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Forecasting: An Engineer's Perspective

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Abstract:
In this modern era of rapid industrialisation overwhelming with the brisk pace of technological growth, precise estimation of demand is necessary to meet the varying requirements of the customers for every seller. In order to better, its product at its sublime level and keeping in mind to satisfy the customer in all aspects, forecasting plays a crucial role. There happens to be a cutthroat competition where each individual tries to better its product just to make a profit out of it. The sale of a product is affected by the weather, political events, region, seasonality, marketing skills, inventory and other factors. Poor forecasting can lead to disastrous decisions and can affect the financial, budgeting and production part of a company. Depending upon the scenario i.e. the data bank, forecasting is done before further planning. For a company to be well aware and cautious of any future worst-case scenario, forecasting is given the top most priority Thus in this thesis the subject matter is to comprehend "what are the important considerations for forecasting". There are a number of forecasting methods but only some of them can be accurate up to the desired level. Thus, in this thesis the subject matter is to check the desired method which is required to estimate or forecast the required inventory in the future of Soft Drinks in a food joint defining the budget and inventory that would be required .This will be valuable for the students, the store owner and the investors to envisage their profit scenario in their business. The forecasting methods can be analysed and checked upon which is the most accurate .Therefore, the aim of the study is to study the trend of the sales and accordingly forecast the sales ahead which is to be met by demand. This analysis was carried out in a selected food joint i.e. KIIT FOOD COURT located in KIIT UNIVERSITY

Keywords: Forecast, Methods of Forecast, Measuring Accuracy of Forecast

I. INTRODUCTION

Forecasting can be described as a method of prediction, a method which is widely used in any field be it Cricket, Business, Weather, Stock Market, hydrology etc. It is not just a random prediction process rather a more calculated analysis sort of prediction based on the past events and the experiments .No one can remember from how long the forecasting method is being used. The key factors of forecasting are risk and uncertainty. Therefore, in case you are looking to predict or forecast something, you need to have your data: systematic and accurate.

Nowadays, we try to predict the rate of success in marriages, investments and occupations .Forecasting is not just about generating numbers .It is more than that. We need to know the benefits of using them, the users of forecast, the people participating in forecasting process, the better forecasting process, which process would give a much higher success rate.

We have always wanted to predict the future. It was long back when Sadhus used to predict future seeing the palm of a person but the forecasting method we use today is kind of integral part .It begins the planning process of any business. Now the objective is to reduce the risk in decision-making. Forecasts form the key factor in production planning, inventory planning, manpower planning, financial planning, budget and marketing and of course research .Forecasting has been divided into quantitative and qualitative methods. If historical data and times are available, then we can quantitative methods are equipped else Qualitative methods are the only option. This process is based on some assumptions by collecting data that is time-invariant and stationary, by analysing the consequences of the actual from the predicted ones, selecting the best model for forecasting. In this age, new methods are being used with near to cent percent predictability rate, which varies with the scenario.

"What men have seen they know; but what shall come hereafter No man before the event can see, nor what ends for him."

-Sophocles.

II. BACKGROUND

Forecasting can be defined as determination of the future trends using the historic data. Companies use forecasting to determine their sales expectation. Stock analysts can use forecasting to extrapolate the trends in GDP or unemployment and to find how it may vary over time. It is also used by statisticians in cases, which require forecasting, such as data may be collected for the impact of business hour on customer satisfaction. There are two type of forecasting model Qualitative model and Quantitative model. Quantitative method contains Executive Opinions, Delphi Method etc. whereas Qualitative method contains Naïve method, Moving Average method, Exponential Smoothing etc.[1]

III. FORECASTING

Forecasting can be viewed as a tool that helps the management in its endeavour to cope with uncertainty of the future, which is mainly relying on the facts and the figures and strategizing a

perfect way based on calculation for taking risk .The success of the organisation depends upon its capability to foresee the future and deal with upcoming scenarios.

"Business more than any other occupation, is a continual dealing with the future; it is continual calculation, an instinctive exercise in foresight"

-Henry R.Luce

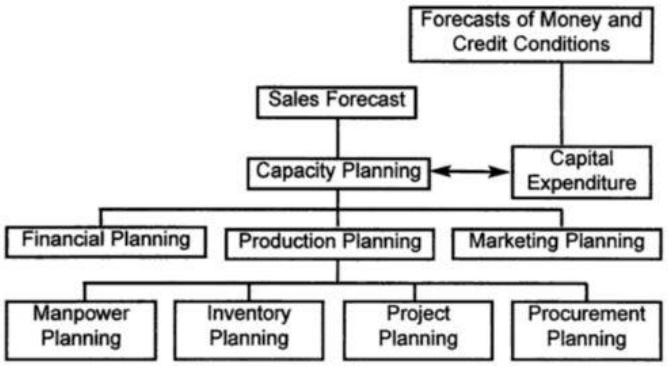
Forecasting dates long back .The sadhus could predict the future by looking at the palm of a person. Casting aside these facts, the man's view on uncertainty drastically changed over the period of time. It follows an evolutionary path, which basically began with the Ancient Greeks who believed that it was not man who could predict the future but God himself could alter and control it. What really changed the views of the people was the age of Renaissance: age of knowledge .When people started seeing the events, they started questioning and soon analysing the situation and as a result, these uncertainty and probabilistic events could be deciphered easily. In the latter part of 1900s,the soon introduced "Nash Equilibrium:game theory" could help people realise that it depends upon the people the control a certain part of the future.Therefore, if you are a rational person, you could predict the future.And then,the forecasting methods have just evolved in a better way, with each way more accurate than the previous one.

Subsequent years saw the advancement of forecasting with the coming up of exponential smoothening methods developed by the industry practitioner, Robert G. Brown. This method still live now and is based on by many software for prediction purposes.Be how complex may the event be, several methods have been devised to describe the probabilistic demand of the market.Some of them are weighted moving averages,moving averages etc. and the more delicate ones like Fourierseries, which account for seasonal variations.

In this age of growing consumerism, the job of forecasting has become more difficult .Thus, the industry forecasters could no longer make random predictions but have to analyse the case. Investors started marketing and bringing out new schemes for the promotion of the product .Business planning has become a tedious process .Technology is and will be helping in keeping us at par with the growing complexity .Earlier, simple computer systems were used for tabulating and keeping the records of the forecast which utilised less computer space. Today, on the other hand commercial software applications are being used to revise, estimate, plan and forecast the future of the company.

Forecasting aims at reduction in risk planning .Ranges from capacity planning, inventory planning, manpower planning, planning for sales, market share, financial planning, budgeting and research and development planning.[2]

Marketing managers use forecasting to determine sales, setting up of goals, promotions and advertisements.



Why do we need Forecast?

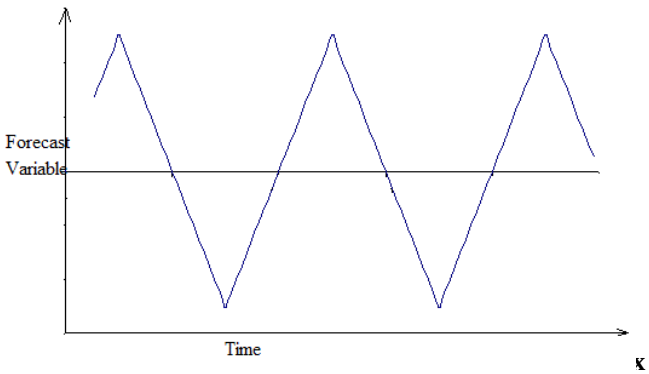
Based on this, financial dept. must ensure cash inflow and outflow, the budget, expenses and revenues. Future economic activity must be predicted and for increasing the efficiency. The finance section must also look into the capital structure and credit condition.Foreign exchange rates are also a matter to be looked into. Labour dept. also capitalises on hiring, planning, training and for this certain benefits are also awarded which are better as compared to others in the market.

Medical hospitals also forecast the healthcare needs of community. It depends upon the population in the various age group and it also depends upon various medical urgencies. Universities forecast students admissions, operation cost and funds for tuition. Banks also forecast demands, deposits and loans.[2]

i. Patterns of forecasting[5]

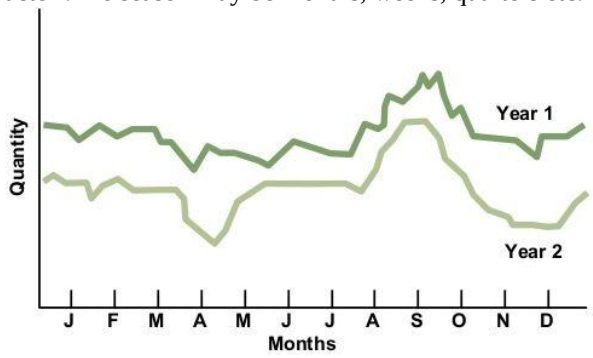
Demand Patterns: Forecasting is done by following the pattern of event in the past. Pattern can be seen as a function of time. This kind of pattern can directly be observed from historical data. Another relationship exist between two or more variables. Some of them are:

- **Historical Pattern (Stationary Pattern):** This kind of pattern exists when mean does not change over time. Product with stable sales are some examples.



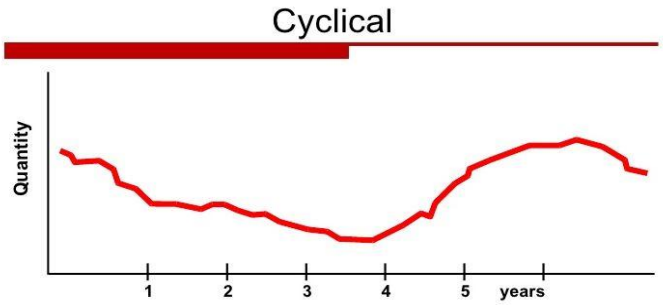
Stationary Pattern

- **Seasonal Demand Pattern:** This demand pattern exists when the series fluctuates according to some seasonal factor .The season may be months, weeks, quarters etc.



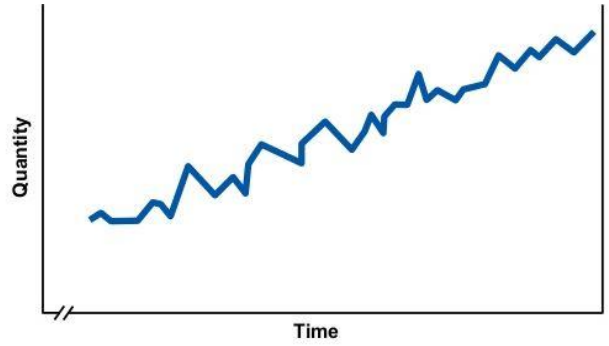
Seasonal Demand Pattern
(Data consistently shows peaks and valleys)

- **Cyclical Pattern:** In this type of pattern, the length of a single cycle is longer than a year .The cycle does not repeat at constant intervals of time. Some of the examples are prices of metals, gross domestic product etc.



(Cyclical Pattern of data showing gradual increase and decrease over extended periods)

- **Trend Pattern:** This type of pattern exists when there is and increase or decrease in the value of variable over time. Examples are sales of many products, stock prices, business and economic indicators.



Trend Pattern

iii. Types of Forecasts

Forecasts methods maybe classified into several categories when it depends upon the objective and situations .Some of them are:

a. Sales Forecast: This kind of forecast gives the expected level of products for future period. It helps in budgeting and planning functions for the company.

b. Financial Forecasts: Sales forecast acts as an input to financial decisions. This includes forecasts for cash flows, budget, inventory, capital structure.

c. Economic Forecasts :Normally undertaken by private and government forecasting firms .A company can utilise these predictions to reach to another set of predictions like how the market would be influencing the demand of its resources. They cover several areas like GDP, employment rates, interest rates and foreign exchange rates.

d. Technological Forecasts: Giving an overview of progress of science .Experts need to know what kind of technology would be ideal for solving the problem of the masses .As a result, a certain product can be prepared which may or may not appeal to the customers and depending upon that the sales of the product would happen. It may or may not give competition to other rival markets.

iv. Basis of selection of a Forecasting Method:

While selecting a particular method of forecasting, we need to evaluate various conditions but it is mostly affected by the life cycle of the product. The company, which will be making an investment, does a survey regarding the product. In the introduction phase, decisions taken are quick and expenditure is high; a high level of accuracy is needed .After the product enters into a product maturity stage, decisions are routine which involves marketing and manufacturing. So, for selecting a forecasting method various elements are taken into consideration .The option of picking up a forecasting technique are as follows:

- The cost of developing a forecasting model i.e. Will the cost be finally be paying off resulting from the profit by using this model?
- The complexity of the trend of sales of the product.
- Whether the forecast taken into consideration is supposed to be a short term or a long-term purpose.
- Level of accuracy desired.
- Expected level of range of error.
- Sort of the data available. Techniques may vary with the types of the data available

v. Assumptions of Forecasting:[3]

Each scenario requires a particular technique to be adopted and forecasting have some assumptions of their own.

- The methods that are to be used have to be based on the historical data i.e. the trend that is followed in the past should remain the same in the future.
- Forecasts are not always perfect. Therefore, allowances should be kept beforehand i.e. safety stock should be kept an option.
- With the increasing amount of time, the level of accuracy of forecasts decreases. It happens, as the level of

uncertainness a long-term forecast holds is more than that of a short-term forecast.

- Forecasting the sales of group items seems to more accurate than that of individual items, since errors of forecasting in a group cancels out each other.

vi. Process of Forecast

- Determining what and Why of the process of forecast required and the level of accuracy desired.
- Setting up a time horizon, be it short term or long term.
- Selecting a forecasting method.
- Survey and collection of data.
- Identifying the assumptions made for this forecast.
- Then, analysing the forecast and predicting and checking to see if the predicted results matches the actual results. Developing an evaluation system.

vii. Qualitative vs. Quantitative Approach:[4]

a. Qualitative Approach: This judgemental approach is a useful tool in short-term forecast .It employs the opinions of experts for predictions. This kind of approach is elemental in scenarios where historical data is not available. Some of the methods used in this process are Delhi Method, market research, Executive opinions, Sales force polling and PERT derived techniques .Elaborating them :

i. Executive Opinions: In this kind of approach, the estimated data of sales, purchase, marketing, production and finance are averaged to forecast about the future sales. This method is used in concurrence with a quantitative method such as trend extrapolation .The management team modify the data according to their own expectations. This type of method has an advantage i.e. forecasting is done quickly without any elaborate statistics. In the absence of past data, the members of the executive opinions are the only feasible and reliable source of information. Some of the disadvantages may be that the members may be swayed away by outside opinions; an Imperfect leadership of the group could lead to a biased decision, which may be different from the actual forecast.

ii. Delphi Method: Delphi is a method in which a panel consisting of experts are individually questioned about their perceptions of future occurrences. As the group does not meet, so the possibility of being swayed away by someone else's opinion can be struck off. Instead, the forecasts and outside arguments related to the questionnaire are returned separately to experts followed by bunch of more number of questions. This is a process that continues until the group reaches a agreeable consensus .This kind of method is useful for long range forecasting. There is no committee or debate .Other's opinions do not influence. The main disadvantage is low reliability and lack of consensus.

iii. Sales Force Polling: Some companies use sales people as a means of forecast as they have direct contact with the customers. It is believed that the sale person have insights into the future market. The sales force polling can then be averaged to develop a future forecast. The advantages being ,it is simple to use and understand, it uses the specialized knowledge of those who are close to it, placing the responsibility in hands of those who affect the actual results, the information can easily be obtained by territory ,product ,customer or salesperson. Disadvantages being the sale person being over-optimistic and inaccuracies due to broader economic events which are larger beyond control.

iv. Consumer Surveys : Some companies conduct their own market surveys of consumer purchasing plans. These may consist of telephone contacts, personal interviews and questionnaire .Statistic analysis is used to survey results in order to test hypothesis generated regarding consumer behaviour.

v. PERT-Derived Forecasts: Program evaluation and review technique has been an important tool in producing estimates based on executive opinions and Surveys .This kind of methodology needs the experts to give three sort of opinions 1).pessimistic 2).most likely 3).optimistic . Now these estimates combine to form a single estimated value:

EV=(a+4m+b)/6

with a standard deviation (σ) of

$\sigma = (b-a)/6$

where EV= expected (mean) value of the forecast

σ = standard deviation of the forecast

It is often easier to ask a more realistic range of values to an expert rather than a specific forecast value. This method uses dispersion method that makes it possible to develop probabilistic statements .In the above examples

a. Quantitative Methods: These methods are used when historical data on the variables are available to use .It works as long as there is no or little change in environment .These are applied to short or intermediate range decisions. They are of various categories-

- **Forecasts based on Historical data:**

1. Naive Methods: These are the most cost-effective methods of forecasting model. This provides a benchmark for comparing other models.By using time series method for naive methods, forecasts would be obtained equal to the last observed value. This is a favoured method for economic and financial time series which often have patterns that are difficult to predict.Now, if the naive approach has seasonality then seasonal approach is appreciated.It can also use a drift which would allow the last observation taken plus the average change from the first to last observation. In time series notation:

$$\hat{y}_{T+h|T} = y_T$$

2. Moving Averages: It takes the unweighted means of previous n data.It ensures the variations in the mean is aligned with the variation in the data rather than being shifted in time.The period selected depends upon the type of movement of interest, such as long, short and intermediate.One feature of simple moving average is that if the data have periodic fluctuation,then applying this process will eliminate the variation. A major drawback of simple moving average is that results may not be smooth.

$$MA_n = \frac{\sum_{i=1}^{n} D_i}{n}$$

Where,

n = number of periods in the moving average
D_i = demand in period i

Weighted moving average is an average which has multiplying factors to give different weights to data at different positions .One of the application is removal of pixelisation from a digital graphical image

$$M = \frac{\sum_{t=1}^{n} W_t * V_t}{\sum_{t=1}^{n} W_t}$$

M = Average value
V = Actual value
W = Weighting factor
n = Number of periods in the weighting group

3. **ExponentialSmoothening:** This is a popular technique among all financial managers for short run forecasting .This technique uses a weighted average of all the past data as the basis of forecast. This process gives greatest weight to the more recent information and less weight to data of the past. Reason for this is that the predicted results will mainly affected by the recent data than the past observations. The method is effective when there is randomness and no seasonal fluctuations. One of the disadvantages of it is that, it does not take into account economic or industrial factors such as market conditions, prices etc.

$Y^{NEW}=\alpha Y^{OLD}+(1-\alpha)Y^{1OLD}$

where

Y^{NEW}=Exponentially smoothed average to be forecast

Y^{OLD} = Most recent actual data

Y^{1OLD} =Most recent smoothed forecast

α=Smoothing constant

4. **Trend Estimation:** It is a technique used to help in data interpretation. When the measurement in series are treated as time series, statements can be justified and used for tendencies in the data through relating time measurement if they occur.

5. **GrowthCurves:** These are the empirical models of the way quantity over time evolves. Curves of growth are widely used in quantities of biology such as population size, density, demography and population growth .

6.**KalmanFiltering: This** liner quadratic estimation is an algorithm that uses measurements in a series that have been observed to occur over time, containing inaccuracies such as noise and producing unknown variable estimates.

- **Casual Forecasts: These** kind of forecasts are based on perceived relationships between the factor to be forecast and other external forecasts. These take account of regular seasonal variations. They do not use strict algorithms rather the judgement of the forecaster .The past account of relationship between the variables are taken into consideration. Some types of it are :

1. Simple Linear Regression: This is a kind of statistical method, which allows us to summarize and calculate the relationship between two continuous variables. One variable, denoted by x, is the predictor or independent variable while the other variable, denoted by y, is the response or dependent variable. It gets the term simple as it is concerned with the study of a single variable. When the data points are drawn on a single piece of paper, it forms a single straight line. It looks into finding the best fitting line passing through the points. This line would be called a regression line and the vertical lines drawn from the points to regression line represents the errors of prediction. The assumptions taken here are: Both the dependent and the independent variables are to be measured at interval level, errors in prediction of Y are distributed such that it approaches the normal curve, errors in prediction of Y are all independent of each other and distribution of errors in prediction of Y is constant regardless of X.

2.**Multiple Regression** : Now what would be our approach given that, there are number of independent variables, this is where this technique comes in handy .It is a statistical tool that is used to examine the relationship between the independent variables and the dependent variable. When you have more than one independent variable you can make a more accurate prediction about the dependent variable. It enables us to study the individual of the variables on the output.
In general the equation of Y on X_1, X2...Xk is given by:

$Y=b_0+b_1X_1+b_2X_2.....b_kX_k$

Here b_0 is the intercept and b1, b2,.....b_k are analogous to the slope in regression equation and are also called regression coefficients. The coefficient of determination (R2) always lies between 0 and 1.Some of the assumptions of this process are: it assumes that the data are linear and the nonexistence of multi-collinearity and also normality. If the dependent variable is dichotomous then logistic regression should be employed.

3. **Econometric models:** These are statistical models used in econometric. It helps in forecasting future developments in economy. This specifies the relationship of the different quantities under a certain economic idea .The quantities analysed are taken up as random variables. This model helps in tracking the behaviour of economy in particular, the trend income, product, consumptions, investment, interest rate etc.An economic model generally consists of set of equations describing the behaviour (derived from the economic model that has two parts observed variables and disturbances), statement about errors in the observed value of variables, a specification of probability of distribution of disturbances

- **Forecasts based on consumer behaviour (Markov Approach):**It is model in which is used to model randomly changing systems where it is to be assumed that the future

states depends on the present state and not on the set of sequences of events that preceded it. It utilises certain actions which visions to maximise the utility in view of desired results.

- **Indirect methods:** [5]Thistype of method describes the flow from one sector of economy to another and thus predict the input required to produce output in another sector.

1. Market Surveys : Markey surveys can be a daunting tasks and so various focus groups are employed to collect the data be it previous sale data in a geographical region depending upon which demands are seen and market is moved to customer friendly place to boost customers and sales. It helps in anticipating market forces the big leagues in the market and how they would be affecting the demands and sales. It helps in predicting the market and big changes that are about to take place.

2. **Input-Output Analysis:** It is a set of related methods which shows how the parts of a system are affected provided the change in another part of a system .They show how industries linked together through supplying units for the output of an economy. It provides for individual branches of economy's estimates of production .In addition to direct requirements the direct requirements can also be evaluated. As the model is liner in nature, it lends itself to rapid computation as well as flexibility in the effects of change in demand.

IV. MEASURING ACCURACY OF FORECAST[5]

People often do a lot of mathematical errors while forecasting .It can affect the desired results .It can so happen that the yield might be lot more different than the expected one .These are the mathematical errors. Therefore, to measure the forecasting accuracy, some of the methods are:

- **Cumulative Forecast Error (CFE) or Running Sum Forecast Error (RSFE):** This is a technique, which measure any bias in the forecasting process.

$$\mathrm{CFE} = \sum(\text{actual} - \text{forecast})$$

- **Mean Forecast Error or BIAS :**This is a technique to measure the total error in a forecast with regard to sign

$$MFE = \frac{\sum_{t=1}^{N}(A_t - F_t)}{N}$$

- **Mean Absolute Deviation (MAD):** This is a technique to measure the total error in a forecast without regard to the sign.

$$\mathrm{MAD} = \frac{\sum|\text{actual} - \text{forecast}|}{\mathrm{n}}$$

It can be the most useful when linked to revenue, APS some independent measure of value. It can measure which high value forecasts are causing high rate errors.

- **Mean Square Error (MSE)**: It penalises larger errors. It measures the average of the squared errors or deviations i.e. difference between the estimated and the estimator. The difference occurs because of randomness or because the estimator does not account for information that could produce a more accurate estimate .These error may be smoothed out by inventory or overtime work.

$$\mathrm{MSE} = \frac{\sum(\text{actual} - \text{forecast})^2}{\mathrm{n}}$$

- **Tracking Signal:** In statistics or management sciences, it measure if the model is working. It monitors any forecasts that have been made in comparison with the actual and warns if there is any anomaly or unexpected departure of the outcomes of forecasts. It is most often used when the validity of the model might be in jeopardy.

- **Mean Absolute Percentage Error (MAPE):** Mean Absolute Percentage error (MAPE) is the mean of the percent deviations of the forecast demands from the actual demands.

$$MAPE = \frac{100}{n}\sum_{t=1}^{n}\frac{|y_t - \hat{y}_t|}{|y_t|}$$

V. EXPERIMENTATION

a. Understanding the Market[5]

KIIT Food court has been a solution to students to help them of the pathetic food and place to hang out and place for the meetings, a place for birthday celebration etc. KIIT university home to around 30000 students and numerous Teachers nearby. The active and vibrant nature of the FOOD Court makes it a perfect capable market to sell the necessary product. Since there are so many students studying here, Chances are that profits will increase and in summer, profits will skyrocket.

b. Business Model Canvas

A business model illustrates how an organisation creates, delivers and captures value. Business model canvas is a strategic management template for developing new business models or provide a solution to existing business models .It is described by nine elements:

- **Customer Segments:** An effective business model must try to understand its customers. The age group it is catering to .It must understand the market.

- **Value Propositions:** A business seeks to solve the customer's problems and satisfy needs and problems with the required product.

- **Channels:** Value propositionsare delivered to customers through channels. Fast and efficient means of communication, distribution and sales makes an effective channel.
- **Customer Relationship:** Certain relationships must be established between the customers segments in order for a

company to survive. Relationships may vary from personal assistance to automation.

- **Revenue Stream:** Revenue is generated when value propositions are effectively communicated to the customer segments.

- **Key Resources: The** assets that are required to fulfil the value propositions.

- **Key Activities: These** are the most important activities in fulfilling the value proportion.

- **Key Partnerships: To**optimise costs and reduce risk, work may have to be outsourced so the company can focus on its key activities. Strategic alliance may be made to improve standing.

- **Cost structure: Knowing** whether the company is cost driven or value driven and identifying the fixed and variable costs.

c. Supply Chain

Supply Chains are the connections of organisations, people, technology, information and activities and that aim to process products and sell those products to end-consumers .Supply chains include suppliers, producers, customers and end-consumers but also transporters, warehouses and retailers depending on the specific supply chain configuration. In order to ensure materials, information and financial flows between supply chain partners, supply chains must be dynamic and flexible, built on cooperation, coordination, control and trust.

Supply Chain Design is a process to build supply chains consisting of:

- Choice of supply chain partners.
- Identification of customer segments.
- Location of production and distribution facilities.
- Identification of facility capacity and transportation means.

Supply chain partners achieve competitiveness and customer service through enacting supply chain activities such as managing relationships, defining supply chain leadership and advanced planning. In the food industry, large distribution companies do much of this work.

d. Barriers to Products

Challenges arises when people opt for natural fruit juice, season change and other drinks rather than soft drinks. As soft drinks cater younger to older generation, they need to cater to people on a regular and more regular basis. Some of the barriers are increased logistical burden on the company, unpredictability of the availability of the product and other market conditions.

e. Location of Distributors

In choosing a location, decision must be requirement driven .Thus an optimum location should be selected to satisfy those who are concerned about the sale of the product. For choosing the location of the distributor, the important factors are market size, accessibility and growth potential of the region, geographicallocation, transport facilities and modern logistic services.

f. Cost Analysis

Performing a cost analysis before opening up a food joint or aneating-place will give insight into whether setting up a business will be successful. To purchase a place and setting up according to the requirement depending upon size, style and location will cost a lot of money. The number of employees will also act as a factor in getting the sales up .Inventory costs are based off a percentage of annual revenue .They can cost from 25% to 40 % of the revenue. If it can generate profit then it is known to be doing well or profit. Much of the predicted cost and sales will help in estimation .The price that is to be charged is much likely based on the price of one individual item.

g. Forecasting the Future

Based on the recent facts and figures, the representatives can draw an estimate of the sales and inventory required for future .It will help them in production planning ,inventory planning, budget planning, financial planning and strategy planning .This would help them in the way that, they would be prepared well ahead of whatever the circumstances they may be. They can analyse the budget, rectify the mistakes and come up with new schemes that can help them in boosting the profit.

h. DESIGN OF EXPERIMENT

The design of this experiment is broken into:

1. Business Plan
2. Location Analysis
3. Selection of Product
4. Data Collection and Calculation

Business Plan

Elements of a Business Plan:

i. Business Concept :-

- Describe what your business does in general terms.
- Include your mission or vision statement
- Describe what differentiates your business from others. This is important to the reader, as they want to know how your business will be able to create new customers. What do you offer that will take customers away from competitors?

ii. Goals and Objectives :-

State your sales, production and profit goals. Be specific in amount and timeline.

iii. Products and Services :-

a. Purpose: The purpose of the product/service section is to detail exactly what your business does for the customer and what makes these offerings desirable.

b. Product Oriented Businesses:

- Describe each product you sell. The combination of products is your product mix.
- If you cannot list each product, break the business down into logical categories.
- Describe the key product features, and how your products are different from those of your competition. (Functionality, durability, ease of use, etc.).

- Describe product protection such as patents, copyrights and trademarks.

c. Service Businesses:

- Describe each type of service you offer (be specific).
- Describe the service features in terms important to the customer.
- Describe any service protection such as copyrights or trademarks.

d. Product Risks:

If there are, any risks associated with your product or service such as product liability, Professional liability, or ease of duplication by competition, state them and describe how you will mitigate these risks

Market Research:

i. Purpose: The purpose of the Industry and Market Research section is to prove that the market is large enough in your area to support the survival and growth of your business.

ii. Industry Research: Describe your industry. If you are in a new industry, or an industry not well knownto a reader, this will be a comprehensivesection. A better known industry requires less explanation

- Describe the state of the industry. Is it a new industry, growth industry competitive industry, or a stable mature industry?

	Consumer Markets	Business Markets
Who is the customer?	AGE	INDUSTRY TYPE
	GENDER	SIZE OF CUSTOMER
	INCOME	ANNUAL SALES
	FAMILY STATUS	
	Be sure to include how many customers there are in each grouping.	Estimate the number of companies using of directory
Where is the customer?	Target the geographic radius of your customer base by city, region province or country	The geography of business to business markets tends to be larger than consumer market.
When do they buy?	Is there a particularly busy season for your product or service	If you are selling to seasonal business, the timing can be crucial.
What do they buy?	Necessity	Inventory Item
	Luxury Item	Capital Item
	High involvement/Big ticket	Consumable Item
	Low involvement/consumable	
Why do they buy?	How does your product or service help the consumer?	How does your product enhance the performance of the customers business
How much do they buy?	Determine how much is spent on your product by your customers	Estimate the commercial expenditure by the industries in your target area

- Document industry trends on a local, national or world scale. Sales, number of customers, number of units sold, trends in related industries are all good industry indicators.
- Provide other national/international economic indicators that encourage the health of your industry

iii. Target Market Customer Research: The Target Market is the groupings of consumers or businesses most likely to purchase your products or services. The first group you plan to target is your Primary Target Market; the second is your Secondary Target Market. It is very important that you understand your target markets − after all, these are the customers you need to keep happy!!

Competitive Analysis:

- Provide the results of any customer survey work you have done and the sources or information.
- List the direct competitors in your local market. These firms offer exactly what you offer. List the current number and the number in existence for the past three-year period.
- List the indirect competitors in your local market. These firms offer substitute products.
- List any business companies who have gone out of business in the past and if possible show the reason why their business failed.
- Explain how will firm will survive and compete in the market with these giants.
- Examine risks that could occur while you enter the market. For e.g. what if your competitor cuts the price when you open the business?
- Position your product and analyse what would be your strategy to show that how your product is different from others.

Market Strategies:

Purpose: The purpose of the Marketing section is to demonstrate how you plan to tap your market. This includes pricing, distribution, sales and promotional strategies. To many, marketingis sales and promotion. Sales and promotion are important elements of marketing,but marketing is a broader concept. It envelops the design and packaging of aproduct – the price and discounting strategies for the business – and the intimateknowledge of the current and future needs and wants of the target market. Here are some of the key elements of marketingyou want to address in your business plan.

Price Strategy:

- What are your prices for different products and services?
- How did you arrive at those prices? (i.e., Charge going rate, industry standard
Mark-up, etc.)
- Do you have any price packages? What is your price image?
- How do your prices compare with your competition?

Physical Distribution:

Describe which of the following distribution systems you plan to use in yourbusiness:

- Direct Distribution – selling directly from producer/provider to the customer
- Wholesale Distribution – selling to a retailer who sells to the customer.
- Brokers or Agents – using a third party to sell the product – usually on a commission basis. This can be done for goods (Manufacturers' Agents) or for services.
- Internet Sales – See Internet Strategies Section.

Location:

- Neighbourhood Location (use a map). Traffic counts and supporting information such as population radius is helpful. Remember to include direct and indirect competitors on your map.
- Site Location – place in a mall, shopping centre, or city block. Show the other tenants and access/egress for parking if applicable
- Facility Location – including a diagram of the business layout.

Advertising and Promotion:

Your promotional strategy is made up of three main areas .Not all businesses use three, so only include the parts relevant to your situation. Small business has resource people to help client with this aspect of your business.

Advertising Plan (Paid Advertising)

- Provide a list of the media you plan to use. You may include newspapers, magazines, radio, television, direct mail or Internet advertising.
- Develop a monthly advertising schedule with planned budget amounts.

Public Relations Plan

- Include media sources you plan to use to promote your business
- Include press releases in the appendices to the business plan

Personal Selling Plan

- Describe how will you prospect and find new customers.
- Describe how will you provide new customers with information

Internet

Canada uses consumer benefit model known as ICET. You should describe the internet strategy in the same way with the following:

- Information Gathering:-This includes the information provided to the consumer about your business, products and services.
- Communication:-This includes more specific forms of two-way communication such as customer service and feedback mechanisms.
- Entertainment: - This is the multimedia aspect approach to your site. This includes entertainment, video clips and animations.
- Transactions: This is the ability to actually order and pay for products over the internet.

Operations

The purpose of the operations sections is to indicate how you plan to operate the business. This means how you will provide the services.

- **Production Plans (Manufacturing Businesses)** The production plan demonstrates your ability to produce products. This section may not apply to service businesses.
- **Production Flow chart** Provide a flow chart/process diagram showing the entire production process from start to finish.

List and budget production equipment required for the business

- **Procurement (Businesses that manufacture or sell products)** Sources of supply and order lead-time.

Terms and conditions of sale
Alternate sources of supply (this addresses procurement risk).
Inventory control systems
Physical space requirements (unless covered in location sections).

- **Sub-Contractors (both goods and services)**

Provide a list of sub-contractors
Show exactly what these sub-contractors do and where they fit into the
production of the business
Show alternative sub-contractors (this addresses sub-contract risk).

Human Resources

The Human Resources section demonstrates how you will determine your HR needs, fill them, manage your staff and pay them.

Staffing

- Organizational chart (show reporting structure).
- Job descriptions (show what people do).
- Job specifications (show the skills and knowledge required to do each job).
- Recruiting – Where will you find good people?
- Management – How will you treat those good people?
- Compensation – How much will you pay your people?

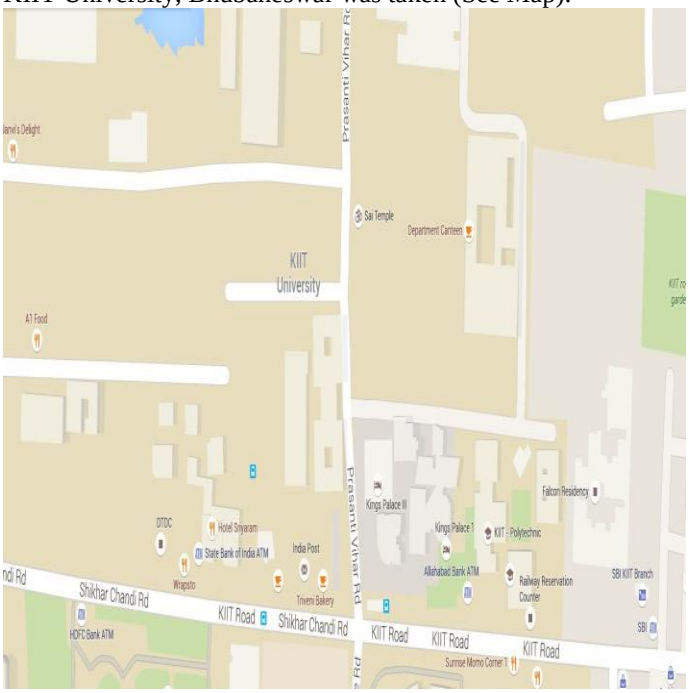
This includes base wages, commissions, bonuses and other incentives.

Legal and Administrative

- Share Distribution (Corporation Only)
- Buy Sell Agreement (Corporation and Partnerships Only)
- List of key legal agreements such as contracts, leases, agreements, franchise agreements, personal loan guarantees etc. The actual documentation is often put into the appendix of the business plan.
- Insurance/Risk management

Deciding the Location

Since we are going to decide a restaurant that will be near to our college campus, therefore the map of Food Court situated at KIIT University, Bhubaneswar was taken (See Map).



Selection of the Product

The selection of our product was one of the ubiquitous item i.e. soft drinks that is really soaring its market share and gaining popularity among the people, amid of the high competition these days.

A soft drink is a drink that typically contains carbonated water, a sweetener, and a natural or artificial flavouring. The sweetener may be sugar, high-fructose corn syrup, fruit juice, sugar substitutes (in the case of diet drinks), or some combination of these.

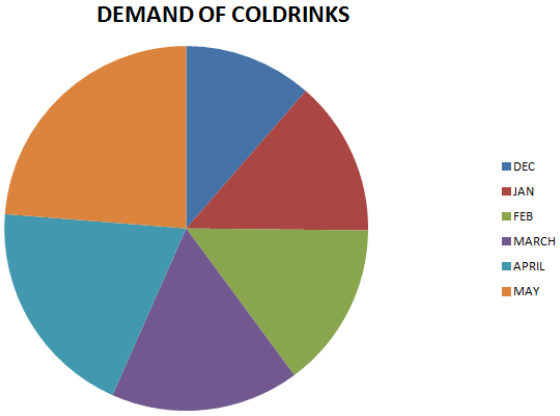
Demand for cold drinks is witnessing growth at a fast pace especially among younger section of the population Though India is a tropical country with long summers, consumption of carbonated beverages stands at roughly 5-6 bottles per year compared to around 21 bottles in Sri Lanka and as high as 605 bottles in Mexico.. Players are trying to penetrate rural markets by offering low priced unit sized packaging formats.

Overall cold drinks market was valued at INR 193 billion in 2013-14, of which carbonated soft drinks accounts for a major share of around 62%. Coca Cola India and PepsiCo India together account for around 85% of the overall carbonated beverage market in India, of which Coca Cola accounts for over 55%followed by PepsiCo with a market share of around 35%. Coca Cola's 'Maaza' leads the market in the fruit drink category followed by Parle Agro's 'Frooti'.

Company	Carbonated Drinks / Soda	Fruit based drinks	Functional drinks
Coca Cola India	Coca Cola, Diet Coke, Coke Zero, Thumps Up, Sprite, Kinley Soda, Schweppes, Fanta, Limca	Maaza, Minute Maid, Nimbu Fresh	Burn (energy drink)
PepsiCo India	Pepsi, 7 UP, Mountain Dew	Slice, Nimbooz, Mirinda, Nimbooz, Tropicana and Tropicana 100%	Gatorade (sports drink)

Data Collection:

MONTH	DEMAND
DECEMBER	4785
JANUARY	5778
FEBRUARY	6171
MARCH	7035
APRIL	8224



Selection of the Forecasting Method:

We have selected two methods of forecasting: Linear regression and Adjusted exponential smoothing method for forecasting .While collecting data, we witness an increasing trend of data. With the selection of our product: SOFT DRINKS, there is an increase in its sales in the month of summer, when we move forward from the month of December.

Linear regression implements a statistical model that, when relationships between the independent variables and the dependent variable are almost linear, shows optimal results, here sales of Soft drinks being the dependent and month being the independent variable. It is a more accurate form of forecasting method for an increasing or decreasing trend .It can also be used to model non-linear relationships.

Forecasting the sales up to a more granular level would require the regression method to be used. Whereas, in a smoothing method it can produce accurate forecasts .It gives more weight to recent observations. It can alter the value of the smoothing constant to fit the model properly in any different circumstances. It does not handle trend very well. Forecasts generated by an adjusted exponential smoothing model are sensitive to the specification of the smoothing constant

Calculation:

Prediction of forecast using adjusted exponential smoothing method

- For the month of January:

$F_{t+1} = F_t + T_t$

$F_t = \alpha D_{t-1} + (1-\alpha)(F_{t-1} + T_{t-1})$

$= (0.5 \times 4785) + (0.5 \times (4785+0))$

=4785

$T_t = \beta (F_t - F_{t-1}) + (1-\beta)T_{t-1}$

= (0.4× (4785 - 4785)) + (0.6×0)

=0

$F_{t+1} = F_t + T_t$

=4785+0

=4785

- For the month of February:

$F_{t+1} = F_t + T_t$

$F_t = \alpha D_{t-1} + (1-\alpha) (F_{t-1} + T_{t-1})$

= (0.5×5778) + (0.5× (4785+0))

=5281.5

$T_t = \beta (F_t - F_{t-1}) + (1-\beta)T_{t-1}$

= (0.4× (5201.5 - 4785)) + (0.6×0)

=198.6

$F_{t+1} = F_t + T_t$

=5281.5+198.6

=5480.1

- For the month of March:

$F_{t+1} = F_t + T_t$

$F_t = \alpha D_{t-1} + (1-\alpha) (F_{t-1} + T_{t-1})$

= (0.5×6171) + (0.5× (5281.5+5480.1))

=5825.55

$T_t = \beta (F_t - F_{t-1}) + (1-\beta)T_{t-1}$

= (0.4× (5282.55 - 5281.5)) + (0.6×198.6)

=217.62+119.16

=336.78

$F_{t+1} = F_t + T_t$

=5825.55+376.78

=6162.33

- For the month of April:

$F_{t+1} = F_t + T_t$

$F_t = \alpha D_{t-1} + (1-\alpha) (F_{t-1} + T_{t-1})$

= (0.5×7035) + (0.5× (5282.5+336.70))

=6598.665

$T_t = \beta (F_t - F_{t-1}) + (1-\beta)T_{t-1}$

= (0.4× (6598.665 - 5825.55)) + (0.6×336.78)

=309.246+202.068

=511.314

$F_{t+1} = F_t + T_t$

=6590.665+511.314

=7109.975

- For the month of May:

$F_{t+1} = F_t + T_t$

$F_t = \alpha D_{t-1} + (1-\alpha) (F_{t-1} + T_{t-1})$

= (0.5×8224) + (0.5× (6598.665+511.314))

=7666.9895

$T_t = \beta (F_t - F_{t-1}) + (1-\beta)T_{t-1}$

=(0.4×(7666.9895 - 6598.665)) + (0.6×511.314)

=427.3298+306.7884

=734.1182

$F_{t+1} = F_t + T_t$

=7616.9895+734.1182

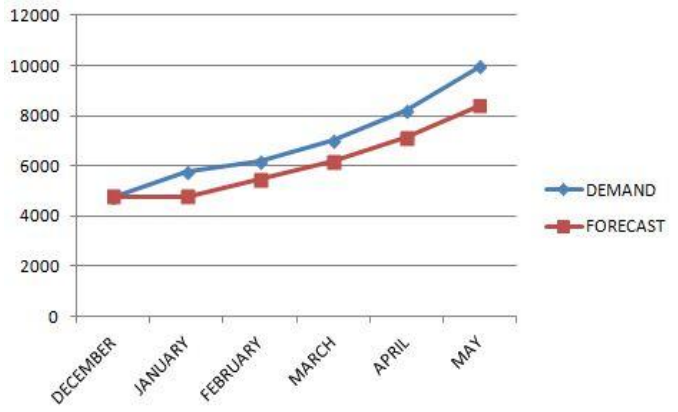
= 8401.1077

MONTH	DEMAND	F_t	T_t	AF_t
DECEMBER	4785	4785	-	-
JANUARY	5778	4785	0	4785
FEBRUARY	6171	5281.5	198.6	5480.1
MARCH	7035	5825.55	336.78	6162.33
APRIL	8224	6598.665	511.314	7109.975
MAY	9964	7666.9895	734.1182	8401.1077

Graphically:

MONTH	DEMAND	FORECAST
DECEMBER	4785	4785
JANUARY	5778	4785
FEBRUARY	6171	5480.1
MARCH	7035	6162.33
APRIL	8224	7109.975
MAY	9964	8401.108

MONTH	DEMAND (Y)	X	XY	X^2
DECEMBER	4785	-2	-9750	4
JANUARY	5778	-1	-5778	1
FEBRUARY	6171	0	0	0
MARCH	7035	1	7035	1
APRIL	8224	2	16448	4
	∑ Y=31993	∑ X=0	∑ XY=7955	∑ X^2=10



Prediction of forecast using simple linear regression method:

Considering the model for the simple linear regression of the form

$$Y=a+bX$$

Where

Y=Dependent Variable

X=Independent Variable

a=Intercept

b=Slope of the Independent Variable

The equations used in computing the value of 'a' and 'b' are

$$\sum Y=na + b\sum X$$

$$\sum XY=a\sum X + b\sum XY$$

Thus the values of 'a' and 'b' obtained from the above two equations are

a=6398.6

b=795.5

Hence the model obtained from the simple linear regression is

Y=6398.6 + 795.5X

Now, putting the value of X=3 to predict the forecast for the month of May

Y=6398.6 + (795.5×3)

Y=8785.1

The forecasted value for the month of May using Linear Regression method is predicted to be 8785.1

Forecasting Errors (Adjusted exponential smoothing method)

- Cumulative Forecast Error(CFE) or Running Sum Forecast Error(RSFE):

$$\mathrm{CFE}=\sum(\text{actual}-\text{forecast})$$

= 5233.4873

- Mean Forecast Error or BIAS:

$$MFE=\frac{\sum_{t=1}^{N}(A_t-F_t)}{N}$$

= 1046.69746

- Mean Absolute Deviation(MAD):

$$\mathrm{MAD}=\frac{\sum|\text{actual}-\text{forecast}|}{\mathrm{n}}$$

= 1046.69746

- Mean Square Error (MSE):

$$\mathrm{MSE}=\frac{\sum(\text{actual}-\text{forecast})^2}{\mathrm{n}}$$

=1181725.756

- Mean Absolute Percentage Error (MAPE):

$$MAPE = \frac{100}{n} \sum_{t=1}^{n} \frac{|y_t - \hat{y}_t|}{|y_t|}$$

=14.461%

Conclusion

An experiment was conducted in the KIIT FOOD COURT for predicting the sales of SOFT drinks .The data was tabulated and appropriate method of forecasting was used to forecast. The objective was to check the forecasted sales and by drawing a graph estimate its deviation from the actual sales. The experiment was successful in its process. Both the objectives were met.

While conducting the experiment the demand was 9964 units while the forecasted value was at 8401 units using exponential smoothing method and 8785 units using linear regression method . Such accuracy is difficult to obtain using exponential smoothing method when a trend is followed. It mainly depends on the smoothing coefficients for the forecast to be accurate. In this method, it is a difficult task to estimate the value of the smoothing coefficients, which govern the forecasted value. In the case of linearregression, the forecasted value was more close to the actual demand value.

This process of forecast helped us in being prepared for the worst and control our budget and inventory for the future purpose .For obtaining profit, the shop owner can accordingly devise some new schemes to boost the sales of the product.

Risk and uncertainty are key to the forecasting, it is generally considered a good practice to indicate the degree of uncertainty attached to forecasts .While the trend is increasing here ,it can so happen that due to some factors the sales of soft drinks could drop affecting the demand ,the sales and in turn the profit .

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