Abstract

The development of the global economy and the demands of consumers cause that the manufacture and production of articles every day must be more reliable and transparent, in the case of food, it is essential in the current market to guarantee the safety and security of food and drinks. One of the fundamental tools to guarantee this process is provided by metrology and traceability of the entire production process, which is not only a requirement from the scope of product quality, but also from the logistical point of view, to achieve a detailed control of the product and to establish the necessary corrections of the process. In the present work, an extensive review of the literature is carried out; where the causes for which a traceability system is evaluated, the indicators of performance used in order to detect possible failures or weaknesses, as well as the best practices used for its improvement and better performance in entities. As an application, it presents a case study in the Central Ronera "Agustín López Mena" with a view to the improvement of its internal traceability system in the production process of the Cubay Rum.

Keywords: Traceability, internal traceability, performance indicators, supply chain

1. Introduction

Today's business world becomes increasingly complex and unpredictable for businesses globally. Increased competition from certain productions, economic, financial, energy, food and environmental crisis and the rapid development of science and technology, combined with market globalization, make all organizations and especially the Cuban, is face a race to find solutions that ensure them a market position, help them optimize their processes and make them more competitive. Authors such as: [1], [2], [3], y [4] suggest that the logistics today, ranging from the design and management of all activities necessary to acquire and channeling resources for processing to distribution and final delivery. Which in turn interacts with aspects of quality, customer loyalty, timely presence in the market, boost sales, operating costs and foreign trade or design and redesign of the product or service itself. Proper management of information is useful for managers for making effective management decisions and environmental impact of the supply chain, reaffirm these criteria: [5] y [6].

The authors [7],[8],[9] ensures that traceability systems are part of a field of relatively new logistics and arise with the need to respond effectively to the demands of customers or consumers. The reality that companies live is that getting data quickly and accurately throughout the supply chain, helps make accurate and timely decisions in the face of any adversity.

When analyzing the manufacturing process of rums, inviolate different stages of the production process or critical points and the high volumes of rums produced with the premise of meeting the requirements of its
customers, ensuring quality and safety are highlighted. However, when carrying out their internal audits and checks on the current traceability system, they find weaknesses, which do not yet affect the final quality of the product, but they hinder the effective responses of the company’s management in case of complaints. In addition, the international legal framework on food and beverages has been updated in recent years, so the traceability system must also be updated to meet these legal standards and work to reduce the problematic situation identified in the Basic Business Unit: Ronera Cental “Agustín Rodríguez Mena”.

According to the above, the general objective is defined as: improving the current system of traceability of the Ronera, integrating logistic control and product quality.

The specific objectives of the research are:
- Identify the characteristic elements of the traceability system through the evaluation of the entity.
- Evaluate the traceability system, taking into account the activities and functions of logistics, which allows assessing their management in the entity under study.
- Analysis of possible improvements for the current system.

In order to comply with the objectives, the current traceability system of the studied entity will be analyzed, which follows a system of hazard analysis and critical control points (HACCP) in English. In addition to complementing the evaluation with the review of the internal audit reports of the entity. The possible measures of improvements that the company can take to improve the system will also be taken into account.

2. Research background

Several authors defend the importance of analyzing traceability in a supply chain, as well as its impact. When analyzing these authors, it’s observed how the traceability takes different nuances taking into account the legal frameworks of the zones, which are usually divided, by areas such as Latin America, the United States, Europe and Asia. Some of these authors are: [10], [11], [12].

The International Organization for Standardization (ISO 9001: 2008 AND ASME 18001) defines the term traceability, in its International Vocabulary of Basic and General Terms in Metrology, as follows:

The property of the result of a measurement or of the value of a standard where it can be related to specified references, usually national or international standards, through a continuous chain of comparisons all with specified uncertainties.

According to the Committee of Alimentary Security of AECOC:

“Traceability is understood as the set of those pre-established and self-sufficient procedures that allow knowing the history, location and trajectory of a product or batch of products along the supply chain at a given time, through certain tools”.

When it comes to having to understand the traceability of a product that moves through its supply chain or its logistics branch, the concept of traceability is divided into two types: Internal Traceability is to obtain the trace that leaves a product through all the internal processes of a company, with its manipulations, its composition, the machinery used, its turn, its temperature, its lot, etc., that is, all the indications that make or can vary the product for the final consumer.

External Traceability, is to externalize the data of the internal trace and add some more indications if necessary, such as a breakage of the packaging, a change in the temperature chain, etc.

According to Regulation 178/2002 of the European Commission, traceability is the possibility of finding and following the trace, through all stages of production, transformation and distribution, of a food, a food, a substance or an animal intended for the production of food. On the other hand, to be incorporated or likely to be incorporated into food or feed [13]

Several authors such as: [8], [11], [14], [10], [15], [16], [17], [7], [18][19] coincide in many points of what traceability is. Said colloquially, is the possibility of following the steps that has gone through a product and its components from its origin to reach the hands of the consumer or by all steps in the supply chain.

Traceability Evolution

The principle of the identification of lots has been considered as a satisfactory solution, but there has been a global escalation. The first of these was the mad cow crisis, which took place in the mid-1990s, and issues related to the traceability of all products of animal origin were raised. The legacy of the second event still remains follows this: the attack on the Twin Towers of New York on September 11, 2001. The event opened the eyes of the United States on its own property and external attacks and bioterrorism. As a real threat by the government. [20]

These tragedies were decisive, in 2002 the efforts of the United States and Europe were accelerated by a legislator in the field of traceability. The first developed their “treaty
against bioterrorism", while in Europe was introduced on food security.
Costs caused by traceability, technological characteristics and lack of cooperation between manufacturers, logistic means, distributors and retailers are not allowed in their original application. However, traceability can only be the result of coordinated actions between the different participants or links of the supply chain, all of them have to invest in technology and in a review of their processes, in order to avoid risks from the law. This is how [21], [22]
With the passage of time, public and private organizations began to react. This was the case of the FDA (Food and Drug Administration) of the United States, the EMA (European Medicines Agency) in Europe or, from a more global point of view, the GS1, an agency in charge of identification standards governing the coding of packaged units.
Currently, there is a strong trend in the industry towards a unit processing solution, in one place in a batch processing solution. This means that the traceability of a particular product does not correspond to a sales identifier and its manufacturing environment, but rather to an individual identification through a unique serial number. It implies that each product unit must have its own identity, which allows us to discover its origin, but also, what is more interesting, the route that has been followed and the situations that have passed before reaching the consumer's hands. The unique identification of the product units has a unique history that is enriched at each stage of its useful life.

3. Methodology
The methodology chosen to carry out the evaluation is the one described in NC 136 2017 [23], which establishes the prerequisites that a company must have to apply the HACCP system or model and how to subsequently evaluate the same. The principles that describe how to proceed with the evaluation are the following:

- Principle 6: Establish verification or verification procedures to confirm that the HACCP / HACCP System works effectively.
- Principle 7: Establish a documentation system on all procedures and appropriate records for these principles and their application.

Fulfilling Principles, 6 and 7 UEB Quarterly traceability of a batch of rum be reviewed, capturing the results in the register RM 01 PT 150/04 exercise traceability rums which can be seen in Figure 1:

![Figure 1: RM 01 PT 150/04 Rong traceability exercise record.](image)

Source: [24]

In this model, all data reflected in the sequence of operations for traceability from receipt of raw materials to distribution to the customer are recognized.

In addition, as part of the evolution and following Principle 7, the documentation as well as the reports of the internal responses audits will be reviewed in order to make an accurate evaluation in the UEB traceability system. Apart from this exercise, the Internal and External Audits carried out at the UEB were also taken into account over the years, with the aim of having a greater number of information to be able to make decisions.

4. Results
The exercise begins by choosing a lot randomly, this can be in production, in finished productions and even already dispatched and delivered in the stores of the parent company Ron SA. Once the lot in question has been selected, information is sought at the control points of the chain, which were selected taking into account NC 136 2007, these points were chosen following the procedure shown in the standard which can be seen in the Annex 2 of the standard. The control points chosen in the supply chain can be seen in table 1.

<table>
<thead>
<tr>
<th>Critical Control Points of the Supply Chain of the UEB Central Ronera “Agustín Rodrigues Mena”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reception of raw materials.</td>
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<tr>
<td>Preparation of alcoholized syrup.</td>
</tr>
<tr>
<td>Aged in oak barrels of fresh brandy.</td>
</tr>
<tr>
<td>Mix and Dilution</td>
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<tr>
<td>Preparation of the finished Rum.</td>
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<tr>
<td>Filtration of the finished rum.</td>
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<tr>
<td>Rinsed Fill.</td>
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<tr>
<td>Checking and filling control.</td>
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<tr>
<td>Labeling and Coding.</td>
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<tr>
<td>Revision.</td>
</tr>
<tr>
<td>Packed in boxes.</td>
</tr>
</tbody>
</table>
In order to fulfill the proposed objectives for the research, two possible solutions are proposed to counteract the difficulties observed in the evaluation of the system. The first is based on the updating of the traceability system of the institution based on the study of the main standards and the legal framework that affects its products. Followed by the restructuring of the system following the general model proposed in the book: *Introducción a la Trazabilidad: un primer acercamiento para su comprensión e implementación*.

According to the author [25] traceability, systems for food and beverages must have a series of minimum requirements and propose a general model for the supply chain. The collection of them is shown below:

- Information system that allows the exchange of information between client and provider as a collaboration facilitator.
- Relationship between the actors in the chain.
- Definition of criteria for grouping products coding system.
- Establish necessary records and documentation.
- Information gathering tools.
- Record management and storage practices.
- Must comply with food safety regulations.

After the system update would move to the next improvement proposal. This would be the implementation of a computer system for the management of information through the supply chain of the institution. So far, they have not decided on any option, since there are several software options that can meet the conditions of the entity. Some of the software that you have taken into account are:

- Arballon Business Software.
- Dipole Trace Suite
- IBM.
- webMethods.
- Tibco.
- Oat Systems.
- SAP
- RedPrairie
- HighJump
- Logility.

Although the option that has, greater acceptance in the institution is the creation of a database of its own. Since this would be designed on the unique conditions of Cubay's Ron supply chain. What would allow other


Table 1: Critical Control Points of the Supply Chain of the UEB Central Ronera "Agustín Rodríguez Mena"

Source: self-made.

Once at the checkpoints, the documentation that is in order is checked and the registration information of the selected batch is searched, as well as the quality and history tests of the same. The input and output information of the control point is checked and compared with the previous and the later to check the validity of the information transmitted and received.

Upon completing the evaluation of the exercise and the traceability systems of the UEB, it was observed that traceability is controlled and functional; but it was also noted that they have some international standards outdated in the example systems of this is ISO 9000 2015 and ISO 9001, in contrast has other very updated as the NC 136 2017. The current system of traceability does not include economic indicators and quality, although in practice if they are analyzed and used decision-making. The traceability information is fragmented by the different links of the supply chain, although it is registered access is difficult and the heads of the work zones must be interrupted to access them.

An important point that was pointed out is the non-existence of an information backup digitally not only for decision-making; but also to use them as a database to generate knowledge and have a historical record of the productions and events that occur.

The good training of workers regarding the issues of production, quality, traceability and hygiene of the job was also pointed out. In addition to the importance of complying with all sanitary measures, since they are working with products of human consumption and in great demand by the national population.

As a final result, it was decided to give the evaluation of Regular to the traceability system of the UEB because the system complies with the minimum traceability standards that customers demand, but they do not have the speed to respond in case of a claim already that the information necessary to act is dispersed by the different.

4.1 Proposed improvements
series of benefits and facilities for further research.

4.2 Conclusions
- The development of logistic traceability systems grows rapidly after 2002 with the imposition of new transformations of the legal framework of the main economic blocks of the world.
- The differences between the large number of traceability systems in companies producing similar food and beverages depend to a large extent on the technologies available to the company.
- New technologies, as well as the use of software, are able to facilitate and collect the use and collection of a greater amount of information, but it depends on the training of the staff to make the system work correctly.
- The UEB has a traceability system capable of ensuring quality compliance but it is not integrated into the integral management sought by the Cuba Ron Company. SA
- Is able to respond to clients in case of complaints; but not quickly and precisely due to the fragmentation of information and its dispersion through the supply chain.
- No existence of a computerized backup of the information and history of traceability in the company.
- Improvement proposals are intended to reduce the impact of the weaknesses found in the evaluation of the entity's traceability system.

Bibliography
5. Estrada, M., Análisis de estrategias eficientes en la logística de distribución de paquetería. 2007: Cuba, Departamento de Ingeniería Industrial. CUJAE – La Habana.