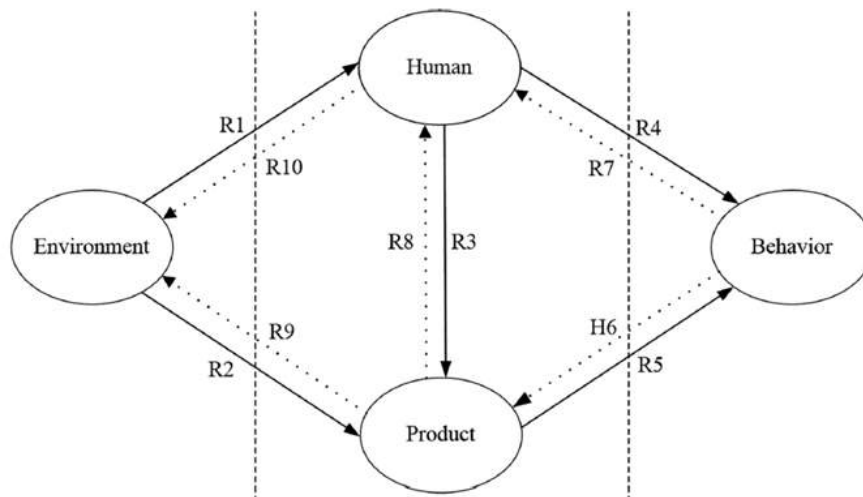
In the paper “Modelling the acceptance of fully autonomous vehicles: A media-based perception and adoption model” autonomous vehicles (AVs), is also known as, except:

- Automated car.
- Driverless car.
- Self-driving car.

- Robotic car.
- Navigating vehicle.

### QUESTÃO

According to the paper of Zhu *et al.* (2020) and based on the figure below, it is correct to say that the dynamic progress of innovation adoption can be divided into the following three stages, in this order:



- Pre-adoption, perception and post-adoption.
- Stimulation, perception and action.
- Pre-adoption, stimulation and post-adoption.
- Action, stimulation and perception.
- Perception, pre-adoption and post-adoption.

### QUESTÃO

According to the theoretical frame of pre-adoption presented by Zhu *et al.* (2020), a media-based AVs perception and adoption model is developed with eight constructs, twenty hypotheses, and four determinants. The false determinant is:

- Environmental determinants: mass media & social media.
- Personal determinants: self-efficacy and subjective norms.
- Behavioral determinants: public AVs and subjective intention to adopt AVs.
- Product determinants: perceived usefulness and perceived risks.
- Behavioral determinants: intention to adopt AVs and public AVs.

### QUESTÃO

In the paper “Modelling the acceptance of fully autonomous vehicles: A media-based perception and adoption model”, the results of the media-based perception and adoption model (MPAM) presented below is true, except:



- The present results indicate the information from mass media and social media have different effects on perception of fully AVs. Mass media significantly enhances one's self-efficacy of AVs, while social media has a significant impact on subjective norms.
- The results verify that mass media help people comprehensively realize the utility of AVs and the risks as well, which strengthens the mixed opinions about AVs.
- The present results indicate the social media has no salient impact on perceived usefulness of AVs but have a negative influence on perceived risks.
- The results do not support the hypotheses that self-efficacy builds up the perceived usefulness of AVs and directly drives one's adoption intention to AVs.
- The perceived usefulness has a stronger positive stimulating role in intention, but perceived risks hinder users' intention to adopt AVs.

### QUESTÃO (ANULADA)

Which of the following options was the routing method/algorithm used by the Anylogic software to plan the e-commerce deliveries reported in the paper of Alves *et al.* (2019)?

- Neighbor / furthest point.
- Clarke and Wright.
- Nearest neighbor/point.
- Scan.
- Tableau.

### QUESTÃO (ANULADA)

As described by Souza and D'Agosto (2013), the options below are parameters related to the vehicles to enable e-commerce deliveries in a simulation environment with the Anylogic software, except:

- Downtime.
- Number of trucks.
- Weight.
- Volume.
- Location.

### QUESTÃO

Souza and D'Agosto (2013) presented on their paper the logistical costs that is applicable to the reverse logistics chain for scrap tires. The alternatives below are related to this logistical costs, except:

- Transportation.
- Storage.
- Stock.
- Production.



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- Order processing.

### QUESTÃO

In the paper “Using best-worst scaling to identify barriers to walkability: a study of Porto Alegre, Brazil”, the authors said, “people living in pedestrian-oriented neighborhoods are encouraged to drive less and walk more”. Based on this paper, how is characterized the pedestrian-oriented neighborhood?

- Sidewalks, job density and comfort.
- Mix land use, comfort and street connectivity.
- **Street connectivity, mixed land use and high population density.**
- High population density, conviviality and comfort.
- Conviviality, mixed land use and sidewalks.

### QUESTÃO

Larranaga *et al.*, (2018) lists some metrics to measure walkability. Which one is applied to the analyzed case?

- Neighborhood Environment Walkability Scale.
- 5D's: density, diversity, design, distance to transit and accessible destinations.
- 7C's: connectivity, convenience, comfort, conviviality, conspicuousness, coexistence and commitment.
- **Safety, security, convenience and attractiveness.**
- Walkability index.

### QUESTÃO

Based on the results of the paper “Using best-worst scaling to identify barriers to walkability: a study of Porto Alegre, Brazil”, the authors highlighted the importance of the scale used to measure walkability. About the scale used in the paper, it is correct affirm that:

- **Microscale built environment factors is more adequate to walkability estimation.**
- Mesoscale built environment factors can be used to general analysis of walkability with correct estimation of the variables.
- It is better to measure walkability with micro and mesoscale built environment factors.
- The scale used do not affect the results.
- Microscale built environment factors have the same results of Mesoscale built environment factors.

### QUESTÃO

In the paper “How does neighborhood design affect life satisfaction? Evidence from Twin Cities”, the author presents a literature review related to variables the affect life satisfaction. What variables were used by the author in the modeling process?



- Density, diversity, design and environmental amenities of residential neighborhoods.
- Urban greenway trails and quality of life.
- Neighborhood open space characteristics, presence of public park and bus rapid transit.
- Perceived neighborhood characteristics, building density and vegetation rate.
- Safety of parks, safety from traffic, and street noises.

## QUESTÃO

Considering the results presented in the table below and in Cao (2016) analysis, and considering a significance level of 8%, it is correct affirm that:

**Table 3**

Standardized total effects of objective neighborhood characteristics on life satisfaction.

	Total Effects	p-Value
Population density	-0.005	0.000
Land use mix	-0.031	0.184
Cul-de-sac density	-0.286	0.074
Share of open space	0.023	0.667

- All variables are statistically significant.
- No variable is statistically significant.
- Population density is significant and have great impact on life satisfaction.
- The total effect of the cul-de-sacs density variable is negative and marginally significant.
- Land use mix and the share of open space are statistically significant.





## Justificativa

### QUESTÃO (ANULADA)

*The main contribution of the paper “A new zone system to analyze the spatial relationships between the built environment and traffic safety” was:*

- *Create a new crash-related zone system.*
- *Create a large zone system because they are easy to analyze.*
- *Create a zone system smaller than the traffic zone and census units, usually used in crash data studies.*
- *Show that the relationships between injury crashes and individual built environment features vary over space.*
- *Show the best model that fits the crash data.*

#### Justificativa:

A partir da análise de recursos interpostos pelos candidatos, a Comissão de Seleção avaliou que apesar de não haver erros no enunciado ou nas alternativas, há mais de uma resposta possível para a questão. Dessa forma, a Comissão optou pela anulação da questão.

### QUESTÃO (ANULADA)

*Which of the following options was the routing method/algorithm used by the Anylogic software to plan the e-commerce deliveries reported in the paper of Alves et al. (2019)?*

- *Neighbor / furthest point.*
- *Clarke and Wright.*
- *Nearest neighbor/point.*
- *Scan.*
- *Tableau.*

#### Justificativa:

A partir da análise de recursos interpostos pelos candidatos, a Comissão de Seleção avaliou que apesar de não haver erros no enunciado ou nas alternativas, há opções de resposta passíveis de causar dúvidas na seleção de uma das opções. Dessa forma, a Comissão optou pela anulação da questão.

### QUESTÃO (ANULADA)

*As described by Souza and D’Agosto (2013), the options below are parameters related to the vehicles to enable e-commerce deliveries in a simulation environment with the Anylogic software, except:*



- *Downtime.*
- *Number of trucks.*
- *Weight.*
- *Volume.*
- *Location.*

**Justificativa:**

A partir da análise de recursos interpostos pelos candidatos, a Comissão de Seleção avaliou que há a possibilidade de ambiguidade na tradução de termos do artigo que poderiam causar dúvidas na análise das opções de resposta. Dessa forma, a Comissão optou pela anulação da questão.