

QATAR UNIVERSITY
COLLEGE OF ENGINEERING
APPLYING DECISION-MAKING TECHNIQUES FOR FEASIBILITY ANALYSIS
FOR DIAPER PRODUCTION FACTORY
BY
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A Thesis Submitted to
the Faculty of the College of
Engineering
in Partial Fulfillment
of the Requirements
for the Degree of
Masters of Science in Engineering Management

June 2018

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ABSTRACT

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Masters of Science in Engineering Management

Title: Applying Decision-Making Tools for Feasibility Analysis for Diaper Production Factory

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The main purpose of the study is to profoundly analyze the viability of opening up a diaper factory in Qatar. Qatar has shown substantial amount of progress over the years and have shifted successfully to knowledge-based economy. However, recent blockade against Qatar created challenges for the government and residents in gaining accessibility to necessary products which were being imported from other countries. Therefore, the main motivation behind analyzing diaper factory in Qatar is self-sufficiency as Qatar imports diapers currently.

In addition, different techniques have been used in the study for analyses and determining location which is most feasible for the project. Industrial area was chosen as a location for the factory as it was most suitable. Referring to the population across the world, the diaper industry has been reluctant to follow the trends and increase the feasibility of the core product. Since diapers are in expansible as well as fall in the preference products, which makes it near to being inelastic with respect to the price. The research design is purely conclusive which means it has two segments to be divided into descriptive and causal. Descriptive researches describe the phenomenon or elaborating more on different variables of the respective study. Such researches are conducted in order illuminate more a particular issue or to drive a conclusion on the validity of the study.

DEDICATION

This project is dedicated to my father and my mother for their constant love and encouragement.

*I never would have made it here without you supporting and believing in me. You taught me to
work hard and I hope I've made you proud.*

ACKNOWLEDGMENTS

I would first like to thank my project advisor Prof Dr. Mohammed Haouari at Qatar university. The door to Prof. Mohammed office was always open whenever I ran into a trouble spot or had a question during the last two years. He consistently supports this project to be my own work after learning a new technique in Engineering Management program.

I would like also to express my deepest appreciation to all those who provided me the possibility to complete this project. Not only to read and write about it, but also to make it really happened and opening my own factory.

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CHAPTER 1: INTRODUCTION

Diapers are basically a kind of an underwear specifically designed for the kids. The wearers, who are not inculcated enough to use the toilet on their own, use this product. Diapers absorb urine and contain rubbish in order to avoid staining the clothes or the entire environment. Diapers are designed by using soft and comfortable fabrics, which later can be synthesized or can be disposed. There are two main types of diapers: cloth diapers and disposable diapers. Cloth diapers are made of multiple layers of fabric, which make the diapers comfortable as well as reusable. Whereas, the disposable diapers are made to be used one time only; these diapers are extensively comfortable but are thrown away after a single usage, which makes the purchase of this product more frequent than the cloth diapers.

The idea under study is to establish a factory for the production and marketing of baby diapers that are used to prevent water leakage on the child's body. The objective of the project is to establish a factory for the production of diapers, which has been very widespread in recent years, and aims to equip the factory with the latest equipment and production lines used in the manufacture of these products, the project should be located in the industrial city of Doha, which has been characterized by an economic growth and high property in the recent years.

Many industries have developed majorly over the past years, as a result of the unlimited support of the Qatari authorities in the desire to create an industrial renaissance and the work of some kind of economic diversification to reduce dependence on oil as a major source of national income. Perhaps the most important of these industries are the paper

industries due to the diversity of its products and the high demand of its various kinds. The consumer products associated with the paper industry range from paper tissues, diapers and sanitary pads to women, whose demand has increased as a result of population growth, in particular those two categories, where families have become mainly dependent on these products as opposed to the past, following societal developments that have taken place the Qatari society and the high level of income.

Hence the establishing of a factory for the production of diapers to meet the increasing demand for these products became an important idea. We target for our plant to be equipped with the latest equipment and machinery used in this field, and to be located in the city's industrial plant site in Doha, which is characterized by the high population and the economic growth significantly in recent years.

But before starting the targeted project, it is a must to prepare a feasibility study for the targeted project, since the feasibility study is a scientific method aimed to reduce the risk of investment through the application of a number of methods, scientific indicators, market study and the diverse needs of the project.

Project Objectives

1. Enhancing the competitiveness of the paper industry in general and the manufacture of baby diapers in particular through the addition of the scientific techniques and the latest production lines to manufacture the targeted products.
2. To meet the increasing demand for paper products for its versatility and diversity of users.
3. Providing products conforming to local and international standards and taking into account the quality standards in different stages of production. We strive to improve

the quality of the final marketable product.

4. Providing modern production lines and equipment that increase the production capacity of the project and make the project competitive in the national market.
5. Achieving higher profitability than the national market rates.

The Reasons behind the Selection of This Projects

1. The economic and social development achieved by Qatar in recent years, which is considered as a guarantee for the success of investment projects in various sectors.
2. The steady growth of the population of Qatar in general and Doha in particular, which encourages the expansion of existing projects and the establishment of modern projects, the population of Qatar during the current year about 2.5 million people.
3. The high demand for paper products of baby diapers.
4. The rise in the value of imports of paper products.
5. The laws and regulations of the state are not inconsistent with the establishment of such projects.

Project Outlines

There are six main sections in the report that are introduction, Literature review, Business portfolio analysis, technology selection, location selection and conclusion. Every section has sub-section in order to further simplify the research.

CHAPTER 2: LITERATURE REVIEW

Diapers are hygienic products designed in order to absorb urine and rubbish of a child specifically a baby. Diapers have persisted their existence since 1960s however; various twists in the product along with maintaining the core product have taken place. The utilization of diapers commenced with containing tissues and clothes; nonetheless, with the passage of time, as more latent needs are identified by different businesses and their competitors (Dereli, Baykasoğlu, & Yılankırkan, 2009). Since, the businesses who identified the need of mothers needing a product designed cautiously, the designers and developers started to look through the problem transformed the core product into a well-structured piece of hygienic product. Diaper industry has various barriers; because of such strong hygienic issues, it is often hard for families to choose different diapers every time they shop for it, which also makes it hard for the business to opt for cost leadership strategies. Since mothers would rather pay slightly higher amount but would also always prefer hygienic and rash-free diaper product for their kids. This analysis brings the study to understanding why the sales and utility of disposable diapers have been increasing over the years (Prasad, Srivastava, & Verma, 2004).

According to the studies and researches for the year 2016, the worth of the diaper industry on a global scale was more than US \$ 54 billion. Furthermore, there is a massive opportunity of growth in this industry due to increasing population worldwide (Hanna, 2014).

Referring to the increasing population across the world, the diaper industry has been reluctant to follow the trends and increase the feasibility of the core product. Since diapers are in expansible as well as fall in the preference products, which makes it near to being

inelastic with respect to the price, the price of the product has relatively minor impact on the demand of the product. Such products are most likely to have calculated buyers, which makes it relatively easier for the new entrants of the industry to measure the potential growth of the industry before entering into the market (Reece, 2004).

Another factor that leads to the growth in the diaper industry is the delayed toilet training provided to the kids and children. However, past research and studies show that delayed toilet training is the result of companies producing hyper thin and comfortable diapers, which gives the wearers a hard time getting rid of them. Moreover, the increasing feasibilities and escalating trends in the online shopping has led the parents to procrastinating the trouble of toilet training to their kids. All these factors are subconsciously contributing to the success rate of the diaper industry and the reasons to the growing sales of diaper products. Furthermore, the new entrants consider the growth in this particular industry because if communicated efficiently and effectively, diaper products are not the one to become obsolete; there will always be comeback in the industry. Considering the theoretical facts and radicals, researches have shown the market value to be increasing by approximately US \$ 17 billion in the year of 2022, which makes the worth equivalent to US \$ 71 billion (Mirabella N. , 2013).

Previous studies have dissected the diaper products considering the types of baby as well as adult diapers. Baby diapers are particularly designed considering the needs and requirements of an infant whereas adult diapers are specifically designed for kids' bodies larger than infants are – toddlers are. The diversifying needs of the kids and children led the diaper companies and businesses to produce variations in the core product and further categorize the segment considering every minute detailing in the structure of the product.

The diapers, as simple as it seems, is further categorized into disposable and non-disposable and further, into pad type, training diapers, swim diapers, flat diapers, pant diapers, etc. Among all the types of the diapers, disposable diapers persist the majority of the baby diaper share in the industry and meanwhile, pad diapers hold the most share in the adult diaper share of the industry (Erasala, 2011).

Every industry has a traditional distribution channel installed and planned. New entrants attempt to twist and bring innovations in the distribution channels however; the core flow line remains the same unless a mega trend takes over the globe as internet did. Likewise, the diaper industry has consistent and rigid distribution channels recently adopting the mega-trend of online purchasing and maintaining wide variety of products varying according to the needs of the consumers – wearers. The diaper market has segregated itself on the basis of collaborating with multiple distribution channels. Since the product is in expansive, the distribution channels include all the highly populated markets like hyper stores, utility stores, along with maintaining the stock with small or big pharmacies and small retailers. Among all the distribution channels, pharmacies maintain the highest ratio of safety stock of diapers (Dey, Helmes, White, & Zhou, 2014).

Moving to the industry leaders of the industry, Procter, Gamble, and Kimberly-Clark are the two leading companies in this industry. Both the companies have strived to depth to formulate new designs and acquire deep consumer insights in order gain the emotional attachment as well as product engagement with the parents. Both the companies targeted mothers in particular due to more indulgence of a mother with her kids. Moreover, the respective companies aimed at gaining insights regarding the problems and difficulties a mother and the kid may face if the diaper quality is not up to the expectations. Due to hefty

amount spent of the respective research and development, the big firms capture a cumulative share of approximately 80% of the market share. Further studies findings validate that Procter and Gamble has the highest share in the market of United States where as Kimberly Clark has become a market leader in the localities of Eastern Europe and China (Richer, 2005).

Diapers industry has been one of the industries with minimum changes and extensive advertising because majorly, the product stays at the maturity stage of the product life cycle and continues to exercise itself from growth to maturity repeatedly, or the product falls rapidly to the decline. Therefore, the only major changes brought in this industry are in the operations and processes to make the whole set-up as cost effective as possible. Over the years, the only major changes brought in to the diaper industry are in the machineries and equipment to bring smoothness in the flow of the operations, and the company could increase the efficiency ratio and profitability ratio (Elzinga, 2006).

Before entering into this industry, it has been recommended by various entrants to initially perform a feasibility analysis in order to understand the gap in the market and if the company has the ability and enough resources to make it run and operate in a profitable environment. A feasibility analysis requires the new entrant to thoroughly present the idea taking the entire micro as well as macro environment into account. In majority of the companies, the upper management or the consumer demands drive the product decisions whereas the investment decisions are literally the core decision in an industry where variations cannot be brought into the products or marketing, hence pressuring the company to bring effectiveness into the operations. In order to perform a thorough analysis, companies perform a detailed evaluation test of every activity and operation (Salem Jr &

Salem Jr Bernard Louis, 2009).

Majorly the decision is brought into action according to the diapers demand from the consumers. Nowadays, the traditional product-centric approach has lost its direction and a refined and well-structured customer-centric approach has taken the vacancy. When it comes to devising a strategy to market and sell an extremely rigid and hygienic product, companies tend to become extra careful regarding their marketing and operations practices, which makes it harder to interpret the feasibility analysis. Even though the process concludes an open yes to the company, there is a certain possibility for the company to re-strategize and re-do the analysis (Mirabella, Castellani, & Sala, 2013).

Market Trends

Considering the market themes and associated trends evolved in the diaper industry, marketers have researched on several yet specific factors affecting the sales and growth of diaper products. Some of these trends are:

Birth rates: Birth rates vary from country to country, however earlier 2008, birth rates were considered as one of the most uprising issues and the concerned had begun to strategize policies and schemes to give the birth rates an escalation. Soon after 2011, there was a progress in the balanced birth rate across the globe (Hanna, 2014).

Multi-cultural consumers: Consumers belonging to different cultures absorb the marketers' messages in different ways. In order to establish a long-run relationship with the consumers, marketers aim at developing plans and objectives according to the specific needs of a particular target audience (Hanna, 2014).

Online Influencers: A number of influencers have taken a part in advertising and endorsing the diaper products. Since categorization of diapers have different segments of potential

audience to communicate to, the middle class and lower middle class are highly subjugated against the influencers and tend to purchase the product being endorsed by their liked celebrities (Hanna, 2014).

New Distribution Channels: A rise in the sales of the diaper products have several reasons behind such a growth; one of the reasons is the rising trends of online shopping. Parents, particularly mothers, procrastinate the training and find it feasible to make a diaper purchase online. However, new distribution channels have brought multiple challenges for big retailers specifically in the price differentiations. It has become more complex and challenging for the retailers to win the customers over price while there is a less differentiation in the core product (Hanna, 2014).

Research and Development: In order to bring innovation in a less-differentiated industry, marketers are aiming at spending billions on gaining the consumer insights and transforming the data into relevant relationships and information. Since diaper industry has an extremely rigid competition, the new entrants find it hard to explore the latent demand and transform into a realistic product. New entrants have been looking forward to gaining support primarily from the technology in order to develop a much simpler, comfortable and feasibility in the product (Hanna, 2014).

Diaper Manufacturing Feasibility Analysis

The global market of the diaper industry exhibits various facts and figures regarding the hygienic products as a whole. The global hygienic products include diapers, sanitary napkins, cotton buds, etc. Diapers among all the hygienic products persist the most widely used product across the globe, which means that it captures approximately 46% of the sales worldwide. According to the literature, the industry growth has a massive dependence on

the population of the country followed by the economic conditions, which means the household structuring as well as the income of the inhabitants. Most important radical to project the sales of the diaper industry is the birth rate - which has the most direct relation with the budgeting projections too. According to the research conducted particularly in the European countries, it validates that a baby, before beginning to implement the potty training, uses approximately 4100 diapers as shown in Table 1 (Dereli, Baykasoğlu, & Yılankırkan, 2009).

Table 1:

Baby diaper consumption

<i>Age</i>	<i>Average diaper/day</i>
0-12 months	5-10
12-24 months	4-8
24-36 months	2-4
36-42 months	0-2
<i>Approximate 4100 diaper/baby</i>	

Qatar not considering as big country with huge population, most of the population are expats with more than 80%. Qatar is the 146th most populated country for year 2015. The born of babies is an important factor for any company want to produce diapers for kids.

Table 2 illustrate the increase of population in Qatar.

Table 2:

Population in Qatar

Year	Total Population	Live births
2008	1,448,479	17,210
2009	1,638,626	18,351
2010	1,699,435	19,504
2011	1,732,717	20,623
2012	1,832,903	21,423
2013	2,101,288	23,708
2014	2,172,065	25,443
2015	2,235,355	26,622
2016	2,291,368	26,816

The purpose of various analyzing techniques begins for a feasibility analysis. The feasibility analysis requires the study of a thorough study on the current and future prospects of entering into any industry. The feasibility analysis helps the company address two main radicals of the study, which are the operations: the production of the product; and marketing: the escalations of the demand of the product (Bentley, Dittman, & Whitten, 2011). The feasibility study commences with initially planning a detailed timeline; this step does not require the company to invest in any non-current assets however, a hefty investment in the research and development will be needed in order to drive the consumer needs and demands. A preliminary detailed plan addresses the following concerns:

1. To identify if the product is a result of the latent demand or a stated need
2. To plan a comprehensive plan focusing on the production process
3. To run a feasible costing system in order to allocate the associated costs of the

operations as well as of the future budgeting and projections

4. To project the finances, marketing and operations close to the current scenario and drive the probability of future success chances (Dey P. , 2001)

In the most narrowed and specific feasibility analysis, there are five preliminary tests to conduct before moving to the decision-making process shown in Figure 1:



Figure 1: Preliminary feasibility tests

1. Economic Feasibility: It is the first step to commence the feasibility analysis, which addresses a thorough analysis on the market assessment and the macro environment of the industry.
2. Operational Feasibility: It describes the processes and production alternatives as well as the machinery and equipment along with a broad timeline of the operations.
3. Technical Feasibility: It measures the tactical as well as major and minute technicalities of the available and the future acquired resources. This test aims at identifying the technicalities as well as finding the solutions of them.
4. Schedule Feasibility: This test aims at analyzing the timeline and practicality of the planned timeline. The schedule of the product building as well as product penetration timeline needs to be specific and realistic.

5. Financial Feasibility: It measures the current budgeting and future projections of the project. It deeply analysis the profitability, break even cost as well as the initial investment needs of the project (Wyckham & Wedley, 2000).

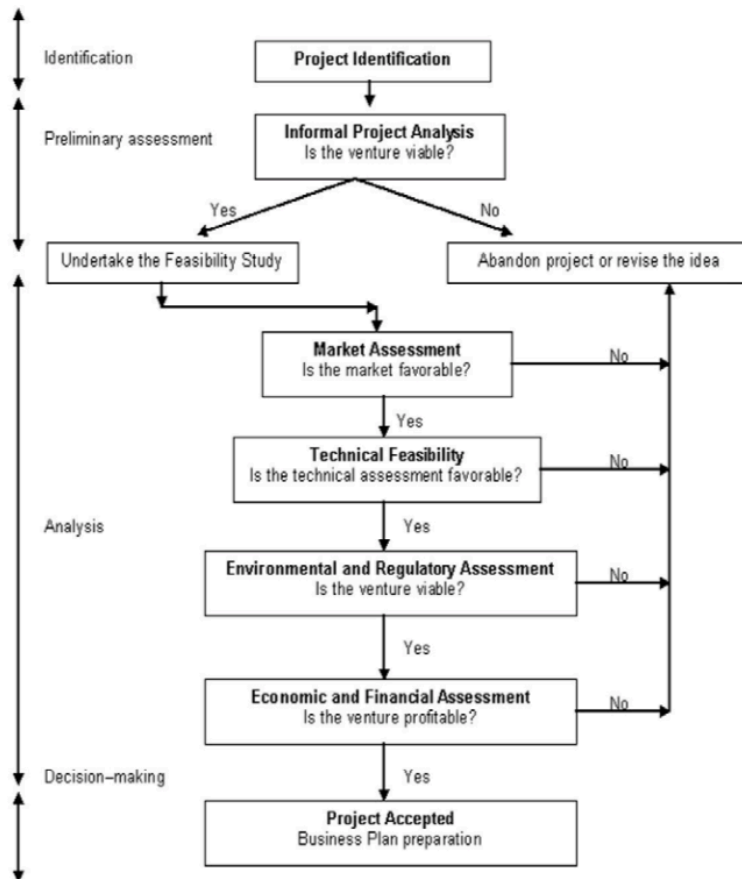


Figure 2: Feasibility Assessment Diagram

Framework of the Feasibility Analysis

The framework of the feasibility analysis digs the research problem deeper and aims at finding out the alternatives as well as solutions to all the hidden problems as well as the identified problems. The criteria to develop a relevant framework involve deeper

technicalities and refer to develop a conceptual framework within the boundaries of the feasibility analysis (Bentley, Dittman, & Whitten, 2011). The criteria for a thorough feasibility analysis are given in the Figure 3.



Figure 3: Framework of Feasibility Analysis

Consumption

This criterion requires a thorough analysis on the current consumption of diapers and the overall market usage of the product. The analysis includes the frequency as well as product packaging. It further needs to question the current and future trends of consumption. This criterion requires you to evaluate the methods of consumption and who consumes the diaper; which in our case, are the kids. Furthermore, a thorough analysis of

the demographics of the diaper consumers and purchases need to be taken into consideration and if the demographically categorized segments are shrinking or growing (Dey P. , 2001)

Markets

The structure of the diaper market and how has it evolved in the past years are mainly focused in this area. A deeper discussion needs to consider the suppliers and distribution channels of the diaper industry. Moreover, it is essential to find out the response of the industry if a new entrant enters into the market. This area also addresses the locality of the customers and potential target market (Dey P. , 2001).

Distribution System:

The distribution channels and sources of transportation will be taken into consideration in this category. The company also assesses its own resources to evaluate the costs of delivering the product and if the company can bear the cost (Dey P. , 2001).

Market Entrant

This realm questions the strategic planning of the product entry and the marketing costs bore by the company to introduce the product into the market. Moreover, the company evaluates the total market potential in this area to find out the drivers of the demand for the respective product. Diapers are hypersensitive products, which mean the company needs thorough and analytical yet creative strategies to attract the buyers (Dey P. , 2001).

Buyers

The company needs to evaluate if the product will be directly sold to the customers or if the company aims at building profitability by bringing an intermediary to sell the products. Moreover, the company assesses the types of buyers will the company interact with and what kind of buying behavior does each buyer persist (Dey P. , 2001).

Selling Arrangement

Selling services and employee force will be taken into consideration in this category specifically addressing the sales force and their compensation plan. Moreover, the company projects the costs of establishing a sales office and plans on to how to sell along with creating a credible image before the customers. It discusses the modes and methods of selling the product and what channels and mediums will be used to provide utmost benefit to the customers (Dey P. , 2001).

Prices

Establishing a price keeping a balance between the demand and supply is one of the most critical steps of bringing a product into the market. The company will have to evaluate the past prices and strategies devised by the competitors and the industry leaders as a whole. In order to devise the right price, the company needs to conduct a survey regarding the expectations of the buyers as well as of the potential prospects (Dey P. , 2001).

Production Processes

This criterion thoroughly presents various processes and manufacturing techniques and thus, becomes one of the most area for analysis for a diaper manufacturing company. The production processes evaluate the raw material and structure in which they would be

utilized. The processes include extend of technological equipment and facility determination. Moreover, production needs, initial investment needs, and labor needs are to be taken into consideration along with a thorough analysis on how the operations to be commenced (Dey P. , 2001).

Facility

The area decides the size of the facility as well as the economic feasibilities of the entrant. The plant size as well as the production per unit ratio is kept under consideration before creating projections regarding the investment plans (Dey P. , 2001).

Investment Capital

Capital investment in the production facility as well as evaluating the core source of financing a project needs to be taken in account for future budgeting processes. Moreover, the company needs to evaluate various projections regarding sales, costs on each activity and operations, human resource capital and their management. Lastly, the core advantages acquired by funding the project (Dey P. , 2001).

Profitability

Profitability is the gains earned over the breakeven (the point where the costs equals the revenues). Profitability in the monetary terms define the points above the break-even whereas in the business terms, it is also about gaining customer as well as brand equity. Becoming a credible player in the hygienic product industry has more complexities than in any other industry (Dey P. , 2001).

Working Capital

In order to run a business, the company needs to evaluate the daily expenses of the operations of the factory and the warehousing plants. Working capital measures the routinely costs of the company (Dey P. , 2001).

Decision Making

Decision making is evaluating the options and alternatives by giving preferences to the prioritized values and weighing factors in the respective (Dey, Helmes, White, & Zhou, 2014; Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Dereli, Baykasoğlu, & Yılankırkan, 2009). Making a decision simply implies that the decision maker has been considering various factors and has been attempting to drive a solution which is the best of the decision maker himself as well as the concerned (Dereli, Baykasoğlu, & Yılankırkan, 2009; Bentley, Dittman, & Whitten, 2011; Hallström, 2004). Opting for the most beneficial decision is not an easy task because it demands the decision maker to weigh every radical involved and weigh accordingly (Triantaphyllou, 2000; Elzinga, 2006). However, it needs to be noted for any business in particular, that after planning certain actions and deciding what is needed by the company, the considered decision will only reduce the risk which indicates that a certain level of risk will always maintain its position in the decision and uncertainties can be changed according to changes in the respective climate of the operations (Hallström, 2004).

Any decision subjugates towards the decision-making process and involves:

- The people who are in authority of making a decision
- The stakeholders because they are being influenced by the company's decision

- The problem area and the associated elements
- The team members and people associated with implementation of the idea
- The system chosen to make a decision and the associated tools
- The supervisor of the decision makers as well as the decision (Dereli, Baykasoğlu, & Yılankırkan, 2009)

For a company with a specific interest in establishing a diaper manufacturing plant and empowering itself to becoming one of the players of the relevant industry, there are some preliminary steps needed to be taken under consideration (Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Golafshani, 2003; Christensen, Johnson, Turner, Christensen, & L.B., 2011). Though a feasibility analysis has already been studied in detail but for such a research area, the feasibility analysis mainly focuses on the core areas which includes the market structure and associated studies like PESTLE, the selection of the right location which would demand the company to identify the market of the customers, the type of technology equipment needed and the operational needs of the company, and finally the financial projections regarding the current and future sales (Triantaphyllou, 2000; Elzinga, 2006; Dey P. , 2001; Christensen, Johnson, Turner, Christensen, & L.B., 2011; Salem Jr & Salem Jr Bernard Louis, 2009).

SWOT Analysis

SWOT investigation is a key improvement apparatus that matches interior authoritative qualities and shortcomings with outer openings and dangers. (SWOT is an acronym for an association's Strengths what's more, Weaknesses and its natural Opportunities and Threats) SWOT investigation depends on the suspicion that if

supervisors painstakingly survey such quality, shortcomings, openings and dangers, a valuable technique for guaranteeing authoritative achievement will end up obvious to them. A SWOT investigation takes a gander at an organization's qualities to expand on, shortcomings to cover, chances to catch and dangers to protect against. A SWOT examination expects to uncover the organization's upper hands, break down organization's prospects for deals and benefit, set up the organization for issues and consider the advancement of alternate courses of action.

Determining the diaper prices

In a diaper industry, parents of the kids, using a specific company's diapers, would want nothing else except the right quality of the diaper as per the company's promise (Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Golafshani, 2003; Christensen, Johnson, Turner, Christensen, & L.B., 2011). The current analysis of the diaper industry on a global perspective show nothing but only improvements in the diapers since the consumer demands drive it that way (Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Golafshani, 2003; Christensen, Johnson, Turner, Christensen, & L.B., 2011; Dereli, Baykasoğlu, & Yılankırkan, 2009; Wild, Wild, & Han, 2008). Not only diapers have set a spectacular pace to achieve the consumer's needed support but also it has worked on providing the best protection against the leakages, providing exclusive comfort as well as providing stretchable diapers products to deliver the more convenience (Dereli, Baykasoğlu, & Yılankırkan, 2009). According to previous findings, there are three major determinants supporting the balance of the demand and supply of the diaper production and its relevant sales:

Market Survey

In order to settle a specified price for the consumers, one of the main determinants is to conduct a market survey (Dereli, Baykasoğlu, & Yılankırkan, 2009; Worthington & Britton, 2003). The entrant in diaper industry needs to stay aware of the current diaper prices as well as the previous trend of prices growth (Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Golafshani, 2003; Christensen, Johnson, Turner, Christensen, & L.B., 2011).. These prices are primarily obtained by conducting a survey in most populated super markets as well as wholesale markets (Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Golafshani, 2003; Christensen, Johnson, Turner, Christensen, & L.B., 2011). Moreover, the price information can also be gathered by hyper stores as well as district markets. The prices are most likely to be found between 0.19 – 0.08\$ / diaper but it may vary from country to country (Rabecca, 2016; Christensen, Johnson, Turner, Christensen, & L.B., 2011; Slack & Lewis, 2017). Moreover, the market survey needs to be conducted on the package size consumed the most and how prices vary according to the size and feasibilities of a diaper (Elzinga, 2006).

Diaper Producer

In order to plant a diaper factory, the company needs to be aware of the main costs and profits of the diaper producer who is currently not a market player (Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Golafshani, 2003; Christensen, Johnson, Turner, Christensen, & L.B., 2011). These producers could be exporters or may be validated as an authentic manufacturer (Dey P. , 2001). They also help in identifying the transportation costs as well as the supply chain costs inculcated in the production and eventually in the prices (Elzinga, 2006).

Seller

Retailers and wholesalers, who sell diaper products to the consumer, are one of the most important sources to formulate a price as well as to get acquainted with the consumer demand. These retailers and wholesalers also help in finding out which company has achieved the price ceiling and why consumers look for it, which ultimately help the new entrant formulate a refined strategy (Elzinga, 2006).

Financial Analysis

The financial study is based on studying the market of supply and demand and trying to survey the financial gap. In this field in order to reach the conviction of the share of the project in the competitive market. Based on the above, we reached the following six points.

Break Even Point

To have the capacity to make a breakeven investigation; the anticipated settled and variable working expenses must be distinguished. Settled expenses are the costs that stay consistent paying little respect to the quantity of offers. Variable costs fluctuate contingent on the volume of generation and deals. Breakeven is computed by settled costs including devaluation partitioned by the distinction between cost per unit and variable expenses per unit.

Payback period

As indicated by payback method, the task that guarantees a speedy recuperation of beginning venture is viewed as alluring. On the off chance that the payback time of an undertaking is shorter than or equivalent to the administration's greatest wanted payback time frame, the task is acknowledged, generally dismissed. For instance, if an organization

needs to recover the cost of a machine inside 5 years of procurement, the most extreme wanted payback time of the organization would be 5 years. The buy of machine would be attractive in the event that it guarantees a payback time of 5 years or less.

Sensitivity analysis

There may have questions about the legitimacy of the net salary esteems figured on the pay explanation. In the event that you experienced difficulty getting great information or are uncertain of critical projections; to quantify the effect that adjustments in any factor (yields, costs, deals, and so on.) will have on net pay, an affectability examination of the information might be performed. It might be recognized one factor that, if transformed from the normal esteem, influences gainfulness the most.

Analytic Hierarchy Process

Thomas Satty has delivered one of the most widely used decision making processes across the globe referred to as Analytic Hierarchy Process (AHP). According to AHP decision making strategy, the decision maker has several objectives, and specific criteria on which the decision maker maintains the foundation of the core decision. This process has the main function of answering *which one* factor to the decision maker (Saaty, Decision making with the analytic hierarchy process., 2008).

AHP is mainly used in solving the complexities of a strong and impactful decision. By using this strategy, the decision maker is able to formulate a solution of multiple questions along with addressing qualitative as well as quantitative questions and the associated criteria to acquire authenticity in the solutions. In AHP, the alternatives conflict with each other on the basis of the radicals prioritized by the decision maker (Vaidya, 2006).

The application of AHP consisted of four different phases:

1. Identifying the core problem and establishing a business model
2. Data collection through different mediums and comparison of the results with literature and experts
3. Determine various radicals to weigh the alternatives
4. Interpretation of the results and concluding a defined solution

In phase 2, AHP uses 1-9 scale for the prioritization process as suggested by Satty and shown in Table 3.

*Table 3:
Ranking Scale for Criteria and Alternatives*

Intensity of importance	Definition	Explanation
1	Equal importance	Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgement slightly favor one over the other
5	Much more important	Experience and judgement strongly favor one over the other
7	Very much more important	Experience and judgement very strongly favor one over the other. It's important is demonstrated in practice
9	Absolutely more important	The evidence favoring one activity over the other is of the highest possible validity
2,4,6,8	Intermediate values	When compromise is needed

Analytical Hierarchy Process has persisted a thorough and incompetent way in literature as an embryonic solution to the larger and complex decisions. It has helped multiple organizations in devising the best option out of many, which makes it more credible and powerful tool to formulate a solution (Ho, 2008).

There are three primary ways to reach to an AHP devised solution:

- 1- Problem Decomposition: the broad research area is required to be subjugated and categorized into various sub-branches, which are further categorized into associated radicals and variables. It creates a kind of hierarchy to follow while formulating any solution to any problem.
- 2- Comparative Analysis: In order to compare alternatives, the decision maker is required to have sufficient knowledge regarding the alternatives to weigh it accurately. Moreover, a comparative analysis is a weighing scale, which helps to provide the decision maker numerical as well as logical assistance.
- 3- Synthesis of Priorities: The decision maker needs to be clear about the radicals and the related priorities given to each radical. Before composing any solid decision, a thorough analysis on each radical should be studied beforehand (Saaty & Vargas, Models, methods, concepts & applications of the analytic hierarchy process, 2012).

CHAPTER 3: RESEARCH METHODOLOGY

Research methodology is the process of gathering relevant information and data from multiple sources or a single authentic source to validate the research. There are different methods used in order to conduct a research on the chosen topic and the methods may vary according to their nature of information – qualitative methods bring information in descriptive and detailed theoretical form and meanwhile, quantitative methods are preferred when there are several variables, their relationship and statistical analysis are involved because the data gathered in such a setting brings data in the numeric form (Kothari, 2004).

Rationale behind the Study

Recent blockade against Qatar created challenges for the government and residents in gaining accessibility to necessary products which were being imported from other countries. Therefore, the main motivation behind analyzing diaper factory in Qatar is self-sufficiency as Qatar imports diapers currently.

The study is conducted to find out the preliminary information as well as forecasted market share for business for my own factory that will be open next year and as a new entrant in the diaper industry (Kothari, 2004).

Problem Identification

The growing demand of a quality diaper product and a significant increase in the global worth of the market value of the diapers has led to deep researches and insights regarding consumer and wearers' needs. A new project generation group has identified the growth in the diaper industry therefore, the research is based on collection on the relative information regarding the respective industry and constituting a feasible analysis with

respect to the project (Christensen, Johnson, Turner, Christensen, & L.B., 2011).

Research Objectives

The core research objectives are:

- Identifying the growth opportunities for the entrants in the diaper industry
- Carry out feasibility analysis regarding a diaper company project
- Executing the search on the basis of consumer trends observed in the respective industry
- Conducting a research to conclude if there is a gap in the market which can be fulfilled by an entrant
- Searching the support of technology in the growing diaper business
- Identifying the price differentiation as well as price elasticity with respect to demand in the diaper industry
- Conducting a thorough research on the analytical hierarchy process in evaluating the decisions regarding the diaper manufacturing company project
- Executing the analytical hierarchy process on the various essential decisions regarding the diaper business project
- Establishing a hypothesis in correspondence to commencing a diaper manufacturing business as a part of the thorough conclusion (Christensen, Johnson, Turner, Christensen, & L.B., 2011)

Research Hypotheses

The research hypothesis is:

H1: the use of analytical hierarchy process is an integral part of the decision-making tools in the diaper manufacturing business in Qatar

Research Design

The research design is purely conclusive which means it has two segments to be divided into descriptive and causal. Descriptive researches describe the phenomenon or elaborating more on different variables of the respective study. Such researches are conducted in order to illuminate more a particular issue or to drive a conclusion on the validity of the study (Kothari, 2004).

In addition to this, this study has also several components of a causal research design. A causal research design is preferred when there is a relationship, or the intensity of the relationship being testified. Such research designs study the causes of one variable affecting the other variable or variables cause and effect design (Kothari, 2004).

Pilot Testing

A feasibility testing has been taken into consideration by adopting analytical hierarchy process. AHP basically assists in conducting a preliminary pilot testing which means providing a holistic view of the new project. This process takes all four sides of a start-up into account, which means there has been a thorough study done on the customers, employees, financial needs and prospects, and lastly, operations management (Mirabella N. , 2013).

Data collection

The study has been conducted in a pure qualitative environment, which means the data has been acquired in an open-ended atmosphere. Moreover, the research has acquired the data from authentic and validated secondary sources. There is an absence of the primary data collection research design therefore the literature has been thoroughly studied to find every minute details regarding the diaper industry as well as its market (Golafshani, 2003).

Secondary Sources

Secondary sources consist of the information and knowledge already been published or studied by previous authors and researchers (Christensen, Johnson, Turner, Christensen, & L.B., 2011). In order to collect data from secondary sources, the relevant channels used are described below.

Documents and Reports

Various journals, reports, articles and documents have been thoroughly studied before formulating any conclusion. These sources are collected from known and credible areas like google scholar. Multiple documents and journals have been taken into account to study the diaper industry on a global as well as a on a per-country basis in order to formulate a conclusion near to being free of errors (Christensen, Johnson, Turner, Christensen, & L.B., 2011).

A wide variety of journal articles with similar research objectives are taken into consideration. On the basis of common radicals and patterns, journal articles and reports are used for current and future facts and figures regarding the diaper manufacturing and retailing across the globe (Christensen, Johnson, Turner, Christensen, & L.B., 2011).

Feasibility Analysis – Analytical Hierarchy Process (AHP)

Feasibility studies using analytical hierarchy process has given an advantage of bringing sustainable yet smooth operations in any company. Successful organizations and initiatives consider feasibility analysis an extremely effective and important in making impactful decisions. Further classifying the feasibility studies, analytical hierarchy process has been proven to be one of the most effective methods in executive a decision-making process. The analytical hierarchy process allows the researchers to consider every aspect of a business: financial, operational, buyers and human capital. Since AHP is a hierarchical approach, it allows the decision makers to categorize the needs required to prioritize before creating sub-variables in each category. AHP takes the research beyond sales and profit budgets; instead, it takes a holistic view of the project by integrating qualitative as well as quantitative devices and tools. The technique to conducting an Analytical Hierarchy Process is free of complications; however, the process follows a rigid and inflexible format. AHP or Analytic Hierarchy process will be used as a method of taking decision related to the business project. AHP is mainly used in solving the complexities of a strong and impactful decision. By using this strategy, the decision maker is able to formulate a solution of multiple questions along with addressing qualitative as well as quantitative questions and the associated criteria to acquire authenticity in the solutions. In AHP, the alternatives conflict with each other on the basis of the radicals prioritized by the decision maker (Vaidya, 2006).

Business Portfolio Analysis

Business Portfolio Analysis will be used in the study as in order to analyses the business portfolio concerning the Diaper factory in Doha. This method is considered to be a standout amongst the most essential variables for any association.

Case Studies

Various case studies have been taken into consideration in order to identify the new trends and innovations in the diaper industry. Case studies were evaluated on the basis of a credible content and how relevant is the information in a world with growing population. Moreover, case studies with radicals like technology are taken into account to show how technology plays a role in the growing success rate of the diaper industry on a global scale (Christensen, Johnson, Turner, Christensen, & L.B., 2011).

Moreover, case studies with such regards provide deeper understanding and insights regarding the associated members of the studies. It gives a thorough idea on how the product needs to be places before the final consumers and what could be possible errors and mishaps in the product manufacturing. In addition to this, they are helpful in understanding consumer past needs and how new needs and latent demands have been explored by the start-ups to capture the untapped markets (Golafshani, 2003).

Data analysis

Since there is an absence of primary research design, the data has been analyzed on the basis of the accuracy and common traits of the research variables. Since this study has, only two core elements to maintain: diaper manufacturing company and analytical hierarchy process, the research has analyzed data according to the common patterns and traits leading to the establishment of relationship of multiple variables (Kothari, 2004).

Limitations of the Study

Limitations are the areas of a research which the researcher has no authority to have a control on. These limitations are essential to be described before conducting any research; a prior acknowledgement to the uncovered areas bring credibility and validity to the research and can be processed for further accumulations.

In this study, the main limitation is that it only takes secondary sources into account and neglects the need of conducting any primary research. Moreover, the global facts and figures are taken as a mean to identifying the growth prospects in Qatar, especially after the blockade. Lastly, limited secondary sources have been taken into examination, which means the current study leaves a gap for potential researches to bring other important means of data collection methods (Kothari, 2004).

CHAPTER 4: DATA AND RESULTS

This chapter deals with the case study and shall describe the project, data collection, business portfolio analysis, SWOT analysis of Qatar diaper market, costing of the project, and finally the financial analysis such as break-even analysis, A three-year projection, pay-back analysis, and sensitivity analysis.

Business Portfolio Analysis

Now it has been chosen to utilize a procedure advancement instrument as an authoritative system definition strategy. For child diaper showcase, “GE Multifactor Portfolio Matrix” has been utilized to assist in creating association technique, which is constructed fundamentally with respect to advertise appeal and business qualities. For this situation, SBUs are taken as the infant diapers producing businesses cover the entire association and has been plotted on a two-dimension framework as industry engaging quality and business position. Every one of these two measurements really comprise of an assortment of elements.

- The year development rate of the business in Qatar
- The rate of market infiltration in Qatar
- The quantity of new conceived every year (youthful populace) in Qatar
- The rate of market infiltration and new conceived every year in neighboring nations, Factors for business position (qualities) have been resolved as takes after:
- High generation limit with respect to ease items.

- Being ready to supply low to medium salary level buyers since most of the population of Qatar are expats.
- Located at the "development stage" of the item life cycle chart
- Good monetary position.

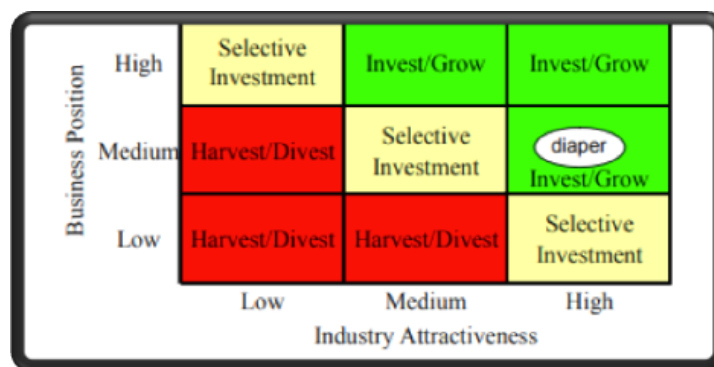


Figure 4: GE Matrix

The rate of industry advancement in Qatar is around 0.3% annually and increased dramatically after the blockade. Also has a market invasion of 7% with around 30,000 new birth each year (Erasala, 2011). The industry rate advancement and market entrance in middle-east countries has around 20 percent with an ordinary yearly birth of 3,201,000 consistently (Christensen, Johnson, Turner, Christensen, & L.B., 2011). It could be inferred that the markets drawing in quality is "high" for an enthusiasm for diapers exhibit.

As for the segments for business characteristics, to assist thing expecting almost no exertion it is unavoidable that there will be a couple of deals on the thing execution, which would lead a modestly less personality boggling thing (Erasala, 2011). As a result of the less eccentrics of the thing, the mechanical assembly advancement depended upon will

produce around 250 to 450 diapers for every minutes and an endless running would make a higher numbers of light tidiness things passing on a nice pay to the association (Golafshani, 2003).

The predominant brings high expenses (Hallström, 2004). As for the thing life cycle, it could unmistakably be communicated the porous neatness things, more especially, the diapers are at the advancement period of its thing life cycle. This support the circumstance of the business. Considering everything, it can be assumed that the business position (quality) can be portrayed as "medium." Right when this is showed up on a GE multifaceted Business Portfolio Matrix, the kid diaper business falls at the "contribute/create" region of the system (Hallström, 2004).

By thinking about all above talk, people perceived at the diaper market and the necessity at the neighboring regions (Dey, Helmes, White, & Zhou, 2014). It has been made a creation, which will offer too lower, to middle pay levels people of the country. Therefore, the investment side in Qatar seems to give better openings. As for the exportation, it has been expected that in the beginning of starting production; the huge prospective markets that would need diapers products are to be from expats living in Qatar (Wyckham & Wedley, 2000).

SWOT Analysis of Qatar Diaper Market

In this section, SWOT analysis has been done for the market of diaper in Qatar. Table 4 illustrate the strength, weakness, opportunities, and threats. It can be noted that SWOT analysis is the best factor to check the strength, opportunity of the project, and to avoid the weakness and mitigate the threats.

Table 4:

SWOT analysis of the market in Qatar

Strength

- The growth in the market is highly stable.
- The demand in the market has also increased over the years.
- The location of the country makes it attractive for diaper factory.

Opportunities

- Higher income segment of the market is not targeted in this project.
- By targeting all market segments, the sales can be increased.

Weakness

- The market size of the Qatar is not very large.
- The market is highly sensitive
- Consumers are not prepared to pay more for the enhancements made on the product.

Threats

- Conceivable nearby waste transfer controls later on may be a testing work. Be that as it may, it ought to be noticed that even at exceedingly created nations there is no any yet.
 - Ease dispensable diapers imported from nations that can create truly at low expenses.
-

Location Selection

It has been all around perceived that company site determination has critical vital ramifications for the activities to be found, because an area choice ordinarily will include long haul duty of assets and be irreversible in nature (Wyckham & Wedley, 2000; Dey, Helmes, White, & Zhou, 2014; Hallström, 2004). In particular, the area decision for an company site may significantly affect the association's key focused position as far as

working cost, conveyance speed execution, and company's adaptability to contend in the commercial center (Wyckham & Wedley, 2000; Rugman & Collinson, 2009; Christensen, Johnson, Turner, Christensen, & L.B., 2011).

One of the objectives of this examination is to settle on a choice for area determination for a child diaper generation speculation (Rugman & Collinson, 2009; Elzinga, 2006; Hallström, 2004). Numerous elements impact area choices. Notwithstanding, it frequently happens that one or a couple of components are important to the point that they overwhelm the choice (Bentley, Dittman, & Whitten, 2011; Golafshani, 2003; Golafshani, 2003; Christensen, Johnson, Turner, Christensen, & L.B., 2011). In this examination the most critical variables have been resolved and three site alternatives are recognized as new industrial area, um-alhoul, and al-karaana new industrial city as shown in Figure 5. The area of current child diaper makers in Qatar is newly established after two months of the blockade and it is in al-wakra city.

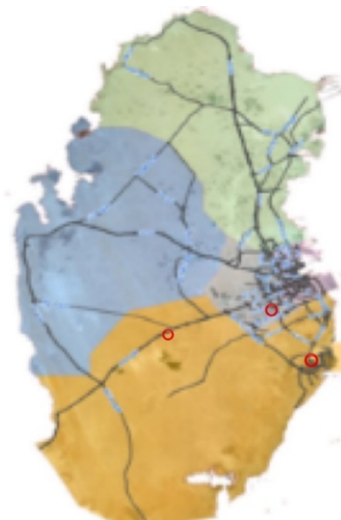


Figure 5: Map of Qatar with three best location for diaper factory

The period of assessment has been made by contributions from X trade company who have the vital experience and can assess factors and site options to the extent a modern area choice is concerned. The variables to be utilized for area choice issue have been resolved and the hierarchy tree has been shaped as needs be in Figure 6.

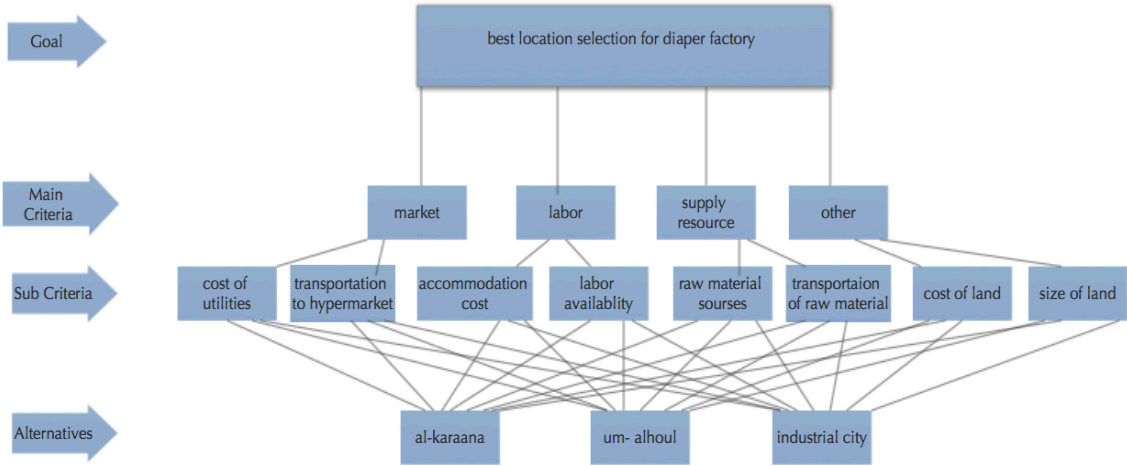


Figure 6: Hierarchy tree for location selection

By mulling over all above and to have a beginning stage of the investigation, three options for the site choice have been instinctively decided. These are Al-karaana new industrial city, Um- alhoul which is new city next to Hamad port, and industrial city which located in Doha. For this work, the three destinations have been thought to be the best three choices accessible. experts can weight criteria utilizing a procedure for creating needs and building accord using accessible AHP programing (e.g. Expert Choice) (Golafshani, 2003), but in this research, it will be done throw tables and excel sheet. The AHP show gives a structure to help choice suppliers in breaking down different area factors, assessing area site options, and making last area choices. The essential standard of the AHP demonstrate is to

coordinate chiefs' inclinations with area site qualities. Alternatives are then assessed and thought about under both quantitative and subjective elements to enable chiefs to consolidate administrative experience and judgment in the arrangement procedure.

To solve the problem, data have been collected from X trade company given below in Table 5 in 10 rating scales after studying all main factors in different cities. 10 is the best.

Table 5:

Data collected from X trade company

City	Market	Labor	Supply resource	Other
Al-Karaana	2	5	1	10
Um-alhoul	5	3	7	4
Industrial City	7	9	10	6

First, we should pairwise each main criteria with cities by interpolation, then normalizing all data as shown from Table 6 till Table 24

$$y_2 = \frac{(x_2 - x_1)(y_3 - y_1)}{(x_3 - x_1)} + y_1$$

Table 6:

Interpolated results of cities

City	Market	Labor	Supply resource	Other
Al-Karaana	1	3.667	1	9
Um-alhoul	5.8	1	6.333	1
Industrial City	9	9	9	3.667

Table 7:

Pairwise market

Market	Al-Karaana	Um-alhoul	Industrial City
Al-Karaana	1	1/5	1/7
Um-alhoul	5	1	1/3
Industrial City	7	3	1
Sum	13	21/5	31/21

Table 8:

Normalizing market

Market	Al-Karaana	Um-alhoul	Industrial City	Average
Al-Karaana	1/13	1/21	3/31	0.08
Um-alhoul	5/13	5/21	7/31	0.28
Industrial City	7/13	15/21	21/31	0.64
Sum	1	1	1	1

Table 9:

Pairwise labor

Labor	Al-Karaana	Um-alhoul	Industrial City
Al-Karaana	1	5	1/5
Um-alhoul	1/5	1	1/7
Industrial City	5	7	1
Sum	31/5	13	47/35

Table 10:

Normalizing labor

Labor	Al-Karaana	Um-alhoul	Industrial City	Average
Al-Karaana	5/31	5/31	7/47	0.23
Um-alhoul	1/31	1/13	5/47	0.07
Industrial City	25/31	7/13	35/47	0.70
Sum	1	1	1	1

Table 11:

Pairwise supply resource

Supply resource	Al-Karaana	Um-alhoul	Industrial City
Al-Karaana	1	1/7	1/9
Um-alhoul	7	1	1/3
Industrial City	9	3	1
Sum	17	29/7	13/9

Table 12:

Normalizing supply resource

Supply resource	Al-Karaana	Um-alhoul	Industrial City	Average
Al-Karaana	1/17	1/29	1/13	0.06
Um-alhoul	7/17	7/29	3/13	0.3
Industrial City	9/17	21/29	9/13	0.64
Sum	1	1	1	1

Table 13:

Pairwise other

Other	Al-Karaana	Um-alhoul	Industrial City
Al-Karaana	1	9	7
Um-alhoul	1/9	1	1/3
Industrial City	1/7	3	1
Sum	79/63	13	25/3

Table 14:

Normalizing other

Other	Al-Karaana	Um-alhoul	Industrial City	Average
Al-Karaana	63/79	9/13	21/25	0.77
Um-alhoul	7/79	1/13	1/25	0.08
Industrial City	9/79	3/13	3/25	0.15
Sum	1	1	1	1

Then pairwise all main criteria together but first consistency ratio should be calculated to make sure all parameter is below 10% and it shown in Figure 7 below.

Category	Priority	Rank
1 Market	57.7%	1
2 Labor	5.6%	4
3 Supply resource	19.3%	2
4 Other	17.4%	3

Number of comparisons = 6
Consistency Ratio CR = 9.5%

Figure 7: Consistency ratio for main criteria for location selection

Table 15:

Pairwise main criteria

Main criteria	Market	Labor	Supply resource	Other
Market	1	7	5	3
Labor	1/7	1	1/3	1/5
Supply resource	1/5	3	1	2
Other	1/3	5	1/2	1
Sum	176/105	16	41/6	31/5

Table 16:

Normalizing main criteria results

Main criteria	Market	Labor	Supply resource	Other	Average
Market	105/176	7/16	30/41	15/31	0.56
Labor	15/176	1/16	2/41	1/31	0.06
Supply resource	21/176	3/16	6/41	10/31	0.19
Other	35/176	5/16	3/41	5/31	0.19
Sum	1	1	1	1	1

Later, we pairwise sub criteria for each main criteria.

Table 17:

Pairwise market

Market	Cost of utilities	Transportation to hypermarket
Cost of utilities	1	1/7
Transportation to hypermarket	7	1
Sum	8	8/7

Table 18:

Normalizing market

Market	Cost of utilities	Transportation to hypermarket	Average
Cost of utilities	1/8	1/8	1/8
Transportation to hypermarket	7/8	7/8	7/8
Sum	1	1	1

Table 19:

Pairwise labor

Labor	Accommodation cost	Labor availability
Accommodation cost	1	1/5
Labor availability	5	1
Sum	6	6/5

Table 20:

Normalizing labor

Labor	Accommodation cost	Labor availability	Average
Accommodation cost	1/6	1/6	1/6
Labor availability	5/6	5/6	5/6
Sum	6	6/5	1

Table 21:

Pairwise supply resource

Supply resource	Raw material source	Transportation of raw material
Raw material source	1	9
Transportation of raw material	1/9	1
Sum	10/9	10

Table 22:

Normalizing supply resource

Supply resource	Raw material source	Transportation of raw material	Average
Raw material source	9/10	9/10	9/10
Transportation of raw material	1/10	1/10	1/10
Sum	1	1	1

Table 23:

Pairwise other

Other	Cost of land	Size of land
Cost of land	1	5
Size of land	1/5	1
Sum	6/5	6

Table 24:

Normalizing other

Other	Cost of land	Size of land	Average
Cost of land	5/6	5/6	5/6
Size of land	1/6	1/6	1/6
Sum	1	1	1

Table 25:

Shows all percentage in one table

Market 0.56		Labor 0.06		Supply resource 0.19		Other 0.19	
Cost of utilities	Transportation to hypermarket	Accommodation cost	Labor availability	Raw material source	Transportation of raw material	Cost of land	Size of land
0.07	0.49	0.01	0.05	0.17	0.02	0.16	0.03

Table 26:

Average ratio of cities

Average	Market	Labor	Supply resource	Other
Al-Karaana	0.08	0.23	0.06	0.77
Um-alhoul	0.28	0.07	0.3	0.08
Industrial City	0.64	0.70	0.64	0.15
Sum	1	1	1	1

Table 27:

Average ratio of criteria

	Market	Labor	Supply resource	Other
Average ratio	0.56	0.06	0.19	0.19

Table 28:

Final result of location selection

Location	Score
Al-Karaana	0.2163
Um-alhoul	0.2332
Industrial City	0.5505

As per the multi criteria, collective choice model shaped for area determination issue that has been tackled through (AHP), as shown in Table 28, the factory has been chosen to be situated at industrial city.

Technology Selection

To make the technical feasibility, it has been chosen to take no less than three hardware producers as reference. One has been chosen out of the three major players of the infant diaper hardware industry in Europe. One has been chosen to frame the greatest child diaper creation apparatus producer of China. Furthermore, the last one has been chosen from Turkey, as a neighborhood merchant.

Specialized details of technical specs and estimate price of the machines have been asked

for from these organizations and assessed. To build up the framework, every one of the three offers has been assembled and the attributes specified by every provider have been broke down. These incorporate how the computerization of the creation line is dealt with, the outline speed and the solid speed figures gave by every provider in Table 29 below.

Table 29:

Most critical specification

	Machine from Europe	Machine from China	Machine from Turkey
Design speed	450	350	400
Efficiency	95%	85%	90%
Product size	NB, S, M, L, XL, XXL	S, M, L, XL	NB, S, M, L, XL
Price	9,125,000	1,158,750	3,650,000

By interpolating the above table, results are shown below.

Table 30:

Interpolated results of machines

	Machine from Europe	Machine from China	Machine from Turkey
Design speed	9	1	5
Efficiency	9	1	5
Product size	9	1	5
Price	1	9	6.5

Then, for each criteria will be pairwise with the machine and normalize the results from Table 31 until Table 40.

Table 31:

Pairwise design speed

Design speed	Machine from Europe	Machine from China	Machine from Turkey
Machine from Europe	1	7	5
Machine from China	1/7	1	1/3
Machine from Turkey	1/5	3	1
Sum	47/35	11	19/3

Table 32:

Normalizing design speed

Design speed	Machine from Europe	Machine from China	Machine from Turkey	Average
Machine from Europe	35/47	7/11	15/19	0.72
Machine from China	5/47	1/11	1/19	0.09
Machine from Turkey	7/47	3/11	3/19	0.19
Sum	1	1	1	1

Table 33:

Pairwise efficiency

Efficiency	Machine from Europe	Machine from China	Machine from Turkey
Machine from Europe	1	7	5
Machine from China	1/7	1	1/3
Machine from Turkey	1/5	3	1
Sum	47/35	11	19/3

Table 34:

Normalizing efficiency

Efficiency	Machine from Europe	Machine from China	Machine from Turkey	Average
Machine from Europe	35/47	7/11	15/19	0.72
Machine from China	5/47	1/11	1/19	0.09
Machine from Turkey	7/47	3/11	3/19	0.19
Sum	1	1	1	1

Table 35:

Pairwise product size

Product size	Machine from Europe	Machine from China	Machine from Turkey
Machine from Europe	1	7	5
Machine from China	1/7	1	1/3
Machine from Turkey	1/5	3	1
Sum	47/35	11	19/3

Table 36:

Normalizing product size

Product size	Machine from Europe	Machine from China	Machine from Turkey	Average
Machine from Europe	35/47	7/11	15/19	0.72
Machine from China	5/47	1/11	1/19	0.09
Machine from Turkey	7/47	3/11	3/19	0.19

Table 37:

Pairwise price

Price	Machine from Europe	Machine from China	Machine from Turkey
Machine from Europe	1	1/9	1/5
Machine from China	9	1	5
Machine from Turkey	5	1/5	1
Sum	15	59/45	31/5

Table 38:

Normalizing price

Price	Machine from Europe	Machine from China	Machine from Turkey	Average
Machine from Europe	1/15	5/59	1/31	0.06
Machine from China	9/15	45/59	25/31	0.72
Machine from Turkey	5/15	9/59	5/31	0.22
Sum	1	1	1	1

The solution, which is the best of the decision maker himself as well as the concerned. Opting for the most beneficial decision is not an easy task because it demands the decision maker to weigh every radical involved and weigh accordingly (Triantaphyllou, 2000). However, it needs to be noted for any business in particular, that after planning certain actions and deciding what is needed by the company, the considered decision will only reduce the risk which indicates that a certain level of risk will always maintain its position in the decision and uncertainties can be changed according to changes in the respective climate of the operations (Hallström, 2004). After analyzing company X feedback, it is critical to check the consistency ratio of the choices. Therefore, cost of machine will get higher ratio, design speed is not necessary to be high because of the population in Qatar is not high like other country. Regarding the sizes it will be better to have multi sizes, so it will be second high ratio. Figure 8 below will demonstrate the consistency ratio.

Category	Priority	Rank
1 Design speed	3.9%	4
2 Efficiency	9.8%	3
3 Different sizes	21.4%	2
4 Cost of machine	64.8%	1

Number of comparisons = 6
Consistency Ratio CR = 9.4%

Figure 8: Consistency Ratio for different criteria for technology selection

Table 39:

Pairwise criteria

	Design speed	Efficiency	Different sizes	Cost of machine
Design speed	1	1/4	1/7	1/9
Efficiency	4	1	1/3	1/7
Different sizes	7	3	1	1/5
Cost of machine	9	7	5	1
Sum	21	45/4	136/21	458/315

Table 40:

Normalize criteria

	Design speed	Efficiency	Different sizes	Cost of machine	Average
Design speed	1/21	1/45	3/136	35/458	0.04
Efficiency	4/21	4/45	7/136	45/458	0.11
Different sizes	7/21	12/45	21/136	63/458	0.22
Cost of machine	9/21	28/45	105/136	315/458	0.63
Sum	1	1	1	1	1

Last step is to multiply the average of criteria with the average of machines.

Table 41:

Average results for machines

Average	Design speed	Efficiency	Product size	Price
Machine from Europe	0.72	0.72	0.72	0.06
Machine from China	0.09	0.09	0.09	0.72
Machine from Turkey	0.19	0.19	0.19	0.22
Sum	1	1	1	1

Table 42:

Average ratio of criteria

Average ratio	Design speed	Efficiency	Product size	Price
	0.04	0.11	0.22	0.63

Table 43:

Final result of technology selection

Machine	Score
Machine from Europe	0.3042
Machine from China	0.4869
Machine from Turkey	0.2089

From Table 43, it is clearly that the best choice is to have the machine from china. Below in Figure 9, picture of the system selected.

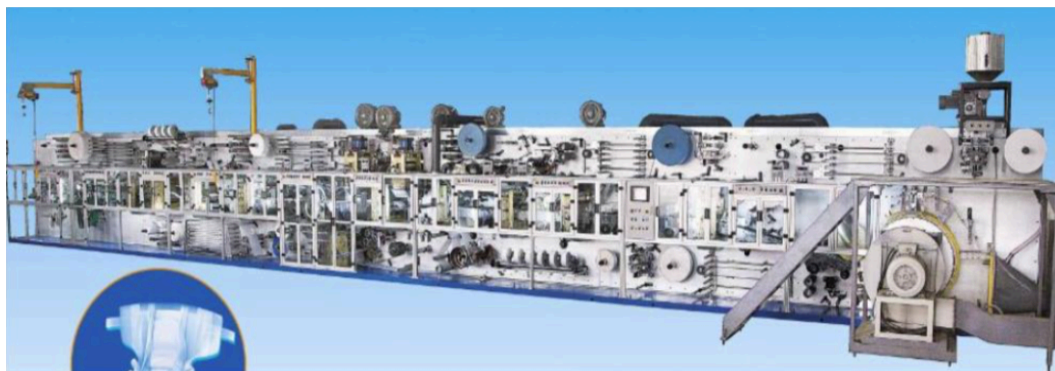


Figure 9: picture of selected machine

Costing of the Project

Costing of an infant diaper is a troublesome errand. Since there are a few factors and the projections made, may not fit to genuine conditions. It is the point of this area to make a cost computation as close as conceivable to genuine creation. To make counts, there ought to be a few suspicions made. To have the capacity to make a cost computation, the accompanying variables has been characterized: creation limit, work required to run the framework, first ventures costs, generation costs, cost of pressing material, transportation, acquiring and dealing with cost, cost of offers, advertising and advancement and other general costs.

A diaper comprises of a few materials that require a decent supply chain management (Golafshani, 2003). The segments of a diaper frame the primary material cost components. These cost components, their utilization per a medium-sized diaper and unit material cost

of a diaper has been figured. Notwithstanding the material cost, the diaper conveys other cost segments that structures the general cost of a diaper generation. To compute these qualities a situation creation limit has been distinguished. The diaper creation limit of the line chose is 350 diapers/minute (Salem Jr & Salem Jr Bernard Louis, 2009). Be that as it may, this is the most extreme yield of the machine characterized for little size diapers. Capital investment in the production facility as well as evaluating the core source of financing a project needs to be taken in account for future budgeting processes. Moreover, the company needs to evaluate various projections regarding sales, costs on each activity and operations, human resource capital and their management. Lastly, the core advantages acquired by funding the project (Dey P. , 2001).

The figuring is made on this examination depend on a medium size item that has medium many-sided quality. The limit with regards to this item extends 250 to 400 diapers for every minute. For estimation purposes, this esteem has been taken as 250 diapers for each minute. Working hours every day is 10 hours by one shift running. However, successful running of the line every day has been taken as 8 hours given the way that the machine needs to stop for set-ups, estimate changes, cleaning, crude material nourishing, move changes, support, and comparative purposes. At the point when estimation is made by these figures, the line comes to around 3 million diapers for every month.

With respect to the worker cost, the investigations made demonstrate that for a smooth activity; 30 to 40 labors should be considered. The normal aggregate cost of faculty to an organization has been taken as 3500QR. This leads around 122,500QR/month.

First investment price keeping a balance between the demand and supply is one of the most critical steps of bringing a product into the market (Dey P. , 2001). The company will have

to evaluate the past prices and strategies devised by the competitors and the industry leaders as a whole. In order to devise the right price, the company needs to conduct a survey regarding the expectations of the buyers as well as of the potential prospects and has already done through X trade company and results are given in Table 44 below.

Table 44:

First investment cost

Investment elements	Investment value	Ratio
Cost of buildings	1,675,000	34%
Cost of equipment and machinery	1,934,625	40%
Cost of cars	560,000	12%
Cost of hardware	89,300	2%
Cost of furniture	72,000	2%
Cash reserve 10%	433,093	10%
Total fixed assets	4,764,018	100%

Table 45:

Project needs for human resource and wages

Statement	Monthly salary	Number of worker	Monthly salaries
Executive manager	15,000	1	15,000
Production manager	12,000	1	12,000
Sales representatives	5,000	2	10,000
Accountant	5,000	1	5,000
Administrative employee	5,000	2	10,000
Production engineer	7,500	1	7,500
Production technician	3,500	2	7,000
Worker	2,000	20	40,000
Driver	2,000	4	8,000
Total		34	114,500

Table 46:

Cost estimated for a diaper

Statement	Monthly cost	QR/diaper
Salaries and wages	114,500	
Marketing expenses	10,000	
Administrative expenses	22,000	
Asset insurance costs	3,512	
Land rent	7,500	
Utilities costs	12,000	
Maintenance costs	13,858	
Raw material costs (0.22QR/diaper)	660,000	
Total 3,000,000 diaper/month	843,370	0.28112 QR/diaper

Financial Analysis

In this section, some technique will be used to have better idea about how much profit will be if we consider starting the project.

Break Even Analysis

To have the capacity to make a breakeven analysis; the fixed cost and variable working expenses must be recognized. fixed expenses are the costs that stay steady paying little heed to the quantity of offers. Variable costs change contingent on the volume of creation and deals. Breakeven is figured by fixed costs including deterioration separated by the distinction between cost per unit and variable expenses per unit.

$$\text{total cost} = \text{fixed cost} + (\text{variable cost} * \text{volume})$$

Total cost = 843,370

Fixed cost = 183,370

Variable cost = 0.22 (each single diaper will cost 0.22 QR of raw material).

At the point when computed by the presumptions made, the company needs to deliver 3 million diapers every month to have the capacity to cover its costs if I will sell it with the same price of production. To add some profit, selling 1 diaper will cost 0.36667QR

A three-year projection

Notwithstanding the suppositions made for the computation of variable and fixed cost; there will be a start-up period of the business both as far as production and furthermore promoting. With the goal that the limit will generally be littler before all else and it will increment logically. Subsequently, a normal month to month offer of 60% of production for the primary year; 70% for the second year and 80% for the third year has been anticipated as shown in Table 47.

Table 47:

Predictable Operations cost and income yearly

	First year	Second year	Third year
Operational power	60%	70%	80%
Raw material cost	4,752,000	5,544,000	6,336,000
Salaries and wages	1,374,000	1,442,700	1,514,835
Marketing expenses	120,000	120,000	120,000
rents	90,000	90,000	90,000
Maintenance cost	166,296	166,296	166,296
Utilities cost	144,000	144,000	144,000
Administrative expenses	264,000	264,000	264,000
Diaper sold per year	21,600,000	25,200,000	28,800,000
Diaper price per piece	0.36667	0.36667	0.36667
Total income	7,920,072	9,240,084	10,560,096
Total cost of operating	6,910,296	7,770,996	8,635,131
Net profit	1,009,776	1,469,088	1,924,965

Payback Analysis

Payback analysis will demonstrate how long it will take the factory to pay for itself. First investment cost has been calculated with 4,764,018 QR. Table 48 below shows the results. The reason of being more than three years because of operational power is not considered to be operated 100% during the first 4 years.

Table 48:

Payback period

	4,764,018	Initial Cost
Payback Analysis	3	Years
	38	months

Sensitivity analysis:

To quantify the effect of progress of profit with the change on deals cost and additionally generation and deals limit, a sensitivity analysis has been performed. For deals value; the net salary has been recalculated at a cost sold 10% less in cost and 10% more in cost. As a comparative way, the generation and deals limit has been diminished 10% and net pay has been computed. Additionally, it has been tried how the pay figures would change if the organization would discover more business and deliver 10% a greater number of diapers every year than the anticipated deals figures shows in Table 49 and Table 50 that 10% of changing in price of the diaper of in the production size of the factory will result in positive revenue.

Table 49:

Sales and production capacity with 10% change

		Year 1	Year 2	Year 3
Sales price	Sales price by year	0.36667	0.36667	0.36667
	10% more	0.40337	0.40337	0.40337
	10% less	0.33	0.33	0.33
Production size	Production size	21,600,000	25,200,000	28,800,000
	10% more	23,760,000	27,720,000	31,680,000
	10% less	19,440,000	22,680,000	25,920,000

Table 50:

Applied sensitivity analysis

Sensitivity analysis		Net profit		
		First year	Second year	Third year
Sales price		1,009,776	1,469,088	1,924,965
Predictable profit				
Sales price	10% more	1,802,496	2,393,928	2,981,925
Predictable profit	10% less	217,704	545,004	868,869
Sales price				
Sales price	10% more	1,326,583.2	1,838,696.4	2,347,347.6
Production size	10% less	692,968.8	1,099,479.6	1,502,555.4

CHAPTER 5: CONCLUSION

Referring to the increasing population across the world, the diaper industry has been reluctant to follow the trends and increase the feasibility of the core product. Since diapers are in expansive as well as fall in the preference products, which makes it near to being inelastic with respect to the price, the price of the product has relatively minor impact on the demand of the product. Such products are most likely to have calculated buyers, which makes it relatively easier for the new entrants of the industry to measure the potential growth of the industry before entering into the market.

Another factor that leads to the growth in the diaper industry is the delayed toilet training provided to the kids and children. However, past research and studies show that delayed toilet training is the result of companies producing hyper thin and comfortable diapers, which gives the wearers a hard time getting rid of them. Moreover, the increasing feasibilities and escalating trends in the online shopping has led the parents to procrastinating the trouble of toilet training to their kids. All these factors are subconsciously contributing to the success rate of the diaper industry and the reasons to the growing sales of diaper products. Furthermore, the new entrants consider the growth in this particular industry because if communicated efficiently and effectively, diaper products are not the one to become obsolete; there will always be comeback in the industry. Feasibility studies using analytical hierarchy process has given an advantage of bringing sustainable yet smooth operations in any company. Successful organizations and initiatives consider feasibility analysis an extremely effective and important in making impactful decisions. Further classifying the feasibility studies, analytical hierarchy process has been proven to be one of the most effective methods in executive a decision-making process. The

analytical hierarchy process allows the researchers to consider every aspect of a business: financial, operational, buyers and human capital. Since AHP is a hierarchical approach, it allows the decision makers to categorize the needs required to prioritize before creating sub-variables in each category. AHP takes the research beyond sales and profit budgets; instead, it takes a holistic view of the project by integrating qualitative as well as quantitative devices and tools. The technique to conducting an Analytical Hierarchy Process is free of complications; however, the process follows a rigid and inflexible format. Different methods and techniques have been used in the study in order to determine the feasibility of starting a diaper factory in Doha, Qatar. It has been observed that the proposed factory in Qatar will be feasible and profitable.

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