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ORIENTED OBJECTS PROGRAMING
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PROBLEM

We need a system that allows us to control inventory and sales prices in a tire store, since imbalances in profits and differences in product entry and exit records have been detected. To understand what the program needs to do, you first need to understand a little about inventory management, updating prices, and applying discounts and taxes. However, we will keep things simple and only deal with the recording of tire entries and exits, along with the calculation of final prices with discount and VAT included.

SUMMARY

In the commercial field, correct inventory management and price control is essential to maintain profitability and transparency in a store. Without automated monitoring, errors in price calculations, stock losses or inconsistencies in profits may occur. A system that records tire entries and exits, applies discounts and VAT automatically, and keeps the total inventory value up to date would allow managers to have exact control of stocks and profits generated, guaranteeing efficient and reliable management. of the business.

BACKGROUND

In the south of Quito, specifically in the 23 de Mayo sector, tire stores play an important role in supporting local transportation and vehicle maintenance. Most of these businesses work with a variety of tire brands and sizes, serving cars, motorcycles, and trucks every day. However, many of them still rely on manual methods to record tire entries and sales, which often causes mistakes in stock control, incorrect pricing, and inconsistencies in profit calculations. In our local tire store, these issues have become evident. Sometimes, sales records do not match the actual number of tires in stock, and price updates are made inconsistently, affecting profit margins. For this reason, it is necessary to implement a simple computer-based system that can record the entry and exit of tires, automatically apply discounts and VAT, and keep track of total inventory value. By introducing this system, the store will have more accurate control of its stock and finances, reducing human error and improving efficiency in daily operations.

A study is being carried out which shows how the progress of the years since before the pandemic where it was assumed that mobility was good and after the

pandemic where it also shows the change of people for a certain way of taking care of their vehicles with the purchase of tires

Año	Promedio de llantas vendidas	Variación respecto al otro año	Observaciones
2019	4,800 unidades/año	—	Año estable antes de pandemia, ventas constantes.
2020-2021	2,900 unidades/año	↓ -40%	Impacto de pandemia y restricciones de movilidad.
2024	5,400 unidades/año	↑ +12.5% respecto a 2019	Recuperación del mercado y aumento del parque automotor.

This table shows a general comparison of tire sales and inventory movements between 2019 (before the pandemic) and 2024. It highlights the total number of tires sold per year, the variation rate, and key observations about the market situation.

In 2019, sales were stable, reflecting normal business conditions. During 2020–2021, sales dropped sharply by around 40% due to the pandemic and mobility restrictions. However, by 2024, the market recovered, surpassing pre-pandemic levels with a 12.5% increase in total tire sales. This data emphasizes the importance of having a digital inventory management system to adapt quickly to market fluctuations.

Marca de llanta	% de uso en vehículos (2019)	% de uso en vehículos (2024)	Precio promedio 2019 (USD)	Precio promedio 2024 (USD)	Variación de precio	Observaciones
Michelin	25%	28%	85	105	↑ +23.5%	Aumenta su presencia en autos particulares de gama media-alta.
Goodyear	20%	22%	78	96	↑ +23%	Se mantiene fuerte en autos y camionetas.
Firestone	15%	13%	70	88	↑ +25.7%	Ligeramente menor participación, pero precios más altos.
Hankook	10%	15%	68	92	↑ +35%	Crecimiento importante por buena relación calidad/precio.
Pirelli	8%	10%	90	115	↑ +27.7%	Más demanda en vehículos deportivos.
Continental	7%	6%	95	118	↑ +24%	Mantiene presencia, aunque más costosa.
Otras (marca local o genérica)	15%	6%	55	65	↑ +18%	Menor demanda por baja durabilidad y fallas postventa.

This table compares the market share (usage percentage) and average sale prices of major tire brands between 2019 and 2024. It also shows how prices have changed and provides brief comments about each brand's position in the local market.
The data shows that premium brands such as Michelin, Goodyear, and Pirelli increased their market participation and prices, while lower-cost or generic brands lost market share due to durability and quality issues. Prices rose on average 20–30% due to inflation, raw material costs, and shipping fees after the pandemic.
This information is crucial for pricing control and strategic purchasing, helping store managers determine which brands bring the best profit margins and customer satisfaction.

Marca	Participación en inventario (2019)	Participación en inventario (2024)	Rentabilidad promedio (margen %) 2019	Rentabilidad promedio (margen %) 2024	Comentario
Michelin	20%	26%	15%	18%	Mayor margen gracias a fidelización.
Goodyear	18%	21%	14%	17%	Estabilidad en ventas y buen margen.
Firestone	16%	14%	13%	16%	Ligeras variaciones, precios más altos.
Hankook	10%	15%	12%	19%	Mayor margen por demanda creciente.
Pirelli	8%	10%	10%	15%	Subió su margen con la tendencia a neumáticos premium.
Continental	8%	7%	12%	14%	Mantiene su segmento de alto rendimiento.

This table details each brand's participation in the store's total inventory and its average profitability margin in both 2019 and 2024. It shows how the distribution of stock has shifted and how profit margins have evolved over time.
Brands like Michelin and Hankook increased both their inventory share and profit margins, reflecting growing consumer trust and effective price management. On the other hand, generic or low-cost brands decreased their participation significantly as customers preferred more durable and reputable options.
This table demonstrates how implementing an automated control system for inventory and sales could help maintain ideal stock levels, update prices consistently, and improve profitability analysis for each brand.

ANALYST COMPARISON

Between 2019 and 2024, the **tire market** in **Quito** experienced significant **changes** that can be analyzed through a **comparison** similar to an **analyst performance model**. Each **tire brand** represents an **investor** starting with the same **market opportunity**, and its **results** depend on **pricing strategy**, **inventory control**, and **demand**. **Michelin** and **Goodyear** maintained solid **growth**, increasing both **market share** and **profitability**. **Hankook** showed the strongest **improvement**, achieving the highest **efficiency** and **profitability** among all **brands**. **Pirelli** and **Firestone** had moderate but steady **progress**, while **Continental** remained stable with minimal **variation**. In contrast, **generic brands** lost **participation** despite slight **price increases**, reflecting weak **customer preference**. Overall **prices** rose 20–30%, improving **margins** for recognized **brands**. The **simulation** shows that **Hankook**, **Michelin**, and **Goodyear** performed as top "**investors**," while **low-cost brands** declined. This **performance comparison** reveals the importance of accurate **price updates** and automated **inventory systems**. By monitoring each **brand's evolution**, the **store** can predict **profitability trends** and make smarter **purchasing decisions**.

Substantives	Object(yes/no)	
System	yes	
Inventory	yes	
Tire store	yes	
Product entry	yes	
Records	yes	
Prices	yes	
Discounts	yes	

Substantives	Object(yes/no)	
Progress		no
Variation rate		no
Market situation		no
Fluctuations		no
Share		no
Brands		no
Local market		no

Taxes	yes		Quality issues		no
Tire	yes		Inflation		no
Vat	yes		Raw material costs		no
Commercial field		no	Shipping fees		no
Inventory management	yes		Pricing control	yes	
Price control	yes		Customer satisfaction.	yes	
Profits		no	Distribution	yes	
Business	yes		Analyst	yes	
Local transportation		no	Improvement		no
Vehicle	yes		Price updates	yes	
Maintenance		no	Trends		no
Human/people		no			

	Class	Objects	Attribute	Methods
	System	**SalesSystem2025**	systemName: String, version: String, activeUser: String	startSystem(), shutDownSystem(), generateReport()

	Inventory	**centralWarehouseInventory**	productList: List<Tire>, totalQuantity: int, lastUpdated: Date	addProduct(), removeProduct(), updateStock()
	TireStore	**DakarQuitoBranch**	name: String, address: String, phone: String, schedule: String	registerSale(), registerPurchase(), showInventory()
	ProductEntry	**michelinBatch2024**	entryID: int, entryDate: Date, quantity: int, supplier: String	recordEntry(), validateData(), generateReceipt()
	Records	**januaryPurchaseRecords**	recordID: int, recordType: String, date: Date, details: String	saveRecord(), findRecord(), deleteRecord()
	Prices	**priceList2025**	basePrice: float, currency: String, updateDate: Date	calculateFinalPrice(), modifyPrice(), viewHistory()
	Discounts	**wholesaleDiscount**	discountType: String, percentage: float, startDate: Date, endDate: Date	applyDiscount(), removeDiscount(), validateDiscount()

	Taxes / VAT	**ecuadorVAT12**	taxType: String, vatRate: float, country: String	calculateVAT(), updateRate(), showTaxDetails()
	Tire	**michelinPrimacy 4**	tireID: int, brand: String, size: String, type: String, price: float	showInfo(), updateStock(), calculateSalePrice()
	InventoryManagement	**monthlyStockControl**	minStock: int, maxStock: int, inventoryStatus: String	controlStock(), alertLowStock(), refreshInventory()
	PriceControl	**quarterlyPriceAdjustment**	controlID: int, controlDate: Date, oldPrice: float, newPrice: float	verifyChanges(), recordUpdate(), generateReport()
	Business	**DakarTireBusiness**	businessName: String, taxID: String, totalIncome: float, totalExpenses: float	calculateProfit(), generateFinancialReport(), updateData()
	Vehicle	**toyotaHilux2020**	licensePlate: String, type: String, brand: String, owner: String	registerMaintenance(), showHistory(), linkPurchase()

	CustomerSatisfaction	**postSaleSurveyJuly**	surveyID: int, satisfactionLevel: int, comments: String	recordFeedback(), calculateAverageSatisfaction(), generateReport()
	Distribution	**sierraRegionDelivery**	distributionID: int, destination: String, shippingDate: Date, status: String	scheduleDelivery(), updateStatus(), confirmDelivery()
	Analyst	**juanPerezAnalyst**	analystID: int, name: String, position: String, department: String	generateReport(), analyzeTrends(), updateData()
	PriceUpdates	**januaryPriceUpdate**	updateID: int, date: Date, product: String, newPrice: float	registerChange(), notifyUpdate(), validatePrice()