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Article

Design of a tool to integrate the costs of dental treatments. Case study: dental station clinic

Diseño de herramienta para integrar los costos de tratamientos dentales. Caso clínica dental station

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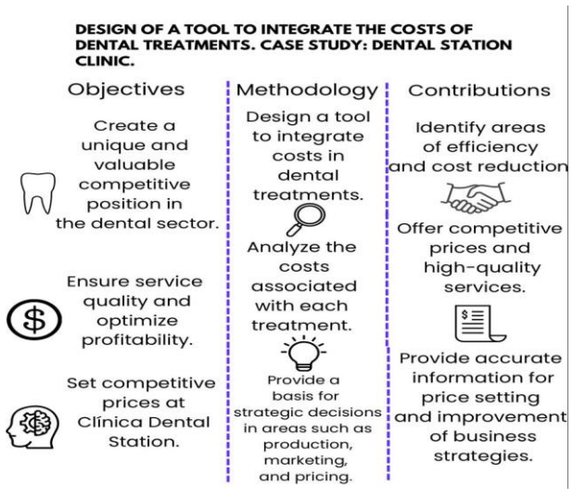
Abstract

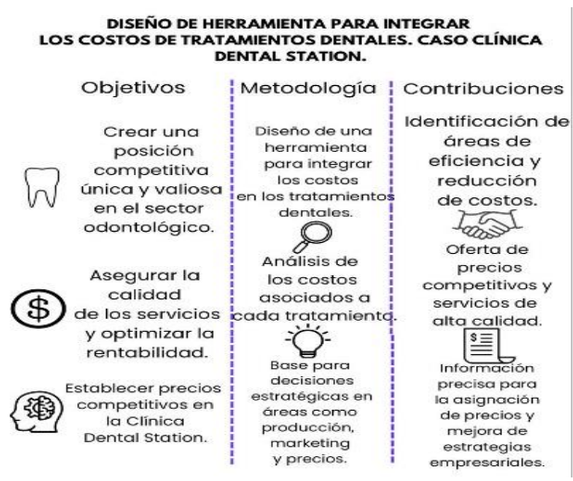
Every company must adopt a plan focused on creating a unique and valuable strategic position in the business realm. This competitive position should generate dissonance with other companies in the same sector. Dental services require strategies to ensure their quality and profitability. Cost integration is a key method to achieve both objectives. This research explores the potential of cost integration to achieve the pricing objective at Dental Station Clinic. An efficient methodology allows for informed decisions about pricing, production, marketing, and other areas, contributing to improved profitability by identifying areas of efficiency and cost reduction. Furthermore, it strengthens competitiveness in the market by enabling the offering of competitive prices and high-quality products or services. The study uses a descriptive methodology to design the tool that will integrate costs for dental treatments, which will enhance profitability. The results obtained will help identify incurred costs and assign selling prices to dental treatments.



Cost integration, Competitiveness, Profitability

Resumen

Toda empresa debe adoptar un plan centrado en la creación de una posición estratégica singular y valiosa en el ámbito empresarial. Esta posición competitiva debe generar disonancia con otras empresas del mismo sector. Los servicios odontológicos requieren de estrategias para garantizar su calidad y rentabilidad. La integración de costos es un método clave para lograr ambos objetivos. Esta investigación explora el potencial de la integración de costos para lograr el objetivo de fijar precios en la Clínica Dental Station. Una metodología eficiente permite tomar decisiones informadas sobre precios, producción, marketing y otras áreas, contribuyendo a la mejora de la rentabilidad al identificar áreas de eficiencia y reducción de costos. Asimismo, fortalece la competitividad en el mercado al posibilitar la oferta de precios competitivos y productos o servicios de alta calidad. El estudio utiliza una metodología descriptiva para diseñar la herramienta que permita integrar los costos para los tratamientos dentales que mejorarán la rentabilidad. Los resultados obtenidos permitirán identificar.



Integración de costos, Competitividad, Rentabilidad

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Introduction

Cost integration as a pricing strategy represents an innovative perspective that directly impacts the competitiveness of dental practices. By understanding and effectively managing the outlays associated with treatments, practitioners have the ability to adjust their pricing strategies precisely and in line with market expectations. The proposed study not only seeks to enhance competitiveness, but also to optimise the profitability of dental practices. Identifying specific cost areas and assessing their integration into the pricing structure opens up the possibility of maximising profit margins without compromising the quality of services offered. This approach translates into sound and sustainable financial management for dental professionals.

In addition, the focus on competitiveness and profitability could have a positive impact on the accessibility of dental treatment to a wider public. Efficient cost management enables clinics to offer competitive fees without sacrificing quality of service, generating benefits for both practitioners and patients.

According to Fernandez (2018), healthcare specialists must become managers in order to succeed. This means changing their traditional vision, which focuses on providing high-quality medical care, to an entrepreneurial vision focused on selling their services, organising and coordinating their staff, and generating profits.

Problem statement

In the dental service delivery sector, the pricing system is based on competition (Brull, 2014), without an analysis of the production and operational costs incurred by the organisation in developing its processes. This praxis has prevailed even before social networks, where competition focused on additional factors such as the prestige of the health professional. The current pricing strategy at Dental Station is affected by the lack of a cost study and competitive pressure that has led to the distortion of the perception of the real costs of dental treatment.

The repercussions for the company include decreasing profitability, liquidity, quality of services and creating an environment that discourages healthy competition. The lack of a proper pricing method has significant consequences for the organisation, including the loss of customers, the quality of services, and the damage to its image as a dental institution. In addition, the organisation faces constraints caused by the recent reopening of the facility, lack of experience in resource management and restricted cash flows.

Taking into consideration the above, the following general objective is presented: To design the tool for the integration of costs as a pricing strategy in dental treatments in order to enhance competitiveness and profitability. And as specific objectives:

a) To describe the existing cost theories.

b) To recognise the tools for cost integration.

c) To distinguish the factors that influence sectorially the pricing of dental treatments.

d) To identify the success cases.

e) To design the tool for cost integration as a measure of profitability.

Theoretical framework

According to Scoponi et al. (2018), the General Cost Theory (GCT) comprises the composition, variability and accumulation of costs as well as factor categories. Market segmentation establishes the target group of people with similar characteristics to which a service or product is addressed (Cárdenas et al., 2020). In addition to the above, this makes it possible to draw up marketing strategies that are aimed at increasing customer traffic. It serves as a guide in strategic decision making, allowing to delimit the guidelines of this chapter, in order to conceptualise different terms that underpin the proposed solution in this research.

Cost theory for pricing

GCT is examined through two perspectives, the prescriptive one that focuses on the objective meaning of a protocol and the descriptive one through the circumscription of how it perceives information (Scoponi et al., 2018).

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According to Gonzaga (2018), TGC indicates the methodology when defining costs in an analysable scenario as opposed to an ideal situation. The path that allows pricing must have a deep analysis of the cost, it is presented as an indicator of economic efficiency in function of allowing the comparative between results in different time lapses (Gómez et al., 2018).

According to Tiepermann and Porporato (2021), costs are defined as the resignation of resources allocated to meet a particular objective and are classified according to their function, allocation (direct and indirect), behaviour and variability (Castillo et al., 2019). With the vast observation, knowledge of the costing unit is obtained, which can be subjected to measurement in order to attribute and allocate costs (Scoponi et al., 2018). According to Cordoba and Moreno (2017), cost-based pricing can lead to underestimating the attractiveness of the product or service, which can result in the market rate being lower than its true value.

Cost elements are the division of disbursements made in production processes and are accumulated in the inventory category of developing items (Rincón et. al., 2019). As Gómez et al. (2018), expenditure is understood as the measure of consumption linked to the capacity granted to carry out processes. According to Gómez et al. (2018), it is conceptually posed as a cost that has generated benefits and has expired, i.e. it has borne fruit; in this way, it makes it possible to obtain income, in other words, benefits.

Costs can be divided into two according to their evaluation time, real historical costs that examine the disbursements incurred in the past and interpret them in order to evaluate the management carried out in the development of the activity. They can also be budgeted, these collect information from the past and present and attempt to describe what management will look like, deciphering and revealing possible future outcomes (Molina et al., 2019). In allocation, direct costs are clearly recognised in a cost object through an obvious quantitative tracking mechanism, while indirect costs can only be described in that element through a specific attribution formula (Toro, 2016).

The unit of costing is constant, what varies are the ways of representing it; the categories are not similar because the classification attributes defining the division rules are different (Scoponi et al., 2018). The elements of cost are identified based on the group that grants to capture the disbursement applied by the company in the production phase of its products or services (Rincón and Sánchez, 2019). There are other ordinary manufacturing outlays that do not fall between material and indirect labour.

There are two classifications of costs that coincide in the elements they describe, the first is by volume (Molina et al., 2019) and the second is by behaviour (Cárdenas et al., 2020), both mentioning both variable and fixed costs. The latter remain unchanged in isolation from variation in production. They are subject to changes by management, therefore, they are not affected by fluctuations in activities. Step costs are referred to by their unchanging behaviour during certain production lapses (Parra et al., 2014).

These outlays are subject to changes in a firm's activities and vary in line with production volumes (Gómez et al., 2018). Semi-variable costs constitute a sub-category that is characterised by having both a static and a variable part (Parra et al., 2014).

Identification of factors influencing the pricing of dental treatment

Fee setting in dental services is a complex process that involves taking into account various factors, both internal and external, which play a crucial role in identifying and determining the appropriate cost for dental treatments (Fernandez, 2018). The key aspects of each category are detailed below:

Internal Factors:

- Costs: It is essential to consider the cost of production when setting prices, encompassing expenses associated with raw material (M.P.D.), labour (direct and indirect) and general practice outlays (C.I.F). An accurate understanding of this data is essential to determine the appropriate costing method to cover operating expenses and ensure financial viability.

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- Profitability: The company must ensure that the values set allow for adequate profitability. This involves establishing the break-even point to support the long-term sustainability of the clinic.

- Marketing Objectives: The main goal will be to generate customer experiences through social networking, innovative treatments through the use of new biomaterials, technological tools and techniques (Tiol, 2019).

External Factors:

- Competition: The organisation must be aware of market rates to adjust its amounts in a competitive and attractive way for patients (Rodriguez, 2015).

- Demand: Demand is influenced by various factors, such as the perceived need for care, the selling price and the customer's perception of value. Understanding these aspects helps to establish values aligned with market expectations (Gonzaga et al., 2018).

- Regulations: Government regulations can directly affect the price of dental treatments such as the payment of Income Tax (ISR) for business activities, the organisation's registration of its workers with the Mexican Social Security Institute (IMSS). It is essential to comply with established regulations and adjust fees according to legal restrictions and requirements (Tiol, 2019).

Market segmentation is a process by which patients receive appropriate treatment for their health problems and clinics dispose of their resources to solve and monetise that need (Paredes, 2014).

According to Paredes, (2014), a niche is a group of consumers that is even narrower than a segment and whose demands are unsatisfied. The B2C (Business to consumer) approach aims at the consumption of the service by the customer. Its segmentation criteria include geographic, psychographic, behavioural and demographic.

For the dental company, the last group will be addressed because it is divided into age, gender, family size, family life cycle, generation, income, occupation, education, religion, race and nationality (Ciribeli and Miquelito, 2015).

This division is made in order to align demographic characteristics with the dental mix, headed in breadth by specialties such as Orthodontics, Oral Rehabilitation, Surgery and Paediatric Dentistry, and in depth by the service offerings of each. The alignment of the specialities with the postgraduate programmes allows for efficient market segmentation, for example:

The primary target market of paediatric dentistry, would be children and adolescents between one month to 12 years as users and their parents or guardians as buyers, their niche would be patients with some disabling congenital and genetic variation, such as a 23 year old adult with cerebral palsy (Medina et al., 2020).

Every company must adopt a plan focused on creating a unique and valuable strategic position in the business environment. This competitive position must create dissonance with other companies in the same sector. Companies have three options to achieve a more favourable position against the competition, according to Chirinos and Rosado, (2016):

- We can find the generic cost strategy in the first place, which has been implemented in most national companies in order to optimise processes and generate economies of scale that make it possible to offer products at lower prices, in the case of the dental clinic would be to establish a cost system that manages to identify, group and efficiently determine the different disbursements disbursed for the setting of sales prices for each service offered.

- Secondly, there is the basic tactic of targeting, applied exclusively to a niche market, adapting to the specific needs of that customer group, distinguishing the mix of services in breadth (specialities) and depth (treatments by speciality) in order to offer each one according to the particular requirements of the applicants.

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- The third approach, less commonly used, but still an opportunity, is the overall differentiation plan, characterised by offering products with superior value in terms of design, functionality and service. If this leads to superior performance, the company is said to have developed a competitive advantage.

Competitiveness and Profitability

According to Herrera et al. (2016), competitiveness is a dynamic factor, as higher profitability enables faster accumulation and lower costs through economies of scale. This can translate into increasing market share, which eventually leads to the disappearance of firms that are less competitive and unable to generate sufficient returns.

Profitability is the measure of the return on capital employed in a given period (Ochoa and Marrufo, 2020). Financial ratios are analytical tools to assess the performance and financial health of a company. These indicators provide valuable information for decision-making and analysis of operational efficiency (Sarango et al., 2023).

The evaluation of the profitability of dental procedures is a crucial factor for strategic decision-making in clinics and practices. The performance of different profitability indices allows to analyse the financial viability of treatments, to optimise the management of resources and to determine the convenience of offering certain services.

Methodology

Dental health care companies in Mexico are deficient in their financial planning, as they lack efficient strategies for the application of costing systems. This aspect is directly reflected in pricing, as internal and external factors that affect sales values and, therefore, the organisation's profits are not taken into consideration.

This research used the case method developed to illustrate situations, actions or decisions as a story of events that have occurred and from which lessons can be learned, with the objective of providing real means that allow, through analysis and discussion, to present alternative solutions that have been applied in similar situations and that were developed based on the main concepts and theories associated with the phenomenon under study (Naumes and Naumes, 2006).

The case method seeks not only to identify the factors that affect a phenomenon, but also the detailed knowledge of these factors in the units of analysis (Marcelino, Baldazo and Valdés, 2012).

The methodological design used is nested of an illustrative type, as it presents or exemplifies the phenomenon that is investigated under a specific theory approach consisting of a single case with more than one unit of analysis: the different cost components of Dental Station are analysed, in order to develop a tool in a spreadsheet programme that can integrate all the disbursements incurred in order to be able to assign sales prices to the different dental treatments in order to increase competitiveness and profitability (Yopan, 2020).

This proposed costing tool can be applied to make comparisons over different time periods to see if it does indeed work as a measure of profitability, as well as to enable the use of various marketing strategies to attract and retain customers. The services presented were two of the most representative services, consultation and resin, in order to exemplify the integration of costs. The tool was designed using Microsoft Excel with the intention of facilitating its application for dental service companies.

The project phases are arranged in a logical sequence based on the theoretical construction of the previous chapter. Through two general schemes, the first stage identifies and describes the fixed and variable costs (Figure 1), while the next stage determines the direct raw material per service (Figure 2) in order to be added to the formula for the calculation of the sales price..

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Box 1

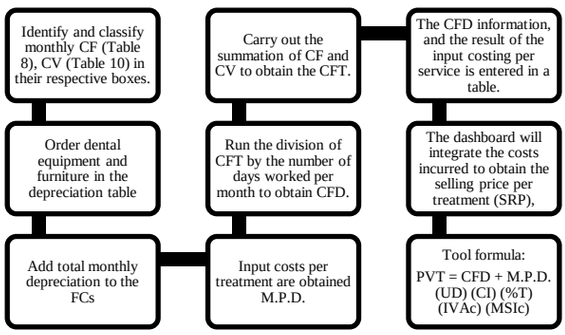

Figure 1

Methodology for the integration of costs

Source: own elaboration with data from Ávila et al. (2023)

Box 2

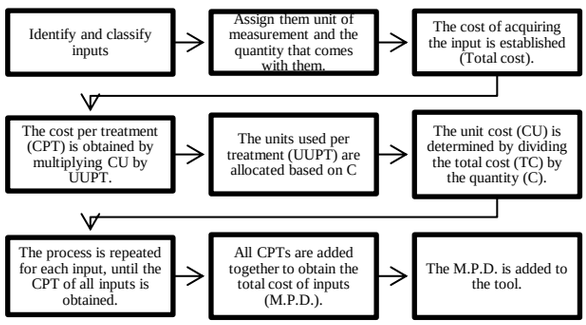

Figure 2

Procedure for the costing of inputs per treatment

Source: own elaboration with data from Ávila et al. (2023)

Results

Organisational background

In 1988, Dr. Román Avila Parrao founded the Oral and Maxillofacial Surgery Dental Clinic to address the shortage of specialists in this field in the state of Campeche. Although there was a high demand for Maxillofacial Surgery services, the population was unaware of the speciality, so they turned to general dentists. However, due to the complexity of the conditions, they could not solve all the problems, so some referred patients to Dr. Avila's office, which allowed him to build up a portfolio of clients. With the constant changes in dentistry, the increase in preventive oral health care and competition from other specialists, the practice began to lose surgery patients. Initially, the practice was staffed by Dr. Avila and an assistant.

In May 2023, the clinic acquired a new identity, Station Dental Clinic, to reflect its new focus on comprehensive oral health care. They added Dental Surgeon Eduardo Avila Morales, specialist in Orthodontics; C.D. Paulina Arce Hadar, in charge of Oral Rehabilitation; Fernando Avila Morales, dentist and general manager; administrative assistant; dental assistant; and a cleaning assistant. The clinic has had three different locations throughout its history. The first, on Calle 16 in the San Roman neighbourhood, was chosen because of its proximity to busy areas. In 2002, the clinic moved to Calle 12 in the Samulá neighbourhood, because the property at the first location was under lease and not large enough.

The last change was to Calle Prolongación Allende, in 2022, to provide ample space, ease of access and parking opportunities. The clinic, founded in 1988, focused on oral and maxillofacial surgery until 2020.

However, the COVID-19 pandemic forced the organisation to suspend operations. In mid-2021, consultation is resumed for a limited number of patients. However, the client portfolio decreased considerably due to various factors such as the cessation of activities during the contingency, lack of marketing strategies and a very limited supply of treatments in the different specialties. Subsequently, in 2022, the new work team was reorganised and the clinic was in the process of changing its location.

In 2023, it redefined its concept, going on to offer a comprehensive range of dental services. This in order to generate a new patient base and achieve patient loyalty.

Design of the tool the analysis of the clinic's costs begins with their classification. Fixed costs are made up of outlays that do not change over a period of time. Among them we can find the remuneration of dental staff, which for working purposes is classified as MOD, while payments related to staff in other areas are categorised as MOI. Also grouped under C.I.F. are expenditures to cover items indispensable for the operation of the company such as rent and various services (Table 1).

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Box 3

Table 1
Fixed costs for the dental clinic

Fixed costs	Mensual
Rent	CF1
Doctor 1	CF2
Depreciation	AM
TOTAL, CF	CF = CF1+CF2+AM

Source: own elaboration with data from Avila et al. (2023) and Molina et al., (2019)

Among the depreciations (Table 2) we can find the dental unit, low and high speed parts, among others.

Box 4

Table 2
Depreciation

Depreciation of medical equipment and real estate			Depreciation rate (%PD)		
Product	Cost (C)	Useful life (years) (VU)	Residual value (VR)	Annual depreciation (AA)	Mensual (AM)
Dental Unit	C	VU	VR= C/%PD	AA1= (C-VU) / VR	AM1= AA/12
High and low part	C	VU	VR= C/%PD	AA2= (C-VU) / VR	AM2= AA/12
	CT			AA= AA1+AA2	AM= AM1+AM2

Source: own elaboration with data from Avila et al.. (2023).

The next step is to determine the variable costs (Table 3), different manufacturing overheads can be seen in services such as internet, electricity, among others.

Box 5

Table 3
Indirect variable costs

Indirect variable costs	Mensual
Internet	CV1
Electricity	CV2
TOTAL CV	CV= CV1+CV2

Source: own elaboration with data from Ávila et al. (2023)

Fixed cost per patient

The sum of fixed and variable costs allows us to calculate the total fixed cost (TFC). Next, we determine the number of working days per month, which will cover Monday to Saturday, totalling 24 days. We then divide the CFT by 24, which gives us the daily fixed cost (DFC). Finally, we estimate the number of patients to be seen per day, setting a value of 12, which will serve as the divisor for the CFD, resulting in the fixed cost per patient (CFP). The formula could be viewed as follows. CF + CV = CFT 2. CFT / 24 = CFD 3. CFD / 12 = CFP Table 4 shows the result of this formula applied to a dental company.

Box 6

Table 4
Obtaining the fixed cost per patient.

Cost per treatment at my Dental Clinic	Fixed costs	Indirect variable costs	Costo Fijo Total
TOTAL	CF +	CV =	CFT
Working days per month	24	M to S is 24 working days per month.	
Daily fixed cost	CFD = CFT /24		
Patients per day	12		
Fixed daily cost per patient	CFP = CFD/12		

Source: own elaboration with data from Avila et al.. (2023)

Costing of direct raw materials by treatment

The costs incurred in inputs per service will be obtained (Table 5). For this purpose, two treatments will be used as an example, general consultation and resin in anterior dental organs.

Box 7

Table 5
Inputs needed for general consultation

Consulta general	Nombre de producto	Unidad de medida	Cantidad (C)	Costo Unitario (CU)	Costo Total (CT)	Unidades utilizadas por tratamiento (UUPT)	Costo por tratamiento (CPT)
Insumo 1	Guantes	caja	C	CU= CT/C	CT	UUPT	CPT1 = CU * UUPT
Insumo 2	Cubrebocas	caja	C	CU= CT/C	CT	UUPT	CPT2 = CU * UUPT
						Total:	MPD = CPT1 + CP2

Source: own elaboration with data from Avila et al. (2023)

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The methodology used for the elaboration of the above tables was inspired by the information presented in the tables of Direct Raw Materials in the article "Industrial production costs in Ecuador" (Arias et al., 2020). Determination of the selling price based on the integration of costs. The sales prices will be determined by service (Table 6), the ones that will be presented are those of the general consultation and the resin in anterior dental organs. To do this, we will have to add up the M.P.D and PIC, and obtain the cost of the treatment without profit, then we will assign a desired profit percentage, multiply the cost without profit with the desired percentage, and this will result in the cost of the service with profit. Then multiply the above amount with the tax percentage. Finally, the calculations are made to be able to offer digital payments and interest-free months, the percentages will be obtained depending on the banking company that provides the services.

Box 8

Table 6

Integration of costs to determine the selling price

	%		%		%			%		%	
						12 patients per day			Months Free (MSI)		Interest Proposal
Service	MPD	CFP	CSUD	UD	CCU	CI	%T	IVAc	MSIc	PVT	
Treatment	MPD	+ CFP =	CSUD	*UD	= CCU	CCU	* CI	**% T	*IVAc	*MSIc =	PVT

Note: Table showing the sum of costs to obtain the final selling price. Adapted from: own elaboration with data from Ávila et al.. (2023)

Desired profit and tax percentages may vary depending on the financial, fiscal and marketing strategies of the clinic that chooses to use the methodology. Selling prices may change according to the needs and objectives of each organisation.

Conclusions

The tool described above will allow the identification of costs incurred and the allocation of selling prices for dental treatment. The construction of the tool was based on the theoretical framework with the following points.

- The general cost theory and its components such as function, allocation and variability were described.
- The different costing systems such as absorption, direct, ABC, process and order costing were discussed.
- Elements such as market segmentation, differentiation and customer perceived valuation were presented.
- The different pricing strategies such as profitability margin, target price, demand and competition were also explained.
- The success stories presented showed how the costing systems were applied to two service companies.

The instrument was created in Microsoft Excel, based on the above information and data from the Dental Station clinic, and is an absorbing costing method since it groups fixed and variable costs.

The application of the previously designed costing methodology will influence:

- Efficient cost and inventory control.
- Distinction of incurred disbursements.
- Allocation of prices based on the cost integration performed and marketing strategies.
- Increased profitability as a result of the breakdown of costs and the addition of the desired profit margin.
- Patient satisfaction as a result of knowing that the sales prices of the services include interest-free monthly payments.

Detecting opportunities for improvement in financial planning.

The use of the tool in other clinics, in order to provide feedback on the work carried out and help them achieve their goals.

After the implementation of the tool at Dental Station, the following is suggested:

Establish a continuous monitoring of the tool in order to continuously improve it since costs at given times will be changing.

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Adopt a system for inventory control in order to optimise direct raw material costs and avoid losses in this area.

Adopt different marketing strategies in order to increase the client portfolio, among these measures can be addressed different treatment packages with reduced sales prices, maintain the offer of payment at months without interest, increase the value of the brand and attention by providing amenities such as air-conditioned areas, internet, pleasant waiting room with comfortable seating, among other proposals.

Measure and record the profitability of the organisation through the financial ratios described in the third chapter by means of a research work, since there is no information on these topics.

After testing the efficiency of the product, provide advice to other organisations in the sector that require it, such as private clinics and dental schools.

Explore the possibility of applying the methodology to speciality dental services such as Orthodontics, Surgery, Paediatric Dentistry and Endodontics.

Declarations

The authors declare that they have no conflicts of interest. They have no known competing financial interests or personal relationships that might have appeared to influence the reported article.

Authors' contribution

Fernando Avila provided the framework, tool design and conclusions.

Giselle Guillermo formulated the introduction, its elements and methodology.

Román Quijano carried out the analysis of results.

Roger Patrón constructed the theoretical framework.

Availability of data and materials

The data used in the research is available for publication without access restrictions.

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Abbreviations

%PD: Percentage of depreciation.

%T: Amount charged by the terminal company per transaction.

AA: Annual depreciation.

ABC Costing: Activity Based Costing.

AM: Monthly amortisation.

C.I.F: Indirect manufacturing costs.

C: Cost.

CCU: Cost with profit.

CF: Fixed cost.

CFD: Fixed daily cost.

FPC: Fixed cost per patient.

CFT: Total fixed costs.

CI: Cost of taxes.

CPT: Cost per treatment.

CSUD: Cost without profit.

TC: Total cost.

CU: Unit cost.

CV: Variable cost.

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DA: Annual depreciation.

B2C (Business to consumer) approach: Aims at the consumption of the service by the customer.

IMSS: Mexican Social Security Institute.

INFONAVIT: Instituto del Fondo Nacional de la Vivienda para los Trabajadores (National Workers' Housing Fund Institute).

ISR: Income tax.

M.O.D: Direct labour.

M.O.I: Indirect labour.

D.P.M: Direct raw material.

MCU: Unit contribution margin.

VATc: Value added tax on transaction fee.

MSIc: Interest-free month commission.

EP: Break-even point.

PVT: Selling price.

Q. Sales volume of the product.

Qe: Sales volume of the product when profit is zero.

TGC: General Cost Theory.

UD: Desired Utility Percentage.

Ut: Utility.

UUPT: Units used per treatment.

V: Sales.

RV: Residual value.

VU: Useful life.

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