PalArch's Journal of Archaeology of Egypt / Egyptology

THE ROLE OF FORECASTING ON EVENTS PLANNING AND STAFF SCHEDULING

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ABSTRACT

Forecasting is an important element for an organization in any field. Usually, forecasting is used to predict the outcome of an event that will assist in the planning of a project. This work was therefore done to highlight the role of forecasting in event planning. This research paper is a statistical study that has been done on three forecasting techniques based on historical data obtained from two event organizing companies. The paper examines which method is most appropriate for planning an event and predicts the number of visitors per day by using the most the optimal technique. The three forecasting techniques that were used are Naïve approach, Exponential Smoothing (ES), and Period Moving Averages (PMA). The optimal approach was chosen on the basis of the error percentage using median absolute deviation (MAD). The key findings of this work have shown that the most accurate forecast technique was the period moving average, as it has demonstrated a low percentage of error in the MAD analysis. Thus, the outcome of this work has shown that forecasting method supports event planning companies to build a full pre-planning process.

INTRODUCTION

Operational planning is one of the most important tools for managing the operation, the management function that involves setting objectives and setting the course of action to achieve those objectives [1]. It also facilitates the coordination of resources such as human, financial and physical resources. Planning is vital because it can improve the accomplishment of goals, prevent haphazard behavior, minimize uncertainties, help to ensure the appropriate use of funds and provide a foundation for command [2]. The planning method needs executives to be aware of the environmental circumstances surrounding the organization and to predict future circumstances [3].

Forecasting plays a key role in policy formulation and implementation, particularly in the management of an organization [4]. It is one of the tools used in planning to design a plan for long-term or short-term managers that tend to predict the future and minimize uncertainties. In other words, forecasting means predicting the future as accurately as possible, taking into account all the information available, including historical data and knowledge of any future events that may have an impact on the forecasts [5]. Instead of pursuing accurate projections of potential circumstances, higher management of organization acknowledges the uncertainties connected with forecasting potential results and calls for account of a variety of feasible potential results [5].

According to Ittner and Michels [6], forecasting methods can be categorized into two distinct techniques. These techniques are quantitative and qualitative. These two techniques are totally different in terms of price, precision and complexity [6]. According to Ferreira et al. [7], there is a substantial distinction in precision between the qualitative and quantitative methods of assessment. The quantitative method of forecasting is generally used by the optimization technique to predict future data [7]. Srivastava et al. [8] found that linear programming is a method of forecasting that optimizes the associated issue and obtains ideal alternatives. According to Xiao et al. [9], the commonly used technique of forecasting is the time series method that these techniques are supposed to predict time variables. The forecasting method has been used in a variety of fields, ranging from fiancé and revenue.

Revenue is a dynamic factor in every business that changes at all times due to many factors [10]. This depends heavily on sales at different times of the year. The revenue forecast is important as it would allow store owners to predict the range of their net cash flow and also measure the performance of their business at different times of the year [10]. Forecasts are needed to predict the future outcome of any events that requires huge capital investments [10]. According to Li et al. [11] forecasting is needed in important circumstances, and it assist in planning for the worst conditions, for example, heavy traffic flow in the highway during the peak times.

According to Hyndman and Athanasopoulos [12] that naive method is a approach in which the actual results of the last period are used as the prediction for this period, without changing them or trying to identify causal variables. It is used only for comparing with the forecasts produced by improved methods. According to Yuan et al. [13], Moving Average (MA) is a commonly used tool in fundamental forecast analysis that enables to balance out value intervention by separating the outlier from arbitrary value changes. According to Batselier and Vanhoucke [14], some of the most effective forecasting methods have been driven by exponential smoothing. Forecasts generated using exponential smoothing techniques are weighted totals of previous findings. This structure produces credible forecasts rapidly and for a broad spectrum of time series, which are of excellent benefit and significance for implementations in the sector [14].

There are currently a number of events taking place in Jeddah City by the Entertainment Authority and other organizing companies. The author has noticed that some of them do not follow a complete pre-planning process. Thus, there is need to plan the event based on forecasting approach. By forecasting, managers will be able to allocate their resources in the most efficient manner. Therefore, this work was done to highlight the role of forecasting in event planning. The authors have made a forecast for a future event that included historical data on previous similar events that have already taken place. Based on these events, the forecast using the forecasting models has been calculated.

METHODOLOGY

This research was conducted in Jeddah, Saudi Arabia. A quantitative approach has been used in this study and the main reason for using this study method is to quantify the problem by creating numerical data that can be transformed into usable statistics. This method was therefore used to quantify the variables specified. In this work, previous historical data from "Pops and Peeps" and "Dmg Events" companies, both assigned to Jeddah City, were collected. Previous historical data collected is the number of visitors to the events organized by the companies. Thus, on the basis of the date, a future forecast for a similar upcoming event was made using Naïve, Period Moving Average and Exponential Smoothing forecasting techniques. After the forecast was made, the authors selected the forecast with the lower percentage of error using the median absolute deviation (MAD) and then the liner programming is used by the authors to assign the correct number of staff, organizers per day for the event. Table 1 shows the collected data of actual numbers of visitors per day in 5 events. This data is used for the forecast analysis.

Table 1: The Actual Numbers of Visitors Per Day In 5 Events

Events	Day 1 (Actual)	Day 2 (Actual)	Day 3 (Actual)
1	3366	4500	2900
2	5900	4700	3700
3	9870	12312	6532
4	8009	5490	1501
5	5400	3678	4300

RESULT AND DISCUSSION

Forecast Analysis

Table 2 shows the forecast result attained using the Naïve approach. Based on Table 2, for the Naïve approach 1, it used the actual previous data from day 1. Thus, the forecast result for Naïve approach day 1 is 5400 visitors per day. For the Naïve approach day 2, the forecasted visitors per day are 3678. Furthermore, for the Naïve approach day 3, the forecasted visitor per day is 4300.

Table 2: Forecast Number of Visitor Using Naïve Approach

Events	Naïve Approach Day 1	Naïve Approach Day 2	Naïve Approach Day 3
1	-	-	-
2	3366	4500	2900
3	5900	4700	3700
4	9870	12312	6532
5	8009	5490	1501
Forecast 6	5400	3678	4300

Table 3 shows the forecast result attained using 3-month Period Moving Average (PMA) technique. Based on Table 3, for the PMA Day 1, the forecasted value was attained based on the average value of the previous year's data. Thus, for PMA Day 1, the forecasted number of visitors are 7759.67. For PMA Day 2, the forecasted number of visitors is 7160. For PMA Day 3, the forecasted number of visitors is 4111.

Table 3: Forecast Number of Visitor Using Period Moving Average (PMA)

Events	PMA Day 1	PMA Day 2	PMA Day 3
1	3366.00	4500	2900
2	5900.00	4700	3700
3	9870.00	12312	6532
4	6378.67	7170.66	4377.33
5	7926.33	7500.66	3911
Forecast 6	7759.67	7160	4111

Table 4 shows the forecast result attained using Exponential Smoothing technique. The value of the exponential used were a= 0.3. Based on Table 4, the forecasted number of visitors for day 1 is 6168.06. Furthermore, the forecasted number of visitors for day 2 is 5639.06. Finally, the forecasted number of visitors for day 3 is 5785.42.

Table 4: Forecast Number of Visitor Using Exponential Smoothing

Events	ES Day 1	ES Day 2	ES Day 3
1	3366.00	4500	2900
2	3366.00	4500	2900
3	4126.20	4560	2900
4	5849.34	6903.6	7621.6
5	6497.238	6479.52	5785.42
Forecast 6	6168.06	5639.06	5785.42

Furthermore, median absolute deviation (MAD) analysis was done on all the forecasted result and the outcome is shown in Table 5. Thus, based on Table 5, it was found that the most accurate forecast technique was the period moving average, because it has the less percentage of error.

Table 5: Median Absolute Deviation (MAD)

Data	Day 1	Day 2	Day 3
Actual	6509	6136	3786.6
Naïve	2235	4317	3915
PMA	2078.33	1469.50	1632.67
ES	1598.18	693.96	3803.01

In addition, after conducting the forecast and choosing the right technique, liner programing equation is applied in table 6, which assign the number of staff needed per day in an event. The Equation 1 used is stated as follow

$$\square\ \square = 0.02\ \square\ \square \qquad (1)$$

Where Ot = Organizer or staff member, Ft = the forecast. Table 6 shows the results the forecast and the creation of liner programing equations to schedule the staff that will be needed to match the capacity with the demand. Based on Table 6, the equation shows that day one the organizer of the event will hire 42 staff members to match the visitor number which is 2078, and they will hire 29 staff members to match the 1470 visitors for day two, and also day three they will hire 33 staff members to match 1632 visitor.

Table 6: Event 6: Number of Visitors Per Day Forecast

Day	Day 1	Day 2	Day 3
PMA (MAD) values	2078.33	1469.50	1632.67
Staff needed based on equation 1.	42	29	33

OVERALL DISCUSSION

In this work, three forecast techniques were used to forecast the number of visitors for an event. The three techniques used were Naïve approach, exponential smoothing (ES) and period moving average (PMA). All three techniques were used and based on the results of MAD analysis, it was found that PMA had exhibited a more accurate forecast result as it had the lowest percentage of error, when compared to the other techniques. Thus, based on the findings of this, it is deduced that for forecasting events, PMA technique is more suitable to be used, and it is subjected to its low percentage of error. Keles et al. [15] work has confirmed that moving average technique is a reliable technique that can be used to predict the value or data of future events based on the availability of previous data collected.

CONCLUSION

Planning is the key to this work, where the objective of planning an event by forecasting lower costs and maximizing profits and balancing demand with adequate capacity. This paper demonstrated the importance of forecasting in scheduling. This work also introduced three forecasting techniques based on historical data and the best technique was chosen for the MAD calculation. Furthermore, linear programming technique was used to forecast the number of staff needed for the future event. The purpose of the forecast is to ensure that event planning companies use such techniques to manage their resources,

reduce costs and hire the right number of staff per event, managing capacity on demand. Hence, the outcome of this study has shown the application of forecasting technique for event planning.

ACKNOWLEDGMENTS
The authors would like to thank the College of Business, Effat University for its unconditional support.

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