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Mixology Based on Sensory Science and Cost Engineering: Development of Cocktails, Standardization of Technical Specifications, and Optimization of Financial Performance in Bars and Restaurants

Mixology Based on Sensory Science and Cost Engineering: Cocktail Development, Standardization of Technical Data Sheets, and Optimization of Financial Performance in Bars and Restaurants

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Summary

Cocktail making occupies a strategic position in bars, restaurants, and hospitality operations, as it articulates the sensory experience, the establishment's identity, financial performance, and... Operational dynamics. Despite this, a significant portion of cocktail menus are still structured with low technical formalization, poorly standardized recipes, insufficient portion control, unmeasured losses, and pricing based on intuitive criteria. This article analyzes cocktail management from the perspective of integrating sensory science and cost engineering, understanding the cocktail as a product that is simultaneously organoleptic, operational, and economic. The research adopts a qualitative, bibliographic, and theoretical-applied approach, based on an integrative literature review on multisensory taste perception, acceptance of alcoholic beverages, menu management, menu engineering, activity-based costing, and waste in hospitality.

It is argued that the quality of a cocktail depends not only on the combination of ingredients, but also on the coherence between the sensory formulation, the preparation method, the yield of ingredients, the execution time, loss control, operational safety, and the value perceived by the consumer. As a contribution, a technical model for cocktail development and governance is proposed, structured in six stages: diagnosis, prototyping, internal sensory evaluation, technical-economic adjustment, formalization of the technical sheet, and post-launch monitoring. It is concluded that the professionalization of mixology requires overcoming the undocumented artisanal logic, without eliminating creativity, but subjecting it to criteria of consistency, viability, and performance.

Keywords: mixology; sensory science; cocktail making; cost engineering; menu management; hospitality.

Abstract

Cocktail management has become strategically relevant in bars, restaurants, and hospitality operations because it connects sensory experience, business identity, financial performance, and operational flow. However, many cocktail menus are still developed with limited technical formalization, poorly standardized recipes, insufficient portion control, unmeasured losses, and intuitive pricing. This article analyzes cocktail management by integrating sensory science and cost engineering, understanding cocktails as sensory, operational, and economic products. The study adopts a qualitative, bibliographic, and applied-theoretical approach, based on an integrative review of literature on multisensory flavor perception, alcoholic beverage acceptability, menu management, menu engineering, activity-based costing, and food waste in hospitality. It argues that cocktail quality depends not only on ingredient combinations but also on the coherence among sensory formulation, preparation methods, standard recipes, ingredient yields, execution times, waste control, operational safety, and consumer-perceived value. As a contribution, the article proposes a technical model for cocktail development and governance structured in six stages: diagnosis, prototyping, internal sensory assessment, technical-economic adjustment, standard recipe formalization, and post-launch monitoring. The article concludes that professional mixology requires overcoming undocumented, craft-based practices without suppressing creativity, but by subjecting it to criteria of consistency, feasibility, and performance.

Keywords: mixology; sensory science; cocktails; standard recipe; cost engineering; menu management; hospitality.

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1. Introduction

Cocktail making has become one of the most visible aspects of contemporary hospitality. In bars and
In restaurants, a cocktail is not just a drink prepared for immediate consumption;
It constitutes a product with a significant margin, a differentiating resource, a vector of experience and
a tool for composing the menu. The choice of a drink can anticipate the perception of
Customer feedback on the establishment, influencing the average spending per customer, extending stays, and increasing sales.
food and strengthen the sensory identity of the establishment.

This relevance, however, is not always accompanied by managerial maturity. In many operations,
Creating cocktail menus still depends on individual repertoire and memory.
The process is based on informal and poorly defined criteria. Recipes are passed down orally; measurements vary.
Among professionals; fruits and syrups do not have a calculated yield; garnishes are prepared above.
based on demand; losses are absorbed as an unavoidable cost; and prices are determined by comparison.
A generic approach compared to competitors. The result is a vulnerable operation: the same cocktail can change.
The flavor varies depending on the bartender, the shift, the amount of ice available, the preparation time, or the pressure of the serving.

The problem isn't limited to recipe standardization. Cocktail making encompasses sensory dimensions,
Operational and economic factors that need to be addressed together. A drink, technically speaking.
A balanced system can be financially unviable if it uses expensive, perishable, and slow-moving inputs.
A profitable cocktail can compromise the experience if it has low sensory acceptance or
Inconsistent execution. An original item can enhance the image of the house, but it can create bottlenecks in...
Peak hours require many preparation steps. Efficient management therefore demands that...
creativity, the sensory method, and cost control should be understood as parts of a
same system.

Sensory science provides a basis for understanding how aroma, taste, appearance, texture,
Temperature and context influence consumer perception. Cost engineering, therefore,
In turn, it allows you to identify the real cost of the portion, the yield of inputs, and losses due to...
Perishability, the impact of labor, and the contribution of each item to the financial result.
Menu management integrates these dimensions by treating the menu as an instrument of
Planning, communication, operation, and performance analysis.

The aim of this article is to propose a technical model for the development and governance of
cocktails in bars and restaurants, combining sensory science and standardization of technical specifications.
Loss management and pricing. The research starts from the following question: how does the integration between
Sensory analysis and cost engineering can improve operational consistency and performance.
What is the financial aspect of cocktail menus?

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2. The cocktail as a sensory product

The cocktail is a sensorially dense product. Its perception does not arise solely from the sum of its components.
ingredients, but also the interaction between gustatory, aromatic, tactile, visual and other stimuli
Contextual factors. Sweetness, acidity, bitterness, alcohol content, body, temperature, and dilution do not play a role.
In isolation. Each element modifies the other. Acidity can make sweetness cleaner; sugar
It can reduce alcoholic aggressiveness; bitterness can extend persistence; dilution can integrate
Flavors; temperature can alter aromatic volatility; the glass can influence expectations.
Literature on multisensory taste perception demonstrates that consumers do not evaluate
food and drinks exclusively for taste. The aroma, especially through the retronasal route,
Appearance plays a decisive role in the taste experience. Texture anticipates expectations.
It participates in the idea of the body. Temperature alters the freshness, intensity, and perception of alcohol. Even
The environment can interfere with the evaluation of the product. In the world of cocktails, this phenomenon is even more pronounced.
This is evident, as alcohol acts as an aromatic solvent, a thermal agent, and an element of tactile perception.
The sensory experience of a cocktail depends on balance, but balance doesn't mean...
Neutrality. A drink can be dry, bitter, acidic, alcoholic, or sweet, as long as that direction is...
consistent with the drink's concept. An aperitif can sustain the bitterness; a sour requires tension between
acidity and sweetness; a *highball* emphasizes lightness and carbonation; a stirred cocktail can enhance...
the alcoholic strength and aromatic depth; a dessert drink can explore the body and the
Persistence. The technical error lies not in the intensity, but in the lack of mastery.
Acceptance also depends on the context of consumption. Alcoholic beverages are consumed in
distinct social, gastronomic, and emotional contexts. The same cocktail can be appropriate for
Relaxation, celebration, aperitif, dinner, or nighttime consumption. Consumer preference does not
It stems solely from the chemical attributes of the beverage; it involves familiarity, occasion, company,
expectation and willingness to experiment. Therefore, the formulation of drinks should consider not
It's not just about what will be served, but also to whom, when, and with what function in the experience.
Sensory science helps transform vague impressions into evaluative criteria. Instead of
To record whether a cocktail is "strong," "weak," or "good," the technical evaluation must identify if there is...
Excessive perceived alcohol content, low dilution, low acidity, excessive sweetness, muted aroma, body.
Insufficient or unbalanced ending. Each diagnosis requires a different intervention. Increasing the
Sugar content doesn't solve an aroma problem; reducing the distillate content doesn't correct it.
necessarily an inadequate dilution; replacing the gasket does not solve a structural failure of
acidity.

This type of analysis does not eliminate the bartender's creativity. On the contrary, it allows for creation to be...

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Communicable, repeatable, and improvable. Professional mixology depends on repertoire, but also
of method. Without registration, the creation remains fragile. With sensory evaluation, technical data sheet and
Monitoring means the cocktail is no longer just an individual act, but a product.
manageable.

3. Cocktail menu and menu management

The menu is often perceived as a list of available products. In terms
In management roles, their function is broader. They determine purchases, inventory, *mise en place,* training,
Equipment, production time, customer communication, and profitability monitoring. In this case
In the world of cocktails, this function is even more sensitive, as each item may involve spirits, liqueurs,
Fruits, syrups, infusions, ice, garnishes, utensils, specific techniques, and preparation times.
distinct.

The literature on menu management understands the menu as an integrated planning process.
Pricing, design, operation, and development. Applied to cocktail making, this understanding...
It prevents the menu from being treated as a collection of independent recipes. A drinks menu.
It must have composition, hierarchy, and purpose. It's not enough to simply assemble technically interesting cocktails;
It is necessary to organize a portfolio capable of meeting the needs of different consumer profiles and moments.
consumption patterns, price ranges, complexity levels, and margin objectives.
Planning should begin with an operational diagnosis. A high-volume bar needs drinks.
Fast, consistent, and suited to customer flow. A *fine dining* restaurant can sustain this .
greater complexity, provided the service can explain and deliver the proposal. A casual operation.
You can prioritize drinks that are easy to understand, with low waste, and affordable. In all cases,
The selection of items should consider the audience, the gastronomic offering, the staff's capabilities, and...
Physical structure, suppliers, and demand behavior.
Variety is a point of balance. Extensive menus broaden the choice, but increase the risk.
Inventory, training, risk of loss, and operational dispersion. Very limited menus.
They make control easier, but they can limit the experience. The criterion should not be quantity, but the...
Complementarity. A consistent menu might include citrus, refreshing, bitter cocktails,
Stirred, sparkling, fruity, non-alcoholic, and seasonal, as long as each item has a function.
defined.

The language used in a menu directly influences the choice. Names, descriptions, and visual organization.
They are not decorative elements. They guide expectation and perceived value. A description
An effective label should provide information about the alcoholic base, sensory profile, and distinctive characteristics without...

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Avoid using excessive adjectives. The consumer needs to understand if the drink is citrusy, sweet, bitter,
Dry, light, full-bodied, aromatic, or alcoholic. Descriptions that are too abstract make it difficult to decide.
Overly technical descriptions can alienate less familiar consumers.
Pricing should be aligned with the portfolio. The price of a cocktail doesn't depend solely on its cost.
of the ingredients. It also depends on the perceived value, the comparison with substitute items, the
contribution margin, preparation time, presentation, demand, and positioning of
A low-cost drink can command a high price if it has high acceptance and strong appeal.
Identity. A cocktail with expensive ingredients may be unfeasible if it doesn't provide a perception.
proportional. The menu needs to balance volume products, margin products, and items of
Image and access options.

4. Technical specifications, standardization and operation

The technical sheet is the main instrument for controlling cocktail production. It should record ingredients,
quantities, preparation method, type of ice, glass, garnish, estimated preparation time,
yield, cost, price, margin, shelf life of intermediate preparations, allergens and observations
of service. When well-designed, it doesn't just function as a recipe. It organizes production,
Training, purchasing, inventory, pricing, and performance evaluation.
The lack of a technical sheet creates variability. One bartender might use more spirit than another; one
It can shake for longer; another may use unsuitable ice; another may change the garnish by
convenience; another may compensate for acidity with sugar indiscriminately. The consumer notices these
Differences are seen as an inconsistency. The company, in turn, absorbs the effects in the form of costs.
Unforeseen events, distorted margins, and loss of confidence.
Standardization requires precision in measurements. The use of *jiggers,* scales, written recipes, and...
Clear procedures reduce portion deviations. In cocktails with citrus, standardization is even more important.
Most importantly, because lemons, oranges, and other fruits vary in acidity, sweetness, and yield. Syrups
Cordials and other similar products require a defined proportion, identified batch, and controlled expiration date. Infusions require...
Time, temperature, alcohol content, and filtration method are recorded. This applies to foams,
purées, *shrubs* and more complex preparations.
Mise *-en-place* constitutes the practical dimension of the technical sheet. A menu is only executable if...
The bar station should be organized. Cut fruit, sanitized herbs, labeled syrups, bottles
Properly positioned ice, adequate ice, clean utensils, and readily available glasses reduce service time and costs.
Execution errors. The mise-en-place, however, needs to be scaled according to demand.
Preparing too little leads to disruption; preparing too much leads to waste. The right approach depends on the history.

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sales, day of the week, weather, reservations, events and seasonality.

The training should cover both execution and communication. The bar staff needs to replicate the...

technique and standard; the service team needs to understand the sensory profile, the alcoholic intensity,

The occasion for consumption and the reason for recommendation. A cocktail can have an excellent formulation.

And sales can drop if the team doesn't know how to present it. It can also sell well initially and then lose value.

Credibility is lost if the execution does not match the description.

Standardization should include operational safety. The bar handles ice, fruit, herbs, utensils,

Surfaces, beverages, dairy products, eggs, tree nuts, and other potential allergens. Ice is an ingredient.

Not just a means of cooling. Garnishes come into direct contact with the beverage. Syrups and

Fruits have an expiration date. Poorly sanitized utensils can compromise safety and flavor.

Customer experience also depends on the invisibility of these controls.

5. Cost and waste engineering

The profitability of a cocktail begins before the sale. It is built up during purchase, storage,

The cost of the beverage extends from preparation and portioning to serving and disposal. It's not limited to the main spirit.

Includes liqueurs, *bitters,* juices, syrups, fruits, garnishes, special ice, intermediate preparations,

Losses in yield, breakdowns, overdosing, and, in more comprehensive analyses, labor time.

The cost per serving should be calculated based on the recipe card. Beverages can be converted into

Cost per milliliter. Fruits should be evaluated by net yield, not just price.

Purchase. One kilogram of fruit rarely corresponds to one kilogram of usable input. Peels, seeds,

Fiber, oxidation, maturation, and disposal all affect the actual cost. Artisanal syrups should take these factors into account.

ingredients and the final usable volume. Garnishes, although they seem small, become

relevant when multiplied by sales volume.

Waste in the hospitality industry often stems from flaws distributed throughout the entire process.

bar, it appears in purchases exceeding demand, inadequate storage, spoiled fruit,

Oxidized juices, discarded herbs, expired syrups, unused garnishes, remade drinks,

Spills, incorrect inventory, and unrecorded consumption. The loss is not just financial. It

This reveals a misalignment between the menu, demand forecasting, *mise en place ,* and operation.

Waste management should be preventative. The best way to reduce loss is not just...

to oversee disposal, but also to design the menu and processes for disposal to occur.

Less. Sharing ingredients between different cocktails can increase turnover and reduce costs.

Perishability is a concern, provided it doesn't make the menu repetitive. Seasonal ingredients can be used.

When they offer the best value for money, garnishes should be sensory and visual, not merely superfluous.

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Ornamentals. Intermediate preparations should have a volume compatible with the projected sales.
Activity-based costing expands this analysis. Two cocktails with input costs.
Similar things can have very different operational impacts. A drink assembled directly on the
A glass of water takes less time than a drink that requires dry shaking, double straining, and frothing.
Smoking and finishing at the table. During peak hours, preparation time is the production capacity.
A high-margin cocktail can reduce profitability by creating bottlenecks, delaying orders, and preventing...
Selling items faster.
Therefore, cost engineering must consider both material and operational costs. The first
The first one appears in the ingredients list. The second one appears in the time, complexity, training, and...
without the risk of error. A mature operation doesn't necessarily eliminate complex drinks, but it does reserve them.
Complexity for products that justify price, image, margin, and demand.

6. Methodology

The research is qualitative, bibliographic, and theoretical-applied. An integrative review of the...
Literature focusing on six axes: multisensory perception of flavor; acceptance of cocktails.
Alcoholics and consumption context; restaurant menu management; menu *engineering;* costing
based on activities; and waste in hospitality.
The choice of an integrative review is justified by the interdisciplinary nature of the subject matter. The management of
Cocktails do not belong to a single field of analysis. It requires dialogue between sensory science, the...
consumer behavior, food and beverage operations, management accounting,
Pricing and hospitality. This approach allows for the combination of conceptual and applied contributions to...
to build an operational governance model.
Peer-reviewed articles, technical works on mixology, and references on the subject were prioritized.
Food and beverage management. The analysis was conducted using a thematic approach, with the objective of
Identify recurring categories: sensory balance, consumption context, standardization, cost per
Portion size, yield, losses, pricing, preparation time, and menu monitoring. Starting from
From these categories, a six-step cocktail development model was created, with
purpose applied to bars and restaurants.
No real financial data, consumer testing, or internal information was used.
specific establishments. The proposal is both conceptual and operational in nature. Its objective is to offer
a technically sound decision-making structure, adaptable to the type of operation, the audience, and the
location, legislation, suppliers, and business positioning.

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7. Technical model for cocktail development and governance

The development of cocktails should begin with diagnosis. Before creation, it is necessary
understand the problem that the new item aims to solve. A drink can be created to expand
On the margins, renew the menu, meet the demand for low-alcohol content, offer an alternative.
without alcohol, reduce losses of a given ingredient, harmonize with dishes, speed up service or
To reinforce the house's identity. The absence of this diagnosis leads to the creation of interesting products,
but without a clear function.

The second stage is prototyping. The prototype should test proportions, techniques, and ingredients with...
Accurate record. Each version must indicate measurements, method, ice, glass, garnish, and cooking time.
Preparation and sensory observations. Prototyping allows for comparison of versions and understanding of the effect.
Small adjustments are all it takes. In citrus cocktails, a few milliliters of syrup or juice can alter the...
Balance. In stirred drinks, dilution and temperature define the integration. In bitter drinks,
Dosage influences acceptance. In carbonated cocktails, the order of assembly and preservation also play a role.
The gas interferes with the perception of freshness.

The third stage is the internal sensory evaluation. A panel made up of bar, restaurant and other professionals...
Management can assess balance, aroma, acidity, sweetness, bitterness, body, finish, presentation,
Execution time and ease of recommendation. The presence of the dining area is relevant because the waiter
The maître d' often translates the product to the customer. Management is involved in evaluating cost, inventory,
Price and feasibility. The evaluation should produce a diagnosis, not just approval or rejection.

The fourth stage is the technical-economic adjustment. The product, even after sensory approval, may still require further adjustments.
Cost, yield, or operational adjustments. If the drink is good but expensive, it's possible to review the...
The ingredient, the portion, the garnish, or the price. If the formula is profitable but sensorially unstable, it
It needs to be adjusted. If it's appealing but slow, it may require some preparation or simplification. The
Proper adjustment preserves the cocktail's intent and eliminates weaknesses that compromise its effectiveness.
remaining on the menu.

The fifth step is formalizing the technical specifications. The cocktail party should only be launched once its execution is complete.
It can be reproduced. The sheet must contain the recipe, method, visual standard, cost, price, and expiration date.
Ingredients, allergens, and sales guidelines. It should also include information on sensory profile and the occasion.
Recommended. This commercial dimension is crucial: the team needs to know who to offer the drink to and
How to describe it.

The sixth step is post-launch monitoring. The menu should be tracked by sales,
Margin, losses, preparation time, team feedback, and customer reaction. A cocktail party can...
It received good reviews in internal testing, but performed poorly in the showroom. The problem may be the price.

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In the name, description, positioning, recommendation, or sensory profile. Without
With monitoring, management makes decisions based on impressions. With monitoring, decisions are based on evidence.
operational.
This process transforms cocktail making into a system of governance. The creative aspect remains present.
But it ceases to be an isolated act. The product is born from a need, it is tested, adjusted,
Documented, sold, and monitored. The logic is similar to that of product development in...
Food and drinks, adapted to the reality of the bar.

8. Discussion

The integration of sensory science and cost engineering allows us to overcome a recurring weakness.
In cocktail making: the separation between creation and management. When the drink is treated merely as a...
Creative expression tends to lack control. When treated merely as a cost item, it tends to...
to lose sensory value. Efficient operation depends on the articulation between these two perspectives.
Sensory literature demonstrates that consumers perceive beverages as an integrated experience.
Aroma, appearance, temperature, texture, and context all contribute to the evaluation. The literature on management...
Studies on menus show that the menu organizes production, sales, and control decisions.
Cost indicators show that the actual margin depends on the portion size, yield, losses, and activities.
consumed. Studies on waste show that losses result from poorly managed processes.
planned, not just individual failures.
This convergence reinforces the need for robust technical specifications. The specification sheet should not be seen as
bureaucracy, but as an instrument for preserving quality. It allows for team training,
Calculate costs, control inventory, reduce variability, and protect the customer experience.
It also allows creativity to be scalable. A signature drink without a menu depends on the creator; a
A documented, signature drink can be executed by the operation.
Another relevant point is portfolio analysis. The performance of a cocktail party should not be evaluated.
individually. An item may have a smaller margin and still be strategic due to volume, accessibility, or
Entry-level function. Another may have high and low sales margins, requiring repositioning. One
A third option can reinforce the image, but it can also consume an excessive amount of time. The decision to
Whether to keep, adjust, or remove something requires considering the whole picture, not just internal preference.
Pricing also needs to be handled with greater sophistication. The price needs to cover costs and...
sustain the margin, but also engage with perceived value, competition, the occasion, and the
Substitutes. Reducing the price without identifying the cause of the drop in sales can harm the margin.
without solving the problem. Raising the price of a popular item may be feasible, but it requires...

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Monitoring price elasticity and the shift in demand towards similar items.

Waste management, finally, should be incorporated into menu development. A cocktail

It should not be launched without analysis of perishability, yield, cross-use of inputs, and...

Demand forecasting. The economic and environmental sustainability of the operation begins with the design of the

The more coherent the menu, the lower the risk of scattered purchases and excessive *mise en place.*

and recurring disposal.

Final considerations

Professional cocktail making demands an approach that combines creativity, sensory experience, and practical application.

Financial control. A cocktail is not just a combination of ingredients; it's a product of...

Hospitality needs to be formulated, standardized, priced, executed, and monitored. Its

Quality depends on the consistency between sensory balance, preparation method, technical specifications, and...

Intake efficiency, service time, operational safety, and perceived value.

Sensory science contributes by offering criteria for evaluating aroma, flavor, body, acidity, sweetness,

Bitterness, temperature, and dilution. Cost engineering allows for measuring portion size, losses, margin,

Performance and operational impact. Menu management organizes this information into decisions.

portfolio, pricing, communication, and development. When these areas operate

Separately, the menu loses consistency. When used together, the cocktail menu gains...

Predictability and performance.

The proposed model has six stages — diagnosis, prototyping, internal sensory evaluation, adjustment.

Technical-economic analysis, technical specifications, and post-launch monitoring — offers an applicable path.

to bars and restaurants. Their main contribution is transforming cocktail creation into a process.

It's managerial, without taking away space for creativity. The method doesn't replace the bartender's talent; it

Organize this talent so that the product can be replicated, sold, evaluated, and improved.

The professionalization of mixology requires overcoming undocumented improvisation. Bars and

Restaurants that treat their cocktail menu as a living system tend to reduce waste.

To improve consistency, enhance the customer experience, and strengthen profitability. The future.

The use of cocktails in food and beverage operations depends less on exuberant formulas and more

the ability to combine sensory precision, operational discipline, and economic intelligence.

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