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# Optimization of Business Decision Accuracy through the Application of Mathematical Economics

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**Abstract:** In the dynamic landscape of contemporary business environments, the need for precise decision-making has become paramount for organizational succes. It explores the strategic integration of mathematical economics as a powerful tool for enchancing decision accuracy in business. Mathematical economics, a discipline that combines economic theories with mathematical methodologies, offers a structured framework to model, and analyze a complex business strategy decision. This study delves into a theorical foundations of mathematical economics and investigates it practical applications in real-world business decision-making processes. Through the utilization of mathematical model, optimization techniques, and statistical analyses, businesses can gain insights into market dynamics, resource allocation, and risk assessment. The objective is to establish a systematic approach that aids decision-makers in formulating well-informed strategies, minimizing uncertaintes, and maximizing overall business performance.

**Keywords:** Decision-making, Business Application, Price, Market, Business Mathematical systematic.

***Abstrak:*** *Dalam lanskap dinamis lingkungan bisnis kontemporer, kebutuhan akan pengambilan keputusan yang tepat telah menjadi sangat penting bagi keberhasilan organisasi. Buku ini mengeksplorasi integrasi strategis ekonomi matematika sebagai alat yang ampuh untuk meningkatkan akurasi keputusan dalam bisnis. Ekonomi matematika, sebuah disiplin ilmu yang menggabungkan teori-teori ekonomi dengan metodologi matematika, menawarkan kerangka kerja yang terstruktur untuk memodelkan dan menganalisis keputusan strategi bisnis yang kompleks. Studi ini mempelajari dasar-dasar teori ekonomi matematika dan menyelidiki*

*aplikasi praktisnya dalam proses pengambilan keputusan bisnis di dunia nyata. Melalui pemanfaatan model matematika, teknik optimasi, dan analisis statistik, bisnis dapat memperoleh wawasan tentang dinamika pasar, alokasi sumber daya, dan penilaian risiko. Tujuannya adalah untuk membangun pendekatan sistematis yang membantu para pengambil keputusan dalam merumuskan strategi yang terinformasi dengan baik, meminimalkan ketidakpastian, dan memaksimalkan kinerja bisnis secara keseluruhan.*

***Kata Kunci:*** *Pengambilan Keputusan, Aplikasi Bisnis, Harga, Pasar, Sistematika Matematika Bisnis.*

## INTRODUCTION

In today's fast-paced and ever-changing business environment, the ability to make well-informed decisions is not just advantageous but essential for a company's sustained success and competitive edge. The complexities inherent in the business landscape demand a sophisticated approach to decision-making, and mathematical economics emerges as a powerful tool in this pursuit. Imagine a bustling boardroom where executives are faced with critical choices that could shape the future of their organization. Traditionally, decision-makers may have relied on intuition, past experiences, and qualitative analyses to navigate these complexities. However, the inherent subjectivity and potential biases in such approaches can be limiting.

Enter mathematical economics a strategic ally that introduces a structured and quantitative framework to decision-making. This journal delves into the pivotal role of mathematical economics in optimizing the accuracy of business decisions. It's not merely about numbers and equations; it's about unlocking a new dimension of precision and reliability in decision-making. Consider a scenario where a company is contemplating strategic investments, weighing potential risks, and identifying growth opportunities. Mathematical economics, with its integration of economic principles and advanced mathematical tools, provides a comprehensive analysis. It's a powerful lens that allows decision-makers to view complex business scenarios in a systematic manner.

Optimization techniques become the compass guiding executives through the decision-making labyrinth. Constraints, uncertainties, and multiple variables are no longer stumbling blocks; they become data points in a mathematical model designed to identify the most favorable decisions aligned with organizational goals. It's about turning abstract possibilities into concrete choices backed by data-driven insights. But the power of mathematical economics extends beyond the immediate decision-making process. It's a visionary tool that enables companies to peer into the future. By leveraging economic theories, statistical methods, and sophisticated models, decision-makers can forecast outcomes and anticipate challenges. It's akin to having a crystal ball that reveals potential consequences, allowing organizations to proactively strategize and adapt. mathematical economics becomes the silent orchestrator behind every strategic move, transforming decision-making from an art into a science. It's not just about making choices; it's about making the right choices – choices grounded in data, guided by optimization, and fortified with the foresight to navigate the intricate dance of the business landscape.

### Problem Formulation

Despite the acknowledged importance of informed decision-making in the business landscape, organizations often grapple with the challenge of achieving optimal accuracy in their choices. Traditional decision-making methods, rooted in intuition and qualitative analysis, may fall short in addressing the multifaceted nature of contemporary business environments. As businesses strive for sustained success and competitiveness, there is a pressing need to overcome the limitations of conventional approaches and embrace methodologies that can

enhance decision accuracy. The problem at hand revolves around the inherent complexities and uncertainties associated with business decision-making. Intuitive and experience-based decision-making, while valuable, may be influenced by cognitive biases and lacks a systematic approach to handle the intricate interplay of factors affecting choices. To address this, there is a need to explore and implement methodologies that provide a structured and quantitative framework for decision-making, thereby optimizing accuracy and aligning choices with organizational goals.

Mathematical economics emerges as a potential solution to this problem. While its application in business decision-making is recognized, there is a gap in understanding the specific challenges organizations face and the ways in which mathematical economics can be effectively employed to address these challenges. The problem formulation thus involves a comprehensive investigation into the following key aspects:

a. **Identification of Decision-Making Challenges,** What are the primary challenges organizations encounter in achieving optimal decision accuracy? This involves an in-depth examination of factors such as uncertainties, risks, and the limitations of traditional decision-making methods.

b. **Evaluation of Current Decision-Making Methods,** How do organizations currently approach decision-making? What are the strengths and weaknesses of existing methods, particularly in the context of accuracy and precision?

c. **Assessment of Mathematical Economics Applications,** What specific mathematical economics tools and models can be applied to enhance decision accuracy? This involves a thorough exploration of methodologies like game theory, linear programming, and econometrics, and their relevance in diverse business scenarios.

d. **Impact of Mathematical Economics on Decision Outcomes,** How does the integration of mathematical economics contribute to optimizing decision outcomes? Through empirical studies and case analyses, it is crucial to assess the tangible impact of adopting mathematical economics methodologies on overall business performance.

e. **Practical Implementation Challenges,** What challenges might organizations face in implementing mathematical economics in real-world decision-making processes? This involves considering issues related to data availability, model complexity, and organizational readiness.

## LITERATURE REVIEW

| No | Author, Year | Previous Author | Article Similarity | Article Differences |
|---|---|---|---|---|
| 1 | (Yang, 2017) | Financial mathematics, also known as analytical finance, means that mathematics is applied to theories and methods in finance and economics. Financial mathematics has a | Discusses the application of economic mathematics in decision making | The previous article discusses in depth the theory or basic concepts of financial mathematics |

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|---|---|---|---|---|
| | | direct influence on corporate investment decision-making through three important applications of mathematics in financial mathematics, namely differential game method, capital asset pricing method (CPAM), and stochastic optimal control theory. | | and also its examples. |
| 2. | (Al-Sulaiti & Aldereai, 2022) | Business mathematics can be applied to finance, market research, tourism, and behavioral science has an important role in determining performance and sustainability. The application of business mathematics helps tourist decision making and preferences using stakeholder theory and fuzzy theory in the application of tourism business mathematic | Discusses economic mathematical analysis in decision making | discusses the broad application of business mathematics across finance, market research, tourism, and behavioral science. It underscores the crucial role of business mathematics in determining business performance and sustainability. The focus is on its application in the tourism sector, where it influences tourist decision-making and preference |
| 3. | (Burlov, 2020) | A mathematical model for making management decisions that looks at the | Discusses economic mathematical | it involves analyzing the available technical |

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|---|---|---|---|---|
| | | technical resources available and how prepared the employees involved are | analysis in decision making | resources, such as equipment or technology, and assessing the readiness or training of the employees who will be handling these resources. The mathematical model likely aims to provide a systematic and quantitative approach to decision-making in management, taking into account both the technical aspects of resources and the human factor of employee preparedness |
| 4. | (Wierzbicki, 1981) | The idea of a value (utility) function is changed mathematically to reflect the satisficing behavior; this modified value function, known as the achievement scalarizing function, should be both order approaching and order preserving. | Discusses how we calculate the value (utility) for something and change it mathematically (achievement scalarizing function) so that we can focus on achieving adequate goals rather than looking for optimal decision | discussing a modification to the concept of a value (utility) function in decision-making. Traditionally, a value function is used to represent preferences or utility associated with different outcomes. In this context, the modification involves |

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| | | | | adjusting the value function to reflect "satisficing" behavior |
| 5. | ( Aye Myint Oo ) | Applied mathematics in this paper is direct application to commerce and real life problems. Business mathematics includes mathematics course taken at an undergraduate level by business students. Examples of business mathematics in this paper are matrix algebra, exponential function and natural logarithm function. This paper emphasizes on the formulas derivation for financial mathematics and continuous growth. | Discusses economic mathematical analysis in decision making | the discussion focus is on demonstrating how mathematical concepts, particularly those relevant to business and finance, can be directly applied to solve practical problems and address real-world scenarios |
| 6. | ( Fahmi, 2013 ) | Decision making itself can be interpreted as a problem tracing process that starts from the background behind the problem, identifying the problem to form a conclusion or recommendation | Discusses economic mathematical analysis in decision making | suggests that decision-making can be viewed as a problem-tracing process |
| 7. | ( Purbowati, R., & Utomo, L. P. ,2016 ) | Pure mathematics, when applied with various economic sciences, can also form planning models such as purchasing, selling, and even auditing for public | Discusses economic mathematical application in decision making. | the practical utility of pure mathematics in addressing real-world economic challenges and decision- |

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| | | finance | | making processes |
| 8. | ( Eko, 2009 ) | Demand and supply can be influenced by price, and vice versa. The price and quantity of an item being traded can be determined by looking at the balance between demand and supply in a market | Discusses economic mathematical supply and demand to analysis in market | when demand for a product or service is high and supply is limited, prices tend to rise. Conversely, when supply exceeds demand, prices may decrease. The passage underscores the dynamic and interconnected nature of these economic factors in determining market outcomes |
| 9. | ( Marugán and Márquez, 2018 ) | Decision-making is a selection method. It is daily used in a personal and professional context. There are a large number of times where DM is carried out. Decisions can require weeks, even months in order to reach the correct alternative. | Discusses economic mathematical analysis in decision making | The importance and complexity of decision-making processes in navigating daily life and professional endeavors |
| 10. | (Marugán and Márquez, 2015) | Decision-making could be defined as the choosing process from several options. It can be done by simple or advanced analytics, by exact or not procedures, by the | Discusses economic mathematical analysis in decision making | decision-making is a multifaceted process influenced by various factors, and the methods employed can |

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| | | opinion of any, etc. | | vary based on the nature of the decision and the context in which it occurs |
| 11. | (Wahjono dkk, 2019) | Decision making is a process of identification and selection a series of actions to deal with a problem or take profit from an opportunity | Discusses the defenition of Decesion-Making in Business Mathematic | decision-making involves a dynamic and often iterative process of identifying, selecting, and implementing actions to address challenges or capitalize on opportunities. It requires a thoughtful consideration of various factors, including problem-solving skills, risk assessment, and the pursuit of positive outcomes. |
| 12. | (Anju C P, 2021 ) | Understanding business mathematics is important to maintain profitable operations and accurate keeping of records. | Discusses the important of business mathematic in business | a solid understanding of business mathematics is indispensable for effective financial management, strategic decision-making, and the overall success and |

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| | | | | sustainability of a business. It provides the tools and techniques necessary to navigate the complex financial landscape and achieve the goals of the organization |
| 13. | ( Prastyawan dan Lestari, 2020 ) | Decision making can be stated as the science and art of selecting alternative solutions or alternative actions from a number of alternative solutions and actions available to solve problems | Discusses economic mathematical analysis in decision making | the dual nature of decision-making as both a science and an art. It emphasizes the process of selecting the best alternative from a range of options to solve problems, acknowledging the analytical and creative elements involved in decision-making |
| 14. | (Terry, 2016 ) | Decision making is the selection of a particular behavioral alternative (behavior) from two or more existing alternatives. | Discusses the defenition of Decesion-Making in Business Mathematic | The definition aligns with the broader understanding of decision-making, which can occur in various contexts, from personal choices to organizational decision |

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| | | | | processes |
| 15. | (Permana, 2010) | Decision making in an organization or company is a process of communication and initiation within an organization or company. | Discusses the defenition of Decesion-Making in Business Mathematic | decision-making in an organization is a dynamic process that involves effective communication and the initiation of actions. It requires collaboration, clear communication channels, and a keen understanding of the organizational context to ensure that decisions are not only made but also successfully implemented for the benefit of the organization |

**Mathematical Business Decision-Making**

Various events in the economy are interconnected with each other, so that they will influence each other that event. For example; If income rises, consumption patterns also increases, product prices rise, then the pattern demand will decrease. These various economic events can be expressed by changes in variable values. A variable is something whose value changes, for example costs, prices, quantities, income, interest rates and so on. Mathematics plays an important role in Analyze various economic events. With using mathematics as an analytical tool, results can be obtained concrete analysis, easy to use as a basis planning, control tools, and the basis for carrying out evaluation. There is a lot of use of mathematics in analysis quantitative, namely analysis that provides results in the form of numbers. In economic statistics, mathematics is useful for the following:

**1. Quantitative Analysis**

Mathematics is fundamental to quantitative analysis in economics. It allows economists to express economic relationships and behaviors in a precise, numerical manner. Economic

variables, such as costs, prices, quantities, income, and interest rates, are often represented as mathematical functions or equations. This formalization helps in modeling and understanding the interconnections between these variables.

**2. Consumption Patterns and Income**

There's a relationship between income and consumption patterns. This can be expressed mathematically through various models such as the consumption function, which illustrates how changes in income impact consumer spending.

**3. Price Changes and Demand**

Price elasticity of demand is a mathematical concept that measures how changes in the price of a good or service affect the quantity demanded. This relationship is essential for businesses and policymakers to understand market dynamics.

**4. Statistical Formulas**

Mathematics is crucial in understanding and applying statistical formulas. These formulas are used to calculate various statistical measures, such as sums, averages, percentages, and coefficients. For example, the calculation of GDP involves complex mathematical formulas.

**5. Estimation Methods**

Mathematical techniques like the least squares method and maximum likelihood estimation are essential for estimating parameters in economic models. These methods rely on differential calculus, which helps find the minimum or maximum values of functions, contributing to accurate parameter estimates.

**6. Planning and Control Tools**

Mathematics provides a solid foundation for planning and control in economic decision-making. Optimization techniques, for instance, help businesses and governments make decisions that maximize or minimize certain objectives, considering various constraints.

**7. Evaluation and Economic Statistics**

Economic statistics involve the collection, analysis, and interpretation of data. Mathematics facilitates the development of models and methods for evaluating economic performance, forecasting future trends, and making informed policy decisions. the use of mathematics in economics enhances the precision of analysis, supports planning and control, and provides a basis for evaluating economic events. It enables economists to quantify relationships, make predictions, and derive meaningful insights from data, contributing to a more systematic and rigorous understanding of economic phenomena.

**Business Economics Mathematical Application**

The foundation of any successful business is math, specifically business math. This field applies mathematical concepts to practical business situations, focusing on key areas like profit, loss, interest, and financial formulas. These tools empower businesses to effectively manage tasks like calculating profit margins, optimizing inventory, and setting tax rates. Business math is closely linked to statistics, which provides valuable insights for solving business challenges. When money or goods are exchanged, understanding profit, loss, and their associated percentages and discounts becomes crucial. While pure math may not be a major requirement, strong mathematical reasoning and some key formulas are essential for navigating the financial landscape of any business.

Profit and loss are the driving forces behind business math, with product costs carefully calculated to ensure profitability. Factors like desired profit margins, cash discounts, and trade discounts all play a role in this calculation. Businesses leverage this mathematical expertise to keep their financial operations running smoothly. From accounting and inventory management to marketing, sales forecasting, and financial analysis, various departments rely on the power of math to make informed decisions and drive success.

**Business Mathematics Main Key**

The most important topics covered in Business Mathematics are:

- Profit and Loss
- Statistics
- Simple and Compound Interest
- Interest Rates
- Loans
- Markups and markdowns
- Taxes and Tax Laws
- Discount Factor
- Annuities
- Insurance
- Credit
- Depreciation
- Future and Present Values
- Financial Statements

**Business Mathematics Basic Terms and Formulas**

Profit and Loss:

1. Net Income:
   A company's net income is an indicator of its total profitability. The computation involves deducting the whole expenses from the total revenue. The outcome is a crucial measure of how much money a business has made once all of its expenses have been met.

   Revenue - Expenses

2. Gross Profit:
   A company's profitability in relation to its sales or manufacturing operations is gauged by its gross profit. It is calculated by subtracting the total sales from the cost of goods sold (COGS). This graph sheds light on pricing and production techniques' effectiveness.

   Sales - Cost of Goods Sold (COGS)

3. Profit Margin:
   The profitability of a company in relation to its revenue is shown by its profit margin, which is stated as a percentage. It is computed by multiplying the result by 100% after dividing net income by total revenue. This formula is essential for determining how successfully a business is turning a profit on sales.

   (Net Income / Revenue) x 100%

Costing and Pricing:

4. Break-even Point:
   The sales level at which a company pays all of its expenses and experiences neither a profit nor a loss is known as the break-even point. The formula calculates it by dividing the fixed costs by the difference between the unit selling price and the unit variable cost.

   Fixed Costs / (Selling Price per Unit - Variable Cost per Unit)

5. Markup:
   The percentage increase between the selling price and the cost of goods sold (COGS) is known as markup. It calculates how profitable each item sold is. The percentage difference between the selling price and the COGS in relation to the COGS is computed using the formula.

   [(Selling Price - COGS) / COGS] x 100%

6. Markdown:
   Markdown refers to the percentage that a product's initial price is reduced from in order to determine its sale price. Calculating the percentage drop from the original price to the sale price aids in assessing the efficacy of discounting techniques.

   [(Original Price - Sale Price) / Original Price] x 100%

Finance and Investment:

7. Simple Interest:
   The simplest way to figure out the interest on a loan or investment is to use simple interest. The interest rate, the principal amount, and the length of time the money is invested or borrowed are multiplied in the calculation.

   Principal x Interest Rate x Time

8. Compound Interest:
   Compound interest yields interest on both the principal amount and the accrued interest from prior periods by accounting for the compounding impact. The principal, interest rate, and time are used to compute the future value.

   Future Value = Principal x (1 + Interest Rate) ^Time

9. Return on Investment (ROI):
   ROI calculates an investment's profitability in relation to its cost. It is calculated by multiplying the outcome by 100% after dividing the investment's gain by its cost. This measure is essential for assessing how well investment choices are working out.

   [(Gain from Investment - Cost of Investment) / Cost of Investment] x 100%

**Selling Price**

The selling price is the monetary value assigned to a product or service when it is made available for purchase by customers. It is the price that consumers are willing to pay to acquire the goods or services offered by a business.

**Cost Price**

The cost price is the total cost incurred by a business to produce, purchase, or acquire a product. It includes the cost of raw materials, labor, overhead, and any other expenses associated with bringing the product to market.

**Profit**

Profit is the positive financial result of a business operation. It is the difference between total revenue and total costs during a specific period. Essentially, profit is what remains after all expenses and costs have been subtracted from the revenue

The general formula of calculating Profit :

Profit = Total Revenue – Total Cost

Gross Profit is the difference between total revenue and the cost of goods sold (COGS). The formula is:

Gross Profit = Total Revenue – Cost of Goods Sold (COGS)

Operating Profit is the operating income, is the profit derived from a company's core business operations. It is calculated by subtracting operating expenses from gross profit:

Operating Profit = Gross Profit – Operating Expenses

Net Profit referred to as the bottom line or net income, the final profit figure after deducting all expenses, including operating expenses, interest, taxes. And other costs:

Net Profit = Total Revenue – Total Expenses

**Loss**

A loss occurs when the expenses and costs associated with running a business are greater than the income generated from the sale of goods or services. In other words, it is the negative difference between total revenue and total costs.

Loss = Total Costs – Total Revenue

**Discount**

discount refers to a reduction or deduction from the original price of a product or service. It is a financial incentive offered by sellers to buyers, usually for specific reasons such as encouraging sales, promoting loyalty, or facilitating timely payments. Discounts play a significant role in pricing strategies and are a common aspect of financial transactions in various industries.

**Simple Interest**

Simple interest is a method of calculating the interest on a loan or investment based on the principal amount (initial sum of money), the interest rate, and the time for which the money is borrowed or invested. simple interest is calculated only on the original principal throughout the entire period. The formula for simple interest is :

Simple Interest (SI) = P x R x T

*P* is the principal amount
*R* is the interest rate per period
*T* is the time the money is borrowed or invested, usually measured in years.

**Compound Interest**

Compound interest is a method of calculating interest on a loan or investment where interest is not only earned on the initial principal amount but also on the accumulated interest from previous periods. This compounding effect leads to the exponential growth of the total amount over time. The formula for compound interest is given by :

Future Value (FV) = $P$ x $(1 + r)^t$

*P* is the principal amount
*r* is the interest rate per compounding period
*t* is the number of compounding periods
Future Value (FV) is the total amount accumulated after *t* compounding periods.

While doing business, one can earn a good profit or face loss. The price of a product is fixed, taking into consideration it's cost price, profit, margin, trade discount, cash discount, etc. The price marked on the commodity is called marked price or catalogue price. For trading purposes, the manufacturer proposes a discount on the MRP to the buyer. This is called a trade discount. In addition to the trade discount, if the buyer pays cash against goods, he gets another cut called cash discount. The price of the object after subtracting the trade discount and cash discount is called the selling price.

## METHODS

The writing method used in writing this journal is analytical descriptive, while the approach is qualitative and quantitative and the data collected is secondary data and obtained from various references that are relevant to the problems and studies raised. This method begins with an exhaustive review of existing literature, delving into the realms of business decision-making and the application of mathematical economics. The descriptive phase will involve summarizing pivotal concepts, methodologies, and challenges prevalent in prior research, paving the way for a critical analytic examination of these elements to identify gaps and discern emerging trends. Moving forward, the research will meticulously analyze current decision-making practices within a variety of organizations. Through surveys and case studies, the descriptive aspect will document prevalent methods, tools, and approaches. Subsequently, the analytic phase will scrutinize these practices, evaluating their strengths and weaknesses, with a specific emphasis on their accuracy and precision. The study will meticulously identify patterns and variations across diverse industries, facilitating a nuanced understanding. In tandem, the research will identify and describe challenges encountered by organizations striving for optimal decision accuracy. The descriptive phase will employ interviews, surveys, and case studies to gather comprehensive data on these challenges, setting the stage for the analytic phase to categorize and prioritize them. This critical analysis will explore the intricate relationships between these challenges and the organizational contexts in which they manifest.

The application of mathematical economics will be thoroughly explored through a dual descriptive-analytic lens. The descriptive aspect will meticulously detail specific tools and models within mathematical economics, such as game theory, linear programming, and econometrics, through a synthesis of literature and expert interviews. In the ensuing analytic phase, each mathematical economics application will undergo critical assessment to discern

their potential in enhancing decision accuracy. Strengths and limitations of each methodology will be thoroughly scrutinized. An empirical analysis will be conducted to gauge the impact of mathematical economics on decision outcomes. The descriptive aspect will entail real-world applications through empirical studies and case analyses, providing detailed descriptions of scenarios, methodologies applied, and observed outcomes. Subsequently, the analytic phase will delve into the observed impact, evaluating whether the application of these methodologies indeed leads to improved accuracy and more strategic decision-making.

## RESULTS AND DISCUSSION

### Mathematics

Mathematics has many benefits in its field and for daily activities outside its field, and is also used as a means to create superior human resources (Alan and Afriansyah, 2017). As for the definition of mathematics (Suherman, 2003), mathematics is a lesson that uses logic regarding structure, shape, quantity and the relationship between one concept and another. In human life, understanding something is a very crucial thing, so with understanding, humans are required to have the ability to understand.

One of the important factors in mathematics learning today is the importance of improving students' mathematical understanding abilities (Wijaya et al., 2018). According to Suraji et al (2018) the ability to understand mathematical concepts is divided into 2, namely instrumental understanding and rational understanding. The importance of students' mathematical understanding abilities is a vision for developing mathematics learning to meet current problems (Yanti et al., 2019). In line with students' mathematical understanding abilities, understanding is a concept that can be understood by students so that students can digest what is meant and find ways to describe and be able to find out possibilities related to the concept, this was stated by Hewson and Thorley (Nurhayati, 2010).

Based on the definition above, one of the important aspects in learning mathematics is the ability to understand mathematics, because in achieving the school curriculum, one of the aspects that needs to be fulfilled is the ability to understand mathematics (Putri et al., 2018). Someone who has mathematical understanding means that person already knows and understands what he is studying (Alan and Afriansyah, 2017). Without understanding, students will find it difficult to digest the mathematical concepts they have acquired (Rahayu and Pujiastuti, 2018). Researchers use the example that if students are given a mathematics problem with the condition that the student does not understand the mathematical concept of the problem presented, it is certain that the student will not be able to solve the mathematics problem, reinforced by (Mahtuum et al., 2020) the ability to understand mathematics is the mother of all aspects in the indicators mathematics learning achievement.

The results of previous field studies show that there are many students who do not like mathematics, reinforced by the opinion of (Abdul, 2015) who says that efforts have been made so that mathematics can be mastered and liked by students well by education experts and mathematics education experts. However, the results show that there are still many students who don't like mathematics in each class. In the learning process, students are more often directed at the ability to memorize and use formulas to work on questions, which results in students having difficulty solving different variations of questions (Wafa, 2019). According to Jamal (2014), there are 3 things that cause students to experience difficulties in learning mathematics, including perception (mathematical calculations), intervention and extrapolation of the implementation of the teaching and learning process which will greatly determine the extent of success that must be achieved in a mathematics subject. Students' difficulties in mathematics can be caused by students not understanding the learning material provided (Arimurti et al., 2019).

## Impact of Mathematical Economics On Decision-Making

To represent satisficing behavior, the mathematical idea of a value (utility) function is adjusted; the resulting modified value function, called an achievement scalarizing function, should have the properties of order approximation and order preservation. It is demonstrated that the aspiration levels and achievement scalarizing functions-formed mathematical basis can be applied to Pareto optimization as well as satisficing decision making, offering an alternative to methods based on weighting coefficients or typical value functions. Numerous multiobjective analytic problems can be approached pragmatically with the help of this mathematical foundation, which is also a generalization of the goal programming technique in multiobjective optimization. The mathematical foundation of the satisficing approach and the connection between satisficing decisions and optimal decisions remain undeveloped, despite the fact that many partial results have been established. As a result, any strategy based on the application of reference targets has been perceived as an ad hoc, somewhat less scientific strategy. It was unclear if ambition levels for objectives, as opposed to weighting coefficients or value (utility) functions, would allow for the development of a coherent, foundational theory of multiobjective optimization and decision making. This would require formulating the existence conditions, linkages to preference orderings, required and sufficient requirements, and other concepts in terms of reference aims or aspiration levels. The fundamental notion behind developing a mathematical foundation for satisfying choice making is to present the decision maker's preferences as fundamental a priori data in the form of ambition levels. The decision maker is presumed to have assistance from his team (or a mathematical model), which suggests feasible nondominated options that match the aspiration levels. We then create achievement scalarizing functions, which satisfy the order approximation and order preservation constraints and are based on the ambition levels. In addition, they represent the changed rationality of the staff. One of these qualities, the order approximation, also yields a required condition for Pareto optimality, stronger than previous necessary requirements known and applicable to nonconvex issues. Due to its generalization of goal programming and utopia point procedures, the mathematical foundation for satisficing decision making can be viewed as a substitute for multiobjective optimization. The issue of regularizing the solutions of poorly defined mathematical models and trajectory optimization are two other issues it is connected to. The fundamental principle of honoring a decision maker's wants rather than telling him what they should be leads to a useful interactive approach with institutional ramifications, yet this abstract premise is also eminently pragmatic. In Latin, the word "mathematics" comes from the Greek word "mathematike", which means "to study". The word "mathematics" comes from the Greek word "mathema", which means "knowledge" or "science". It is also related to another word with almost the same meaning, "mathein" or "mathenein", which means "study" or "think". So, the word "mathematics" means knowledge that is produced through thinking (reasoning). Mathematics is about the world of ratios (reasoning), not about the results of experiments or observations. Mathematics is about the human mind, which deals with concepts, processes, and reasoning. (Russeffendi ET, 1980 :148).

Mathematics comes from human empirical experience in the real world, then processed and analyzed in the world of ratios through reasoning and cognitive structures, so that mathematical concepts are formed that are easy to understand and manipulate. To achieve this goal, a mathematical language or mathematical notation that has global (universal) value is used. Initially, the branch of mathematics consisted of arithmetic or arithmetic, algebra and geometry. Then it developed into mathematics such as calculators, statistics, topology, abstract algebra, linear algebra, sets, linear geometry, vector analysis, and so on.

Some expert definitions regarding mathematics include:

**a. Russefendi (1988 : 23)**

Mathematics is often called a deductive science because it consists of axioms, undefined elements, definitions, and postulates that are generally valid after being proven to be true.

**b. James and James (1976)**
Mathematics is a field that investigates logic, including shape, structure, quantity, and related concepts. Geometry, algebra, and analysis are the three main parts of mathematics, but some argue that mathematics is divided into four parts: arithmetic, algebra, geometric, and analysis, which includes number theory and statistics.

**c. Johnson and Rising in Russefendi (1972)**
Mathematics is a language that uses carefully defined, clear and accurate terms to show its ideas with symbols, more of a language of symbols than a language of sounds. Mathematics is the science of regular patterns or ideas; its properties in theories are created deductively based on undefined elements; and mathematics is an art, its beauty lies in order and harmony.

**d. Reys - et al (1984)**
Mathematics is the analysis of relationships and patterns, an art, a language, and a method of thinking.

**e. Kline (1973)**
Mathematics helps humans understand and master natural, social, and economic problems, but it is not exclusively perfect knowledge.

## CONCLUSION

The importance of mathematical business calculations in business decision-making is undeniable, as it is the critical foundation for company managers and leaders to make informed and appropriate decisions. Mathematical calculations in a business context involve a number of concepts, formulas, and analysis methods that provide deep insights into various operational and strategic aspects of a company. In this presentation, we explore some of the reasons why math calculations are vital in the context of business decision-making.

1. Financial Analysis and Financial Health:

- Profit and Loss Formula:
  The success of a business is often measured through profit and loss. This formula allows a company to evaluate its financial performance by comparing revenues and costs.

- Net Profit Ratio:
  This ratio helps in assessing the profitability of a company, measuring how efficiently the company makes profits.

2. Financial Management and Time Value of Money:

- Time Value of Money:
  This concept provides a basis for a company to assess the monetary value of a sum of funds at different times. different times.

- Debt Equity Ratio:

Assesses the financial health of the company and how much capital comes from the owners of the company.

3. Investment Selection and Investment Decisions:

- Net Present Value (NPV) Formula:
  Used to assess the net return on an investment after considering the time value of money. of money. Internal Rate of Return (IRR) Formula:

- Finds the rate of return that makes the net present value equal to zero.

4. Management Inventory and Operational Efficiency:

- EOQ (Economic Order Quantity) Inventory Model:
  Optimizes inventory levels by minimizing ordering costs and holding costs.

- Ratio Inventory Turnover Ratio:
  Assesses the efficiency of inventory management by measuring the number of times inventory turns during a given period. period.

5. Risk Analysis and Risk Management:

- Beta Index (Beta Coefficient):
  Measures the risk of an investment to changes in the overall market.
- Variance-Covariance Method
  Measures portfolio risk by calculating the variance and covariance of asset returns.

6. Price Selection and Pricing Strategy:

- Profit Margin Formula:
  Determines the optimal profit margin to achieve profitability goals.
- Minimum Selling Price:
  Ensures an adequate selling price to cover production costs and provide the desired profit.

Mathematical business calculations are an integral element in the entire business decision-making process. From financial analysis to risk management, mathematical calculations provide a solid foundation for business leaders to make accurate, effective and goal-oriented decisions. As technology advances, the application of algorithms and data analysis further strengthens the role of mathematics in helping companies face challenges and capitalize on opportunities for sustainable growth.

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