

TRADER HUB SYSTEM DEVELOPMENT USING VAN K THARP EXPECTANCY THEORY TO ANALYSE RETAIL FOREX TRADING SYSTEM PERFORMANCE

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ABSTRACT

With the advance of technology, foreign exchange trading, known as forex or FX trading, has been conducted electronically using the Internet. Forex traders were using technical analysis to project the best price when buying or selling currencies, and by using the technical analysis tools, they have created their own trading system. Forex traders need to make consistent profitability in the long term to sustain in the forex market, therefore a good trading system is vital. In order to evaluate their trading system performance, forex traders can use the backtesting and forward testing methods. However, these two methods took a long time to perform and did not provide the exact benchmark quality of the trading system. This paper describes how Van K Tharp Expectancy Theory was applied in the development of the Trader Hub System (THS) to evaluate forex trading systems quality. By using the system development life cycle (SDLC) methodology, four phases have been undertaken, which were requirements gathering, requirements analysis, system design, and system development. The outcome is a system that can easily evaluate forex trading system performance; thus, it may help retail forex traders in Malaysia to do technical analysis on their foreign exchange pairs.

Keywords: *Van K Tharp Theory, Foreign Exchange, Forex, System Quality, System Performance, Trading System*

Received for review: 28-04-2020; Accepted: 18-05-2020; Published: 29-07-2020

1. Introduction

The world's largest financial market for currencies trading is the online foreign exchange market or Forex (FX) (Moeeni & Tayebi, 2018). In April 2016, the average daily volume of forex trading reached \$5.1 trillion per day (Triennial Central Bank Survey, 2016). Retail foreign exchange trading is a small chunk of the larger market of foreign exchange where an individual or small organization speculating on the exchange rate between different currencies available. The profit is made from differences between the exchange rates. A retail forex trader is an individual who trades the forex market through a forex broker using forex platforms such as MT4, CTrade, and others (Dolan, 2011). Forex traders use backtesting and forward testing method to test their trading systems performance (Pardo, 2008). Backtesting and forward testing are needed in order to determine whether the system is profitable in the long run or not. A profitable system in the long run is important to make sure forex traders do not gamble or risk all of their capital money in the forex trading industry (Tharp, 1998). Backtesting can be referred to using historical data to test the trading system performance during the time period,

which has been specified (Neely & Weller, 2011). Technicians, a term referred to persons using technical analysis to project the price, regularly use the backtest method, which by then they test on the past data (Neely & Weller, 2011). This particular approach also gives traders valuable information regarding trading account and provide certain data such as total profit, loss, etc. As for forward testing, the approach allows performance testing in a simulation of actual trading and involves the logic of the trading system in a live market environment by which is also called 'paper trading' (Folger, 2012).

The current practice of backtesting, focuses on the trading system averaged profit and loss ratio (Stokes, 2008). The vital potential and viability of a trading system cannot be justified by just using the average of historical data over several periods of time (Stokes, 2008). This is because the market has limited value for a short-term trader and backtesting does not consider the market having varying conditions from good to bad (Pardo, 2008). On the other hand, the forward testing method needs to be run in real and current market conditions, where it consumed time to collect the data. Stokes (2008) recommended doing forward testing for at least 2 or 4 weeks and this clearly indicates it takes a long time in order to test the system. Another approach in analysing the performance of a trading system is proposed through this research, which is using Van K Tharp formula of positive expectancy. The theory of Van K Tharp and the development of the Trader Hub System (THS) prototype will be explained in further details in the following sections.

2. Forex Market Analysis and Trading

A forex market operates through an electronic network of banks, corporations, and individuals trading one currency for another (Amiri *et al.*, 2009). Since the forex market is not centralized, it creates a tiered structure that separates the different participants in the market (Poon *et al.*, 2014). As shown in Figure 1, the top of the hierarchy is known as the 'interbank market' or 'interdealer market' where the trades transaction is done directly between the world's largest banks, followed by medium-sized and small banks. The next tier involves smaller organizations outside of the banks which include retail market makers, retail ECNs, hedge funds and commercial companies. And the last tier is the retail forex traders who are responsible for a majority of the trading volume.

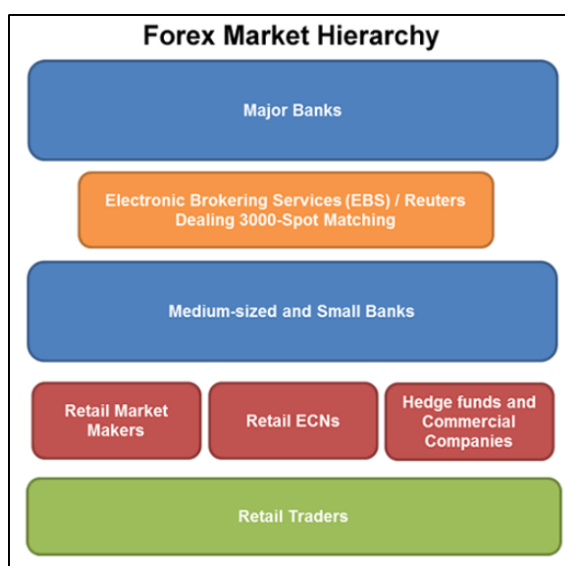


Figure 1: Forex Market Hierarchy (Source: Poon *et al.*, 2014)

Retail forex traders use trading system to help them run and manage their forex trade. The trading systems deploy different kinds of market analysis techniques to predict the movement of prices and help traders make their moves. There are varieties of market analysis techniques available such as fundamental analysis and technical analysis.

In order to perform fundamental analysis, factors such as interest rates, trade laws, economic news and natural/geopolitical events are considered as influencers in the forex market (Shariyah Review Bureau, 2018). Forex traders highly value this information; how it affects the future movement of the country's interest rate becomes the de facto of their decisions.

On the other hand, technical analysis is a method of predicting the movements of the price and future market trends by examining what has occurred in the past using charts (Amiri et al., 2009). The chart provides clues on the levels of supply and demand based on the movements of prices' actions, thus giving indications to the forex investors on deciding their movements either to sell or buy.

A good trading system is one that can make good predictions based on the price movements by using proper market analysis techniques, and this increases the potential success of forex traders in making money (Pardo, 2008). Therefore, in sustaining long-term gain, a forex trader needs to measure the performance of his or her trading system. The trading system needs to be tested in order to know its capabilities in the real market conditions. There are two ways to test the trading system, which are backtesting and forward testing. In backtesting, a trader will choose the trading system or strategy that she or he will use then run the system through a database of historical data to see whether that system or strategy will make money (Logue, 2014). Traders can calculate the average results and performance of the trading system as performed during the period through the trading account. The result from backtesting will provide information on the return, volatility, and win-loss ratios (Logue, 2014). Whereas in forward testing, a simulation of actual trading is performed and involved following the logic of the trading system and it is traded in the live market (Folger, 2012). To do forward testing, a forex trader can use retail forex trading platforms such as MetaTrader 4 which offer dummy or demo accounts to start trading in the live market environment. After reviewing the trading system testing methods, it is found that both methods had their own weaknesses. Backtesting method can only provide a certain data for the trading system through the trading account such as return, win-loss ratios, and volatility and it does not provide the exact score of the trading system's quality. Whereas the forward testing method needs a long time to perform as it needs to run on the real market, and this will be a waste of time for forex traders.

A trading system needs to be measured or evaluated for financial gain. If a trading system is not properly tested, it will lead to problems such as financial loss, losses of hundreds of labour hours, frustration, and disappointment. Thus, by evaluating the trading system, these losses could be avoided (Pardo, 2008).

3. Van K Tharp Model of the Expected Value and Positive Expectancy

There are two methods that can be used to evaluate trading systems which are the Sharpe Ratio and the Expected Value and Positive Expectancy method.

3.1 Sharpe Ratio

Sharpe Ratio is referred to as a measure of risk-adjusted performance (Simons, 1998). It was introduced by William Forsyth Sharpe in 1966. Sharpe Ratio is also known as the Sharpe index, the Sharpe measure, and the reward-to-variability ratio. It is a method to examine the performance of a portfolio of investment by examining and adjusting the risk. The ratio measures the excess return (also known as risk premium) divide by per unit of standard

deviation in trading strategy or investment asset, where this standard deviation was referred to as risk (Jani & Jain, 2014), as shown in Equation 1 below.

$$= \frac{r_p - r_f}{\sigma_p} \quad (1)$$

where:

r_p = Expected portfolio return

r_f = Risk free rate

σ_p = portfolio standard deviation

Excess return is the numerator, where the expected portfolio's return minus the risk-free rate. Expected portfolio return means the average portfolio or trading strategy return over the sample period, where the standard deviation is based on the sample period (Kothari & Warner, 1997). While risk-free rate as explained by Simons (1998) referred to return on completely safe and liquid investment which is available, where usually it can be considered as the rate on 90-days treasury bills or government bond. If there is no risk-free rate or simply no trust in the government bond rate, the formula in Equation 2 below can be used (Damodaran, 2016).

$$\text{Risk Free Rate} = \text{Expected Inflation in Currency} + \text{Expected Real Interest Rate} \quad (2)$$

Damodaran (2016) stated that the expected real interest rate can be set to real growth in the economy. Sharpe Ratio is based on the trade-off between return and risk. A high outcome of the Sharpe Ratio concluded that the fund or investment delivers a lot of returns for its level of volatility. The higher the Sharpe Ratio means that the particular investment portfolio will be better. Sharpe Ratio acted as a measure as it is a good guide to investment decisions but only in a limited set of circumstances, such as when investors put all their money into one diversified fund or invest in the risk-free assets.

3.2 Expected Value and Positive Expectancy

Expected Value is a value produced for a given investment in the future. It gives an average of the expected value investment will gain in the future, considering a number of trades. According to Lorenzo (2012), the expected value or average is calculated by multiplying each event for its probability and thus, is summed up over all possible events.

Expectancy value is how much profit a trader can expect to make on the average per dollar, over a number of trades (Tharp, 1998). To calculate the expectancy value, a formula as in Equation 3 is used.

$$\text{Expectancy} = (\text{PW} * \text{AW}) - (\text{PL} * \text{AL}) \quad (3)$$

From the formula above, PW is the probability or percentage of winning trades, PL is probability or percentage of loss trades, AW is the average of winning trades, and AL is the average of loss trades. Tharp (2009) elaborated, expectancy or mean of R-multiple tell the trader what they can expect from their trading system on average over many trades in term of R. R means the initial risk in a trade and R-Multiple refer to the profits and losses expressed as a ratio of the initial risk.

Table 1: Expressing Profit/Loss as R-Multiples

Trades No.	Profit or loss	R-Multiple
1	\$1000	1.73R
2	\$2,877	4.98R
3	(\$157)	-0.27R
4	\$342	0.59R
5	\$1,234	2.13R
6	\$858	1.48R
7	(\$1,143)	-1.70R
8	(\$432)	-0.75R

Table 1 shows an example of how to calculate R-Multiple. As explained earlier, R is an initial risk, but since there is no initial risk mentioned in the table above, Tharp (2009) also suggested to use the average loss. There are 3 losses here which are \$157, \$1,143, and \$432, where the average is \$577.33. To calculate R-Multiple simply divide each of the profit or loss trade from the initial or the average loss. For example, in trade no. 1, \$1000 is divided with an average loss of \$577.33, where it produced an R-Multiple of 1.73R. To get the average of R-Multiples or the expectancy of the trading system for Table 1, simply sum up all the R-Multiples and divide it by the total trades. The trading system in Table 1 produced an expectancy ratio of 0.84, where it means that for each \$1.00 a trader risks, he or she will expect the return profit of \$0.84. The expectancy ratio or system quality score of 0.84 is a positive expectancy where the score is considered as a “Holy Grail”, meaning it is a very good trading system, as described in Table 2 below.

Table 2: Guideline to System Quality (Source: Tharp, 2009)

Ratio of Expectancy	Quality of the System
0.16 – 0.19	Poor but tradeable
0.20 – 0.24	Average
0.25 – 0.29	Good
0.30 – 0.49	Excellent
0.50 – 0.69	Superb
0.70 or better	Holy Grail

The importance to get a positive expectancy is prominent for a trader to know that he or she has a trading system that is profitable in backtesting and can be used to produce such return in future trading (Pardo, 2008). Pardo (2008) described positive expectancy as the potential of trading profit, where the trading system has been verified having a reasonably high chance of producing a real-time trading return and relatively consistent with the back testing method.

The Expected Value and Positive Expectancy method has been chosen to be applied in this research because it is simple to execute, easy to get required input data, and has plenty of guidelines to help with the evaluation of a trading system.

4. Methodology

The research was divided into four phases which are requirements gathering, requirements analysis, design, and development. Requirements gathering was the initial phase where the researchers reviewed articles related to forex trading, trading system, and evaluation method. Researchers then used an interview and survey methods to elicit the requirements of the system. Interviews were performed with the management of MNA Research Sdn. Bhd., which is a forex trading company, and questionnaire surveys were distributed to the end-users of the company’s

trading systems. In the requirement analysis phase, data that have been collected were analysed to define the functional and non-functional requirements of the system. From the requirements, use cases and activity diagrams have been subsequently designed and developed.

In the design phase, the application was designed to satisfy the requirements identified in the previous phase. Among the activities involved were designing the class diagram, storyboard, and user interface. Lastly, in the development phase, application functions were coded and integrated based on design specified earlier. Using PHP programming language as the main server-side scripting programming language, MySQL database, and CSS and HTML as the client-side languages, the function modules were developed to make a full working Trader Hub System with embedded Van K Tharp's expected value and positive expectancy model.

5. Findings and Development

The functional requirements identified from interviews were analysed by grouping them into two layers' functions. In layer 1, similar requirements were combined into general functions, while in layer 2 they were further combined to create more general functions. Table 3 and 4 list the functional and non-functional requirements gathered from stakeholders of the system.

Table 3: Functional Requirements

Requirement/phrase	Function (layer 1)	Function (layer 2)
Admin upload trading account	Upload, automatic calculation and view the trading system score (both actors – admin and user)	Manage trading system score
User upload trading account		
Input formula for calculating the score		
Automatic calculation of the system		
User – View their own score		
Ouput – give a score, analysis, and category		
Output – notification of low winning rate		
Admin – view list of users trading system's score	View and manage user trading system score	
Admin – edit and delete users trading system's score		
User – view the forex signal post	View forex signal post (user)	Manage forex signal post
Admin – create and view the forex signal post	Create and view the signal post (admin)	
Admin – content of forex signal post		
Referral link banner/space (in user dashboard)	Company business information	
Referral link banner/space		
Company business information		
Expectancy theory explanation	Forex trading information for users	
Forex basic information		

Table 4: Non-functional Requirements

Requirement identified	Comment
Register – username, email, phone number, password. (Both Actor – Admin and user)	Account management
Login – Username & password. (Both Actor – Admin and user)	
Login – Username & password. (Both Actor – Admin and user)	Things to keep confidential
Usability – User and admin dashboard	Dashboard
Usability - Minimal design	Design type, look, and the principle of the system
Usability - Gestalt Principle and Fitts Law	
Portability - Web-based system	
Portability - Responsive design	

After the requirements have been identified, the use cases were created to show a possible sequence of interactions between the system and users, as shown in Figure 2.

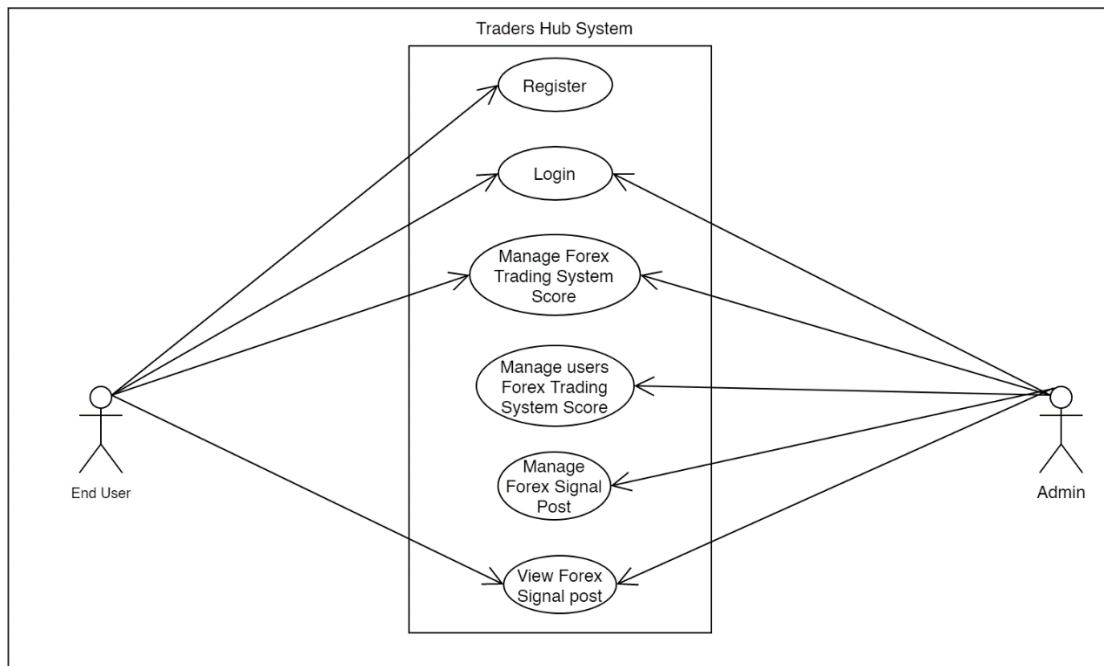


Figure 2: Use Cases for THS

The researchers used storyboarding technique to design the sequence of interactions graphically, then the interfaces of the THS were developed. Figure 3 to Figure 8 display the screenshots of THS.

Initially, a user is required to register or sign in to the system through a login page. Once a user is signed in, the user is directed to the main dashboard, which is shown in Figure 3. A user can create a page for the trading system that he or she would like to evaluate. Using historical data in the form of Excel or CSV file of the trading system to be evaluated, the user can upload it into THS for analysis. The screen for doing this is shown in Figure 4.

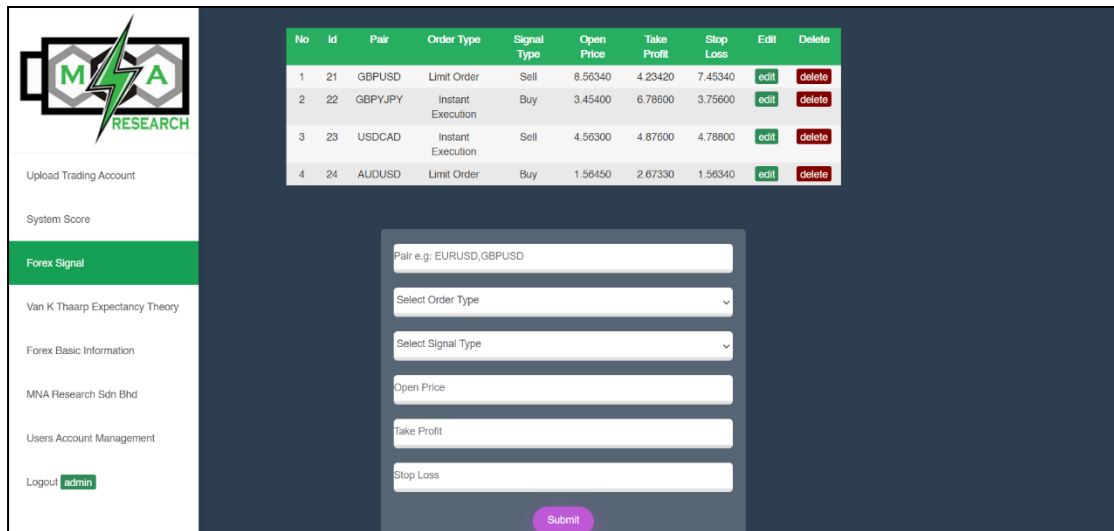


Figure 3: Forex Signal Post Page

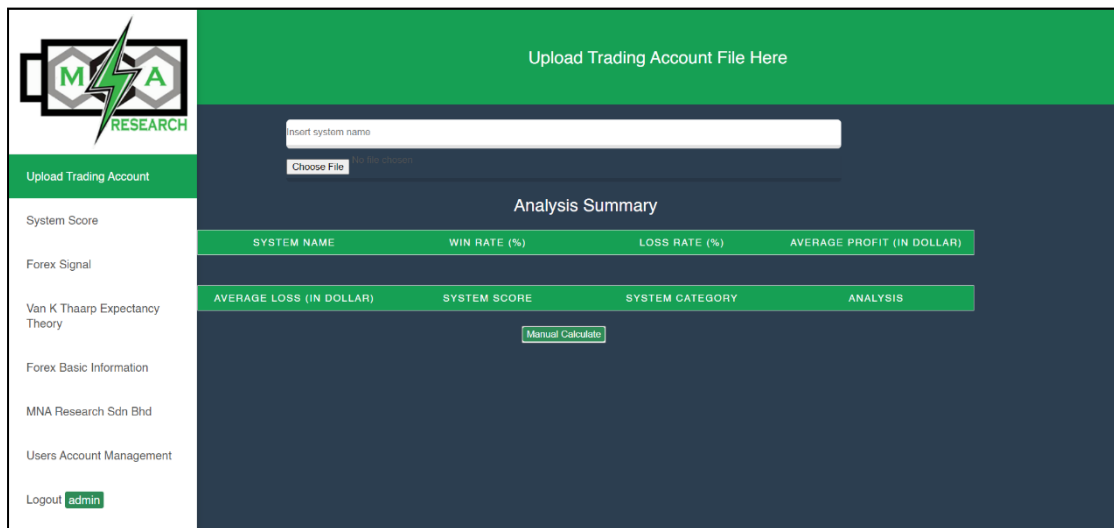


Figure 4: Upload and Save System Name Page

THS will analyse the uploaded historical data using the Van K Tharp algorithm. Once finished, the analysis result page will be displayed as depicted in Figure 5. Meanwhile, Figure 6 shows the overall trading system performance score being monitored by the user. The performance was described according to the Van K Tharp scoring, categorization, and analysis.

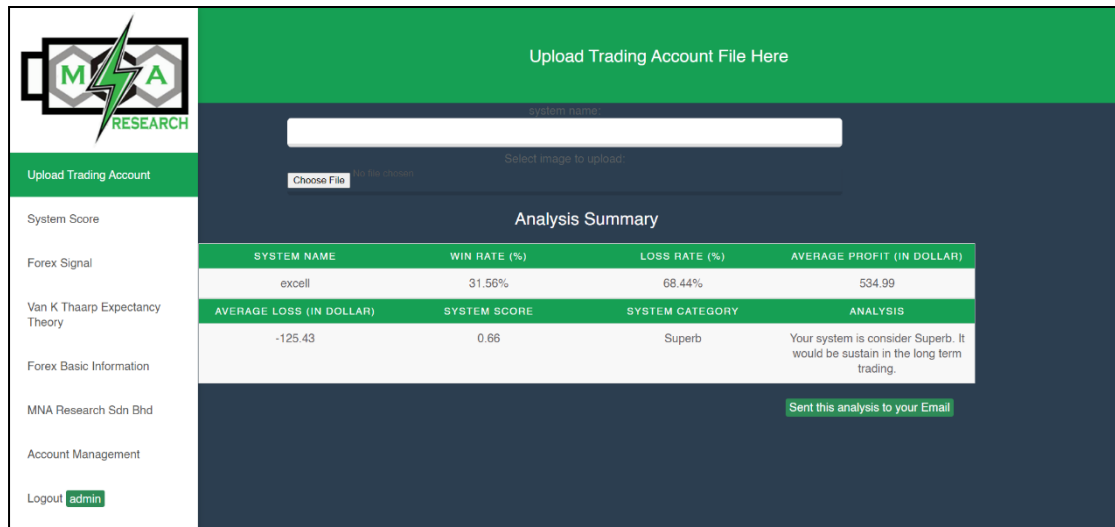


Figure 5: Analysis Page

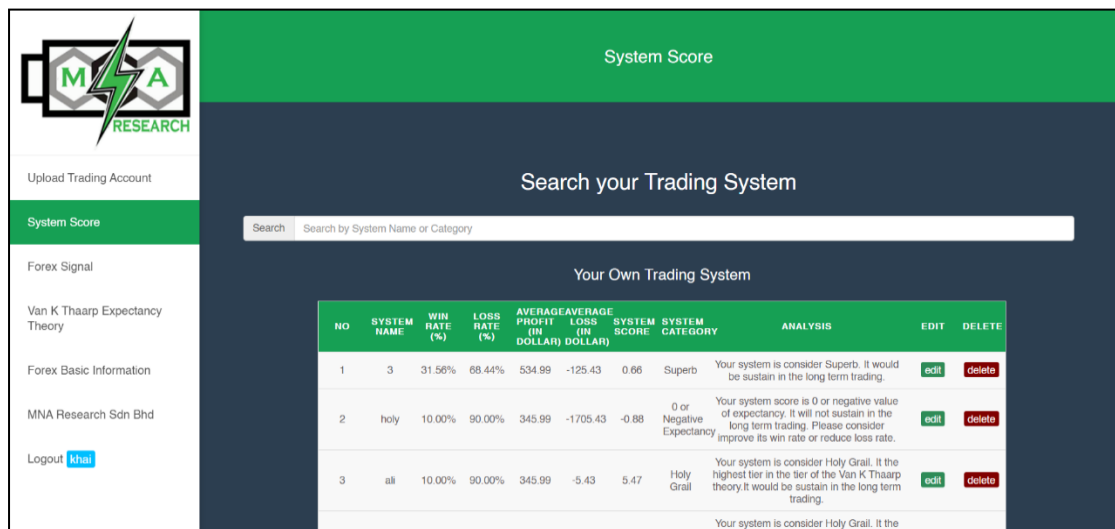


Figure 6: System Score Management Page

Supplementary to the main function of the system, additional pages were provided for the convenience and information of the forex traders, where user can view information regarding the Van K Thaarp theory in detail and information regarding forex market and market analysis technique as shown in Figure 7 and 8.

The screenshot shows a webpage with a green header and a white sidebar. The sidebar contains navigation links: 'Upload Trading Account', 'System Score', 'Forex Signal', 'Van K Tharp Expectancy Theory' (highlighted), 'Forex Basic Information', 'MNA Research Sdn Bhd', and 'Logout' with a 'khai' logo. The main content area has a green header with the title 'So What is V K Tharp Expectancy Theory?'. Below it is a section titled 'Who is Van Tharp?' with a photo of Van K. Tharp. The text describes him as a psychologist and professional trading coach. It includes a quote from him about expectancy and a formula: $Expectancy = (Percentage\ Win * Avg.\ Win) - (Percentage\ Loss * Avg.\ Loss)$. An example calculation is provided: $(0.3 * 10) - (0.7 * 3) = 0.9$.

Figure 7: Explanation Page about the Expectancy Theory

The screenshot shows a webpage with a green header and a white sidebar. The sidebar contains navigation links: 'Upload Trading Account', 'System Score', 'Forex Signal', 'Van K Tharp Expectancy Theory', 'Forex Basic Information' (highlighted), 'MNA Research Sdn Bhd', and 'Logout' with a 'khai' logo. The main content area has a green header with the title 'Forex Trading Basic Information'. Below it is a section titled 'Fundamental Analysis' with a definition: 'Fundamental analysis is a way of looking at the forex market by analyzing economic, social, and political forces that may affect the supply and demand of an asset.' It includes a paragraph explaining that one must look at factors like economic data, interest rates, and monetary policy. To the right is a diagram showing two maps of the USA. The left map is green and labeled 'Good Economy' with a sign 'Higher Currency Value' and an upward arrow. The right map is black and labeled 'Bad Economy' with a sign 'Lower Currency Value' and a downward arrow. The source 'Babypips.com' is noted at the bottom right.

Figure 8: Forex Basic Information Page

6. Data Simulation

This section discussed regarding data simulation for the Trader Hub System and its calculation using the Van K Tharp theory. Due to the confidentiality and privacy of trading records, it was difficult to find live data as a sample to simulate the system performance. Thus, a data sample for this purpose was obtained from a random forex trader who is willing to allow the use of his data anonymously.


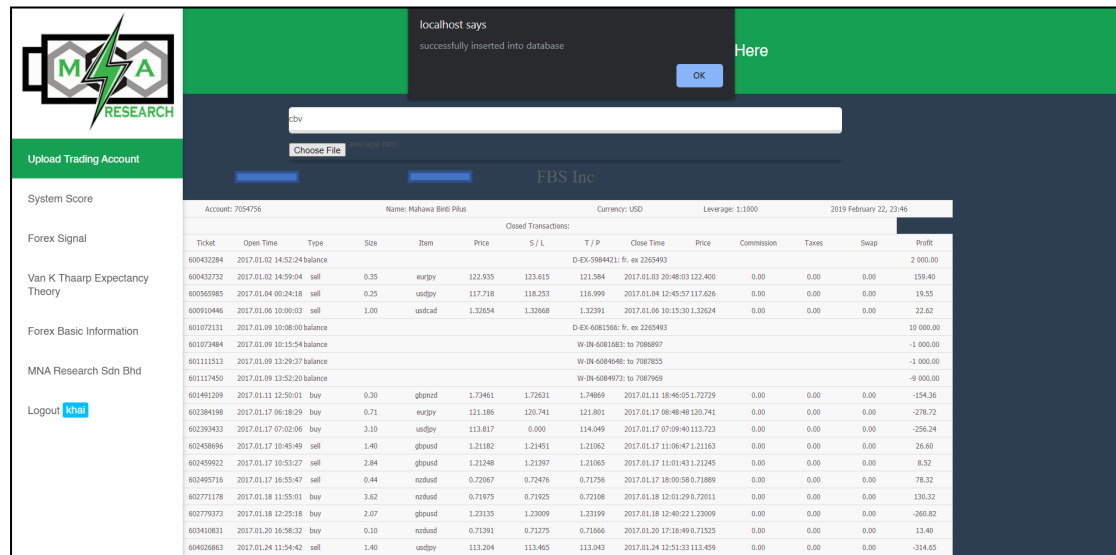
Summary:			
Deposit/Withdrawal:	2 399.72	Credit Facility:	0.00
Closed Trade P/L:	-2 396.27	Floating P/L:	-0.71
Balance:	3.45	Equity:	2.74
		Margin:	1.30
		Free Margin:	1.44
Details:			
			
Gross Profit:	5 615.62	Gross Loss:	8 011.89
Profit Factor:	0.70	Expected Payoff:	-31.95
Absolute Drawdown:	2 396.27	Maximal Drawdown:	3 711.05 (111.95%)
		Relative Drawdown:	111.95% (3 711.05)
Total Trades:	90	Short Positions (won %):	26 (69.23%)
		Long Positions (won %):	49 (36.73%)
		Profit Trades (% of total):	36 (10.00%)
		Loss trades (% of total):	39 (90.00%)
Largest		profit trade:	1 643.30
Average		profit trade:	345.99
Maximum		consecutive wins (\$):	5 (383.76)
Maximal		consecutive profit (count):	2 093.19 (4)
Average		consecutive wins:	2
		consecutive losses (\$):	12 (-633.92)
		consecutive loss (count):	-1 762.29 (3)
		consecutive losses:	2

Figure 9: Sample Data

Figure 9 showed an example of raw data, gathered from the forex trader’s account in a trading platform. The file was in HTML format and contained all the necessary data used in Van K Tharp theory calculation such as percentage of profit and loss trades, and average profit and loss trades. The highlighted section in Figure 9 showed the data that will be used by THS. Using the menu ‘Upload Trading Account’ in Figure 4, the data file was uploaded to THS by inserting the system name and choosing the appropriate file. Then, necessary information will be extracted from the data file, stored in a database and, a success alert message will be displayed, as shown in Figure 10.



The screenshot shows a web interface with a success alert message: "localhost says successfully inserted into database". Below the alert is a "Choose File" button and a "Logout" button. The main content area displays a trading account summary for "FBS Inc" with account number 7054756, name Mahava Binti Pilus, and currency USD. The summary includes a table of closed transactions with columns for Ticket, Open Time, Type, Size, Item, Price, S/L, T/P, Close Time, Price, Commission, Taxes, Swap, and Profit.

Ticket	Open Time	Type	Size	Item	Price	S/L	T/P	Close Time	Price	Commission	Taxes	Swap	Profit
60043284	2017.01.02 14:53:24	balance					D-EX-5984421; fr. ex 2265493						2 000.00
600432732	2017.01.02 14:59:04	sell	0.35	eurjpy	122.935	123.615	121.584	2017.01.03 20:48:03	122.400	0.00	0.00	0.00	159.40
600565985	2017.01.04 00:24:18	sell	0.25	usdjpy	117.718	118.253	116.999	2017.01.04 12:45:57	117.626	0.00	0.00	0.00	19.55
600919446	2017.01.06 10:00:03	sell	1.00	usdcad	1.32654	1.32668	1.32391	2017.01.06 10:15:30	1.32624	0.00	0.00	0.00	22.62
601072131	2017.01.09 10:08:00	balance					D-EX-6081566; fr. ex 2265493						10 000.00
601074894	2017.01.09 10:15:54	balance					W-IN-6081683; to 7088697						-1 000.00
601115153	2017.01.09 13:28:37	balance					W-IN-6084548; to 7087955						-1 000.00
601113450	2017.01.09 13:52:20	balance					W-IN-6084973; to 7087969						-9 000.00
601491209	2017.01.11 12:50:01	buy	0.30	gbpjyd	1.73461	1.72631	1.74869	2017.01.11 18:46:05	1.72729	0.00	0.00	0.00	-154.36
602384198	2017.01.17 06:18:29	buy	0.71	eurjpy	121.186	120.741	121.801	2017.01.17 08:48:48	120.741	0.00	0.00	0.00	-278.72
602383433	2017.01.17 07:02:06	buy	3.10	usdjpy	113.817	0.000	114.049	2017.01.17 07:59:40	113.723	0.00	0.00	0.00	-256.24
602458696	2017.01.17 10:45:49	sell	1.40	gbpjyd	1.21182	1.21451	1.21062	2017.01.17 11:06:47	1.21163	0.00	0.00	0.00	26.60
602459922	2017.01.17 10:53:27	sell	2.84	gbpjyd	1.21248	1.21397	1.21065	2017.01.17 11:01:43	1.21245	0.00	0.00	0.00	8.52
602495716	2017.01.17 16:55:47	sell	0.44	nzusd	0.72067	0.72476	0.71756	2017.01.17 18:00:58	0.71889	0.00	0.00	0.00	78.32
602771178	2017.01.18 11:55:01	buy	3.62	nzusd	0.71975	0.71925	0.72108	2017.01.18 12:01:29	0.72011	0.00	0.00	0.00	130.32
602779373	2017.01.18 12:25:18	buy	2.07	gbpjyd	1.23135	1.23009	1.23199	2017.01.18 12:40:22	1.23009	0.00	0.00	0.00	-260.82
603410831	2017.01.20 16:58:32	buy	0.10	nzusd	0.71391	0.71275	0.71666	2017.01.20 17:16:49	0.71525	0.00	0.00	0.00	13.40
604028863	2017.01.24 11:54:42	sell	1.40	usdjpy	113.204	113.465	113.043	2017.01.24 12:51:33	113.459	0.00	0.00	0.00	-314.65

Figure 10: Success Alert

Using the source data, THS will instantly perform the calculation on it using the Van K Tharp formula. Figure 11 shows the code excerpt from THS that was used to calculate the system score performance. Function, variables and its uses are explained subsequently in Table 5 below.

```
$rewardRatio=$averageprofit/-$averageloss;
$system_score = round((((($profit/100)*$rewardRatio)-(($loss/100)*1)),2);
```

Figure 11: Code of THS for Calculation using the Van K Tharp Theory

Table 5: Function and Variable Explanation

No	Function/Variable	Description
1	\$rewardRatio	Use to get R-Multiple ratio.
2	\$averageprofit	Average Profit (in Dollar).
3	\$averageloss	Average Loss (in Dollar). *the use of (-), as loss is in negative value.
4	\$system_score	Formula to get the system score, it is the Van K Tharp Expectancy theory.
5	round((,2)	Rounding the value to 2 decimal place.
6	\$profit	Profit percentage.
7	\$loss	Loss percentage.

The screenshot displays the MNA Research interface. At the top, there is a green header with the text 'Upload Trading Account File Here'. Below this is a white input field for the trading account name. A 'Choose File' button is visible. The main content area is titled 'Analysis Summary' and contains a table with the following data:

SYSTEM NAME	WIN RATE (%)	LOSS RATE (%)	AVERAGE PROFIT (IN DOLLAR)
cv	10.00%	90.00%	345.99
AVERAGE LOSS (IN DOLLAR)	SYSTEM SCORE	SYSTEM CATEGORY	ANALYSIS
-1705.43	-0.88	0 or Negative Expectancy	Your system score is 0 or negative value of expectancy. It will not sustain in the long term trading. Please consider improve its win rate or reduce loss rate.

Below the table, a red alert message reads: 'Alert! Your Win rate is less than 30%. Increase your win rate to make sure you can make consistent trading in future!'. A green button labeled 'Sent this analysis to your Email' is located at the bottom right of the analysis section.

Figure 12: Analysis of the Data

Figure 12 is the screenshot for result of the analysis. From the simulated data, the forex trader’s system score was calculated at -0.88 value. According to information presented in Table 2: Guideline to System Quality, this technical analysis result contained negative value and did not have any rank in the ranking guideline. The score was categorised in the negative expectancy value and considered as not sustainable for long term trading. In the analysis summary, the system also suggested the trader improve the win percentage or reduce the loss rate for future trades.

7. Conclusion

This research was conducted with the objectives to identify the requirements, design, and develop the Trader Hub Systems to evaluate trading system quality. Van K Tharp's expectancy theory was used in the algorithm of the system as it provided a method to perform technical

analysis to evaluate the trading system performance. Trading companies can adopt the system as a value-added service provided to the clients through their websites. THS is also significant to individual forex traders by determining their trading system performance and from that, they can make improvements to their trading strategies and affect their long-term gains.

Future work can be done to enhance the proposed system to include other financial instruments such as stock, commodities, futures, and others. By broadening the scope of other instruments, trading companies can increase users' retention and attract other traders from different financial markets. Apart from that, the system can be further enhanced by introducing other evaluation theories besides the Van K Tharp expectancy theory, such as the Sharpe ratio. The use of multiple evaluation theories gives an option to the traders to view their trading system from different perspectives and increase confidence in their trading system performance.

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