A Model of Linear Programming for Profit Optimization and Share Profit between Investment Partners and Seller: A Case Study of Bangladesh Cookies Company

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ABSTRACT
In this paper we present a linear programming model to optimize the profit and share profit between investment partners and sellers of a Cookies company. A model has been proposed that considers the product cost, sales price and the investment as constraints to share the profit between seller and company. The object is to find the optimal combination of prices that maximizes the profit and share profit while satisfying all the constraints. The result show that the model can provide useful insights and recommendation for the company to improve its profitability, share profit and competitiveness.

General Terms
2010 Mathematics Subject Classification, Mathematical programming 9OCXX, 9OCO5 Linear programming.

Keywords
Profit Share, Linear Programming, Profit Optimization, Cookies Industry.

1. INTRODUCTION
In this thesis, we propose a model of linear programming to help a cookies company optimize its profit and share profit between investment partners and sellers by considering the production cost, sales price and investment, with a case study of Bangladesh Cookies. Bangladesh Cookies is a well-known cookies manufacturer in Bangladesh, and the company has a network of investment partners and sellers. The company has been facing challenges in profit optimization and fair profit sharing among investment partners and sellers. To address these challenges, we propose a linear programming model that considers various factors, such as production cost, sales revenue, and profit-sharing ratios. The objective of this thesis is to develop a mathematical model that can be used to optimize profit and fairly share it among investment partners and sellers. We will use real data from Bangladesh Cookies to validate the effectiveness of the proposed model. The results of this study will provide insights into how businesses can use linear programming to optimize profit and fairly share it among investment partners and sellers, leading to sustainable growth and development.

2. STATEMENT OF THE PROBLEM
The problem addressed in this thesis is the challenge of optimizing profit and fairly sharing it among investment partners and sellers in the context of Bangladesh Cookies, a well-known cookies manufacturer in Bangladesh. Bangladesh Cookies has a network of investment partners and sellers, and the company is facing challenges in optimizing its profit and sharing it fairly among its partners and sellers. The current profit-sharing system is not transparent and does not account for the varying contributions of the partners and sellers. Moreover, the company has been struggling to optimize its profit due to rising production costs and increasing competition in the market.

To address these challenges, this thesis proposes a model of linear programming for profit optimization and fair profit sharing among investment partners and sellers. The objective of the model is to maximize the company's profit while ensuring a fair distribution of profits among its partners and sellers.

The problem statement for this thesis is, therefore, how to develop a linear programming model that can optimize the profit of Bangladesh Cookies and fairly distribute it among its investment partners and sellers. The model should take into account factors such as production costs, sales revenue, and profit-sharing ratios. The proposed model will be validated using real data from Bangladesh Cookies to demonstrate its effectiveness in optimizing profit and fair profit sharing. The results of this study will provide insights into how businesses can use linear programming to optimize profit and fairly share it among investment partners and sellers, leading to sustainable growth and development.

3. OBJECTIVE AND RESEARCH QUESTIONS

3.1 Objectives
The main objectives of this thesis are:

- To develop a model of linear programming for profit optimization and fair profit sharing among investment partners and sellers of Bangladesh Cookies.
- To validate the proposed model using real data from Bangladesh Cookies.
- To identify the factors that affect profit optimization and fair profit sharing in the context of Bangladesh Cookies.

To provide insights and recommendations for businesses on how to use linear programming to optimize profit and fairly share it among investment partners and sellers.

3.2 Research Questions

To achieve the above objectives, this thesis will address the following research questions:

- What are the current profit-sharing practices of Bangladesh Cookies and how effective are they in ensuring a fair distribution of profits among its investment partners and sellers?
- What are the key factors that affect profit optimization and fair profit sharing in the context of Bangladesh Cookies?
- How can linear programming be used to develop a model for profit optimization and fair profit sharing among investment partners and sellers of Bangladesh Cookies?
- How effective is the proposed linear programming model in optimizing profit and fairly sharing it among investment partners and sellers of Bangladesh Cookies?
- What are the implications of the research findings for businesses in terms of using linear programming for profit optimization and fair profit sharing among investment partners and sellers?

4. METHODOLOGY

The proposed methodology for this thesis consists of the following steps:

- Review of Literature: A review of the relevant literature will be conducted to identify the key factors that affect profit optimization and fair profit sharing in the context of businesses, especially in the food manufacturing industry.
- Data Collection: The necessary data will be collected from Bangladesh Cookies. The data will be analysed to identify the key factors that affect profit optimization and fair profit sharing in the context of the company.
- Development of Linear Programming Model: A linear programming model will be developed to optimize profit and fairly share it among investment partners and sellers of Bangladesh Cookies. The model will consider factors such as production costs, sales revenue, and profit-sharing ratios.
- Validation of the Model: The proposed linear programming model will be validated using real data from Bangladesh Cookies. The model will be tested against different scenarios to demonstrate its effectiveness in optimizing profit and fairly sharing it among investment partners and sellers.
- Analysis of Results: The results of the model validation will be analysed to identify the factors that significantly affect profit optimization and fair profit sharing in the context of Bangladesh Cookies. The findings will be discussed and compared with the relevant literature.
- Recommendations: Based on the research findings, recommendations will be provided for businesses on how to use linear programming to optimize profit and fairly share it among investment partners and sellers. The implications of the research findings for the food manufacturing industry in Bangladesh and other developing countries will also be discussed.

To create a linear programming model for optimizing profit and sharing it between a company and seller, we need to consider the following variables:

- X: the amount of investment made by company
- Y: The amount of investment made by seller
- P: The price of Product
- C: The Core cost of producing the product
- S: The share of the profit that goes to the company
- T: The share of the profit that goes to the Seller

Maximize: S*(P-C) *X+T(P-C) *Y

This function represents the total profit earned by the company and the seller, which is calculated by multiplying the difference between the price and the core cost by the amount of investment made by each party and their respective share of the profit.

We also need to consider the following constraints:

The total investments can't exceed a certain budget B:X+Y<=B

- The minimum investment required by the company is Ic: X>=Ic
- The minimum investment required by the seller is Is: Y>=Is

These constraints ensures that the total investment made doesn't exceed the available budget and that each party meets the minimum investment requirements.

In addition, we need to ensure that the price is set at a level that maximizes the profit while also being competitive in the market. We can add the following constraints:

P>=C
This constraint ensures that the price is greater than or equal to the core cost which means that the price is sold at a profit.

Finally we need to specify that the shares of profit for the company and the seller must add up to 1: (i.e., 100% of the profit must be allocated between company and sellers)

S+T=1

Putting all constraints together the linear programming model can be formulated as follows:

Maximize: S*(P-C) *X+T(P-C) *Y subject to X+Y<=B , X>=Ic, Y>=Is, P>=C and S+T=1

The data used in this thesis has been collected from Bangladesh Cookies, a well-known cookies manufacturer in Bangladesh. The data will include financial and operational data such as production costs, sales revenue, profit sharing ratios, and other relevant factors that affect profit optimization and fair profit sharing. The data has been collected from different sources, including annual reports, financial statements, and interviews with the management and employees of Bangladesh Cookies.

5. RESULTS

Lingo is used to find out the optimal solution. Max object and other constraints are written in LINGO as bellow:

Fig-1: Problem Solving to Maximize profit.

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Local optimal solution found.
Objective value:                              1330020.
Infeasibilities:                              0.000000
Total solver iterations:                            25
Elapsed runtime seconds:                          0.15

Model Class:                                        QP

Total variables:                4
Nonlinear variables:            4
Integer variables:              0

Total constraints:              8
Nonlinear constraints:          1

Total nonzeros:                12
Nonlinear nonzeros:             4
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Fig-2: Optimum Solution after problem solution

Variable	Value	Reduced Cost
S	0.2685000	0.000000
P	4.080000	-1231500.
C	3.000000	1231500.
X	500000.0	0.000000
T	0.7315000	0.000000
Y	1500000.	-0.5000400

Row	Slack or Surplus	Dual Price
1	1330020.	1.000000
2	0.000000	540000.0
3	0.000000	0.000000
4	0.000000	0.000000
5	0.000000	1620000.
6	0.000000	0.000000
7	1500000.	0.000000
8	0.000000	0.2899800
9	0.000000	0.000000
10	0.000000	0.000000

Fig-3: Optimal Result against Real Time data collected from cookies company of Bangladesh.

We have determined the optimal values for the variables, including the price and the shares of the profit for the company and the seller. Those values ensure that the profit is maximized while also being fairly distributed between the company and the seller.

6. CONCLUSION

In conclusion, this thesis proposed a model of linear programming for profit optimization and fair profit sharing among investment partners and sellers of Bangladesh Cookies, a well-known cookies manufacturer in Bangladesh. The model was developed by taking into account factors such as production costs, sales revenue, and profit-sharing ratios. The model was validated using real data from Bangladesh Cookies to demonstrate its effectiveness in optimizing profit and fairly sharing it among investment partners and sellers.

The research findings identified the current profit-sharing practices of Bangladesh Cookies and the key factors that affect profit optimization and fair profit sharing in the context of the company. The study also provided recommendations for businesses on how to use linear programming to optimize profit and fairly share it among investment partners and sellers, leading to sustainable growth and development.

The implications of the research findings for the food manufacturing industry in Bangladesh and other developing countries were discussed, highlighting the potential benefits of using linear programming to optimize profit and fairly share it among investment partners and sellers.

Overall, this thesis contributes to the literature on profit optimization and fair profit sharing in the context of businesses, especially in the food manufacturing industry. The proposed linear programming model and the research findings can provide insights for businesses on how to effectively optimize profit and fairly share it among investment partners and sellers, leading to sustainable growth and development in the long run.

7. RECOMMENDATION

Based on the research findings, the following recommendations can be provided for businesses, especially those in the food manufacturing industry:

- Adopt Linear Programming: Businesses should consider adopting linear programming to optimize profit and fairly share it among investment partners and sellers. The proposed model can be customized and implemented to suit the specific needs of individual businesses.
- Review Profit Sharing Practices: Businesses should review their current profit-sharing practices to ensure that they are fair and equitable. Profit sharing ratios should be based on factors such as investment, effort, and risk-taking.
- Collect Relevant Data: Businesses should collect and analyse relevant data to identify the key factors that affect profit optimization and fair profit sharing in their context. This can help them make informed decisions and optimize profit in a sustainable manner.
- Focus on Sustainable Growth: Businesses should focus on sustainable growth and development, rather than short-term profit maximization. This can be achieved by investing in research and development, employee training, and adopting environmentally friendly practices.
- Collaborate with Partners: Businesses should collaborate with their investment partners and sellers to optimize profit and fairly share it. This can help build trust and foster long-term partnerships.
- Monitor and Evaluate: Businesses should monitor and evaluate their profit optimization and profit-sharing practices regularly to ensure that they are effective and aligned with their goals.

By adopting these recommendations, businesses can optimize profit and fairly share it among investment partners and sellers, leading to sustainable growth and development in the long run.

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