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Parameters for the Evaluation and Choice of a Good Computer Based Forecasting Technique

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Abstract: ***Many a time, most business organizations, industries and companies fail as a result of the choice their management made regarding things to do, and when to do them. The choices can be beneficial when correct prediction of business conditions were made. Computer-based forecasting systems present themselves as the most appropriate tools for effective prediction of business conditions. This paper critically examines the parameters for the evaluation of various computer-based forecasting techniques to determine and present suitable tools for correct prediction of business conditions to business managers. Data from primary sources were gathered with instruments in a structured questionnaire. The data was analyzed using frequency, percentage ratio and mean to determine a more positive stand on the parameters for the evaluation. The research revealed that parameters like flexibility of forecasting technique, compatibility, time period of forecast and cost benefit of the forecast were useful to determine the choice of a given forecasting technique. When good choice is made, forecasts whether in business, government, economy etcetera will be very reliable and aid well informed amd quality management decision.***

Keywords: Parameters, Evaluation, Forecasting Technique, management decision, business conditions

1. Introduction

Human beings are naturally faced with the frequent problems of choice in their day-to-day activities in life. This is also the same in the case of managers of businesses, institutions, industries, companies, government and non-governmental organisations. For managers of business, or institution to be effective, there must be some kind of good decision making. To make good decision, the manager has to look into (predict) certain business conditions in the future bearing in mind some history of the organisation, institution or business. The best tools for such predictions are the use of good forecasting techniques in the areas to determine the weakness and strength of the business, institution and companies in future so that the organization will achieve its set objectives. A good computer-based forecasting technique can help the manager deal with all these troubles or worries. To use the good forecasting technique, we need to know about the general principles of forecasting. What it can do and what it cannot do for us. Also we need to know which technique is suitable for a particular need in a given moment.

In computer base forecasting, resonance predictions of demands and trends are no longer luxury items, but a necessity, if managers are to cope with seasonality, unexpected changes in demand levels, price-cutting maneuvers of the competition, strikes, and large swings of the economy. In cases were manager generally assumes that a forecaster to can always prepare a specific projection, the request itself provides sufficient information for the forecaster to go to work and do the job. This is almost never true.

In addition, if any forecast is to set a "standard" against which to evaluate performance, the forecasting method should not take into account special actions, such as promotions and other marketing devices, since these are meant to change historical patterns and relationships and hence form part of the "performance" to be evaluated.

Forecast that simply sketch what the future will be like if a company makes no significant changes in tactics and strategy are usually not good enough for planning purposes. On the other hand, if management wants a forecast of the effect that a certain marketing strategy under debate will have on sales growth, then the technique must be sophisticated enough to take explicit account of the special actions and events the strategy entails.

These days Business forecasting generally attempts to predict future customer demand for a firm's goods or services Macroeconomic forecasting attempts to predict future behavior of the economy and identify business cycle turning points

Motivation

The drive for this research work is the way individual, business organisations, forecaster government agency and institution make decision without considering necessary requirement and implication of the choice in future which in turn affect an entire system negatively in future.

Aim and Objectives

The main aim of the research work is to determine the Parameters for the evaluation and the Choice of a good computer base forecasting technique

The Specific objectives are:

- To identify the various computer base forecasting technique.
- To evaluate this forecasting techniques based on the parameters for the determination of a choice for good computer base forecasting technique.

2. Literature Review

In the time-series prediction algorithms, the stock price is assumed to be the linear combination of the past data and the error term. The error term is modeled according to the normal probability distribution. Recent study results reveal

that the probabilistic distribution function of the stock price is not unimodal and therefore, the stock price cannot be represented well by the normal probability distribution. For overcoming this difficulty, authors presented the stock price prediction by using Bayesian network based on discrete variables [1].

The accurate forecasting of hotel occupancy rates is important in virtually all areas of hotel operations. In a study by [2] to determine whether time-series models gave accurate occupancy forecasts, the results indicated that times-series models in addition to giving accurate forecasts, the models can be easily implemented through off-the-shelf software and hardware. This study helped to fill the gap in the academic hospitality literature regarding time-series models and hotel occupancy forecasts[2].

Accurate reservation forecasting is of growing concern to the hotel industry. The need for improved accuracy is a direct result of intensifying competition and shrinking profit margins. Hotel room forecasting can be based on a number of different models and varying specifications [3]

Kesten *et al* [4] opined that categories of naïve methods, moving average, trend curve analysis, exponential smoothing, and the autoregressive integrated moving averages (ARIMA) models are all techniques that are appropriate when we want to describe the general patterns or tendencies, without regard to the factors affecting the variable to be forecast. One of the reasons for its popularity is the lower cost. Easy to develop and implement, times series models are preferred for they have been used in many applications such as: Economic Forecasting, Sales Forecasting, Budgetary Analysis, Stock Market Analysis, Process and Quality Control and Inventory Studies [5].

On the other hand, the causal methods search for reasons for demand, and are preferred when a set of variables affecting the situation are available [6]. Among the models of this category, multiple linear regression uses a predictive causal model that identifies the causal relationships between the predictive (forecast) variable and a set of predictors (causal factors). For example, the customer demand can be predicted through a set of causal factors such as predictors product price, advertising costs, sales promotion, seasonality, etc. [7]. Both kinds of models (time series models and the linear causal methods) are easy to develop and implement. However they may not be able to capture the nonlinear pattern in data. Neural Network modelling is a promising alternative to overcome these limitations [8] [9] compared different forecasting methods like Moving Average (MA) and Autoregressive Integrated Moving Average (ARIMA) with Neural Networks (NN) models as Feed-forward NN and Nonlinear Autoregressive network with eXogenous inputs (NARX). The results have shown that forecasting with NN offers better predictive performances.

After being properly configured and trained by historical data, artificial neural networks (ANNs) can be used to approximate accurately any measurable function. Because they are fast and accurate, several researchers use ANNs to solve problems related to demand forecasting. The essence of the approach is to learn the patterns hidden in data and make generalizations of these patterns. ANN provides outstanding results even in the presence of noise or missing information [10].

Benkachcha et al [11] suggested that the casual and time series forecasting techniques can be used based on Artificial Neural Network to show the similarity in terms of performance obtained by the two methods. In this case the cost criteria was use to choose which forecasting technique that is most appropriate.

2.1 What is Computer-Base Forecasting Technique?

A computer based forecasting technique is the application or use of computer to make prediction of an activity for a given period of time, using any appropriate forecasting method to ascertain a desirable result.

2.2 Types of Computer Base forecasting Techniques

Forecasting techniques can be categorized into two broad categories: quantitative and qualitative. The techniques in the quantitative category include mathematical models such as moving average, straight-line projection, exponential smoothing, regression, trend-line analysis, simulation, life-cycle analysis, decomposition, Box-Jenkins, expert systems, and neural network. The techniques in the qualitative category include subjective or intuitive models such as jury or executive opinion, sales force composite, and customer expectations[12][13].

Some the various types of computer-base forecasting techniques under this two broad categories are statement and explained below:

2.2.1 Quantitative Technique:

1) ***Regression Analysis*:** statically relates sales to one or more explanatory (independent) variables. Explanatory variables may be marketing decisions (price changes, for instance), competitive information, economic data, or any other variable related to sales.
2) ***Exponential smoothing*** makes an exponentially smoothed weighted average of past sales, trends, and seasonality to derive a forecast.
3) ***Moving average*** takes an average of a specified number of past observations to make a forecast. As new observations become available, they are used in the forecast and the oldest observations are dropped.
4) ***Box-Jenkins*** uses the auto correlative structure of sales data to develop an autoregressive moving average forecast from past sales and forecast errors.
5) ***Trend line analysis*** fits a line to the sales data by minimizing the squared error between the line and actual past sales values. This line is then projected into the future as the forecast.
6) ***Decomposition*** breaks the sales data into seasonal, cyclical, trend and noise components and projects each into the future. *Straight-line projection* is a visual extrapolation of the past data, which is projected into the future as the forecast.
7) ***Life-cycle analysis*** bases the forecast upon whether the product is judged to be in the introduction, growth, maturity, or decline stage of the life cycle.

8) ***Simulation*** uses the computer to model the forces, which affect sales: customers, marketing plans, competitors, flow of goods, etc. The simulation model is a mathematical replication of the actual corporation.
9) ***Expert systems*** use the knowledge of one or more forecasting experts to develop decision rules to arrive at a forecast.
10) ***Neural networks*** look for patterns in previous history of sales and explanatory data to uncover relationships. These relationships are used to produce the forecast.

2.2.2 Qualitative Technique

1) ***Jury of executive*** *opinion* consists of combining top executives' views concerning future sales.
2) ***Sales force composite*** combines the individual forecasts of salespeople.
3) ***Customer expectations*** *(customer surveys)* use customers' expectations as the basis for the forecast. The data are typically gathered by a customer survey by the sales force.
4) ***Delphi model*** is similar to jury of executive opinion in taking advantage of the wisdom of experts. However, it has the additional advantage of anonymity among participants.
5) ***Naïve model*** assumes that the next period will be identical to the present. The forecast is based on the most recent observation of data.

2.3 Parameters for Evaluation and Choice of Computer Base Forecasting Techniques

In the determination of good forecasting techniques we will consider the following as the parameters that will be use in the evaluation and choice of a good computer based forecasting technique as stated and explained below:

1) ***Flexibility of forecasting techniques***: This is the ability of computer base forecasting technique to allow for a change in code of that particular techniques that is been used, without affecting the entire program that was develop using any forecasting technique.
2) ***Compatibility of the computer base forecasting technique:*** Compatibility of a forecasting technique has to do with the ability of computer base forecasting technique to combine with another forecasting technique in other to improve on the workability of the forecast, so that the organization or business can achieve it sets goals. It is the integration of two or more computer base forecasting technique techniques.
3) ***Context of the forecast:*** This is one parameter that must be considered while evaluating the choice of a given computer base forecasting technique, it involves the process of determining the nature of the forecast or the domain of the forecast what it intend to achieve.
4) ***Relevance and availability of the historical data:*** A good forecasting technique that uses historical data must have enough data that is relevance to the given problem to be forecast because the availability of past data determine how good the computer base forecasting technique is.
5) ***The degree of accuracy desirable:*** It also another factors to consider while evaluating the choice of a good computer base forecasting technique in this case, it has to do with degree accuracy of the forecast in achieving the desire results needed.
6) ***Time period to be forecast:*** Every computer base forecast must meet up the needed time required to achieve it results. On this note time period of the forecast is one parameter that is considered for evaluation. It must meet the needed time frame required which may be either long term, medium term or short term forecast.
7) ***Cost/benefit of the forecast:*** In this case it has to do with the cost of carryout the forecast and the benefit of the computer base forecasting technique to the managers of business, organization and institution as the case may be. So in our choice of good computer base forecasting technique we must take this factor into consideration before choosing any computer base forecasting technique.
8) ***Availability of time in making analysis*** In the light of decision making in choosing a good computer base forecasting technique, the availability of time in making analysis of the existing problems, we are trying to solve should be put into consideration because a problem that will take more time in analysis will need a computer base forecasting technique that is not too complex that will handle the given problem with ease and still achieve the desirable results that is needed because time is of great essences.

3. Methodology

The approaches that were used in this research work in order to determine the parameters for the evaluation and choice of a good computer-based forecasting technique.

3.1 Data Collection

In the process of gathering data from computer professionals that are in the fields of computer science, Information technology and academia that consist of lecturers, forecaster, Analyst and PhD students. A questionnaire was designed and also administered. The questionnaire was divided into three sections. Section one contains questions on socio-economical characteristics of the respondent, second section contains questions regarding information of respondents basic skills, and lastly the third section was designed to collect data about different characterized statements based on the degree of acceptance or rejection as the case may be.

3.2 Data Analysis and Results Presentation

In order to conduct an effective investigation, 100 copies of questionnaires were administered, out of which 70 copies were received. We used different methods to analyze data that was gathered from the various sections of our questionnaire. The frequency and percentage ratio methods were used in Section A and B, which is the first and second section to determine the number of occurrence and percentage involved, while in section C, which is the third section, the mean was used to determined the level of support as its relate to parameters for evaluation and choice of a good computer based forecasting techniques

Table 1: Socio-economic Characteristics of Respondents

	Frequency	Percentage
(a) Gender		
Male	45	64.3
Female	25	35.7
(b) Occupation		
Researcher in IT	15	21.4
Programmers	5	7.1
Forecasters	10	14.3
Lecturers in Comp Sc	20	28.6
Analyst	3	4.3
PhD Students	17	24.3
(c) Experience Computer base forecaster	38	54.3
Less than 5 Years	22	31.4
Less than 10 Years	10	14.3
More than 10 Years		

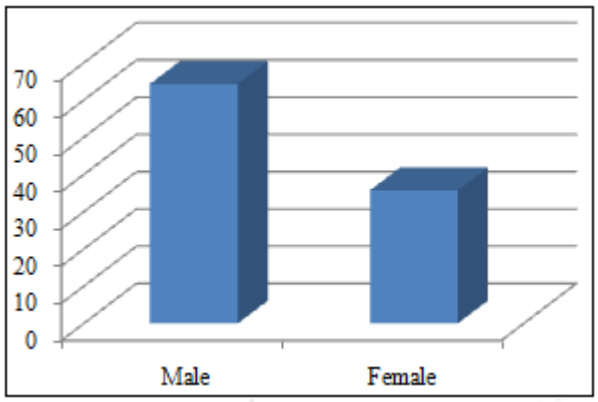

Figure 1: Gender Distribution of Respondent

Figure 1 above shows that the male respondents have a total number of 45 with a percentage of 64.3%, while the female respondents have a total number of 20 with a percentage of 35.7%, which implies that. the male are dominating in forecasting.

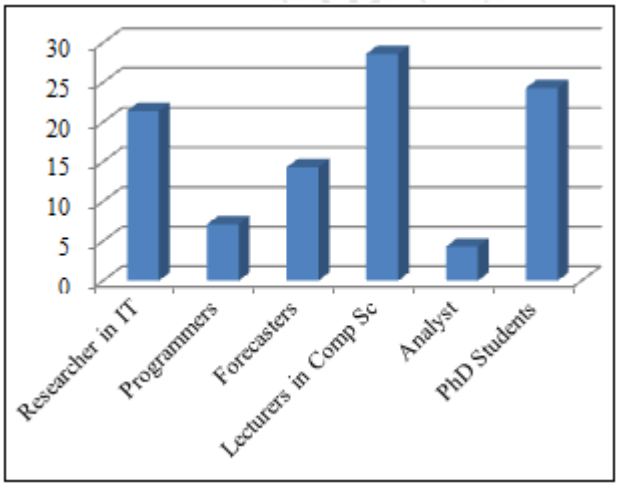

Figure 2: Occupation Distribution of Respondent

Figure 2 above shows that researchers in information technology field were 15 (21.4%), Programmers were 5 (7.1%), Forecasters were 10(14.3%) lecturers in the department of computer science were 20 (28.6%), Analyst were 3 (4.3%), and PhD students were 17 (24.3%), again, this shows that the lecturers in computer science are strongly in support of our notion.

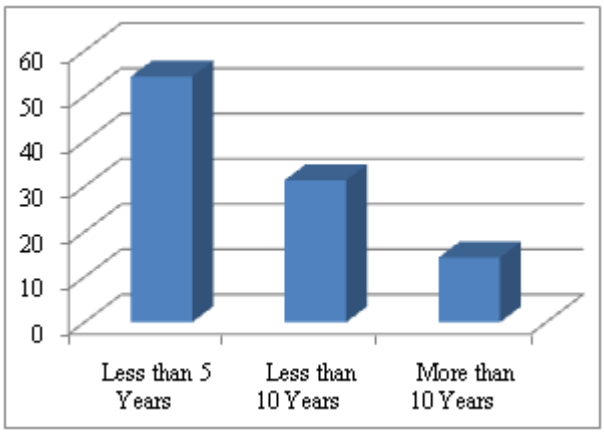

Figure 3: Forecasting Experience

Figure 3 shows computer base forecasting experience which indicate that 38(54.3.3%) respondents out of the 70 has less than 5 years computer base forecasting experience, 22 (31.4%) respondents has less than 10 years experience and 10 (14.3%) respondents has over 10 years forecasting experience. This again shows that young forecasters with less than 5 years forecasting experience are involved in computer base forecasting usage and strongly in support of it parameters for the evaluation and choice of a good computer base forecasting technique.

Table 2: Distribution of respondents according to forecast, forecasting techniques and computer-base forecasting skills

	Frequency	*Percentage*
(a) Do You Forecast?		
Yes	40	57.1
No	20	28.6
Not Exactly	10	14.3
(b) What forecasting Technique do you use?		
Quantitative	15	21.4
Moving Average (MA)	7	10
Box-Jekins (BJ)	8	11.4
Exponential Smoothing(ES)	11	15.7
Trend Analysis (TA)	3	4.3
Decomposition (DP)		
Qualitative		
Delphi Model (DM)	9	12.9
Naïve Model (NM)	7	10
Senario Projection (SP)	4	5.7
Others	6	8.6
(c) Level of Skills in Computer base Forecasting		
Highly Skillful	18	25.7
Moderately Skillful	32	45.7
Not Skillful	20	28.6

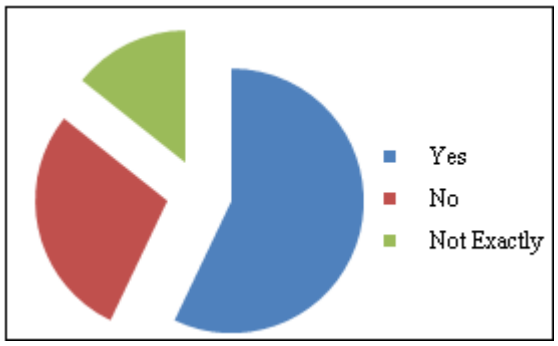

Figure 4: Do you forecast

From figure 4 above shows that 40(57.1%) of the respondents can perform computer base forecasting, 20(28.6%) respondents cannot forecast, while the other 10(14.3%) of the respondents are not so sure.

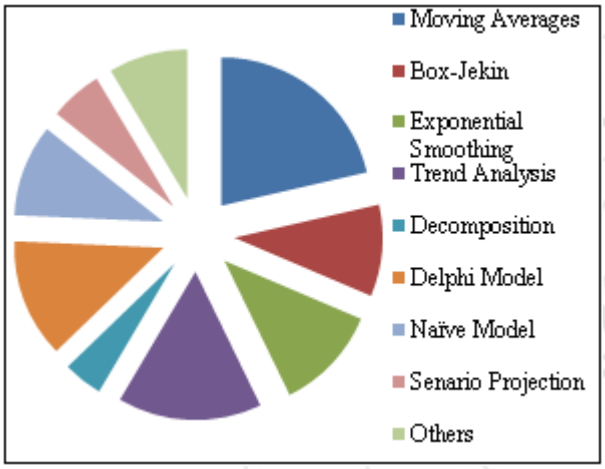

Figure 5: Preferred Computer base forecasting Techniques

Table 3: Parameters for Evaluation and Choice of a good Computer-base forecasting technique usage Respondent Experience

S/N	Statement to determine the parameters for evaluation and choice of good Computer base forecasting Technique	Mean
1	Good choice of forecast depend on the flexibility of the forecasting technique	4.11
2	Choice of good forecast depend on the compatibility of the forecasting technique	4.20
3	Choice of a good forecast depend on the cost/benefit of the computer base forecast	4.43
4	The choice of good forecast depend on the context of the forecasting technique	4.16
5	Choice of good forecast depend on the relevancy and availability of the historical data	4.34
6	Choice of good forecast depend on the degree of accuracy of the forecasting technique	3.94
7	A good forecasting choice depend on the time period to be forecast	3.76
8	Choice of a good computer base forecast depend on the availability of time in making the analysis	4.07
	Agreed (Mean> 3.50)	

From table 3 above it shows the agreed mean and mean values gotten as a result of our statistical analysis ran on data gathered from this section.

$$Mean\ (x) = \frac{\sum fx}{\sum f(n)} \qquad where:\ n_1 + n_2 + n_3 + \cdots n_n = n$$

Our benchmark value for the agreed mean value of 3.50 which is basic assessment of each statement computed mean value in table 3. The computed mean value for each statement as analyzed in Table 3 is compared against the agreed mean value for support of its parameter for evaluation and choice of a good computer base forecasting techniques. If the computed mean value is highly above the agreed mean value, then the statement is strongly in support of choice of a good computer base forecasting technique. The statement is moderately or slightly in support of the argument statement, if the computed mean value is slightly above or in the same range with the agreed mean value or not in support at all, if the computed mean value of the statement is less than the agreed mean value.

4. Discussion

From Table 3 above presented parameters for evaluation and choice of a good computer base forecasting techniques. We observe the following:

1) ***Good choice of forecast depend on the flexibility of the forecasting technique*:** the computed mean value = 4.11. The mean value (4.11) is far above the agreed mean value which is 3.50 this shows that the statement is strongly in support of parameters for the evaluation and choice of a good computer base forecasting techniques.
2) **Choice of good forecast depend on the compatibility of the forecasting technique:** the computed mean value = 4.43. The mean value (4.43) is far above the agreed mean value which is 3.50 this shows that the statement is in agreement with parameters for the evaluation and choice of a good computer base forecasting techniques.
3) **Choice of a good forecast depend on the cost/benefit of the computer base forecast:** the computed mean value = 4.43. The mean value (4.43) is also very far above the agreed mean value of 3.50. This shows that the statement is also in support parameters for the evaluation and choice of a good computer base forecasting techniques.
4) **The choice of good forecast depend on the context of the forecasting technique:** the computed mean value = 4.16. The mean value (4.16) is above the agreed mean value which is 3.50 this again shows that the statement is in support of parameters for the evaluation and choice of a good computer base forecasting techniques.
5) **Choice of good forecast depend on the relevancy and availability of the historical data:** the computed mean value = 4.34. The mean value (4.34) is far above the agreed mean value which is 3.50 this also shows that the statement is in support of parameters for the evaluation and choice of a good computer base forecasting techniques.
6) **Choice of a good computer base forecast depend on the availability of time in making the analysis:** the computed mean value = 4.07. The mean value (4.07) is above the agreed mean value which is 3.50 this shows that the statement is in support of parameters for the evaluation and choice of a good computer base forecasting techniques.

5. Conclusion

In conclusion, we have presented an assessment based on the Parameters for the evaluation and Choice of a good computer base forecasting Techniques. The results of our study reveals and strongly suggested that the choice of a good computer base forecasting techniques depends on the parameters such as flexible of the forecasting technique compatibility, cost/benefit of the forecast, context of the forecast, relevancy and availability of historical data and etc are in support of the Parameters for Evaluation and Choice of a good Computer base Forecasting Technique. The assessment reflects the importance of Parameters used in the evaluation for the choice of a good computer base forecasting techniques.

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