

Association between expansion level and regional culture: An e-commerce view



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ABSTRACT

This study aims analysis the association between regional culture and Expansion Levels in e-commerce business. This study was designed

through an archival approach, and the data has information on 3,065 e-commerce sellers with 100,000 customer purchase orders. We use the regional cultural dimensions of Hofstede et al. (2010) for electronic sellers and the averages of the cultural dimensions of their respective customers. Therefore, to describe the association, we use a machine learning technique, a decision tree, to predict the level of regionalization. The findings described the importance of the long-term orientation dimension. In all decision tree models, this dimension was the most important, as it was decisive for dividing e-commerce sellers into low and high Expansion Levels. Moreover, other dimensions were also relevant. For example, power distance was also highlighted in models that considered the characteristics of customers or sellers only. The sample is only limited to a small business that needs support to develop their sales. The implication of these results is based on how the expansion of e-commerce can be associated with cultural dimensions. And yet, it is noted that the characteristics of the customers were more important to predict the Expansion Level since it obtained the smallest error.

Keywords: Region differences, Cultural dimensions, Expansion Level, E-commerce sellers, E-commerce customers.

1 INTRODUCTION

The internet has expanded in recent years to encompass everyday market transactions, raising the importance of identifying factors influencing consumers to adopt buying behavior. In addition to factors such as perceived risk and purchase intention, it is essential to identify cultural influences (Choi, & Geistfeld, 2004).

Hofstede's dimensions (1983) can play a considerable role in consumer behavior. Considering the cultural comparison at the national level, it presents countries with different cultural characteristics. For example, the characteristic related to high uncertainty avoidance may affect individuals to be more hesitant to make purchases online (Yoon, 2009).



However, the cultures of societies are not directly observable because they refer to a dense and complex construct of symbols, norms, and values that are immersed in society (Schwartz, 2014). Regional differences are as significant as national ones since national differences do not represent the distribution of the population due to regional differences (Taras, Steel, & Kirkman, 2016). In addition, approaches at the regional level may be contextualized at the cross-national level through new insights (Kostova & Beugelsdijk, 2021).

At the regional level, many conditions can be observed to characterize the culture of that region. These characteristics include population size, climatic conditions, vegetation, and economic development, among others (Hofstede, Hilal, Malvezzi, Tanure, & Vinken, 2010). Previous studies show the importance of cultural differences within-national and between-national. Among the findings, it is possible to observe the effects of regional differences in various environments, for example, in e-commerce in some countries in the European Union (Kaasa, Valdi, & Varblane, 2014), differences between the United States of America and Korea (Choi, & Geistfeld, 2004, An, & Kim, 2008), in china (Yoon, 2009), and more.

However, there are arguments against the idea of national culture. Although Minkov and Hofstede (2012) point to fundamental cultural values in country regions that can be grouped by national similarities in emerging nations, Malaysia and Indonesia share an official language, main religion, and long national border. On the other hand, Minkov & Hofstede (2012) also found a higher tendency to form clusters into countries. In this sense, Anglo countries are closer than other regions within Uruguay or Brazil.

Nonetheless, there is evidence that sub-national location is a material element because it can be affected by differences between cities, states, and regions. And these differences also can be justified by institutional idiosyncrasies of potential local (e.g., Ma, Delios, & Lau, 2013), such as economic, productive, historical, demographic, administrative, and governmental, as well as their local culture (Berry, Guillén, & Zhou, 2010, Falaster, & Ferreira, 2020).

Observing the level of regionalization of small businesses in electronic commerce in the face of regional cultural differences can contribute to previous studies to describe a scenario closer to the challenges faced by the population. Thus, we designed this study to answer the following question: What is the association between regional culture and Expansion Levels in e-commerce business? This association allows us to observe the main barriers and cultural opportunities that each seller faces to regionalize.

Thus, we identified the regional cultural dimensions (Hofstede et al., 2010) of the electronic sellers and the averages of the cultural dimensions of their respective customers. And the level of regionalization was calculated by the sales total outside their respective states divided by the sales



total. Thus, to describe the association, we use a machine learning technique, a decision tree model, to predict the level of regionalization.

Our results showed that the most important dimensions are sellers' long-term orientation and customers' long-term orientation. Power distance also proved to be essential for dividing sellers into high and low levels of regionalization. In addition to these, the dimension focused on customers' individualism is also vital to classify sellers at a high Expansion Level. Given this, our study is original because demonstrates how the cultural dimensions contributed to split e-commerce sellers in high and low Expansion Levels by differences in regional culture.

The following topics are organized as follows; the second topic presents the theoretical framework that we offer studies that cover national and regional characteristics and relate e-commerce with cultural factors. The third topic describes the methodological procedures. The fourth topic presents the results and discussion with descriptive analysis and decision trees. Finally, the fifth topic presents the conclusion of the study.

2 THEORETICAL FRAMEWORK

2.1 REGIONAL DIFFERENCES

Various facts influence national cultures, for example, history, languages, and religions. Moreover, national cultures also are associated with factors within a country level, such as the educational system, political regime, economic structure, technological development, etc. Other characteristics are also challenging to generalize. Consequently, different fields of study tend to set a level of culture, from national to individual. Moreover, to elevate the complexity of the issue, there are more layers into cultures, such as values, beliefs, and others, that can focus on separately. Thus, the countries are not good proxies for culture but are still being applied (Vaiman & Brewster, 2015).

Considering cultural index data, the firms tend to stay away from culturally distant countries but are more intricate because considerable cultural distance can impact the subsidiaries negatively. Otherwise, the company's internationalizing movement would not be realized. The perceptual measures approach compared with the cultural distance index show more evident effects and holds a negative impact. Additionally, the cultural distance is sensitive to the sample, in countries in developing, such as Brazil, China, and India, the adverse effects of distance on performance change signal to positive but turns insignificant (Beugelsdijk, Kostova, Kunst, Spadafora, & Essen, 2018).

Therefore, it is appropriate for a theorizing level to see into the national level because diversity could be a relevant condition for other types of cross-national distance. Nevertheless, diversity is a valuable opportunity to bring ideas to attain these study approaches when applied in the national context (Kostova & Beugelsdijk, 2021).



The cultural differences within countries are even comparable with culturally somewhat distant countries. In Europe, countries such as Portugal, Slovenia, Slovakia, Germany, Ukraine, and Spain, can be observed significant within-country differences. Therefore, the cultural distance between some countries can be of the same importance as the within-countries. The implication of this fact, for example, can be benefic designing distinct approaches for management or marketing in these countries. On the other hand, some countries are more culturally homogenous, such as Finland, Sweden, and Norway. In those cases, concern about additional differentiation maybe not be helpful. Consequently, differentiating within-countries cultures is not straightforward because group dimensions depend on the researcher's aims (Kaasa, Valdi, & Varblane, 2014).

However, the differences within countries can be observed by characteristics like population size, climatic conditions, vegetation, ethnicity, languages used, food, music, economic development, and other characteristics. For example, Brazil can be split into five administrative regions, (I) the south with many European and Japanese immigrants and bordering Argentina, Uruguay, and Paraguay, (II) the southeast, that have more than half of the country's industrial production, (III) central west fastest developing region, (IV) the northeast former colonial area like the south of the Equator, and (V) the north, boarding on Bolivia, Peru, Colombia, Venezuela, Guyana, Suriname, French Guiana, and the Atlantic (Hofstede et al., 2010).

Berry, Guillén, & Zhou (2010) point out that cultural distance can discourage organizations from performing investments in foreign countries. In Addition, the cultural approach considers only one of the distance dimensions metrics to influence foreign investment decisions. Although there are effects on that decision, culture, and other distance have a differential effect. For example, cultural, political, administrative, demographic, and geographic distances show opposite results.

Cultural differences influence several characteristics of companies. For example, the findings of Jwijati, Bititci, Caldwell, Garengo, and Dan (2022) point out that national differences influence the technical controls and performance management practices of organizations. Furthermore, masculinity was the cultural dimension that most influenced the construction and use of PMSs and performance management practices. Although the findings support that masculinity is the main relevant dimension of national culture, it also points out that power distance and individualism as the main influencers that influence technical and social controls. However, in terms of performance measurement, other cultural dimensions were also relevant.

When observing the impact of national culture on the strategic alignment of information technology in subsidiaries of multinational corporations, Adaba, Wilson, and Sims (2020) point out that national cultural values tend to be implemented in organizational culture through staff recruitment and training. In addition, the use of information technology tends to standardize the organization's practices.



In addition to influencing corporate social responsibility practices, that is, influencing excellence in terms of governance, transparency, quality of financial reports, human knowledge, and decision-making capacity, cultural factors also influence the quality of companies' investments. Thus, managers must consider the cultural environment in which they live and work to reduce the probability of making decisions that result in excessive or insufficient investments (Rehman et al. 2022).

So, considering the importance of differences within countries culturally and the changes in commercial activities, the next topic describes the relationship between e-commerce and culture.

2.2 E-COMMERCE AND CULTURE

The internet expands to a common standard for marketplace transactions in the world. This is important to identify factors affecting consumer e-commerce adoption and how cultural differences influence these issues. Individualism has an indirect effect on cultural values that implies behavioral intention. There is an indirect effect of individualism in relationships between perceived risk and purchase intention. In this sense, a higher level of individualism tends to have a higher level of perceived risk, and this implies it reduces the choice of online shopping (Choi, & Geistfeld, 2004).

An and Kim (2008) examine the effects of cultural values – through two of Hofstede's dimensions, individualism and uncertainty avoidance – on customer trust in internet shopping. Was analyzed trust of Koreans and Americans in internet sellers from a cross-cultural perspective. The findings show differences significantly in the degree of individualism and uncertainty avoidance between Koreans and Americans. Nevertheless, these cultural factors do not directly affect but improve to predict trust in online shopping.

The findings of the study's Yoon (2009) indicated that national culture affects consumer acceptance of e-commerce, and in Hofstede's cultural dimension, uncertainty avoidance and long-term orientation have a considerable role. So, this fact suggests that countries with high uncertainty avoidance are more hesitant in online shopping because they usually understand e-commerce as having uncertain outcomes. Thus, supporting consumers to feel safe in an online environment using mechanisms such as customer feedback can be a way to solve this barrier. Moreover, in countries such as China, customers have a high long-term orientation. Customers feel trust is more important than perceived usefulness and perceived ease of use (Yoon, 2009).

Likewise, uncertainty avoidance is concerned with e-commerce because the implications between usage intention can be weaker than with uncertainty avoidance culture level. In countries such as Algeria, there is an individual tendency to avoid uncertain situations and is preferred case under known and recognized conditions instead. Otherwise, culture like Malaysia, the individuals do not have any issues accepting the uncertain conditions. So, individuals in an environment with low



uncertainty avoidance tend to have an attitude and intention to involve in e-commerce activities (Belkhamza, & Wafa, 2014).

Customer retention can be improved if was observed marketing strategy across cultures. Although building strategy across countries can be more straightforward and more effective than customer groups with distinct personal values, individual relationships are essential. In this sense, e-commerce organizations can seek to insert into customer profiles cultural data. Additionally, the tendency to increase mobile marketing, social networks, and other digital trends can make accessing personal data less complex to build a marketing strategy value-based. Besides, more collectivist cultures appear to be more effective in creating relationships at individual levels (Frank, Enkawa, & Schvaneveldt, 2015).

In this sense, Xu and Cheng (2021) evidenced that economic development in business-to-customer commerce may be influenced by national culture. The regression model demonstrates a positive relationship between uncertainty avoidance and business-to-customer e-commerce. Nevertheless, these results are contrary to the previous study. Furthermore, countries with high individualism tend to implement and expand well on e-commerce. On the other side, the culture of higher collectivists does not adopt e-commerce.

The conclusions of Arinalhaq and Widyanti (2019) point out that for the e-commerce customer, Indonesian culture tends to influence both the user experience and the usability of the site. However, the design of the electronic site must consider power distance and individualism-collectivism, because not all dimensions are relevant to the construction of sites. Therefore, the effectiveness of the site is related to cultural characteristics. In this way, paying attention to these factors will increase both usability and financial increase.

Furthermore, the government needs to consider institutional and cultural environments because providing safety in nets can mitigate the concerns of potential adopters. So, providing an information technology infrastructure is a relevant factor in increasing e-commerce adoption. Moreover, an example of that relevance is when individuals are reluctant to operate commercial transactions online because their culture has a higher level of uncertainty avoidance. (Ahluwalia & Merhi, 2020).

Looking for another uncertainty measure different from Hofstede, Chen, Li, Davison, and Liu (2021) conclude that imitation behavior influences purchase intention but is not moderated by seller uncertainty. On the other hand, there is a significant moderate from product uncertainty and product fit uncertainty to the relationship between imitation and purchase intention.

Although the effect of cultural differences can be confirmed in online shopping, some studies show these differences, do not necessarily influence customer behavior. Broeder and Nguyen (2020) investigated deal exclusivity on accommodation booking intention. The findings confirmed the



difference between Dutch participants and Vietnamese participants but described that cultural differences do not moderate the effect investigated.

According to Febrian and Fadly (2021), culture did not play a moderating role in electronic word of mouth (eWOM), brand value, and consumer satisfaction. However, culture can directly affect purchase intent. As a limitation, the authors emphasize that the age differences not analyzed, in this sense, consider that not only young customers are making purchases, but also customers of other age groups. In addition, the cultural factors used in the research consider only Indonesian collectivist factors, so divergent results can be obtained with cultures from other countries.

When approaching the role of culture in the analysis of online users Kusawat and Teerakapibal (2021) conclude that there are differences in the form of evaluation according to culture. Individualistic clients act according to their thoughts and emotions, whereas more collectivist clients tend to be more tolerant, adjusting their behavior to social norms. Thus, because more individualistic consumers promote more self-expression and assertiveness, they provoke more negative criticism when faced with negative situations concerning more collectivist consumers.

Although, outside the scope of this study due to the time frame, it recognizes that there was an incentive to reinforce remote work activities and e-commerce during the pandemic. However, according to Christopoulos, Eleftheriou, and Nijkamp (2021), neither remote work activities nor the focus given to e-commerce was sufficient to contain the pandemic. The increase in remote work activities, as well as e-commerce, is recognized.

However, barriers to the implementation of e-commerce are still consistent. The results of Hallikainen and Laukkanen (2018) describe that not all effects between the cultural dimensions and trustworthiness are mediated by the disposition of trust. However, national culture also tends to influence the perception of e-commerce reliability. In that same sense, the results of Yadav, Soni, Gupta, and Kumar (2022) describe barriers and what prevents implementation in SMEs. Among these, lack of benchmarking and lack of management commitment are the most significant factors for implementing e-commerce. In addition, inadequate funds and poor planning are the most influential barriers. The next topic presents the methodological procedures.

3 METHODOLOGY

We design this study through an archival approach because this method type can improve considerably external validity and relevance for policy decisions, as well as its possible measure of socially sensitive facts (Barnes, Dang, Leavitt, Guarana, & Uhlmann, 2018). For analyses of the association between Expansion Level and dimensions cultural the scenario, the choice was Brazilian e-commerce, because it provides a significant difference between individualism versus collectivism,



as well as cultural individualism correlating strongly with national wealth also correlates with regional wealth (Hofstede et al., 2010).

The data sets are actual commercial data anonymized and have 100 thousand orders from 2016 to 2018 received in various marketplaces in Brazil. These data sets are provided by Olist Store at an online community of data scientists and machine learners – Kaggle. Olist Store is the largest department store in Brazilian marketplaces that connects small enterprises in Brazil (Olist Store, 2021).

To calculate the Expansion Level, we aggregate the sum of the total amount of products sells for other states divided by total sales. The seller’s dataset has information on 3,095 sellers. Thus, Table 1 describes the variables used to describe the association between regionalization and regional cultural dimensions.

Table 1. Variables, description, statement

Variable	Statement
Expansion Level	$Rl = \frac{\text{Sales to other States}}{\text{total sales}}$
Power distance seller	Power distance of seller’s region.
Uncertainty Avoidance seller	Uncertainty Avoidance of seller’s region.
Individualism seller	Individualism of seller’s region.
Masculinity seller	The masculinity of the seller's region.
Long-Term Orientation seller	Long Term Orientation seller’s region.
Power distance customer	$PDC = \frac{1}{N} \sum_{ij=1}^N pdcr$ Where PCR is a power distance of the customer's region.
Uncertainty Avoidance customer	$PDC = \frac{1}{N} \sum_{ij=1}^N uacr$ Where uacr is the uncertainty avoidance of the customer’s region.
Individualism customer	$PDC = \frac{1}{N} \sum_{ij=1}^N icr$ Where icr is the individualistic customer of the customer’s region.
Masculinity customer	$PDC = \frac{1}{N} \sum_{ij=1}^N mcr$ Where mcr is the masculine customer of the customer’s region.
Long Term Orientation customer	$PDC = \frac{1}{N} \sum_{ij=1}^N ltocr$



Variable	Statement
	Where ltoctr is the long-term orientation customer of the customer's region.

Source: research data (2023).

The region's cultural dimensions are represented by Hofstede et al. (2010), we calculate to seller's region and customers' region. In this sense, Table 2 shows the values of regional culture clusters of Hofstede et al. (2010).

Table 2. Regional values of survey module score differences between regions and the national average

Region (number of states)	Power Distance	Uncertainty Avoidance	Individualism	Masculinity	Long Term Orientation
South (3)	+4	-3	+6	+3	+2
Southeast urban (5)	+2	+1	+2	-5	-3
Central-West (3)	-1	-4	0	0	+1
Northeast (8)	-3	+5	-1	-3	0
North (4)	0	-7	-5	+10	+2

Source: Hofstede et al. (2010).

Hofstede et al. (2010) chose five administrative regions based on cluster analyses, was include Federal District as southeast as the best-fitting framework to represent the regional differences. This data showed significantly distinct culture profiles in Brazilian regions.

We used Python language programming and library Pandas (McKinney et al., 2010) and Numpy (Harris et al., 2020). We used a decision tree model with a cross-validation technique to split test and train data through the Sklearn library (Pedregosa et al., 2011).

The decision tree model is a non-parametric technique of machine learning and is a supervised learning method. Therefore, the decision tree can be used for classification and regression to predict the value of a dependent variable. In this sense, the model learns simple decision rules to predict the data so that the decision tree can be considered as a piecewise constant approximation (Pedregosa et al., 2011).

We choose this model because it is simple to understand and to be interpreted. Unlike other techniques, decision trees can be visualized, requires little data preparation, and have other advantages (Pedregosa et al., 2011). Considering this fact, the next topic shows the data analysis.

4 RESULTS AND DISCUSSION

This topic presents three decision tree models. The first model has as independent only the variables referring to consumers, the second model only the variables referring to sellers, and the third model with all the variables.



4.1 CUSTOMERS' DECISION TREE

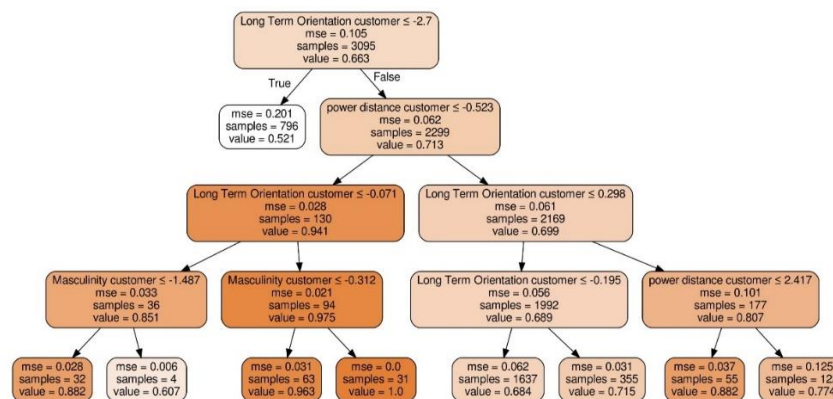
The decision tree model with only the independent variables related to consumers was calculated through cross-validation and obtained a mean accuracy equal to 0.045 (0.14, 0.07, -0.03, 0.1, 0.14, 0.02, 0.13, 0.1, 0.08, 0.09). Therefore, we defined four nodes of depth and 10 to the maximum number of leaves to avoid complexity.

The consumer long-term orientation variable determined the root of this decision tree model. If the seller has long-term orientation customers with values less than -2,7 concerning the national average, the degree of regionalization will be equivalent to 0.521. It is possible to compare this result to the single southeast region that has a value of -3, so e-commerce organizations that have this target audience will have difficulty in obtaining a high degree of regionalization. This result can be attributed to a high level of competition in the southeast region.

On the other hand, the highest level of regionalization is observed by sellers that have customers with a long-term orientation level greater than -0.071 and a power distance less than -0.523. These results are in harmony with the findings of Kaasa, Valdi, and Varblane (2014). It was possible to observe that cultural differences within-country can predict the level of regionalization, as well as it is beneficial to have different management practices and marketing campaigns for each region.

In Figure 1, the decision tree with the cultural dimensions of the consumers is described.

Figure 1 Decision tree model to customer cultural dimension predicts Expansion Level.



Source: research data (2023).

However, considering that the long-term dimension was the root of the model, these results are in line with the findings of Yoon (2009) since the measurements related to uncertainty avoidance and long-term orientation played an important role.

The theoretical implication of this model is how customer cultural characteristics can be divided to predict the degree of regionalization. Unlike previous studies that show a cause-and-effect relationship, this model demonstrates that some cultural aspects prevail over others. Note that of the

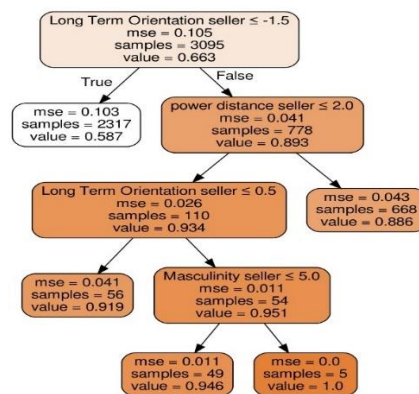


five possible characteristics of customers, 2 (Uncertainty avoidance and individualism) do not have the same importance at this level of depth. This indicates that the other characteristics stand out to predict and, thus, the theoretical implication for managers is to direct their marketing strategies and campaigns to address the characteristics that can increase their expansion, such for example, long-term orientation, power distance, and masculinity.

4.2 SELLERS' DECISION TREE

The sellers' decision tree model also was calculated through cross-validation and obtained a mean accuracy equal to 0.166, thus concerning the score of the previous model has less accuracy (0.16, 0.21, 0.13, 0.18, 0.2, 0.13, 0.18, 0.15, 0.15, 0.16). In the same way, we defined four nodes of depth and 10 to the maximum number of leaves to avoid complexity. In Figure 2, the decision tree with the cultural dimensions of the sellers is described.

Figure 2. The decision tree model to sellers' cultural dimension predicts Expansion Level.



Source: research data (2023).

In the same way, the root node of this model is also determined by the long-term orientation dimension. However, in this model, it refers to sellers. Likewise, from the customers' model, it is possible to attribute these results to sellers in the southeast region. The higher level of regionalization refers to sellers with higher than -1.5 and less than 0.5, power distance less than 2, and masculinity less than 5.

Unlike the findings of Broeder and Nguyen (2020), which suggest that cultural differences do not influence moderation, our results point to an association. Thus, by looking only at the model with the seller's variables, it is possible to argue that the seller's long-term orientation is the most critical dimension.

These results reinforce that the other characteristics of cultures within a country, such as the educational system, political regime, economic and technological structure, and the other factors that



cannot be generalized (Vaiman, & Brewster, 2015), elevate complexity from level to regionalization. And this does not only depend on the sellers but it is also associated with the customers.

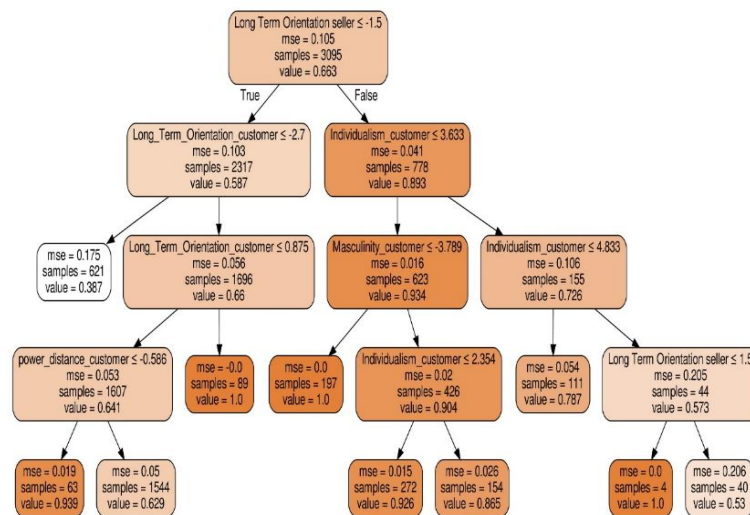
The theoretical implication of this result is based on the importance that the sellers' culture plays in predicting the expansion of the business. Companies in an environment with a longer-term orientation greater than the national average have a high level of regionalization. In this sense, the theoretical implication of this result is also based on providing evidence for how to enter e-commerce companies in a country or state, as it can remove cultural barriers during subsequent processes.

We design a model with both variables and describe the importance of the variables in the next topic.

4.3 DECISION TREE MODEL WITH BOTH CHARACTERISTICS

The decision tree model designed to measure both the cultural characteristics of customers and sellers also was calculated through cross-validation. And the mean accuracy obtained was equal to 0.28, this is the less accurate model (0.29, 0.34, 0.19, 0.31, 0.35, 0.22, 0.27, 0.25, 0.3, 0.32). we defined four nodes of depth and 10 to the maximum number of leaves to avoid complexity. In Figure 3, the decision tree with the cultural dimensions of the sellers is described.

Figure 3. Decision tree model to sellers and customers' cultural dimension.



Source: research data (2023).

Considering all the characteristics of the cultural dimensions of sellers and consumers, the root of the decision tree refers to sellers' long-term orientation. If it is less than -1.5 and customers' long-term orientation is less than -2.7, the level of regionalization will be equivalent to 0.387. This occurs for a sample of 621 sellers, and the mean square error is equal to 0.175.



On the other hand, the most significant number of observations with higher Expansion Levels is contained in the following decision structure; (I) sellers' long-term orientation greater than or equal to -1.5, (II) customers' individualism less than 3.633, and (III) customers' masculinity less than 3.789. This rule covers three nodes with a total of 623 (197 + 272 + 154) sellers with an Expansion Level higher than 0.865.

The findings by Beugelsdijk et al. (2018) on performance and cultural distance, we can interpolate our results by assigning divisions found in the decision tree models as the characteristics of the sample, that is, it is possible to attribute to the fact that Brazil is an emerging market.

Considering that both models with the cultures of sellers and customers can influence the expansion of the business, this model has the theoretical implication demonstrating that the sellers' long-term orientation characteristics are the most important for the growth of the business. However, the other cultural attributes of the customers are predominant in those of the sellers. That is, the elements of the customers are more determinant for the expansion of e-commerce.

These findings contribute to a theoretical framework of previous studies because they show the most important cultural dimension to split the e-commerce business into high or low Expansion Levels. Moreover, we contribute to the debate to discuss the movement of e-commerce business. After all, it is possible to split geographically, thus also is the potential shape and change considering the interest of top management.

Consequently, looking at Brazilian regions, it was viable to observe how cultural diversity is a relevant condition to e-commerce businesses expanding their activities. This result can bring ideas to attain new approaches into the national context, as suggested by Kostova and Beugelsdijk (2021).

5 CONCLUSION

This article aims to describe the association between regional culture and the level of regionalization in electronic commerce. To this end, we studied 3,065 e-commerce sellers and 100,000 customer purchase orders, both from various regions of Brazil, available through the Olist Store, so it was possible to associate the cultural dimensions measured by Hofstede et al. (2010) for customers and sellers with Expansion Level.

In the first model referring to the cultural dimensions of customers, it is possible to observe that the root of the decision tree is the variable long-term orientation, which is associated with an average (0.521) degree of regionalization when sellers have customers with an average long-term orientation equal to or less than 2.7. And the highest degree of regionalization is observed when the long-term orientation is greater than -2.7 and less than -1.071 and the power distance is equal to or less than -0.523, and masculinity is equal to or less than -0.312.



The model with the cultural characteristics of the sellers is also possible to observe that the long-term orientation is the most relevant, as it is the root node and determines that if the value is equal to or less than -1.5, the degree of regionalization of the sellers will be 0.587. The path of the characteristics of sellers with a higher degree of regionalization is followed by power distance equal to or greater than 2, long-term orientation equal to or less than 0.5, and masculinity less than 5.

In the third tree, with the cultural characteristics of the sellers and customers in the same set, the long-term orientation of the sellers was the root node. However, the lowest level of regionalization is observed after the second node with the long-term orientation from customers. The structure with the highest level of regionalization is for the sample split following characteristics; long-term orientation of sellers, the individualism of consumers, and the masculinity of consumers, representing 426 companies in the sample.

The contribution of these findings is based on the importance of the long-term orientation dimension. In all decision tree models, this dimension was the most important, as it was decisive for dividing e-commerce sellers into low and high Expansion Levels.

However, other dimensions were also relevant. For example, power distance was also highlighted in models that considered the characteristics of customers or sellers only. Furthermore, the dimension of customers' individualism determined the classification of 778 e-commerce sellers as a high level of regionalization.

In this way, we reinforce the need to look at regional differences, especially in developing countries, as they may imply cultural barriers or opportunities to be explored. This fact indicates that even domestic sellers have difficulty in regionalization due to cultural factors, so foreign companies must also observe regional cultural differences in their internationalization decisions.

In this sense, the implication of these results is based on how the expansion of e-commerce can be associated with cultural dimensions. And yet, it is noted that the characteristics of the customers were more important to predict the Expansion Level since it obtained the smallest error.

As a limitation we have the small business sample that needs support to develop their sales, on the other hand, we believe that this fact benefits the analysis, as it demonstrates the reality at a level closer to that of most regional companies. In addition, the imbalance of the data can also be considered a limitation. However, we do not use techniques to balance it because we believe that this scenario adequately represents its economic distribution. Moreover, we cannot confirm that all orders for each seller have been placed in the data set, but we do consider a representative number that may reflect cultural differences.

For future studies, we suggest adding other characteristics of the regions, such as the most varied distance measurements in the literature, such as economic, and political, among others. Demonstrating this association between within-national into more decisive economic blocs can also



contribute by describing how regionalization behaves in the face of cultural factors in other environments.



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