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Application of Porter's Five Forces Model in Battery Manufacturing Industries of Bangladesh.

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ABSTRACT
This paper is concentrated on the analysis of Porter's Five Forces model in regard to battery industry of Bangladesh. The five forces are impact of supplier, power of customer, competition between existing manufacturers, threats of substitutes and entrance of new manufacturer. This paper has analyzed the five forces to find out how a battery industry can be put in an advantageous position in a highly competitive market. The strongest of the five forces has been shown as the power of customer and competitive rivalry. The elements controlling customers are customer volume, price sensitivity, option of substitute and product differentiation. Threat of substitutes include advent of new or improved technology, and improved performance. The weakest of the forces has been found as substitute product and bargaining power of supplier. It can be suggested that the companies should pay more attention in providing quality rather than thinking cost.

Keywords: Energy sector, Porter's Five Forces model, Operations strategy, Industrial Engineering.

1. Introduction (Top heading should be in bold)
Michael E. Porter first introduced and constructed the model of the five forces that shapes the company strategy in his book "Competitive Strategy: Techniques for Analyzing Industries and Competitors" in 1980. Porter's Five Forces model highlights the strength, potential profitability and balance of power between different organizations in a competitive market Although over time some limitations of this model has been found, still now this model works as the basis for determining the strategies to be adopted for surviving and expanding in this highly competitive and aggressive market .

The global battery industry witnessed good growth during the past decade and holds immense growth potential for the future. The global market size for batteries is expected to reach $86.6 billion by 2018. The industry is boosted by growing demand of battery in consumer electronic products and automotive vehicles. Growing demand of electric, hybrid electric, and plug-in hybrid electric vehicles are creating huge growth opportunities for the battery industry. Technological development, increasing disposable income of customers, development of new application for batteries, and decreasing prices of raw materials for manufacturing latest battery products further aided the battery Industry. [1]

The global market share of the lead-acid battery in 2010 was 36.2 billion U. S. dollars, a growth of 8.6% compared to 2009. The future of the industry, following the market growth of automobiles, motorcycles, and storage applications, is estimated to have a 2~5% annual market growth rate until 2015. Compared to the 2.8 billion U. S. dollars of nickel-based rechargeable batteries, and the near 10 billion U. S. dollars of lithium batteries

sold, the lead-acid battery still has the highest market share of all electric storage device products today. [2]

Batteries are divided into two categories: primary and secondary. In 2009, primary batteries made up 23.6 percent of the global market. Frost & Sullivan (2009) predict a 7.4 percent decline of the primary battery in revenue distribution by 2015. Primary batteries are used in watches, electronic keys, remote controls, children's toys, light beacons and military devices. The real growth lies in secondary batteries. Frost & Sullivan say that rechargeable batteries account for 76.4 percent of the global market, a number that is expected to increase to 82.6 percent in 2015. [3]

Lead-acid accounts for half the demand of rechargeable batteries. This battery is mainly used for automotive and stand-by applications. Because of low cost and dependable service in adverse environmental conditions, lead-acid enjoys a steady increase. Multiple use of lead acid battery is growing fast in the country.

According to Bangladesh Accumulator & Battery Manufacturers Association (BABMA), annually about 2.8 million pieces of batteries are used by different sectors in the country with its 10 percent growth rate. Of these, 420,000 pieces are used by motor vehicles, 411,000 pieces by IPS and UPS users, 150,000 pieces by heavy equipment of the industries, 1,050,000 pieces by electric vehicles and electric-rickshaw, and 700,000 pieces by the solar system. [4]

Recent introduction of solar home system and electric vehicles has given a big boost to the use of lead acid batteries which prompted a number of local firms to come into the battery manufacturing business. At present, there are about 30 battery manufacturers, but six (6) are leading in the battery business as they hold 93 percent of the total market share while only 7 percent by the traders

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who import batteries and sell those locally. Among the local manufacturers, Rahimafrooz has been leading the market with 35 percent market share, followed by Hamko with 18 percent market share. Volvo, Ramso, Rangs and some other companies are also active in the battery market. Rahimafrooz, meeting the compliances, has also been exporting batteries to more than 45 countries across the globe. [4]

2. Literature Review

Bacanu (2010), tried to find a reference framework for the competition that includes Porters competence strategy to achieve the goal of the competitive advantage through cost and differentiation strategy. The study showed that for some products a positive relation exists between the price level of current manufacturer and the new entrants. [5]

Bayraktar (2010), discussed the tools that link between the strategic option and the performance of the company. The survey includes (519) companies and the multi-regression analysis has been used. The study showed that there is a strong impact of the strategic option on improving the performance of the company. [6]

Hill (2010) aimed to improve a framework which identifies the circumstances under the dominance of the differentiation and the cost strategies. The study concludes that the differentiation strategy has an important role in pushing the cost down. [7]

Rada (2010), demonstrates the bargaining power of electro-mechanical suppliers of oil industry companies, especially when the suppliers can add value to their customers through selling the product using different methods to offer the product, namely the best offer, the modern offer, the prompt offer and the lowest price offer. [8]

Dr. Jaradat (2013), studied the application of Porter Model for five competitive forces on the food industrial companies in Jordan to select business strategies. [9]

Amrollahi (2013), conducted an analysis on Open Source Business with Porter's Five Forces. They studied many case studies and previous researches for this analysis and recognized that the issue of license and revenue model has to be precisely considered while a firm adopts the open source strategy. [10]

3. Overview of Current Manufacturers

Navana Limited, the flagship company of the Navana Group (previously Islam Group) was established in 1964. Aftab Automobiles Ltd. Introduced a Battery Manufacturing unit, concern of Navana Group in January 2002, and manufacturing different type of automotive batteries (from small car to big lorries) and marketing the same in the country. This company is manned by 82 staff (all inclusive) in manufacturing plant and by 20 staff (all inclusive) in sales and service center (both Dhaka and Chittagong).

Incorporated in 17th of July, 1996 with absolute determination to produce quality products and bring in cutting edge technology, White Products and Electronics Limited (WP&EL) was founded. Rangs Power Battery,

manufactured in own factory under strict supervision of highly experienced engineers and strong QAD. It stores rated power and ensures uninterrupted service during its life span in Cars, Commercial vehicles, Rickshaws & Three Wheelers, IPS, Solar System and industrial use. Skilled Engineers & Technicians are engaged in after sale service centers evenly distributed all over the country. Achieved ISO 9001, ISO 14000 and OHSAS for its Quality Management, Environmental and Health Safety up to International Standard.

HAMKO Group started its journey in 1979 with the vision to excel in the accumulator industry. After 3 decades of business HAMKO is currently a leading producer of Lead Acid Batteries in Bangladesh. HAMKO is also a pioneer Battery Components and Chemical manufacturer serving and supporting other battery companies of the country. HAMKO Group is also contributing to proliferation of Renewable Power Generation as the supplier for Solar Batteries, Solar Panels and other related accessories to the rural electrification initiative by different NGOs and System integrators at home and abroad. HAMKO Group in its future ventures has a clear focus to advance in the Energy Technology sector, and contribute to mutual development of itself and all its partners and stakeholders.

Panna Group (PG) has sailed on its journey in the year of 1980. Panna Group adopted the strategy of developing a major Bangladesh based manufacturing business through acquisitions and other means from a raw materials trader. Panna Group introduced Panna Battery Ltd. a well-established organization and is recognized by Govt. of Bangladesh as a manufacturing and export outfit in 1978. It is also ISO 14001-2004, ISO 9001-2008, and BSTI certified company. They are holding the permanent membership of International Battery Council, USA. Their quality products are well established and popular in more than 17 countries of the world covering Asia, Africa, Latin America, Middle East, North America and Europe. Annual turnover is US$ 95 million. The group has bagged several awards including National Export Award and Engineering Export Award.

Rahimafrooz Batteries Ltd. (RBL) is the largest lead-acid battery manufacturer in Bangladesh. The company is one of the leading regional players, with market leadership at home and export endeavours to more than 44 countries around the world. It manufactures about 200 different varieties of batteries for automotive, motorcycle, IPS and other applications in its factory located at West Panisail, Zirani Bazaar, and Gazipur. The Company maintains high standards of operations, which are certified in both ISO 9001 as well as ISO 14001 standards. Furthermore, in order to ensure occupational health and safety of its employees, the company has also implemented the occupational health and safety management system, OSHAS 18001 standard.

4. The Study Population and Sample

The population of the study consisted of 30 battery industries located in different parts of Bangladesh. The

sample consisted of 5 industries from this population of 30.

5. Hypotheses and Research Model

H01 Influence of buyer power on cost strategy is average.
H02 Influence of buyer power on differentiation strategy is high.
H03 Influence of supplier power on cost strategy is very low.
H04 Influence of supplier power on differentiation strategy is very low.
H05 Influence of threat of new entrants on cost strategy average.
H06 Influence of threat of new entrants on differentiation strategy is high.
H07 Influence of threat of substitute product on cost strategy low.
H08 Influence of threat of substitute product on differentiation strategy is average.
H09 Influence of competitive rivalry on cost strategy is average.
H10 Influence of competitive rivalry on differentiation strategy is very high.

To find the effect of the five forces on cost strategy and differentiation strategy, t-distribution has been used with two-tail α. Effect of the five forces on the strategies has been quantified using Likert scale and then t-distribution has been used.

6. Analysis of the Five Forces

6.1 Bargaining Power of Buyer

The bargaining power of customers determines how much customers can impose pressure on margins and volumes. Customers bargaining power is likely to be high when they buy large volumes, there is a concentration of buyers, the supplying industry comprises a large number of small operators, the supplying industry operates with high fixed costs, the product is undifferentiated and can be replaced by substitutes, switching to an alternative product is relatively simple and is not related to high costs, customers have low margins and are price-sensitive, customers could produce the product themselves, the product is not strategically important to the customer, the customer knows about the production costs of the product, there is the possibility for the customer integrating backwards.

In this industry, buyers are fragmented, no buyer has any particular influence on price. But buyers influence product characteristics. There is no possibility of customers integrating backward. [11]

The results from t-distribution analysis is summarized in Table 1.

Table 1 Results of t-distribution analysis for bargaining power of buyer

Condition	t	Acceptable Range of	Result of Null Hypothesis
Influence of buyer power	-0.5976	-2.132 to +2.132	Accept

Condition	t	Acceptable Range of	Result of Null Hypothesis
on cost strategy is average.			
Influence of buyer power on differentiation strategy is high.	0.5976	-2.132 to +2.132	Accept

6.2 Bargaining Power of Supplier

The term 'suppliers' comprises all sources for inputs that are needed in order to provide goods or services. Supplier bargaining power is likely to be high when, the market is dominated by a few large suppliers rather than a fragmented source of supply, there are no substitutes for the particular input, the suppliers customers are fragmented, so their bargaining power is low, the switching costs from one supplier to another are high, there is the possibility of the supplier integrating forwards in order to obtain higher prices and margins etc. This threat is especially high when the buying industry has a higher profitability than the supplying industry, the buying industry hinders the supplying industry in their development. In such situations, the buying industry often faces a high pressure on margins from their suppliers. The relationship to powerful suppliers can potentially reduce strategic options for the organization. [11]

Here suppliers have a very low level of influence over the industry. Most of the components are made locally and a good number of suppliers are available. Substitute of some resources are available through different suppliers. Same raw materials are obtained from different suppliers from different countries, so there is very low risk of the suppliers being united and trying to control the industry. Switching cost is not at all high as we see that there is different suppliers supplying at the same time. This industry is a well-established sector, so the supplier enjoy less power of bargaining. Some industries has internal suppliers, such as HAMKO battery has HAMKO plastic and KMI to supply them plastic cover and charging plates. We can conclude that suppliers are weak in this industry. The results from t-distribution analysis is summarized in Table 2.

Table 2 Results of t-distribution analysis for bargaining power of supplier

Condition	t	Acceptable Range of	Result of Null Hypothesis
Influence of supplier power on cost strategy is very low.	0.4564	-2.132 to +2.132	Accept
Influence of supplier power on differentiation	1.8257	-2.132 to +2.132	Accept

strategy is very low.			

6.3 Threat of New Entrants

The competition in an industry will be the higher, the easier it is for other companies to enter this industry. In such a situation, new entrants could change major determinants of the market environment (e.g. market shares, prices, customer loyalty) at any time. There is always a latent pressure for reaction and adjustment for existing players in this industry. The threat of new entries will depend on the extent to which there are barriers to entry. These are typically economies of scale (minimum size requirements for profitable operations), high initial investments and fixed costs, cost advantages of existing players due to experience curve effects of operation with fully depreciated assets, brand loyalty of customers, protected intellectual property like patents, licenses etc., scarcity of important resources, e.g. qualified expert staff, access to raw materials is controlled by existing players, distribution channels are controlled by existing players, existing players have close customer relations, e.g. from long-term service contracts, high switching costs for customers, legislation and government action. [11]

Demand for this product is very high, so possibility of new entrants is very high. Again technological requirement is not very high. But the entrance is bounded by very high initial cost, government policies and environmental laws. Economies of scale is very high in this sector for making profit. Again loyal customer base will not be created if product is not supplied in necessary amount, which is very important factor for running business. For lack of brand loyalty of customers, it will very hard to achieve economies of scale. So close customer relation is necessary to counter new competitor. The results from t-distribution analysis is summarized in Table 3.

Table 3 Results of t-distribution analysis for threat of new entrants

Condition	t	Acceptable Range of	Result of Null Hypothesis
Influence of threat of new entrants on cost strategy average.	-0.3835	-2.132 to +2.132	Accept
Influence of threat of new entrants on differentiation strategy is high.	0.5976	-2.132 to +2.132	Accept

6.4 Threat of Substitutes

A threat from substitutes exists if there are alternative products with lower prices of better performance parameters for the same purpose. They could potentially attract a significant proportion of market volume and hence reduce the potential sales volume for existing players. This category also relates to complementary products. Similarly to the threat of new entrants, the threat of substitutes is determined by factors like brand loyalty of customers, close customer relationships, switching costs for customers, the relative price for performance of substitutes, current trends etc. [11]

Performance constraints of this type of battery, such as poor cycle life, fading performance after repeated discharges, slow charging, and heavy weight may give rise to lithium batteries. The results from t-distribution analysis is summarized in Table 4.

Table 4 Results of t-distribution analysis for threat of substitute.

Condition	t	Acceptable Range of	Result of Null Hypothesis
Influence of threat of substitute product on cost strategy low.	-1.8257	-2.132 to +2.132	Accept
Influence of threat of substitute product on differentiation strategy is average	-0.4564	-2.132 to +2.132	Accept

6.5 Competitive Rivalry

Competition between existing players is likely to be high when there are many players of about the same size, players have similar strategies, there is not much differentiation between players and their products, and hence, there is much price competition, low market growth rates, Barriers for exit are high etc. [11]

Market situation for this industry is very good and growth rate is high, one has to ensure constant supply of product as per requirement and provide quality to sustain improvement. Products from different manufacturers don't differ much in specification and quality, so price competition is not very high. Making price a key to take advantage is not easy, again there is brand loyalty of customers. All the manufacturers generally employ the same strategy to achieve improvement. A small amount of manufacturers are in the market and most of them are producing below the demand rate. So competition is not very high in this sector. The results from t-distribution analysis is summarized in Table 5.

Table 5 Results of t-distribution analysis for competitive rivalry.

Condition	t	Acceptable Range of	Result of Null Hypothesis
Influence of competitive rivalry on cost	0.0	-2.132 to +2.132	Accept

strategy is average.			
Influence of competitive rivalry on differentiation strategy is very high	0.4564	-2.132 to +2.132	Accept

7. Conclusion

Generally three types of strategies are employed in an industry, namely cost strategy, differentiation strategy and focus strategy. Cost strategy and differentiation strategy has been analyzed in this paper in regard to the five forces. After performing survey required information has been obtained and t-distribution analysis has been performed. It has been found that not all the forces has the same impact on the strategies. It has been found that influence of buyer power on cost strategy is average, influence of buyer power on differentiation strategy is high. Influence of supplier power on cost strategy is very low, Influence of supplier power on differentiation strategy is very low. Influence of threat of new entrants on cost strategy average, Influence of threat of new entrants on differentiation strategy is high. Influence of threat of substitute product on cost strategy low, Influence of threat of substitute product on differentiation strategy is average. Influence of competitive rivalry on cost strategy is average, Influence of competitive rivalry on differentiation strategy is very high. Among the strategies, cost strategy is of more importance than differentiation strategy. In particular, the forces have an average impact on cost strategy, but bargaining power of supplier has relatively low impact than others. For differentiation strategy, the forces generally have a high influence, but influence of bargaining power of supplier is very low. So we can conclude that, bargaining of supplier is the least influential force. Whereas, competitive rivalry is the most influential force for both the strategies. It is a matter of great regret that such an important tool is not practiced yet by most of the firm. They are using their as usual operations strategy which do not give them competitive advantages. These firms should adopt operations strategies which help them reduce cost. They should thrive for continuously updating their process and technology. They should emphasize on researching for alternate technology which helps them to take strong leadership in battery industry.

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