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Application of activity and time-based costs in the determination of artisanal açaí wine costs

Abstract

By identifying previous works in which the scouts price the açaí product based on the production costs calculated by them, this result lacks greater accuracy and knowledge about the identification and selection of costs. This is what established in the present work, the objective of measuring the cost of artisanal açaí wine through Activity and Time Based Costing. The research carried out and based on an exploratory methodology added by collecting primary data with theoretical-empirical analysis. As a result, it identified that the costs have two behaviors, one in the Amazonian summer or less rainy phase and the other in the winter of the same region when there is a higher incidence of rain. In the Amazon summer, it found that when the Activity and Time Based Costing is adopted, the transaction costs additional to the transformation costs generate the production of 1 liter of açaí for R$ 7.57. In the winter period, when the same costing method is used, the transaction costs added to the transformation costs generate the production of 1 liter of açaí for R$ 10.24.

Keywords: cost, activity and time based costing, acai beater, acai wine

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Introduction

Historically, the economic environment has influenced businesses in the search for information for management, in this bias Fachini, et al.[1] argue that, in this search and over time, information on product costs has always played a prominent role. Instigating reflections, the purpose of this research underlying the theme focused on the calculation of business costs, however Martins[2] understands that knowledge of costs is vital to know if, given the price, the product is profitable or, if not profitable, there is a possibility of cost reduction.

Also noteworthy is the feasibility of measuring açaí proposed by this research and this becomes feasible when the metric called Activity and Time Based Costing (TDABC) adopted. Time in which we agree with the arguments that TDABC is a metric derived from *ABC costing* that can be used in different environments for process and time improvements for each activity and sub-activity, in addition to specifying the cost of products with greater compliance.[3]

The açaí tapping micro-entrepreneur has natural limitations like everyone else, however, the level of education "jumps the eye", since the most that found in this research were those who attended high school. In view of this and so that, the result of this research can be applicable and easy to understand for artisanal beaters, the application of the measurement artifact called TDABC is appropriate. In this context, we agree with the understandings of Kaplan and Anderson,[4] when they say that the TDABC offers a simple and practical option for determining costs and the capacity to use processes as well as determining the profitability of products.

It is important to emphasize, however, that the Açaí economy permeates this investigation and, in this direction, Silva[5] states that it is "an urban economy, without a doubt, but based in a unique way on the densification of relations with the floodplain regions of the estuary where açaí production intensified". Scouts are predominantly small local traders and their business is usually small and apparently profitable**.** Furthermore, as a rule, these micro-entrepreneurs price the liter of wine based on production costs and these need, in their calculation, criteria with greater consistency and rigor.[5-7]

Scenario in which the following guiding problem of this research arises: **How to apply Activity and Time-Based Costing in measuring the costs of artisanal açaí wine?** As a result, the following objective emerges to **measure the cost of artisanal açaí wine through Activity and Time-Based Costing**.

With this research, an expectation created that knowledge focused on product costing, in particular Activity and Time Based Costing under the foundation of a research line recognized as the Transaction Cost Theory, can contribute with logical and useful to artisanal açaí beaters.

Theoretical framework

Production costs

With a bias towards Accounting, history reports that, before the Industrial Revolution that took place in the 18th century, there was only the accounting science directed to the registration and control of commercial operations and developed in the mercantile period and, in that scenario, companies operated basically with the activity merchant.

With the advent of industry and the need to determine inventory costs, an attempt made to adapt to the industrial company the same criteria used by the commercial company. With the same characteristic, the company's "purchases" value had been replaced by a series of values related to production, goods also called factors of production, so to speak: raw materials, labor and general manufacturing costs. Therefore, this procedure adaptation made it possible to determine the costs of nascent industrial companies.[2]

From another perspective and with an internal or process vision that takes place in the physical space or on the factory floor, the concept of costs explained before and that was born with greater amplitude in the Industrial Revolution, was later adapted to another historical competitive framework. Currently, this conceptual modification survives, so much so that the concept that costs is the consumption of resources computed at the time of using production factors to manufacture a product or a service has prevailed. Consecutively, Martins[2] expresses the following understandings:

I. The raw material is an expense in its acquisition that immediately becomes an investment and in this way, it stays during the time

of its storage. Now of its use in the manufacture of a good, the cost of the raw material appears as an integral part of the elaborated product. This, in turn, is again an investment, since it activated until its sale;

II. Electricity is an expense, when it is acquired, it immediately becomes a cost when it is used in the production process and will be part of the cost of the product; and

III. The machine caused an expense in its acquisition and entry into the company's equity, making it an investment (asset) and, in part, transformed into a cost, through the calculation of depreciation, as it is used in the production process.

Martins[2] directly expresses that "production cost is the sum of costs incurred within the factory". In the same way, Stopatto[8] says that the value of the production factor used for its acquisition makes up the cost of the product. Atkinson et al.[9] say that costs are the consumption of direct materials needed to manufacture or produce a product.

With a holistic view, Fiani[10] contrasts previous knowledge by saying that, without incurring transaction costs, no economic activity carried out and, thus, transaction costs defined as those to organize the productive activity of the company. On the other hand, Coase[11] enters the discussion when he expresses that the firm defined by transaction costs, since there is no transfer of any good that does not generate costs, whether in the search, speculation, negotiation or when executing the operation itself.

Transaction costs: As for the economics of transaction costs addressed by this research, the guiding question is why do firms exist? This makes sense, especially in the context of neoclassical microeconomic theory. To answer this question, which is apparently simple, it is necessary to go back in time. Classical and neoclassical economic theories, based on the understandings of Adam Smith, establish that the market has the ability to coordinate production and carry out economic transactions at a much lower cost and without the participation of the government.[12]

Smith's guiding idea, when publishing the classic work called "The Wealth of Nations", was that the "invisible hand" of the market could coordinate a decentralized system of prices. In this condition, Coase[11] asks the following question: if the market is so efficient to coordinate economic operations, why does it not manage all transactions, otherwise, why would there be transactions managed by firms?

When, in 1937, Coase published the article entitled "The nature of the firm" and answered why firms exist, saying that the reason is that, sometimes, the cost of managing economic transactions through markets is greater than that of managing the same businesses within the confines of one company. Therefore, the cost of using the price system involves activities such as finding what the prices are, (re) negotiating contracts, monitoring and resolving conflicts, that is, transaction costs. Wang[13] explains that transaction cost, in the original formulation by Coase[11], deal with the cost of using price mechanisms, otherwise, and the cost of carrying out a transaction through an exchange with the market.

North[14] explains that transaction costs are part of production costs, which leads to the need to reformulate the traditional conception of the production relationship as follows: (i) total production costs consist of land, labor and capital incurred in transforming the physical attributes of a good such as: size, weight, color, etc.; (ii) in relation to transactions, the procedures related to stipulating, safeguarding and enforcing property rights over goods, such as the right to use, the right to exchange, etc. North[14] recognizes that the production cost comes from the sum of transaction and transformation costs, thus making a new microeconomic analytical framework necessary.

Caleman et al.[15] warn that the measurement of transaction costs is challenging given the complexity of the concepts involved and the synergistic effect between the institutional environment, transaction costs and transformation costs. Furthermore, the transaction cost measurement approach, proposed by Collins and Fabozzi,[16] highlights that transaction costs are equal to the fixed costs added to the variables.

On the other hand, fixed costs are those of commissions plus transfer fees and taxes, and variable costs are those of execution, plus opportunity costs. Kupfer and Hasenvlever[17] understand that the costs considered economists leave those of opportunity, defined by the opportunities that will out if the company or individual does not make the best investment. In this way, the opportunity cost of an action given by the value of the best alternative for allocating the resources used in that action.

In due course, when discussing the fragility of the profit calculated by accounting concepts when compared with the profit calculated by economic concepts, Catelli[18] expresses awareness that accounting theory and practice should move towards a consensus around a single concept of profit, to be as close to economic as possible.

It understood, as a complement to the logical development of the work, the necessary knowledge of another aspect of the Theory of Transaction Costs, that is, the Theory of Measurement Costs (TCM). North[14] highlights that transaction costs are determined by measurement in conjunction with the costly nature of execution, so that when adding the costs of obtaining information and, specifically, of measuring, the problems increase.

Measurement of transaction costs: The challenge of measuring transaction costs is highlighted by Zylbersztajn and Graça,[19] when they understand that the measurement of transaction costs represents a *gap* in TCT when they identify the difficulty of effectively raising their costs. Based on the Theory of Measurement Costs (TCM), a field of research that concerns the development of complementary theoretical models to TCT[13] is opened.

Furthermore, the measurement cost is a key aspect in defining the scope of a firm, because there is a possibility for the transaction gain to dissipate or captured, which can result in cooperative efforts by agents to control this capture.[19] In this context, Barzel[20] stands out in the emphasis that, as a rule, individuals only make exchanges when they perceive that what they receive has greater value than what offered. In this way, the attributes of the products sold need to be measured to ensure adequate perception of the economic-financial fact.

Furthermore, transactions whose attributes are measurable can be governed by contracts, while those involving more subjective and difficult-to-measure components, such as customer relationships, are supported by long-term relationships.[21] In addition, it is stated that execution costs impact the price, in the same way, market *timing costs should be considered*, referring to the movement in the price of an asset at the time of a transaction that can be attributed to other participants in the market.[16]

Wang[13] recognizes that the problem of measuring transaction costs is not simple. The main methods of measuring these are presented in the studies by Wang:[13] (i) sum of the value of the resources needed to locate possible partners and to effect the transactions; (ii) difference between the price paid by the buyer and the price received by the seller; (iii) negotiation and transaction guarantee costs; and (iv) costs of government regulation.

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Each dimension of a transaction has a measurement cost and can be part of the transaction coordinated by contracts — low measurement cost dimension — or by long-term relationships — high measurement cost dimensions.[19] Moving forward, it is necessary to consider the synthesizing perception of Iudícibus[22] when he considers that "financial accounting is concerned with the accrual basis of income and expenses, that of costs, without harming the accrual basis, concerns itself with the cost of production". In this sequence, the research advances and accepts the concern of Iudícibus[22] in the study of the concept and application of the costing terminology.

Activity and time based costing

The understanding of the meaning of costing terminology, developed by Martins,[2] will guide this phase of the research. On an ongoing basis, costing means cost appropriation. Thus, there are absorption costing, direct or variable, ABC, RKW, etc. Therefore, Moura[23] adds that costing methods are tools that are available to organizations to control and decide on production information.

Ribeiro et al.[24] share that cost information management has as a tool the method adopted by the company. Campos[25] and Berto[26] express that among the main existing costing methods, the following can be highlighted absorption costing, direct or variable and *Activity-Based Costing* or Activity -Based Costing (ABC).

As a result of the challenge of tracking how activities consume resources and how products and services consume their practices, Anderson and Kaplan[4] proposed a continuation of *ABC costing*, but with greater operational simplification and lower implementation cost, this called Costing Activity and Time Based (*TDABC*).

Time *-Driven Activity Based Costing,* or *TDABC,* aims to reduce the complexity presented by *ABC costing*, especially those related to the identification of resource drivers. In this sense, Sancovschi and Silva,[27] Bonetti et al.[28] understand that *TDABC costing,* in order to take advantage of the information generated by *ABC costing*, makes it simpler and less costly, in addition to providing informational benefits for companies independent of the segment of activity and equity size.

Bonetti et al.[28] summarizes that, unlike traditional *ABC costing, TDABC does* not require the creation of different variables to measure costs, since in all cases the intervening variable is the time to perform each activity. Time is the best way to measure most of the costs for which *TDABC adopted*.

In sequence, we turn to Schouchana, Sheng and Decotelli,[29] to say that when being competitive, internally and externally, the final product of a production chain needs to have cost and prices compatible with the characteristics of the consumer. In such a direction that the research evolves by highlighting the socioeconomic importance of the açaí product, this so much for the man of the Amazon who survives from it.

The artisanal production of açaí wine

In the Amazon scenario, in relation to economic and environmental resources, it is evident that, among today's products manufactured in this Brazilian region by autonomous agricultural peasants, the sovereign highlight is açaí. Regarding the importance of this fruit for the region, Silva[5] understands that, due to its performance as a product for local consumption, especially in the city of Belém, for export to other regions of Brazil as well as to other countries, this is currently one of the most economically promising products of Amazonian biodiversity.

The Brazilian Institute of Geography and Statistics (IBGE) informs that the positive economic impact in the year 2020 of the açaí production chain for the North region of Brazil was for 222.7 thousand tons, 0.5% above that obtained in the year previous. In this circumstance, and despite the health crisis arising from COVID-19, the state of Pará stands out from the other states in the region, as it recorded the largest production of açaí, with 151.8 thousand tons, which represents a volume of 2.8 thousand tons. % higher than that observed in the previous year. Açaí is a fruit originated from the palm tree scientifically called *Euterpe oleracea*, which is used to prepare the juice also called açaí, a typical food consumed by the Amazonian population.

The focal actor of this investigation is the açaí whisk working at a fixed point of production and sale. These professionals mainly found in the peripheral regions of Belém, identified with red plates and white letters.[30] They work in production units made up of micro and small family businesses.[7] Such micro-entrepreneurs have some characteristics identified by Araújo:[6] (i) most of them are business owners; (ii) most purchase the fruit at the Açaí Fair; (iii) they have an average of two workers per point; and (iii) trust is present in socioeconomic relationships.

As for the origin of this regional entrepreneur, it is important to note, however, that the migration of peoples, especially of low-income caboclo and riverine origin, to the capital of Pará allowed the expansion of the urban population, forming a market for the consumption of açaí.[5] The large number of traditional communities, indigenous reserves and other organizations, in addition to the high degree of "informality" of the workers, are examples that the traditional practices originating from the former inhabitants and adapted between generations have not abandoned the Amazon, and more, they became a model of resistance to the capitalist market economy.[31] Therefore, underlying this historical-economic scenario, there emerged the autonomous activity of artisanal açaí whisk that operates in the central and peripheral neighborhoods of Amazonian cities.

This research report evolves in order to express the design of the work in its broadest dimension, which involves, among others and without considering it exhaustive, the research environment and the determination of data collection and analysis techniques, etc.

Methodological process

The research sought to understand the costs that consumed at a point of production and sale of açaí. Therefore, and with the aim of providing greater familiarity with the problem and order to make it more explicit in relation to objectives that are more general this research is exploratory and based on primary data collection.[32] Regarding the procedures, the investigation privileges the theoretical-empirical analysis through fieldwork.[33]

In order to achieve the outlined purposes, and in relation to the population in terms of space, a survey was carried out with the scouts who work on Augusto Correa street in the Guamá neighborhood, Belém, capital of the state of Pará, this bordering the Federal University of Pará (UFPA) and the Center for Higher Amazon Studies (NAEA). So, when representing the population and from the results of the sample, statements were made about this universe. In a timely manner, Veloso,[30] in the expression of census data released by the IBGE in 2010, expresses that there are 52 scouts active in that neighborhood. On the other hand, Rua Augusto Correa, which starts at the main gate of UFPA, runs for 1.5 km, ends at Rua Caraparu in

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the same district, and has 16 açaí production and sale points. As for the time, the research took place between the months of August to December 2021 in the middle of the Amazonian summer.

The sample is non-probabilistic, non-random and at the discretion of the researcher because, given the relevant peculiarities, the scouts questioned were classified and elected by the explorer. The sample is by judgment and common sense prevailed in the choice of population units.[32,34]

In order to achieve the purpose of this investigation, we sought, first, to determine the transaction cost present in the production of one liter of açaí. It observed that there were no significant variations between those incurred in the summer and in the rainy season in the Amazon, a reality that is not confirmed when it comes to processing costs.

Result analysis

Identification and calculation of transaction costs through TDABC

The relevant activities present in the production of açaí wine highlighted (i) cleaning; (ii) production; and (iii) sale. The next moment intended to identify transaction costs. These identified underlie the understandings of Coase[11] and Wang[13] in their statement that these are the costs of using price mechanisms. Otherwise, the cost of carrying out a transaction through an exchange with the market. In this way, the following transaction costs present in the production of açaí wine identified.

Subsequently, we sought to measure transaction costs through *TDABC* and, in this sense, the adoption of *TDABC costing is justified* in measuring transaction costs present at the point of production and sale of açaí when Weigel and Kremer[35] expose that it has the purpose of controlling costs and analyzing them in detail, which results in detailed and efficient information.

When considering that the production of açaí wine has time as a significant variable and observed to the "naked eye" of the customer, therefore in front of the wine buyer, Kaplan and Anderson[4] are referred to in the statement that "time" is the best way to measure most costs. Zaini and Abu[3] highlight the simplicity and flexibility, when the *TDABC adopted*, in the calculation of costs.

North[14] explains that transaction costs are part of production costs, so that to measure the costs of the first present in the production of açaí wine through TDABC, the understandings of Kaplan and Anderson[4] adopted. As well as those by Everaert and Bruggeman,[36] since they explain that, the cost of capacity sought through a simple equation in which the total of the activities carried out — in the departments of: (i) hygiene; (ii) wine production, and (iii) sales — divided by the final volume of minutes effectively available for each activity. The result of this division is the cost of that activity per minute, that is, how many reais per minute should considered as the cost of that activity. In a specific way, the tables below will describe the calculations of the calculation of the transaction cost per liter of açaí when the concepts that underpin the *TDABC adopted*.

Next, the transaction costs identified in the field research and the respective transformations to the unit of Real/minute will listed, as detailed in Table 2.

Contiguously, the daily value of transaction costs for each activity will tracked, as described in Table 4:

Table 4 shows the tracking of resource consumption for each of the three activities that stand out in the production of açaí wine, so that when dividing the total costs for R$ 14.80 by the total minutes of production, which corresponds to 360 minutes, resulted in the index 0.0411. This, in turn, when multiplied by the number of minutes to carry out each production phase, results in the cost value for each activity. With the same characteristic, in the activity of receiving, washing and bleaching, 0.0411 x 90 m results in the tracked cost for this activity, that is, the value of R$ 3.70 and so on.[4,36] In this way, the transaction costs summarized when the *TDABC* per day adopted, duly measured and directed to each of the activities carried out in the production and sale of açaí wine.

Table 1: Transaction costs identified in the production of açaí wine

Transaction costs
1.Tax with the City Hall of Belém (Alvará)
2. Payment of Federal Tax (MEI)
3. Disposal of the pit
4. Building Renovation

Source: Research data, (2021).

Table 2: Daily activities/minutes

Daily activities		Minutes
1. Sanitation	1 and ½ hours	90 minutes
2 . wine production	1 and ½ hours	90 minutes
3.Sale	3 hours	180 minutes
Total		360 minutes

Source : Survey data (2021).

Table 3: Transaction cost, value per minute

Transaction cost	Calculations
1. Monthly payment of MEI BRL 65.00/month	BRL 65.00 : 30 days = BRL BRL 2.17 per day BRL 2.17 : 6 hours = BRL 0.3617 per hour BRL 0.3617 : 60 minutes = **BRL 0.0079 per minute**
2. Disbursement for açaí disposal BRL 22.00/week	BRL 22.00 : 6 days = BRL 3.67 per day BRL 3.67: 6 hours = BRL 0.6111 per hour BRL 0.6111 : 60 minutes = **BRL 0.0101 per minute**
3. Reform disbursement BRL 4,000.00/16 months	BRL 4,000.00 : 16 months = BRL 250.00 per month BRL 250.00 : 30 days = BRL 8.33 per day BRL 8.33 : 6 hours = BRL 1.3888 per hour BRL 1.3888 : 60 minutes = **BRL 0.0231 per minute**
Total per minute	**BRL 0.0411 x 360 minutes = BRL 14.80 per day**

Source: Survey data (2021).

This stage aimed at identifying and measuring the daily transaction cost in the production and sale of açaí, concluded, stating that the cost of each activity when the *TDABC adopted* is: (i) cleaning = R$ 3.70; (ii) wine production = R$3.70; and (iii) Sales = R$7.40, totaling R$14.80 for sex continuous working hours/day. This research report progresses towards demonstrating the measurement of transformation costs when *TDABC adopted* and directing them to relevant activities present in the production process of açaí wine.

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Measurement of transformation costs when TDABC adopted in the Amazon summer

It understood that the most relevant raw material in the production of wine is the fruit or seed of açaí and this has its different costs, being the lowest in the harvest that begins in July and ends in December of each year. In this period, the rasa or basketball has an average cost of R$ 46.00, and another higher cost that starts in January and goes until June of the same year.[30]

Table 4: Tracking of resources for activities

Daily activities	Minutes	Tracking for activities	Total R$
1. **Sanitation** 1 and ½ hours	90 minutes	BRL 14.80: 360 **= 0.0411** BRL 0.0411 x 90 minutes	3.70
2. **Wine production** 1 and ½ hours	90 minutes	BRL 14.80: 360 = **0.0411** BRL 0.0411 x 90 minutes	3.70
3. **Sale** 3 hours	180 minutes	BRL 14.80: 360 = **0.0411** BRL 0.0411 x 180	7.40
Total 6 hours/day	**360 minutes**	**360 minutes x BRL 0.0411**	**BRL 14.80**

Source: Survey data (2021).

To measure the production costs of açaí wine, the same reasoning adopted in the calculation of transaction costs will used, that is, through the *TDABC*. In this direction, the assumptions of Kaplan and Anderson[4] adopted, as well as those of Everaert and Bruggeman,[36] for which the following activities tracked and the relevant production costs received: (i) Hygiene; (ii) wine production; and (iii) sales activities. Then, the transformation costs identified in the field research and the respective transformations to the unit of Real per minute (R/m) will be listed, as detailed in Table 6.

Uninterruptedly, the daily value of production costs will be tracked and directed to each activity through the index resulting from the total costs consumed divided by the number of minutes needed to produce the wine, that is, R$ 439.47: 360 minutes = 1.22075. As follows, the index found is multiplied by the amount of minutes spent for each activity, for example, 1.22075 x 90 m results in R$ 109.87, as shown in Table 7.

Table 5: Measurement of Transaction Cost through TDABC

Daily activities	Minutes	Daily cost
1. **Sanitation** 1 and ½ hours	90 minutes	BRL 3.70
2. **Wine production** 1 and ½ hours	90 minutes	BRL 3.70
3. **Sale** 3 hours	180 minutes	BRL 7.40
Total	**360 minutes**	**BRL 14.80**

Source : Survey data (2021).

Table 6: Transformation cost: Real/minute

Transformation cost	Calculations
1. Two rasas consumed BRL 46.00 x 2 = BRL 92.00/ day	BRL 46.00 x 2 = BRL 92.00 BRL 92.00: 6 hours = BRL 15.33 per hour BRL 15.33 : 60 minutes **= BRL 0.2555 per minute**
2. Disbursement for freight BRL 13.00/day	BRL 13.00 : 6 hours = BRL 2.17 per hour BRL 2.17 : 60 minutes = **BRL 0.0362 per minute**

Table 6 Continued...

Transformation cost	Calculations
3. Scout's Daily BRL 50.00	BRL 50.00 : 6 hours = BRL 8.33 per hour BRL 8.33 : 60 minutes = **BRL 0.1400 per minute**
4. Assistant's daily BRL 25.00	BRL 25.00: 6 hours = BRL 4.16 BRL 4.16; 60 minutes = **BRL 0.7000 per minute**
5. Average monthly water consumption BRL 53.00	BRL 53.00 : 30 days = BRL 1.77 per day BRL 1.77 per day: 6 hours = BRL 0.2950 per hour BRL 0.2950: 60 minutes = **BRL 0.0049 per minute**
6. Average monthly consumption of electricity BRL 326.00	BRL 326.00: 30 days = BRL 10.87 per day BRL 10.87 : 6 hours = BRL 1.8111 per hour BRL 1.8111 : 60 minutes = BRL **0.0302 per minute**
7. Monthly Plastics BRL 230.00	BRL 230.00 : 30 days = BRL 7.67 per day BRL 7.67: 6 hours = BRL 1.2783 per hour BRL 1.2783 : 60 minutes = **BRL 0.0213 per minute**
8. Hygiene material per month BRL 77.00	BRL 77.00 : 30 days = BRL 2.57 per day BRL 2.57 : 6 hours = BRL 0.4278 per hour BRL 0.4278: 60 minutes = **BRL 0.0071 per minute**
9. Monthly consumption of gloves BRL 56.00	BRL 56.00 : 30 days = BRL 1.87 per day BRL 1.87: 6 hours = BRL 0.3111 per hour BRL 0.3111 : 60 minutes = **BRL 0.0052 per minute**
10. Annual consumption of uniform BRL 97.00	BRL 97.00 : 12 months = BRL 8.08 per month BRL 8.08 per month: 30 days = BRL 0.27 per day BRL 0.27 per day: 6 hours = BRL 0.04490 per hour BRL 0.04490 : 60 minutes **= BRL 0.00075 per minute**
11. Furniture - useful life 1 year and 7 months BRL 2,200.00	BRL 2,200.00: 19 months = BRL BRL 115.79 per month BRL 115.79 : 30 days = BRL 3.8596 per day BRL 3.8596 : 6 hours = BRL 0.6432 per hour BRL 0.6432 : 60 minutes = **BRL 0.0107 per minute**
12. Stove - R$ 400.00 useful life - 3 years	BRL 400.00: 36 months = BRL 11.11 per month BRL 11.11 : 30 days = BRL 0.3703 per day BRL 0.3703 : 6 hours = BRL 0.0617 per hour BRL 0.0617 : 60 minutes = **BRL 0.0010 per minute**
13. Monthly consumption gas cylinder BRL 85.00	BRL 85.00 : 30 days = BRL 2.83 per day BRL 2.83 : 6 hours = BRL 0.4722 per hour BRL 0.4722 : 60 minutes = **BRL 0.0079 per minute**
Total per minute	**BRL 1.22075 x 360 minutes = BRL 439.47**

Source : Survey data (2021).

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Table 7: Tracking of resources for activities

Daily activities	Minutes	Tracking for activities	Total R$
1. Sanitation 1 and ½ hours	90 minutes	BRL 439.47 : 360 = 1.22075 1.22075 x 90 minutes =	109.87
2.Wine production 1 and ½ hours	90 minutes	BRL 439.47: 360=1.22075 1.22075 x 90 minutes	109.87
3.Sale 3 hours	180 minutes	BRL 439.47:360 = 1.2207 1.22075 x 180 minutes	219.73
Total 6 hours/day	**360 minutes**	**360 minutes x BRL 1.22075**	**439.47**

Source: Survey data (2021).

Likewise, the production costs during the açaí harvest period in the Brazilian Amazon region, per day, duly measured and directed to each of the activities underlying the production and sale of açaí wine, summarized.

Immediately, the frame 9 summarizes the transaction and production costs of one liter of açaí, therefore the total costs in the climatic phase of the Amazonian summer calculated through the *TDABC*. North[14] recognizes that the production cost comes from the sum of transaction and transformation costs, similarly, in the author's understanding, a new microeconomic analytical framework is necessary. In addition to the final measurement of total costs, it was possible to achieve it by dividing the total costs by the amount of 60 liters produced per day when using two shallow açaí bowls.[4,10,14,36.]

The board 9 summarizes that the cleaning activity has a cost of R$ 113.57 and the production activities have a daily cost of R$ 113.57, as they consume the same amount of time, the basis of this measurement. As for the sales activity, the daily cost is R$ 227.13, resulting in the total daily transaction cost added to production for R$ 454.27. This total cost, when divided by the amount of wine produced per day, results in the daily unit cost of a liter of açaí, thus: R$ 454.27: 60 liters = R$ 7.57. Then, the costs of Transformation *when TDABC* adopted in the Amazon winter

Measurement of the Costs of Transformation when TDABC adopted in the Amazon winter

As said, the production factor that significantly impacts costs in the two climatic phases of the Amazon is the seed stored in shallow areas, whose average acquisition cost in the summer is R$ 46.00, but in the winter it goes to R$ 126.00 . Therefore, only the variable that composes the costs will considered, since the others do not suffer this seasonal impact. Given this and considering this reality, the calculations will demonstrated.

Table 8: Measurement of transformation cost through TDABC

Daily activities		Minutes	Daily cost
1. Sanitation	1 and ½ hours	90 minutes	BRL 109.87
2.Wine production	1 and ½ hours	90 minutes	BRL 109.87
3.Sale	3 hours	180 minutes	BRL 219.73
Total		**360 minutes**	**BRL 439.47**

Source: Survey data (2021).

The next moment of calculations is aimed at tracking, for each of the three activities carried out in the production of wine, the related costs, having as a tracking foundation the daily time used by each of them. That said, the framework 27 after ratifying the aforementioned calculations.

In sequence, it will synthesized in the Table 12 the calculations after tracking the consumption of resources for each of the activities that stand out in the production of açaí wine.

Table 9: Total production costs of one liter of açaí in the fruit harvest

Daily activities	Transaction cost	Transformation cost	Total cost
1. Sanitation 1 and ½ hours	BRL 3.70	BRL 109.87	BRL 113.57
2.Wine production 1 and ½ hours	BRL 3.70	BRL 109.87	BRL 113.57
3.Sale 3 hours	BRL 7.40	BRL 219.73	BRL 227.13
4.Total costs of Production	**BRL 14.80**	**BRL 439.47**	**BRL 454.27**
5.Daily amount produced	**60 liters**	**60 liters**	**60 liters**
6. Unit cost	**BRL 0.25**	**BRL 7.32**	**BRL 7.57**

Source: Research data, (2021).

Table 10: Production cost value per minute in the Amazon winter

Transformation cost	Calculations
1.Two rasas consumed R$126.00x 2 = BRL252.00/day	BRL 126.00 x 2 = BRL 252.00 BRL 252.00: 6 hours = BRL 42.00 per hour BRL 42.00 : 60 minutes **= BRL 0.7000 per minute**
2.Disbursement for freight BRL 13.00/day	BRL 13.00 : 6 hours = BRL 2.17 per hour BRL 2.17 : 60 minutes = **BRL 0.0362 per minute**
3. Beater's Daria BRL 50.00	BRL 50.00 : 6 hours = BRL 8.33 per hour BRL 8.33 : 60 minutes = **BRL 0.1400 per minute**
4.Assistant's daily BRL 25.00	BRL 25.00: 6 hours = BRL 4.16 BRL 4.16; 60 minutes = **BRL 0.7000 per minute**

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Table10 Continued..

Transformation cost	Calculations
5. Average monthly water consumption BRL 53.00/m	BRL 53.00 : 30 days = BRL 1.77 per day BRL 1.77 per day: 6 hours = BRL 0.2950 per hour BRL 0.2950: 60 minutes = **BRL 0.0049 per minute**
6. Average monthly consumption of electricity BRL 326.00/m	BRL 326.00: 30 days = BRL 10.87 per day BRL 10.87 : 6 hours = BRL 1.8111 per hour BRL 0.1811 : 60 minutes = BRL **0.0302 per minute**
7. Plastics monthly BRL 230.00/m	BRL 230.00 : 30 days = BRL 7.67 per day BRL 7.67: 6 hours = BRL 1.2783 per hour BRL 1.2783 : 60 minutes = **BRL 0.0213 per minute**
8. Hygiene material per month BRL 77.00/m	BRL 77.00 : 30 days = BRL 2.57 per day BRL 2.57 : 6 hours = BRL 0.4278 per hour BRL 0.4278: 60 minutes = **BRL 0.0071 per minute**
9. Monthly consumption of gloves BRL 56.00/m	BRL 56.00 : 30 days = BRL 1.87 per day BRL 1.87: 6 hours = BRL 0.3111 per hour BRL 0.3111 : 60 minutes = **BRL 0.0052 per minute**
10. Annual consumption of uniform BRL 97.00/m	BRL 97.00 : 12 months = BRL 8.08 per month BRL 8.08 per month: 30 days = BRL 0.27 per day BRL 0.27 per day: 6 hours = BRL 0.04490 per hour BRL 0.04490 : 60 minutes **= BRL 0.00075 per minute**
11. Furniture - useful life 1 year and 7 months BRL 2,200.00/19 m	BRL 2,200.00: 19 months = BRL BRL 115.79 per month BRL 115.79 : 30 days = BRL 3.8596 per day BRL 3.8596 : 6 hours = BRL 0.6432 per hour BRL 0.6432 : 60 minutes = **BRL 0.0107 per minute**
12. Stove - R$ 400.00 useful life - 3 years	BRL 400.00: 36 months = BRL 11.11 per month BRL 11.11 : 30 days = BRL 0.3703 per day BRL 0.3703 : 6 hours = BRL 0.0617 per hour BRL 0.0617 : 60 minutes = **BRL 0.0010 per minute**
13. Monthly consumption gas cylinder BRL 85.00	BRL 85.00 : 30 days = BRL 2.83 per day BRL 2.83 : 6 hours = BRL 0.4722 per hour BRL 0.4722 : 60 minutes = **BRL 0.0079 per minute**
Total per minute	**BRL 1.66525 x 360 minutes = BRL 599.49**

Source: Survey data (2021).

Table 11: Resource tracking for Amazon winter activities

Daily activities		Minutes	Tracking for activities		Total R$
1. Sanitation	1 and ½ hours	90 minutes	BRL 599.49: 360 = 1.66525	1.66525 x 90 minutes =	149.87
2. Wine production	1 and ½ hours	90 minutes	BRL 599.49: 360=1.66525	1.66525 x 90 minutes =	149.87
3.Sale	3 hours	180 minutes	BRL 599.49:360 = 1.66525	1.66525 x 180 minutes =	299.75
Total	6 hours/day	**360 minutes**	**360 minutes x BRL 1.66525**		**599.49**

Source: Survey data (2021).

Table 12: Measurement of production cost through TDABC in the amazon winter

Daily activities		Minutes	Daily cost
1. Sanitation	1 and ½ hours	90 minutes	BRL 149.87
2. Wine production	1 and ½ hours	90 minutes	BRL 149.87
3.Sale	3 hours	180 minutes	BRL 299.75
Total		**360 minutes**	**BRL 599.49**

Source: Survey data (2021).

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Table 13: Total production costs of a liter of açaí in the off-season of the fruit

Daily activities		Transaction cost	Transformation cost	Total cost
1. Sanitation	1 and ½ hours	BRL 3.70	BRL 149.87	BRL 153.57
2. Wine production	1 and ½ hours	BRL 3.70	BRL 149.87	BRL 153.57
3.Sale	3 hours	BRL 7.40	BRL 299.75	BRL 307.15
4.Total production costs		**BRL 14.80**	**BRL 599.49**	**BRL 614.29**
5. Daily amount produced		**60 liters**	**60 liters**	**60 liters**
6. Unit cost		**BRL 0.25**	**BRL 9.99**	**BRL 10.24**

Source: Survey data (2021).

The board13 allows the visualization of the calculation of the unit cost of the açaí wine, this one when considering the climatic season of the Amazonian winter.

The board 13 summarizes that cleaning activities have a cost of R$ 153.57 and those of production have a daily cost of R$ 153.57. As for the sales activity, the daily cost is R$307.15, resulting in a total daily cost of R$614.29. This total when divided by the amount of wine produced per day results in the unit cost of a liter of açaí in the amount of R$ 10.24, thus: R$ 614.29: 60 liters = R$ 10.24. In summary, the calculations based on the applications of the understandings of Kaplan and Anderson[4] also Everaert and Bruggeman[36] consider the costs in the off-season or in the Amazon winter, the value of a liter of açaí in the amount of R$ 10.24.

Conclusion

This research aimed to measure the cost of artisanal açaí wine through *TDABC* and, for this, sought information from the scouts working on Augusto Correa Street in the Guamá neighborhood, Belém (PA). The investigation prompted by the fact that previous works identified that the scouts price the açaí product based on the production costs calculated by them, however, this calculation lacks further verification and knowledge about identification and calculation of costs.

The adoption as a measuring method or costing method fell on the *TDABC* due to the authors recognizing the simplicity in the calculation of costs, lower onerousness, in addition to enabling informational benefits for companies regardless of the segment of activity and equity size. But also because the *TDABC does* not require the creation of different variables for the measurement of costs, since in all cases the intervening variable is the time for the execution of each activity.

In the calculation of production costs, transaction costs were also considered, which, when added to the transformation costs, resulted in the production cost. It understood that this calculation procedure makes the costs more realistic and consistent with the real business environment. It identified that the costs have two behaviors, one in the Amazonian summer or less rainy phase and the other in the Amazonian winter, when there is greater rainfall.

In the Amazon summer, it found that the additional transaction costs to the transformation costs generate the cost of producing a liter of açaí for R$ 7.57. In the Amazon winter period, the transaction costs additional to the transformation costs generate the production of 1 liter of açaí for R$ 10.24.

In this investigation, the expectation initially created confirmed, as the work demonstrates the development of knowledge aimed at product costing. In particular, Activity and Time Based Costing under the foundation of a line of research recognized as the Theory of Costs of Transaction, whose information generated on production costs makes it possible to contribute to the management of açaí production and sale points.

As a limitation, the natural barriers in data collection stand out. Some of these aimed at the low schooling of the scouts that made it difficult to understand the questions, others due to the insecurity regarding the reporting of production data to those who were, for them, unknown and, finally, due to the pandemic scenario in which the facts occurred.

In order to identify limitations in the calculation of costs and the resulting pricing, further research suggested with products originating from the Amazon forest, such as chestnuts, wet flour and vegetable oils.

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None

Conflicts of interest

There is conflicts of interest relevant to this article, declared by the authors.

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