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A Framework to Model Site

A Dynamic Level Technical Indicator

Highlights

Propagation of Electric Pulse

Model for Oil Price Forecasting

Discovering Thoughts, Inventing Future

VOLUME 21 — ISSUE 1 — VERSION 1.0



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CONTENTS OF THE ISSUE

- i. Copyright Notice
- ii. Editorial Board Members
- iii. Chief Author and Dean
- iv. Contents of the Issue

1. On The Propagation of Electric Pulse. *1-3*
2. A Dynamic Level Technical Indicator Model for Oil Price Forecasting. *5-14*
3. Exam Management System at Notre Dame University Bangladesh. *15-21*
4. A Framework to Model Site Reliability Engineering Implementations and its Consolidation. *23-24*

- v. Fellows
- vi. Auxiliary Memberships
- vii. Preferred Author Guidelines
- viii. Index



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On The Propagation of Electric Pulse

By Martin G. Abrahamyan & Yanina Ya. Marinosyan

Yerevan «Haybusak» University

Abstract- Considering longitudinal flow in the axon plasma and introducing the substantial derivative, a nonlinear differential equation describing signal propagation along with the axon fiber instead of the cable equation is established. In contrast to the cable equation, which gives solutions that distort the profile of the pulse, a nonlinear equation describes a traveling wave of an unchangeable profile. The speed of the electric pulse wave, $w = 320\sqrt{a}$ m/s, changes proportionally to the square root of the axon fiber radius, a .

Keywords: axon, propagation, action potential, differential equation.

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I. INTRODUCTION

Analogous to the wires that connect different points in an electric circuit, axons are responsible for the transmission of information over the nervous system. The axon, as a part of a cell, separates the internal medium from the external one with the plasma membrane and any perturbations of a membrane

potential (signal) conducted along the axon. The *membrane potential* is the result of ionic gradient currents perpendicular to the membrane.

The following events characterize the transmission of a nerve impulse (Figure 1):

- The resting potential describes the polarized state of a neuron (-70 mV).
- A *graded potential* is a change in the resting potential in the response to a stimulus, which causes Na^+ or K^+ gated channels to open. If Na^+ channels open, the membrane *depolarizes*. If the K^+ channels open, then positive potassium ions exit across the membrane and *hyperpolarizes it* (Figure 1). A graded potential occurs in cell bodies and dendrites and is a local event that does not travel from its origin.

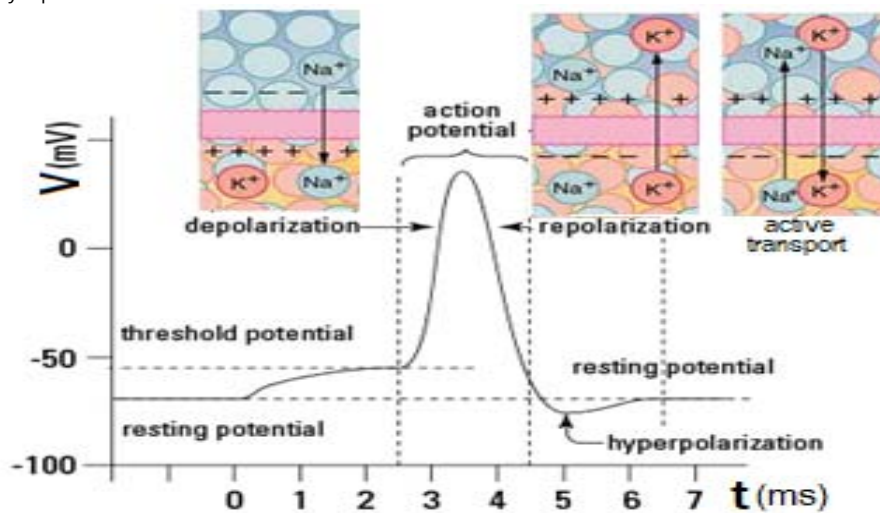


Figure 1: Events that characterize the transmission of a nerve impulse

- Unlike a static graded potential, an *action potential* is dynamic and capable of traveling along with a nerve fiber. If a graded potential is sufficiently large, Na^+ channels open, and Na^+ on the outside of the membrane becomes depolarized (-70 to +30 mV). If the stimulus exceeds a certain *threshold level* (~-55 mV) - additional Na^+ gates open, increasing the flow of Na^+ , causing an action potential, which stimulates neighboring Na^+ gates to open. In this manner, the action potential travels down the length of the axon as opened Na^+ gates stimulate neighboring Na^+ gates to open...

- The inflow of Na^+ , K^+ channels open, allowing K^+ movement out of the cell causes *repolarization* by restoring the original membrane polarization by Na^+/K^+ pumps in the cell membrane.

II. CABLE EQUATION

Nerve impulses flow in only one direction, accompanied by currents across and along the axon trunk. Current across the membrane is

$$I_m = C_m \frac{dV_m}{dt},$$

where $V_m = V_{in} - V_{out}$ is the membrane potential, $C_m = \epsilon\epsilon_0 2\pi aL/b$ is the capacity of an unmyelinated

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cylindrical axon with a length of $L (=1\text{m})$, a membrane thickness of $b = 10 \text{ nm}$, and a radius of $a = 2.5 \mu\text{m}$. The length of the myelinated section is 1.4 mm and the thickness is $b = 2\mu\text{m}$.

In turn, these ionic currents give rise to longitudinal currents that allow the regeneration of the membrane potential changes in the axon [1]:

$$I_i = -\frac{dV}{r_i dx}, \tag{1}$$

where x is the axis along the axon, $r_i = \frac{\rho_i}{\pi a^2}$ is the resistance per unit length of the axon plasma.

The propagation of the *action potential* is described by the well-known cable differential equation [1-3]:

$$\tau \frac{\partial V}{\partial t} = \lambda^2 \frac{\partial^2 V}{\partial x^2} + \Delta V, \tag{2}$$

where $\lambda = \sqrt{ab\rho_m/2\rho_i}$ is the space constant and $\tau = k\epsilon_0\rho_m$ is the time constant,

$$\Delta V = V_{peak} - V_{rest} = -70\text{mV}.$$

The evolution of any initial impulse $V(x', 0)$ is given by the integral

$$V(v, t) = \Delta V \left\{ \frac{t}{\tau} + \sqrt{\frac{\tau}{4\pi t}} \int_0^\infty \frac{V(x', 0)}{\Delta V \lambda} \exp \left[-\frac{\tau(x-x')^2}{4t\lambda^2} \right] dx' \right\}. \tag{3}$$

The nerve impulse describing by this equation changes its form soon during propagation along with the nerve fiber. For example, for the evolution of δ -shape initial impulse, $V(x', 0) = \Delta V \lambda \delta(x')$ integration leads to

$$V(x, t) = \Delta V \left[\frac{t}{\tau} + \sqrt{\frac{\tau}{4\pi t}} \exp \left(-\frac{\tau x^2}{4t\lambda^2} \right) \right], \tag{4}$$

that describes an ink drop diffusion in water, hence the nerve impulse spreads in space-time, distorting initial form, therefore the transmission information. Therefore, the transition of information through the nerve fiber should be occurring by a pulse-wave mechanism that does not change its initial shape.

III. A NEW EQUATION FOR THE SIGNAL TRANSMISSION

Because of longitudinal current, a flow of substance takes place along the axon plasma with an effective speed

$$u = -\left(\frac{\sum \mu_i U_i}{\sum \mu_i} \right) \frac{\partial V}{\partial x},$$

where μ_i is the molar mass of i^{th} type ion and U_i is corresponding mobility. The mass flow in the axon plasma requires the use of the substantial derivative,

$$\frac{d}{dt} = \frac{\partial}{\partial t} + u \frac{\partial}{\partial x},$$

instead of partial $\frac{\partial}{\partial t}$, in the left-hand side of the cable equation (2).

$$\tau \frac{\partial V}{\partial t} - \gamma \lambda^2 \left(\frac{\partial V}{\partial x} \right)^2 = \lambda^2 \frac{\partial^2 V}{\partial x^2} + \Delta V \tag{5}$$

where the constant parameter $\gamma = \tau \sum \mu_i U_i / \lambda^2 \sum \mu_i$ characterizes the longitudinal flow of substance.

Introduction of dimensionless running wave variable $\xi = (x - wt)/\lambda$, where w is the speed of transmission of an electric signal (potential change) over the nervous system, gives ordinary nonlinear differential equation for perturbed potential

$$V'' + \gamma V'^2 + \left(\frac{w\tau}{\lambda} \right) V' + \Delta V = 0, \tag{6}$$

where prime means derivative with respect ξ .

The general solution of nonlinear equation (4), considering $w = \lambda/\tau$ is:

$$V(\xi) = C_2 - \frac{\xi}{2\gamma} + \frac{1}{\gamma} \ln \text{Cosh} \frac{1}{2} \sqrt{1-4\gamma\Delta V} (\xi + C_1) \tag{7}$$

For the intensity of electric field corresponding to generated potential (5), we obtain

$$E(\xi) = -\frac{dV}{dx} = \frac{1}{2\gamma} [1 - \sqrt{1-4\gamma\Delta V} \text{Tanh} \frac{1}{2} \sqrt{1-4\gamma\Delta V} (\xi + C_1)] \tag{8}$$

Taking into account the following boundary conditions:

$$V(0) = V_{peak} \text{ and } V'(0) = 0, \tag{9}$$

For constants C_1 and C_2 we obtain:

$$C_1 = \frac{2}{\sqrt{1-4\gamma\Delta V}} \text{Tanh}^{-1} \frac{1}{\sqrt{1-4\gamma\Delta V}},$$

$$C_2 = \frac{V_{peak}}{\Delta V} - \frac{1}{\gamma\Delta V} \ln \sqrt{1 - \frac{1}{4\gamma\Delta V}}.$$

With the use of numerical values of parameters [4, 5], we can establish the profile of the electric intensity in the running wave (Fig. 2).

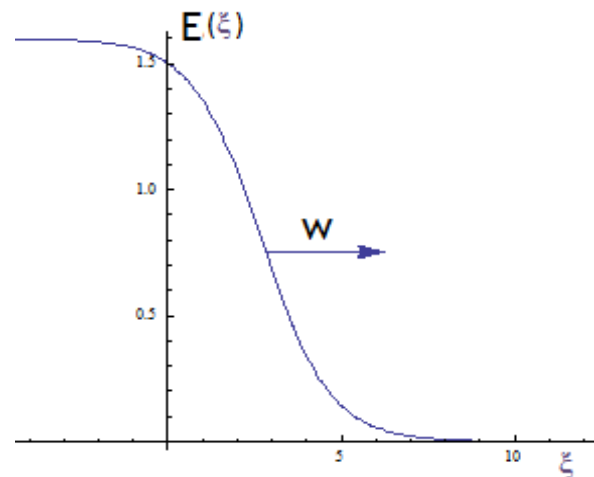


Figure 2: Profile of electric pulse propagation along an axon fiber

IV. CONCLUSION

Considering the longitudinal flow in the electrolyte of an axon plasma and introducing the substantial derivative, we have established nonlinear differential equation (3) describing signal propagation along with the axon fiber as a running wave without changing its profile in contrast to cable equation (2). The solution to this equation is obtained in the form of a running wave. The speed of this wave is

$$w = \frac{\lambda}{\tau} = \sqrt{\frac{ab}{\rho_i \rho_m k^2 \varepsilon_0^2}} = 320\sqrt{a} \frac{m}{s}, \quad (10)$$

which changes proportionally to the square root of the axon fiber radius, a .

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A Dynamic Level Technical Indicator Model for Oil Price Forecasting

By David Ademola Oyemade & David Enebeli

Federal University of Petroleum Resources

Abstract- Investment in commodities and stock requires a nearly accurate prediction of price to make profit and to prevent losses. Technical indicators are usually employed on the software platforms for commodities and stock for such price prediction and forecasting. However, many of the available and popular technical indicators have proved unprofitable and disappointing to investors, often resulting not only in ordinary losses but in total loss of investment capital. We propose a dynamic level technical indicator model for the forecasting of commodities' prices. The proposed model creates dynamic price supports and resistances levels in different time frames of the price chart using a novel algorithm and employs them for price forecasting. In this study, the proposed model was applied to predict the prices of the United Kingdom (UK) Oil. It was compared with the combination of two popular and widely accepted technical indicators, the Moving Average Convergence and Divergence (MACD) and Stochastic Oscillator. The results showed that the proposed dynamic level technical indicator model outperformed MACD and Stochastic Oscillator in terms of profit.

Keywords: *technical indicator, commodities, price forecasting, UK oil, MACD, stochastic oscillator.*

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Keywords: technical indicator, commodities, price forecasting, UK oil, MACD, stochastic oscillator.

I. INTRODUCTION

The price of oil affects the global economy and geographical events, making oil price uncertain and unstable, because oil is a major source of

energy [28]. In the application of computer science and time series mathematical theories to the oil and gas industries, the prediction of oil prices is still a challenge because oil falls under the categories of commodities which are easily affected by change in government policies and unpredictable natural or unnatural events. The oil market is complicated because, like the stock market, its features are neither linear nor stationary [3][4]. Oil, an already volatile market, reached a flash point in 2020 accentuated by the coronavirus (COVID 19) pandemic which resulted in a sharp drop of price that affected the oil exporting countries. Fig. 1 is a pictorial view of an instance in the sharp drop in global oil prices as a result of the COVID 19 pandemic. Fig. 1 shows that oil collapsed to the lowest price in 18 years. Such a price drop negatively impacted on the economy of the nations that depend on oil as a major part of their gross domestic product (GDP) and nations that depend on oil for economy sustenance and survival. Such inadvertent and sharp drops in oil prices also have adverse effects on the performance of software systems designed for the forecasting of oil prices. Therefore, developing a proactive model capable of automation for the prediction of oil prices is of high significance and is worth the efforts.



Fig. 1: Price developments of crude oil in US dollars, from 2000 until April 2020

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Technical indicators, most of which adopt time series or deep learning solutions, are suitable for the prediction of oil prices [1] [5] [10] [11] [12]. However,

many of the available and popular technical indicators have proved unprofitable and disappointing to investors, often resulting not only in ordinary losses but in total loss of investment capital, in spite of the claims of their designers and developers. In this paper, a dynamic level technical indicator model for the forecasting of commodities' prices is proposed. The remaining part of this paper is organized as follows the next section is the background of study. This is, followed by the review of related works, the methodology and the implementation. Finally, the results and discussion are presented and followed by the conclusion and future works.

II. BACKGROUND OF STUDY

Technical Indicators are primarily intended for displaying some graphical signals on a security charts

for the purpose of guiding traders and users on appropriate trading decisions. These graphical signals are displayed through some calculated dependencies achievable through programming codes in a programming language suitable for the terminal employed for the security or commodity. Traditionally, buffers are required in the development of technical indicators because by design, values of indicator arrays must be passed via exchange buffers to a client terminal. Various types of lines and sometimes symbols are usually drawn by the technical indicators. One indicator array and one buffer array are associated with one indicator line, with each buffer having its own index which starts from zero. Fig. 2 demonstrates how values of indicator arrays are passed via a buffer to a client terminal.

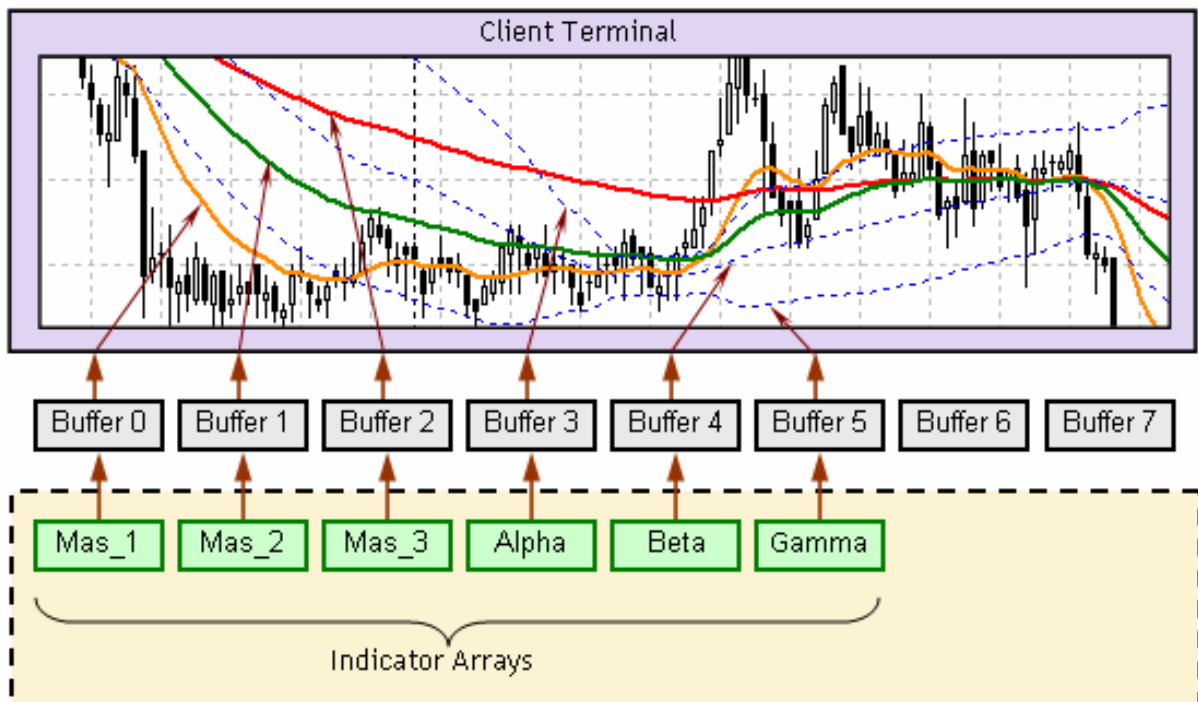


Fig. 2: Technical Indicator Creation - Passing values of indicator arrays via a buffer to a client terminal [13]

Technical analysis refers to the use of technical indicators and historical data for trading decisions in contrast to the use of economic, political or geographical events [3]. The use of events for trading decisions is referred to as fundamental analysis. Technical analysis is a set of rules or charting that anticipates future prices based on the study of the basic security information such as open price, selling price, volume traded, amongst other information. Contemporary technical indicators can be classified into: Trend, Oscillators, Volumes and Bill Williams. Various technical indicators which fall under each can be seen in Fig. 3 which shows the technical indicators tree. Examples of such technical indicators include: Average Directional Movement Index, Bollinger Bands, Average True Range, Bears Power, Accumulative/

Distribution, Money Flow Index, Accelerator oscillator and Alligator.

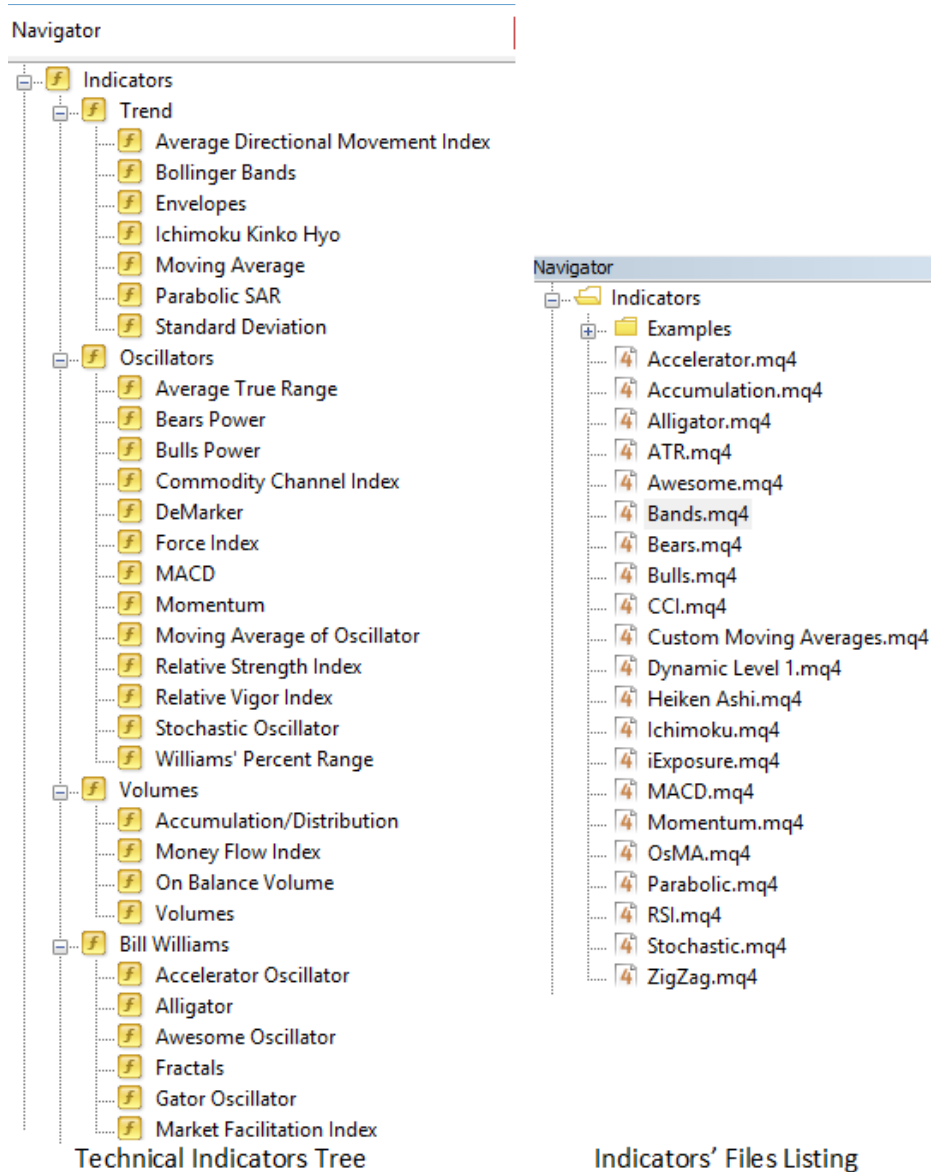


Fig. 3: A Technical Indicators Tree (Showing their Classification) and Indicators' Files Listing

III. RELATED WORKS

Although many technical indicators exist, only few are documented publicly in the research community. Previous works relating to technical indicators are discussed in this section. Bartolucci et al [2] proposed a generalized version of moving average convergence and divergence by adopting the martingale and applied the indicator for the monitoring of crude oil prices. Nazário et al [3] gave the classification of technical analysis on stock market in a literature review. Using the combination of technical indicators and news articles as inputs, Vargas et al [5] applied deep learning for the prediction of daily directional stock price movement. They compared the performance of a hybrid model composed of a Convolutional Neural Network (CNN) for the financial news with Long Short-Term Memory (LSTM) for

technical indicators. Chan and Teong [6] applied neural networks to enhance technical analysis positing that false breakout had been previously experienced with the use of technical analysis. Oriani and Coelho [7] evaluated the impact of a number of technical indicators on the stock market using multilayer perceptrons (MLP) but presented no model. Gholamiangonabadi et al [14] combined Principal Component Analysis, Stepwise Regression Analysis and Artificial Neural Networks for the performance evaluation of the technical indicators of an electrical industry stock exchange. Thawornwong et al [17] also focused on the application of neural networks for decision making in the stock market. Stanković [15] investigated the effectiveness of least square support vector machine and some traditional technical indicators such as MACD and Relative Strength Index (RSI) for financial series stock trend prediction and investment strategy optimization. Chong

and Ng [18] simply tested and compared MACD with RSI using the Financial Times – Institute of Actuaries 30 (FT30) index of Mills. Rosillo [19] also simply tested the RSI, MACD, momentum and stochastic rules for technical analysis using the Spanish stock market. Almeida et al [16] analyzed some technical indicators using an algorithm based on differential evolution to generate Pareto fronts for each technical indicator to achieve multi-objective optimization. Chi and Peng [20] studied the relationship among various technical indicators and using self-organizing map and fuzzy neural network. On the prediction of oil prices, the diverse approaches proposed by other members of the research community include: the use of sentiment on news article [21], autoregressive integrated moving average (ARIMA) model [22], a hybrid of wavelet or Commodity Futures Prices and artificial neural networks [23] [25], deep learning based models [24], statistical learning method [26], time-varying approach [27], gray wave forecasting method and optimization via bagging ensemble models [29].

Most of the existing technical indicator models adopt the statistical approach while recent ones adopt deep learning methodology and they are limited in the diversity of application. Our proposed model creates programmable dynamic levels for price supports and resistances. The proposed model can be used both for trending and hedging markets. In addition, while most of the existing technical indicators were used for stock decision making, our proposed model focuses on the prediction of oil prices. These are some of the main contributions and novelty of this paper.

IV. METHODOLOGY

The proposed model leverages on the overriding impact of support and resistance levels of the terminal charts and their effects on the system's profit. An algorithm was developed to capture, establish and indicate the support and resistance for different timeframes of the terminal charts and to dynamically move these levels as the price of the commodity changes. The relative movements of one minute (M1), five minutes (M5), fifteen minutes (M15), one hour (H1), four hour (H4) and daily (D1) timeframes during price trending, reversal and breakout were observed and studied over a period of time. The result of the research observation was then recommended for order placements and other trading decisions.

a) The Dynamic Level Technical Indicator Model

The proposed dynamic level technical indicator model consists of three components: the dynamic level component, the graphical component and the traditional technical indicator component. These three components are synchronized and they complement each other in functionality. The composition and operations of the components are explained in this section. The

conceptual diagram of the dynamic level technical indicator model is shown in Fig. 4.

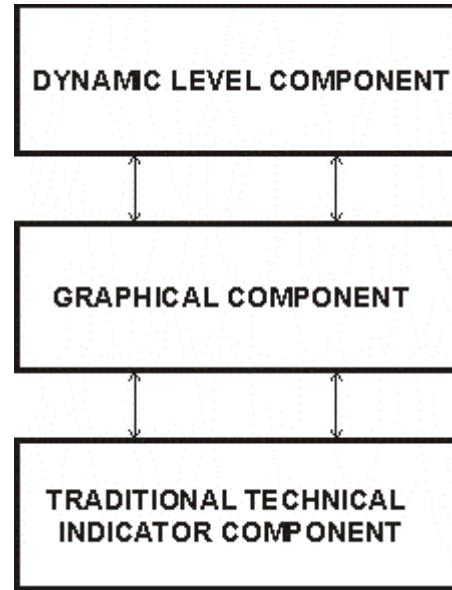


Fig. 4: The Conceptual Diagram of Dynamic Level Technical Indicator Model

b) The Dynamic Level Component

The Dynamic Level Component uses the array data structure to store the prices of the upper and lower shadow of price candles for various timeframes. Different array sizes were applied to different timeframes. Different colors were also assigned to the indicator lines as appropriate. Support and resistance levels are determined by the index of the array with highest upper shadow for bullish (or buy) candles and lowest lower shadow for bearish (or sell) candle. The continually changing values of the indexes of upper and lower candle shadows ensure the dynamism of the established support and resistance levels. The algorithm for the dynamic level component is given below. The algorithm defines the procedure TradeLevel_BuyHigh and the procedure TradeLevel_SellLow with some parameters. This procedures can be reused for different time frames.



i. Algorithm for the Dynamic Level Component

```
// At Resistances
TradeLevel_BuyHigh(BuyPriceArray[],MaxBuyPriceHighIdx, ActiveArraySize, PeriodFrame)
{
    MaxBuyPriceHigh; //declaration
    for(int tkk=1;tkk<=ActiveArraySize;tkk++) // inspect the arrays of the selected candles
    {
        if(iClose(Symbol(),PeriodFrame,tkk)>=iOpen(Symbol(),PeriodFrame,tkk)) // if it is a buy pip
        {
            BuyPriceArray[tkk] ←iHigh(Symbol(),PeriodFrame,tkk); // store the upper shadow high prices in the array
        }
    }
    MaxBuyPriceHighIdx ←ArrayMaximum(BuyPriceArray,ActiveArraySize,1); // determine the index of the maximum upper shadow
    high price
    MaxBuyPriceHigh ←BuyPriceArray[MaxBuyPriceHighIdx]; // store the maximum upper shadow price as the level
    return (MaxBuyPriceHigh);
}
```

```
// Below is the procedure call at M15 Resistance
MaxBuyPriceHigh15M←TradeLevel_BuyHigh(BuyPriceHigh15M, MaxBuyPriceHigh15MIdx, Active15MArraySize, PERIOD_M15);
```

```
// At Support
TradeLevel_SellLow(SellPriceArray[],SellSelectedPriceArray[],MinSellPriceLowIdx, ActiveArraySize, PeriodFrame)
{
    MinSellPriceLow; //declaration
    SellNonZeroCount=1;
    for(int tjj=1;tjj<=ActiveArraySize;tjj++) // inspect the arrays of the selected candles
    {
        if(iClose(Symbol(),PeriodFrame,tjj)<iOpen(Symbol(),PeriodFrame,tjj)) // if it is a sell pip
        {
            SellPriceArray[tjj] ←iLow(Symbol(),PeriodFrame,tjj); // store the upper shadow high prices in the array
            if(SellPriceArray[tjj]>0) //select only positive value and don't include 0
            {
                SellSelectedPriceArray[SellNonZeroCount]=SellPriceArray[tjj];
                SellNonZeroCount←SellNonZeroCount+1;
            }
        }
    }
}

MinSellPriceLowIdx←ArrayMinimum(SellSelectedPriceArray,SellNonZeroCount-1,1);
MinSellPriceLow←SellSelectedPriceArray[MinSellPriceLowIdx];
return (MinSellPriceLow);
}
```

```
// Below is the procedure call at M15 Support
MinSellPriceLow15M ← TradeLevel_SellLow(SellPriceLow15M, SellSelectedPriceLow15M, MinSellPriceLow15MIdx,
Active15MArraySize, PERIOD_M15);
```

c) Traditional Technical Indicator Component

The traditional technical indicator component uses buffers as explained in section 2. For every line displayed in a traditional technical indicator, a buffer is needed. The algorithm for the traditional technical indicator component at M15 resistance is given below.

i. Algorithm for Traditional Technical Indicator Component

```
Declare the array MaxBuyPriceHigh15MBuffer[] for the indicator buffer array
Declare the array MaxBuyPriceHigh15MBuffer[] for the price at resistance
SetIndexBuffer(6,MaxBuyPriceHigh15MBuffer) //initialize the buffer array

Counted_bars ←IndicatorCounted(); // Number of counted bars
i ←Bars-Counted_bars-1; // Index of the first uncounted
while(i>=0) // Loop for uncounted bars
{
```

```
MaxBuyPriceHigh15MBuffer[i] ←MaxBuyPriceHigh15M;
i--; // Calculating index of the next bar
}
```

d) *The Graphical Component*

The graphical component displays the various indicators with different object properties. This component sets the line color, width and style. While the changing values of the dynamic levels can be captured

i. *Algorithm for the graphical component*

The algorithm of the graphical component of the dynamic level component given below for M15 resistance

```
for(int b=0; b<2; b+=2)
{
ObjectDelete("LineNameLabel"+b);
ObjectCreate("LineNameLabel"+b,OBJ_HLINE,0,0,MaxBuyPriceHigh15M); //MaxBuyPriceClose1H
ObjectSet("LineNameLabel"+b,OBJPROP_COLOR,Aqua);
ObjectSet("LineNameLabel"+b,OBJPROP_WIDTH,2);
ObjectSet("LineNameLabel"+b,OBJPROP_RAY,False);
}
```

The algorithm of the graphical component of the traditional technical indicator is given below for M15 resistance.

```
//--- plot MaxBuyPriceHigh15M
indicator_label "MaxBuyPriceHigh15M"
indicator_type DRAW_LINE
indicator_color clrAqua
indicator_style STYLE_SOLID
indicator_width 2
```

e) *Research Observations and Model applications*

It was observed in the course of this study that trending in the bullish direction occurs when the M5 line moves above the M15 line or the M15 line moves above the H1 line at the resistance level. Similarly, trending in the bearish direction occurs when the M5 line moves below the M15 line or the M15 line moves below the H1 line at the support level. Price breakout in the bullish direction occurs when the M15 line moves above the H4 line at the resistance level. In the same way, price breakout in the bearish direction occurs when the M15 line moves below the H4 line at the resistance level. These observations, which has not been stated in previous studies by the research community, produced positive results when implemented. They therefore, form part of the contribution to knowledge of this paper.

f) *Materials*

The experiments carried out in this study were performed with Meta Quote programming language installed on Intel(R) Core(TM) i3-2330M CPU @

with program codes for auto-trading, manual trading depending on the positioning of the indicator lines for trading decision. The algorithm of the graphical component is shown below.

2.20GHz, 4 GB RAM, 64-bit Windows 8 operating system. The program was run on MetaTrader 4 terminal installed on a US based virtual private server.

V. IMPLEMENTATION

The proposed model was implemented for M5, M15, H1, H4 and D1 timeframes. The various properties of the indicator lines in the different timeframes implemented are shown in Table 1. The values of the dynamic level active array size, the line variable names at supports and resistances as well as the line color, line type and line width are shown in Table 1. Fig. 5 illustrates how the proposed model captured the exact support of the H4 with orange color, displayed using the H4 timeframe chart. The proposed technical indicator is implemented with the name "Dynamic Level 1" as shown in Fig. 5. The file name used for saving the indicator's program codes is displayed as "Dynamic Level 1.mq4" under indicators files' Listing in Fig. 3.

Table 1: Dynamic Level Technical Indicators Line Properties

Timeframe	Dynamic Level Active Array Size	Object Property Color	Object Type	Object Width	Line Variable Name at Support	Line Variable Name at Resistance
M1	4		OBJ_HLINE	2		
M5	5	LawnGreen	OBJ_HLINE	2	MinSellPriceLow5M	MaxBuyPriceHigh5M
M15	60	Aqua	OBJ_HLINE	2	MinSellPriceLow15M	MaxBuyPriceHigh15M
H1	72	Yellow	OBJ_HLINE	2	MinSellPriceLow1H	MaxBuyPriceHigh1H
H4	126	Orange	OBJ_HLINE	2	MinSellPriceLow4H	MaxBuyPriceHigh4H
D1	300	Violet	OBJ_HLINE	2	MinSellPriceLowD1	MaxBuyPriceHighD1

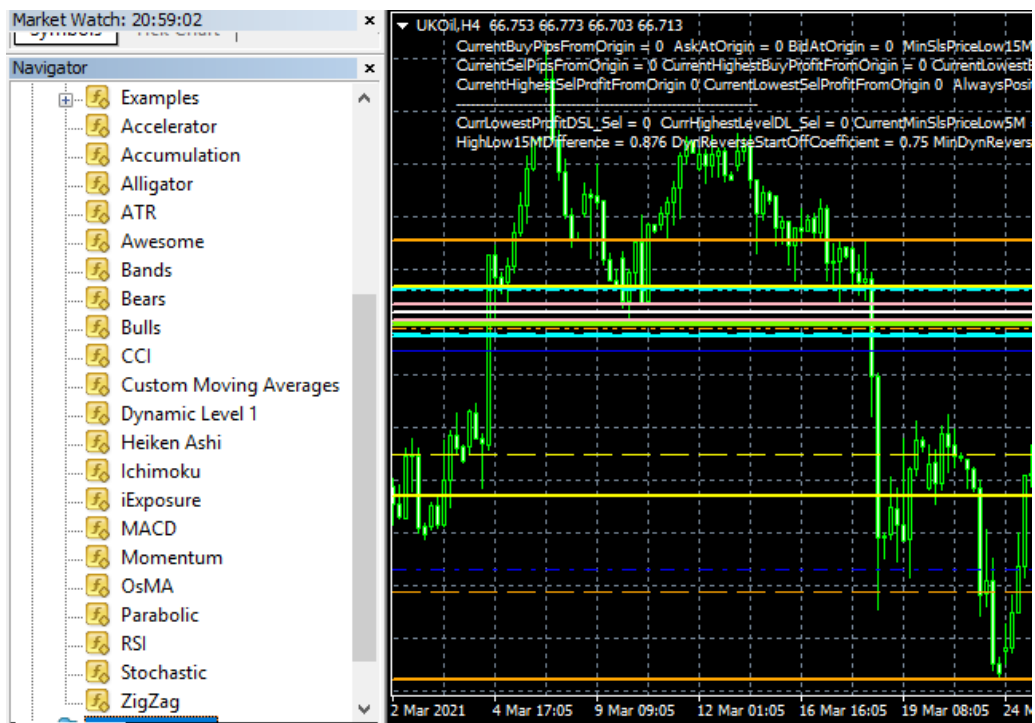


Fig. 5: Dynamic Level Technical Indicator on UK Oil H4 Chart and the Indicators File Listing

VI. RESULTS AND DISCUSSION

Two variations of the proposed dynamic level technical indicator were tested. The first is the dynamic level technical indicator 1 which was designed without any form of modification. This was tested on a live trading platform for a period of 3 months to predict the UK Oil prices and compared with the combination of Moving Average Convergence and Divergence and stochastic oscillator which are popularly and widely accepted technical indicators. The results are displayed in Fig. 6. Our proposed model accrued a profit of 315 pips while the MACD/Stochastic technical indicator model accrued a profit of 123 pips. The results shows that our proposed dynamic level technical indicator model is more profitable than the MACD/Stochastic technical indicators. However, it was noticed that good profitable opportunities were lost due to a long period of inactive trading, as a result of unclosed orders. This drawback was addressed in the second technical indicator. In dynamic level technical indicator 2, active profit modification was applied. The result showed that the dynamic level technical indicator 2 outperformed both the dynamic level technical indicator 1 and the MACD/Stochastic indicators by recording 432 pips profit as shown in Fig. 7.

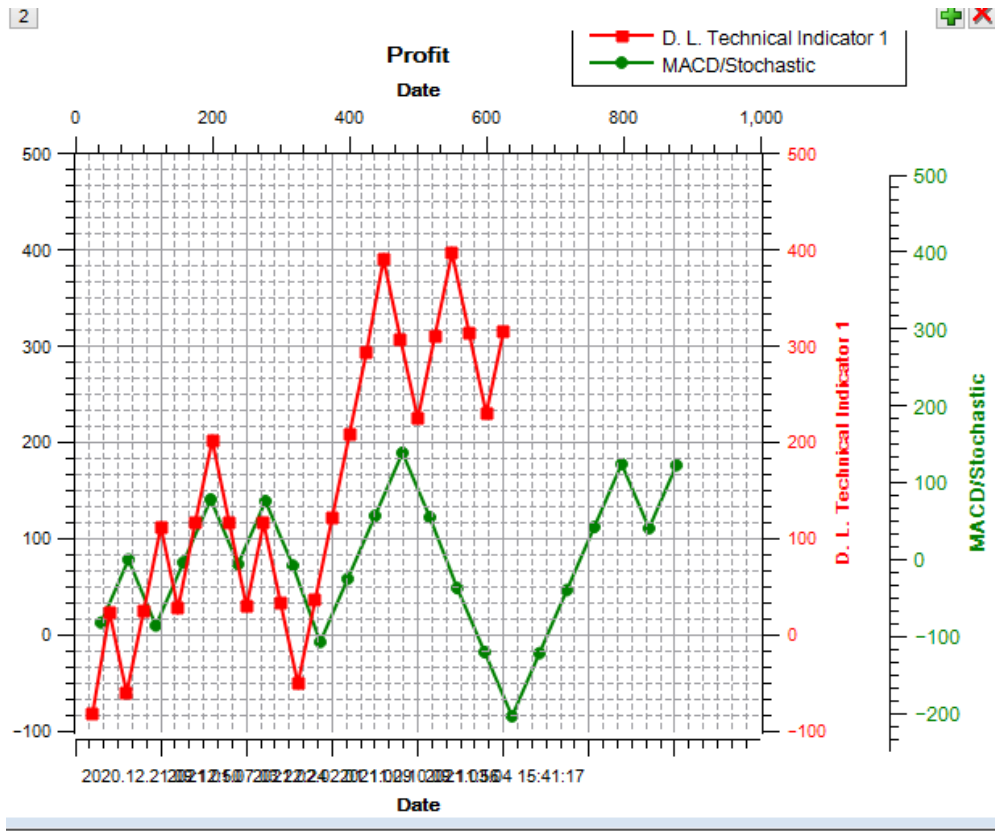


Fig. 6: Three Months Performance Chart of Dynamic Level Technical Indicator 1 and MACD/Stochastic Indicator

An instance of the operation and result of dynamic level technical indicator 2 is shown in Fig. 8 which accentuates the profitability of the proposed model.

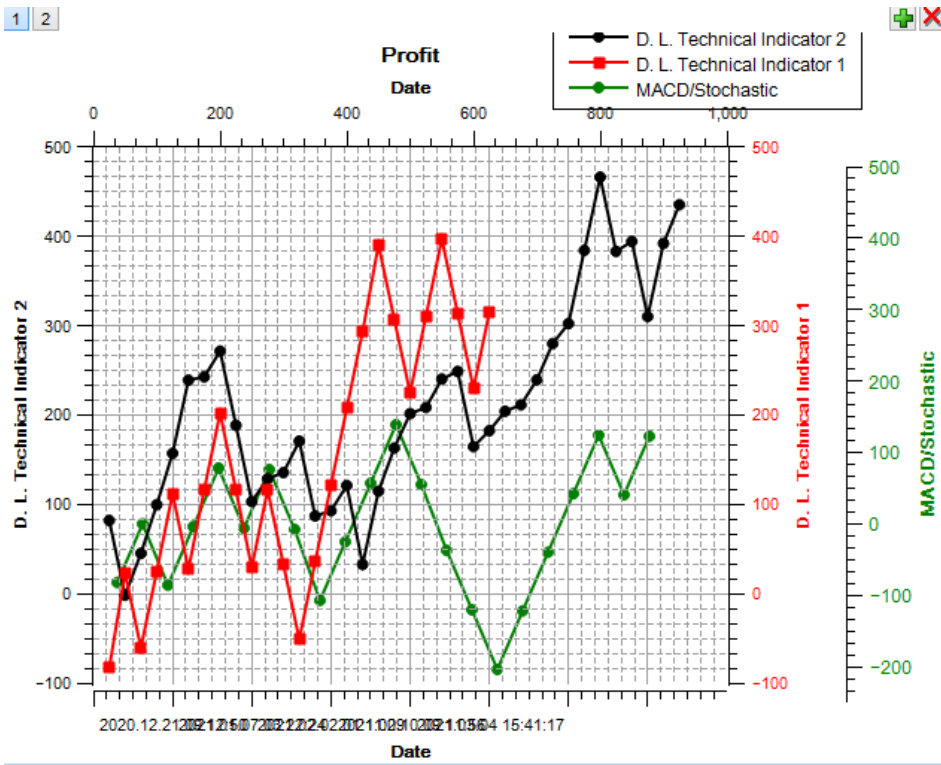


Fig. 7: Three Months Performance Chart of Dynamic Level Technical Indicator 1 and 2 versus MACD/Stochastic Indicators

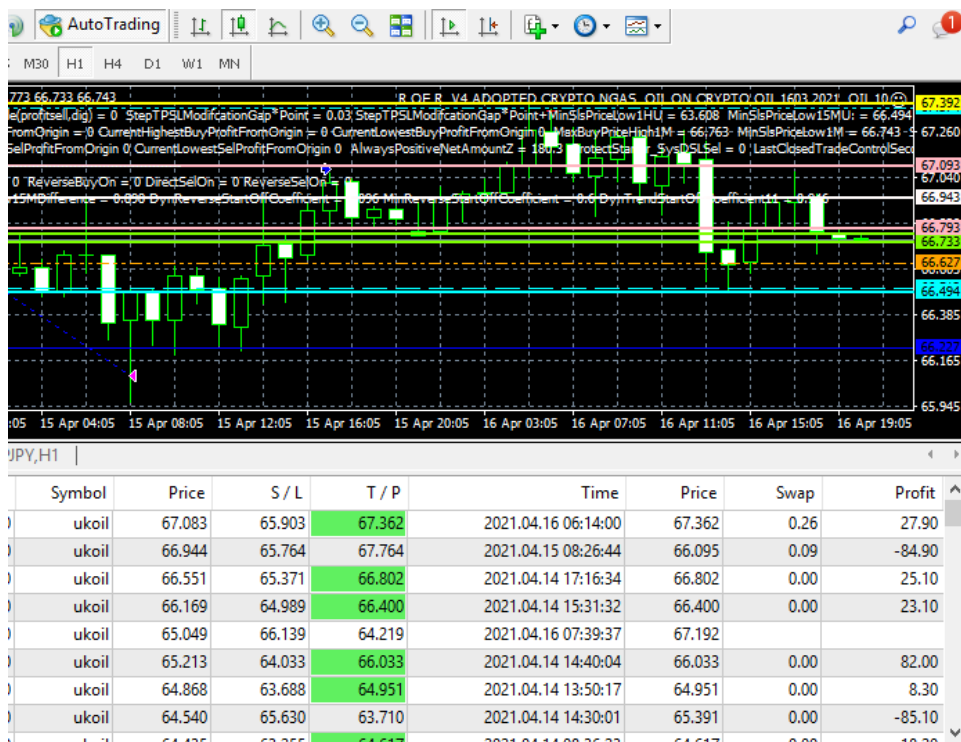


Fig. 8: An Instance of UK Oil Implementation of Dynamic Level Technical Indicator Model

VII. CONCLUSION AND FUTURE WORK

The price of oil affects the global economy because oil is a major source of energy. However, the features of the oil market is neither linear nor stationary, making the prediction of oil price a challenge. In this paper, a dynamic level indicator model has been proposed for the forecasting of oil prices. The proposed model was deployed for the UK Oil on live trading for a period of three months and compared with MACD/ Stochastic Oscillator technical indicators which ran at the same period. The result showed that the proposed model is more profitable than MACD/Stochastic Oscillator indicators and therefore can be adopted for oil price prediction. In addition, the research observation of this paper introduces a novel method of price trend prediction based on the relative movements of the dynamic levels in the terminal charts.

Future works shall focus on the investigation of further possible profit optimization of the dynamic level technical indicator model.

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Exam Management System at Notre Dame University Bangladesh

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Index Terms: exam management system, student management system, Laravel, MySQL, NDUB.

GJCST-G Classification: H.2.0



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Exam Management System at Notre Dame University Bangladesh

A. H. M. Saiful Islam^α, Md. Harun Aur Rashid Khan Ishan^σ, Nilima Ahmed^ρ
& Manabendra Kishore Chakraborty^ω

Abstract- Exam Management System (EMS) at Notre Dame University Bangladesh (NDUB) is an effective system for managing exam and course-related activities for NDUB. EMS automates the conventional system of managing exams. EMS helps NDUB faculties, students, and other academic officers to manage the exam processing very easily and effectively and EMS can maintain mobility of these activities better than conventional manual systems. The main intentions of EMS are to conduct the exam and course-related activities very easily and rapidly. Comprehensively EMS has many interesting features altogether situated in a fair intended web application. EMS is designed using recent technologies like 'Laravel 7.0', 'Bootstrap', 'JavaScript', 'jQuery', 'MySQL'. EMS's working speed is very rapid and its database can take a massive user load at a time. EMS can be very useful for the exam and course-related operations of Notre Dame University Bangladesh.

Index Terms: exam management system, student management system, Laravel, MySQL, NDUB.

I. INTRODUCTION

The Exam Management System can help Notre Dame University Bangladesh to get rid of complex database searches because EMS allows users to do the same tasks in a very user-friendly way. For operating those kinds of database tasks, this institute needs skilled manpower but the user interface of this management system will make this very simple and anyone will feel comfortable with the interface. Managing exams and courses is a very important and time-consuming task for a university. Assigning faculties manually for different courses is not a very arduous task. This task will take more time for an institute and an institute has a lot more work to manage, one of those tasks is assigning students for different courses according to different trimesters which is also a very time-consuming task if done manually. To automate these kinds of manual tasks Exam Management System is a very well-intended web application with a simple and attractive user interface.

User authentication is one of the important parts of EMS. The Exam Management System will take care of the privacy of each user and keep safe important information. When this web application gets a password as input it quickly hashes the password. So hacking any

user account will be a very hard task for any anonymous hacker. EMS begins with the Registrar. Before everything, the registrar needs to create a department for the university. The registrar has the responsibility to create accounts for users as well as, to manage trimesters and create batches according to trimester and, assign faculties in special cases. A course coordinator organizes faculties with courses, set credit hours for faculties and courses, assign solo students in trimester as well as a batch to trimester, assign courses to batches, and many more significant tasks are done by the course coordinator, manage repeat, supplementary, credit transfer students, and so on. Faculties got to see all the assigned courses and students at their accounts and can do the marking of students' works, and can submit the mark sheet to the Exam Controller[1]. The Exam Controller has the responsibility to publish the final trimester mark. The Exam Controller can see all mark sheets according to the trimester and also gets access to students' mark sheets if there are any mistakes in marking occur[2]. Finally, when the trimester result is published then students can see their results in their accounts and can see all previous mark sheets[1] which were already published also can download the mark sheet transcript[3].

Above all, the Exam Management System is a highly secured, well-intended web application, developed with the latest and most secured technologies. EMS will help the staff and students to automate manual tasks and increase their speed of work. EMS will reduce the amount of paperwork and every user will be able to operate their works from anywhere.

II. METHODOLOGY

The Notre Dame University Bangladesh (NDUB) operates its course and exam related activities conventionally. Though the university's way of managing exams and courses is very composite, effective, and well organized but due to the process is operating manually with manpower and lots of paperwork, the university needs quite a heavy amount of time to wrap up one trimester and start a new trimester. So the Exam Management System (EMS) is developed in a very amazing way that it can overcome all time and manpower issues and provide a much better service

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than the manual system. To structure the system we need to deeply analyze the composite system in which NDUB manages its exam and course-related activities. Developing the Exam Management System (EMS) requires a lot of analysis because a lot of end-users are going to use this management system so we need to collect requirements from all the possible end-users and combine all those requirements in the EMS. We have studied so many ways to analyze how to make things work in the automated system, simply because the manual system that NDUB uses is very composite. Notre Dame University Bangladesh (NDUB) didn't use automation before to manage its exam and course-related activities. So we have researched the impact and possibilities of the Exam Management System (EMS) over the existing manual system.

To develop Exam Management System a step-by-step process has followed which is required to develop a well-intended system. A well-intended system can be made by identifying and observing the needs of end-users by acquiring end-user requirements by various means and methods. To develop Exam Management System a development cycle has been used which makes this system well-developed and comfortable for end-users. This is a very simple but effective approach. Steps that have been followed to develop the Exam Management System are i) system planning, ii) system analysis, iii) system design, iv) system implementation, v) system support.

a) System Planning

Notre Dame University Bangladesh (NDUB) does not have any online exam management system. We regard the importance of an online exam management system that can help students, faculties, as well as university officials to minimize their amount of paperwork. So by observing the university's exam and course management process we decide to automate the exam and course management process and develop a well-intended web application that will reduce the amount of work for students, faculties, and university officials. Exam Management System (EMS) is developed in such a way that it is appropriate for many kinds of important operations, such as EMS will reduce the paperwork for faculties and university officials, it will take less manpower than the manual way of running the whole exam and course-related activities. EMS could save a lot of money because it needs less manpower so it can save the money of more employee salaries. By observing the manual process of exam and course-related process of the university we have developed the system.

b) System Analysis

In this phase, we tried to gather all requirements from the end-users of the Exam Management System (EMS), as well as collecting requirements we perform a feasibility study on the EMS. We were gathering

requirements from the possible end-users who will use the Exam Management System in the organization and each one has a different requirement and retrieves different information. We perform a feasibility study on the Exam Management System based on economic feasibility and technical feasibility to ensure that EMS can carry out the requirements of Notre Dame University Bangladesh.

Requirements from End-users: We observe the manual process of exam management, assigning faculty, assigning courses, result publication, etc. As well as by several meetings and conversations with the possible end-users of the system we gather many important requirements for the Exam Management System. Can create new departments.

Requirements gathered from the registrar's office are as follows, the registrar can create new batches, can create new trimesters, create new accounts for students, can create new accounts for faculties, can create new accounts for course coordinators, can view all departments. Also, the registrar can update the department name, the registrar can view all batches, can update batch information, and can update faculty designation. From the registrar's office, all students' information should be available at any time, students' batch information should be updatable, and all faculties' information should be available at any time.

Requirements gathered from the departmental course coordinator are as follows, course coordinator should be able to assign regular courses for batches, should be able to assign repeat/retake courses for students[4], can assign supplementary exams for students. can assign single courses with batches for credit transfer students, and should be able to assign faculty for all kinds of courses[1].

Requirements gathered from faculties are, faculties can view all assigned courses, and faculties should be able to mark students' work.

Requirements gathered from the exam controller are as follows, the exam controller can view all assigned courses, should be able to mark students' work, should be able to view all mark sheets any time[2], if necessary, can update students' marks, can see unsubmitted mark sheets, and the exam controller can publish trimester final result.

Requirements gathered from students are, students can see trimester final results after results are published[3], students should be able to see previous trimesters' results, and students should be able to know remaining credit hours for graduation.

Feasibility Study: A feasibility study determines the possibility of promoting a system and produces refined estimates for more development of the system. Feasibility study is a formal system proposal that acts as

a decision document that includes the complete nature and scope of the proposed system.

Economic Feasibility: We examine the economic feasibility of our system. By an economically feasible system, we mean a system that provides the best value for invested money on that system. The economic feasibility test provides some very valuable information for the responsible organization. By economic feasibility, an organization can understand how much amount of money should they invest in a project. Economic feasibility is evaluating the effectiveness of the EMS by using the cost/benefit analysis method. We try to develop the Exam Management System as an economically feasible system. To develop the EMS we won't have to spend any money on technologies. Because we are only using open-source tools and technologies. So the Exam Management System (EMS) is economically feasible.

Technical Feasibility: Technical feasibility is applied to decide on what technology should we use to develop our desire project. We usually use the latest and most popular technologies to develop a system to make it technically feasible so that we could get long-term support from the used technologies. The Exam Management System (EMS) is developing by trending open-source technologies. So the EMS could be supported by existing technologies. Technical feasibility determines whether current technical resources be upgraded or added that fulfill the new requirements. The technologies that we are using are very popular and support many amazing and complex web application's backends for many years. So the technologies that we are using to develop EMS can be upgraded and can fulfill new requirements if necessary.

To develop the Exam Management System we use HTML, CSS, Bootstrap, JavaScript, jQuery for frontend and Laravel for backend, and MySQL in the database. These technologies have served the purpose of the technological world for a long time and these still come first when developers think to develop a well-intended web application. So of course these technologies will ensure the requirements that the Exam Management System needs to be technically feasible.

c) *System Design*

In this phase, various physical models or diagrams have been created that will satisfy all gathered requirements from end-users. At this stage, we were designing various UML diagrams and architecture that have helpful for end-users to understand the system's overview and as well as developers to understand the requirements of end-users.

Use Case Diagram: Exam Management System has a separate user account for each user role. The Exam Management System works with five users, which are 'Registrar', 'Course Coordinator', 'Faculty', 'Exam

Controller', and 'Student'. 'Registrar' and 'Course Coordinator' are the primary actors of EMS and 'Faculty', 'Exam Controller', and 'Student' are the secondary actors of EMS. The use case diagram of EMS is displayed in Figure 01.

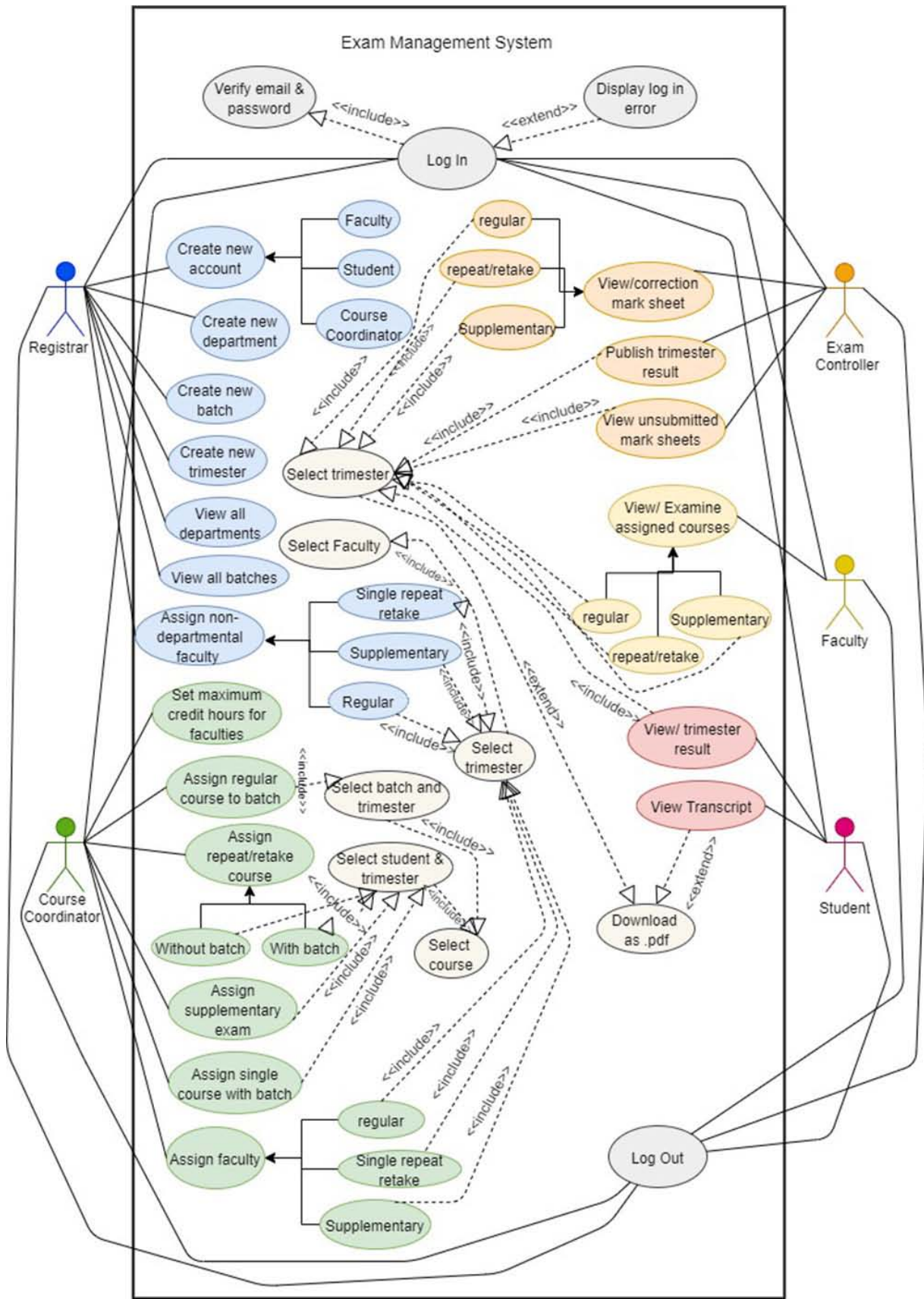


Fig. 1: Use Case Diagram of Exam Management System

Entity Relationship Diagram: Generally, entities represent currently existing tables of the database in the ER diagram. Attributes are the column of a table. Simply we represent entities with rectangle shape boxes and we represent attributes by oval shape which are connected with the entity box. Relationships are represented by

lines. When an entity is connected with another entity we can say that those tables are related or sharing information by one or more foreign keys or composite keys. The ER diagram of EMS is a design based on the existing tables in the EMS database. The ER diagram of EMS is presented in Figure 02.

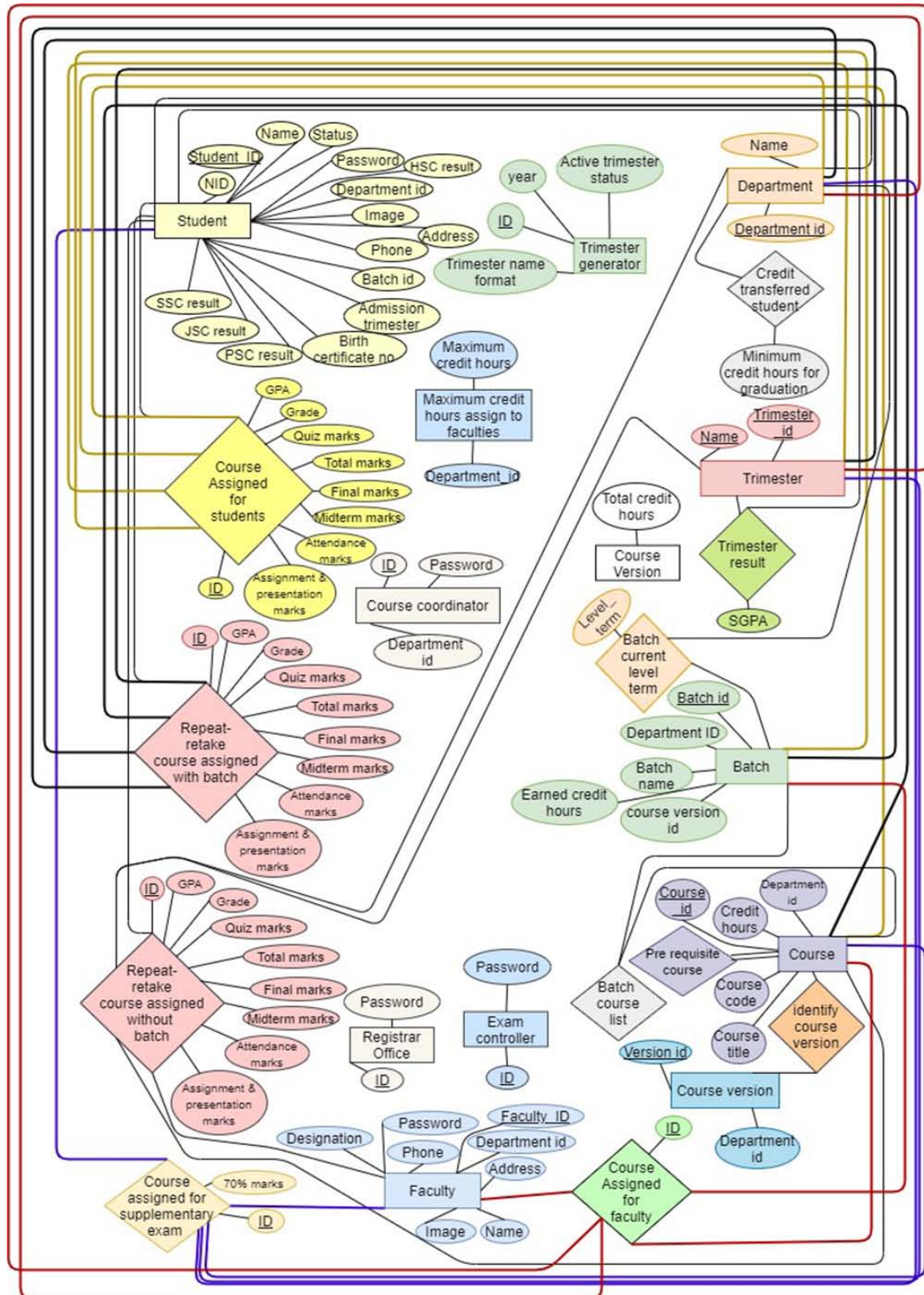


Fig. 2: Entity Relationship Diagram of Exam Management System

System Architecture: We develop the Exam Management System based on MVC architecture. This is one of the mostly used architectural patterns for developing various applications. MVC stands for Model,

View, and Controller which an MVC framework consists of. These three categories have their functions. In Figure 03 the system architecture of EMS is displayed.

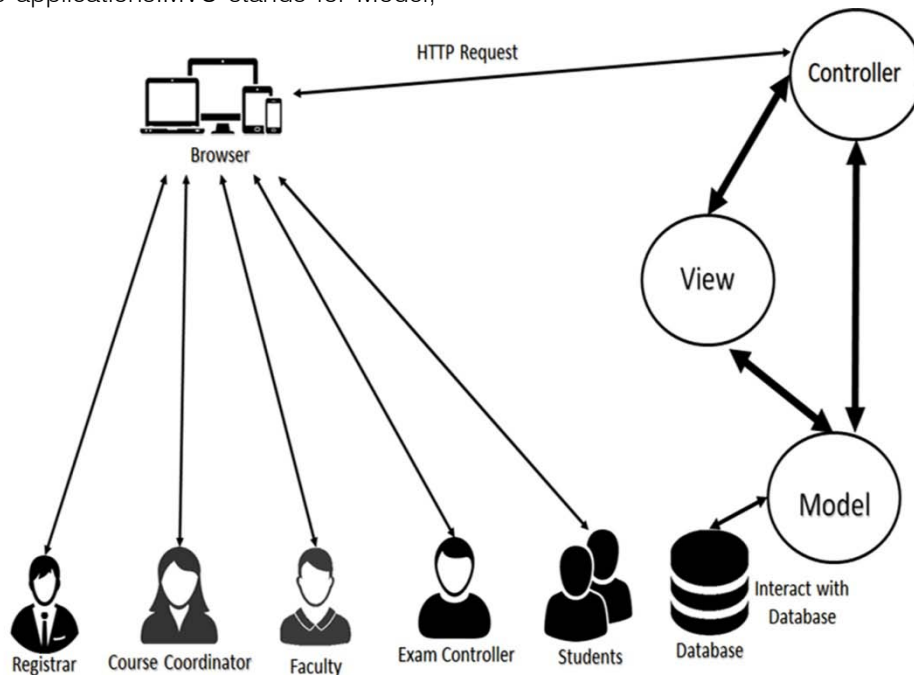


Fig. 3: System Architecture of Exam Management System

d) System Implementation

This is the construction phase. At this stage, we have written programs for Exam Management System. Also, we develop the system, test the system, do the documentation for the system and install the system on the local server. We also evaluate the system and enter data in the system to prepare for end-users.

e) Functionalities of the Software

Exam Management System (EMS) has many functionalities. Exam Management System has five types of end-user roles, such as Registrar, Course Coordinator, Faculty, Exam Controller, Student. For every end-user, this system has various well-intended functionalities.

Home Page and common features: The Exam Management System has a fascinating home page to attract users. EMS has some common features that can be accessed from any end-users account. Such as Every user can log in and logout from his/her account. Each user can update his/her profile information as well as can change their password, also users can change their profile picture.

Registrar: The registrar has some general role in the management system. Registrar has a dashboard from where the registrar can operate all kinds of operations concerned to him. From the dashboard, the registrar can view and update his/her profile if necessary. The registrar can create a new account for 'Course

Coordinator', 'Faculty', and 'Student'. The registrar also can create new departments as well as new batches and new trimesters. From the registrar account all existing departments, batches, students, faculties can be viewed. The registrar can assign faculty for non-departmental courses for any department if the departmental course coordinator wants.

Course Coordinator: Course coordinator of a department has some very important roles in Exam Management System. Course coordinators need to manage the work process between students and faculty. From assign faculties to assign students, a course coordinator needs to do many important tasks. A course coordinator can perform all these operations from his/her dashboard.

A course coordinator has the responsibility to set faculties maximum credit hours. A course coordinator can assign regular courses for any batch also can assign repeat/retake courses (with batch/without batch) and supplementary courses for students. A course coordinator needs to assign faculties for regular, repeat/retake, and supplementary courses for any trimester at this stage course coordinator can send a request to the register for assigning faculties for non-departmental courses if necessary.

Faculty: Faculties are one of the most important parts of an educational institute. Faculties need to manage a lot of work besides teaching. That's why Exam

Management System has a lot of facilities for faculties that are accessible from their well-intended dashboard.

Faculties examine students' work and give them marks on the online mark sheet. Faculties can download the mark sheets if necessary. Faculties got their assigned courses and batches after the departmental Course Coordinator assigned them. Faculties got to see all the assigned courses and students from their accounts. Faculties examine students' work and give them marks on the online mark sheet. Faculties can download the mark sheets if necessary. Faculties can see a mark update information if the exam controller updates any student's mark who was assigned to him/her for that course. when the marking of trimester final will be done faculties will be able to submit the mark sheet to the Exam Controller.

Exam Controller: The Exam Controller starts his/her work after faculties submit the final mark sheet. The responsibility of the Exam Controller is to publish the final trimester result at the most suitable time. When the Exam Controller will publish the trimester final result only then students will be able to see their trimester result on their account. The Exam Controller can manage all these tasks from his/her dashboard.

The exam controller can see all mark sheets which are already published by faculties from his/her account. The exam controller has the responsibility to publish the trimester final result. If any faculty doesn't submit a trimester mark sheet then the exam controller can see the list of those unsubmitted mark sheets.

Students: Students are the last part of this management system. Students can see their results when all other users have finally done their work. Students can control all features from their well-designed dashboard.

Students can see their newly published results, as well as they, can see their old results searching by trimester name. Students are also able to see their whole mark sheet transcript at once on one page which will contain all the results of the already published results and CGPA of completed trimesters. Students' dashboard has a section from where they can know their remaining trimesters and credit hours.

f) *System Support*

This step is necessary when the system is in use for real-life operations. During this phase, IT staff maintains, enhances, and protects the system. IT staff maintains the system's security and solves if any technical issue occurs.

III. RESULTS AND DISCUSSION

The Exam Management System (EMS) has provided very good performance in the testing phase. EMS performs all necessary tasks in a very short time. EMS can take a massive amount of user load due to the combination of Laravel and MySQL. EMS serves all end-

users requirements, as well as EMS, offers some extra features also which are very appreciated by the end-users because by those features end-users can manage their work more easily. The Exam Management System is definitely able to serve its purpose to manage exam and course-related activities of Notre Dame University Bangladesh. By its performance, EMS assured that it can save a lot of time for students and university officials and of course can save a decent amount of money.

IV. CONCLUSION

Exam Management System (EMS) is a very important web application. This application is developed based on the work process of Notre Dame University Bangladesh (NDUB). This web application will help to automate the process of how NDUB manages exams, faculties, students, and courses. EMS is certainly very helpful as a management system that could be a very good example of how a management system can help educational institutions to improve their work process and quality of work. EMS digitalized manual things, which will help students to know their results from anywhere without rushing to notice board when results are published as well as faculties to examine students work very easily. Other officials will also get benefited from this system because it will reduce the amount of manual workload. Overall EMS could create a good environment for the university officials as well as students.

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A Framework to Model Site Reliability Engineering Implementations and its Consolidation

By Anand Sunder

Abstract- Site Reliability Engineering has opened a pandora's box of new technological challenges [1],[3],[6],[10]. Trying to condense all of it into one structure or system is one such requirement.

We show the interaction between people, processes, and technology as against the levels of maturity on reliability scale of 5.

GJCST-G Classification: D.3.3



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A Framework to Model Site Reliability Engineering Implementations and its Consolidation

Anand Sunder

Abstract- Site Reliability Engineering has opened a Pandora's box of new technological challenges [1],[9],[6],[10]. Trying to condense all of it into one structure or system is one such requirement.

We show the interaction between people, processes, and technology as against the levels of maturity on reliability scale of 5 [1].

I. INTRODUCTION

We classify the degree of reliability in systems into five discrete levels as shown below in the table:

Table 1: Discrete levels of classification of SRE maturity levels [1,3]

Level	Type
I	Chaotic
II	Repeatable
III	Defined
IV	Managed
V	Optimizing

Also in lieu of various tenets of Site Reliability Engineering we include the following:

Table 2: Tenets of SRE [1,3,6]

1	Monitoring Distributed Systems
2	Incident Management
3	Exception Handling
4	Emergency Response
5	Toil Elimination
6	Chaos Engineering

Based on the interaction between people, processes, and technology and the five discrete levels of maturity we come here with a map of their interactions:

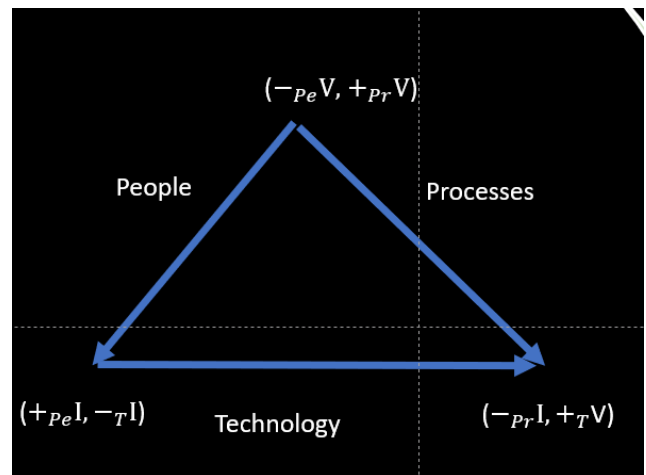


Figure 1: Interaction of people, processes and technology [1,2,3,6,9]

Technology bridges the gap between people and processes, so across the discrete levels of maturity, i.e, Levels I -V the above diagram approximates the interactions in most of the cases occurring in real life scenarios.

We have also come up with an approximate flow map of the tenets across 5 discrete levels as shown below:

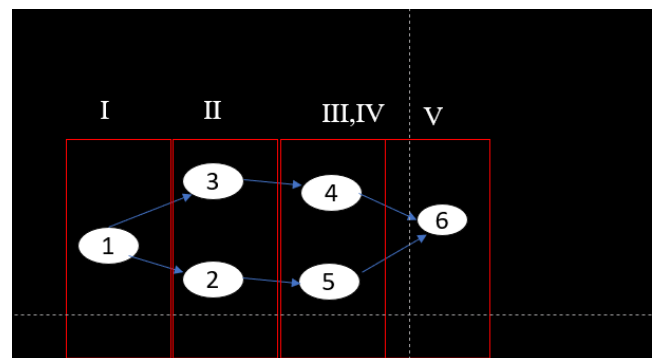


Figure 2: Levels against Tenets of SRE [1,3,6]

Monitoring distributed systems reinforces incident management (2) and exception handling (3).

A mature incident management (2) leads to better elimination of unnecessary toil (5).

An evolved exception handling (3) will lead to an evolved emergency response (4).

Ultimately Levels I-V of maturity will be mapped to various tenets as shown above, with highest level of maturity at chaos engineering (6).

II. CONCLUSION

The abovementioned framework, can lead to some really insightful systemic understanding for improving reliability of services. Further insights and improved level of understanding can be extracted by applying this across multiple scenarios.

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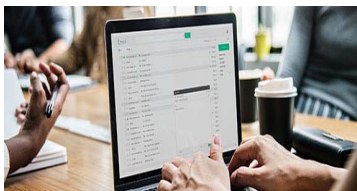
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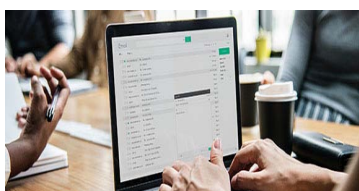
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- i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
- j) There should be brief acknowledgments.
- k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.



FORMAT STRUCTURE

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, "What words would a source have to include to be truly valuable in a research paper?" Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.



Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

PREPARATION OF ELETRONIC FIGURES FOR PUBLICATION

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

TIPS FOR WRITING A GOOD QUALITY COMPUTER SCIENCE RESEARCH PAPER

Techniques for writing a good quality computer science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of computer science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.



20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium through which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

INFORMAL GUIDELINES OF RESEARCH PAPER WRITING

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.



The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."



Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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CRITERION FOR GRADING A RESEARCH PAPER (COMPILATION)
BY GLOBAL JOURNALS INC. (US)

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Topics	Grades		
	A-B	C-D	E-F
<i>Abstract</i>	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
<i>Introduction</i>	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
<i>Methods and Procedures</i>	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
<i>Result</i>	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
<i>Discussion</i>	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
<i>References</i>	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring



INDEX

A

Axon · 1, 2, 3

B

Bearish · 8, 10

E

Electrolyte · 3

H

Hyperpolarizes · 1

I

Ionic · 1, 2

M

Membrane · 1, 2

O

Oscillator · 5, 6, 11

P

Perceptrons · 7

Perturbations · 1

Pictorial · 5

S

Stochastic · 5, 8, 11

T

Trimesters · 15, 16, 20, 21



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