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METHODOLOGY AND METHOD

3.1 INTRODUCTION

As stated earlier, the aim of this research project is to calculate the 2023 sales forecast according to the sales history from the past 3.5 years with four specific objectives.

Primary research has been used to obtain quantitative historical sales data from the company. In this chapter, the researcher reviews the methodology and the analytical techniques used to interpret and understand the collected data, as well as the techniques to achieve the objectives.

3.2 PHILOSOPHICAL ASSUMPTIONS

Research studies are always driven by certain philosophical assumptions and beliefs, whether or not one is aware of them. As a researcher looks for information to answer questions, they influence and shape how the researchers and evaluate the results of a study. The research process involves identifying research questions, designing the study, collecting data, and analysing the results. Four philosophical assumptions are briefly discussed:

Ontology: The concept of ontology refers to the notions about the nature and kind of reality and social life. It refers to the question "What is the nature of reality?," which refer to the study of the "being" and "what is" the structure and the nature of reality and what can be known about the world. It can be understood as the assumptions one makes about the reality and what exists. In other words, ontology is connected to the central question of whether social entities should be viewed as objective or subjective. Consequently, subjectivism and objectivism can be regarded as key assumptions of ontology (Islam, 2020).

To understand how researchers analyse data, an understanding of ontology is essential. How research questions are developed, how they

are understood, and how data analysis is approached depend on one's ontological beliefs (Moroi, 2020).

Epistemology: Epistemology is the study of knowledge. In research, "this refers to the assumptions one makes about the kind or the nature of knowledge, or how it is possible to find out about the world" (Islam, 2020). Understanding the world and making sense of it are part of the way of looking at it; to put it simply, it refers to how people come to know something and how they know the truth. It addresses the question "What can be accepted as knowledge?".

Researchers who participate in quantitative research believe that real life is objective, rationally organized, and independent of their perceptions, perceptions of others, as well as their own perceptions. As a result, quantitative research carries an etic viewpoint in epistemology, which means that researchers are outsiders to the subject being studied (Moroi, 2020).

Methodology: The purpose of a methodological assumption is to explain why one believes a particular interpretation to be true or how an interpretation can be justified (Lee, 2017). It "has to do with philosophies that guide data gathering, and it determines methods" (Moroi, 2020). It can be explained with the question "How knowledge regarding given question can be produced?".

To determine which methodology and method will help researchers answer their research question, researchers should ask themselves: What methodology and method will accomplish what I am trying to achieve? (Moroi, 2020).

Axiology: Axiology is a branch of philosophy that deals with the study of values and value judgments. Thus, axiology is also called a "Theory of value," which includes a range of methods for determining how, why, and how much humans ought to value things, and whether they are people, ideas, objects, or anything else (Naseerali, 2016). "Axiology has to do with the role of values in research. Quantitative research, which takes the positivist approach, makes a distinction between facts and values" (Moroi, 2020). The axiological assumption here is that objectivity is acceptable, and subjectivity is inadequate.

3.3 RESEARCH QUESTIONS

Research questions should help the researcher find out exactly what they are looking for in their research. Based on the four objectives, researcher

has come with the following research questions to help reach the objectives and aims.

Objective 1: Find the 10 products with the highest sales during the past 3.5 years.

- What are the top 10 sold products on the past 3 years?
- Which families are with the highest sales during the study period?

Objective 2: Understand if the top 10 products have a significant impact on the total sales.

- How do these 10 products affect the total sales?

Objective 3: Analyse the sales fluctuations for the top 10 products during the past 3.5 years.

- How has the demand from the top 10 sale products changed during the past 3 years?

Objective 4: Forecast the sales of the top 10 products for 2023, based on the historical data.

- How have sales behaved for the current year compared to the predictions?
- What are the expected sales of the top 10 products for the next year?

Answering these questions helped achieve the above objectives.

It is important to mention that the researcher will not be sampling the data; however, the researcher will be working with the total sales in the data set, by only filtering, though some variables according to the researcher needs.

Another important topic is the method on which the research was carried out. The researcher objectives were addressed through a quantitative and mathematical analysis in which the researcher compiles the sales information per part number, per year, and for the total of the study period.

3.4 VALIDITY AND RELIABILITY

In this section, the researcher discusses about to measurements that can help the researcher achieve the rigour of the research. The first is validity, which is defined as "the extent to which a concept is accurately measured

in a quantitative study" (Heale and Twycross, 2015), and the second is reliability that can be understood as the accuracy of an instrument, which means the reliability to which a research instrument gets the same results when used in the same situation on repeated occasions.

As mentioned before, validity tells us how accurate a method measures something. Four main types of validity are as follows:

- Construct validity refers to the question "Does the test measure the concept that it is intended to measure?". Primary research has been done to determine the actual concerns of the company regarding the sale.
- Content validity answers the question "Is the test fully representative of what it aims to measure?". The data on which the research is based were shared by the company itself, assuring the content validity.
- Face validity goes hand with hand with content validity and responds to the question "Does the content of the test appear to be suitable to its aims?". In this case, one knows that one has face validity because the research questions are based on the company´s need and their data.
- Criterion validity refers to the question "Do the results accurately measure the concrete outcome they are designed to measure?". By being able to answer the research questions, one confirms that one has met criterion validity.

In contrast, one knows that reliability relates to the consistency of a measure; however, there are three types of reliability:

- Test–retest: This assesses the consistency across time, that is, if one gets the same results when one repeats the measurement. The top 10 products can be change during different time periods, and the significance that the top 10 products have over the totals sales will depend on how the company responds to the current significance of the top 10 products.
- Inter-rater: This refers to the consistency of a measure across observers, that is, if one gets the same results when different people conduct the same measurement. For this, the researcher has asked a third party to answer the first objective, and after comparing results, they both have come with the same information.
- Internal consistency: This refers to the consistency of the measurement itself, this means, if one gets the same results from different part of the test that are designed to measure the same thing.

3.5 DATA SELECTION AND COLLECTION

This is a quantitative research, in which data have been selected and collected from the historical sales records of the company´s information system. The researcher has asked the company to download three different tables to obtain all the information they need for analysis. The first table is the Invoice table, which contains the following information:

- IDCliente: Specific ID for each client
- IDProducto: SKU
- TotalUnidades: Pieces
- UM: Unit of Measure
- FechaFactura: Invoice Date
- LineaLlave: Specific code for each line in each invoice
- TransTipeDoc: Type of document
- TransDoc: Document number
- Precio Unitario: Unite price
- Venta: Total sale
- NumFac: Invoice number
- TipoDocFac: Invoice type

The next is Client table, in which the researcher used the "IDCliente" variable to obtain the following information:

- Región Cliente: Type of customer
- NombreZonaVenta Cliente: Sales zone
- IDcliente: Specific ID for each client
- CombreCliente: Client's name

And the final is Product table, in which the researcher used the "IDProduto" variable to obtain the following information:

- IDProducto: SKU
- DescProducto: Product description
- Familia: Product family
- IngredienteActivo: Active Ingredient

Once the final table is obtained, which is a combination of the three tables obtained from the company's system, the researcher needs to choose the variables that help answer the business questions.

3.6 ETHICS AND BIAS

Ethical considerations in research refer to "a set of principles that guide one's research designs and practices. Scientists and researchers must always adhere to a certain code of conduct when collecting data" (Bhandari, 2021).

Some of the ethical principles the researcher needs to follow are as follows:

- Honesty: The researcher must be honest when reporting data, results, methods, procedures, and publication status and does not fabricate, falsify, or mispresent data.
- Objectivity: The researcher must avoid being bias in any aspect of the research.
- Integrity: The researcher needs to act with sincerity and keep promises and agreements.
- Carefulness: The researcher avoids careless errors and negligence by keeping a good record of research activities.
- Respect for intellectual property: If dealing with patents, copyright, or other form of intellectual property, honour it. The researcher must give credit where credit is due.
- Confidentiality: Reason for which as asked by the company, the company´s name will not be disclosure at any moment.
- Responsible publication: Publications should seek the benefit of the community, not only the researchers themself. The researcher is seeking the benefit of the company the researcher is working with.
- Social responsibility: It is necessary to promote social good and prevent harms through research. The researcher does not seek to harm with the research, and they must make sure that it is not used for it, even when it was not personal purpose.
- Non-discrimination.
- Legality: The researcher must follow and obey laws and policies that apply to their research.
- Animal care: This does not apply to this research, but it does not hurt to say that it is important to respect and care for animals when working with them.
- Human Subjects Protection: This also does not apply to the research, but when conducting research on human subjects, one should minimize harms and risks and maximize benefits.

3.7 LIMITATIONS

Limitations and assumptions are part of almost every research, but the ability to recognize and describe these problems is key to a good research.

An example of this is that sometimes one needs to make assumptions during the analysis and confirming these assumptions could lead to a more accurate analysis, there are also limitations to consider in every analysis.

A **limitation** is the inability of a study team to fully meet the study objectives or investigate the study issues to their fullest extent.

Limitations of a dissertation are factors that can adversely affect one´s study, such as limited funding, choice of research design, constraints on the statistical model, or other factors. Furthermore, a limitation is something that affects the design and results of one´s study and cannot be dismissed reasonably. One cannot avoid limitations because all research projects, as well as pretty much everything else in life, have limitations.

The main limitation the researcher encountered was the time frame of the data, having more data normally translates into a more precise analysis, and in this case specifically, it could have help to have a more accurate result because the time the researcher is analysing is the same period where all markets were affected by the COVID-19 pandemic.

The **assumption** refers to a statement that is taken as true in the absence of facts, usually to accommodate a limitation.

One's dissertation or thesis will include assumptions that are accepted by researchers and peers as true, or at least plausible. By this, one means that anyone reading the paper will assume that certain aspects of the study are true based on the population, the statistical test, the design of the study, or some other limitation. Since most assumptions are not discussed in-text, the assumptions that are discussed in-text are usually discussed in "Discussion" section in light of the study's limitations.

Some of the assumptions the researcher had to make are as follows:

- The information is reliable and complete.
- All "CE" type of invoice (credit note) affects the inventory.

Both assumptions and limitations affect the inferences one can draw from the study, so it is essential to be aware of these matters.