

**DECISION-MAKING VISUALISATION APPLICATION
BASED ON ARGUMENT-AS METAPHOR**

By

Shirlene Meredith John

A project dissertation submitted in partial fulfilment of
the requirement for the
Bachelor of Technology (Hons)
(Information and Communication Technology)

JANUARY 2008

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CERTIFICATION OF APPROVAL

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Information and Communication Technology
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Approved by,

(Dr. Mohamed Nordin Zakaria)

**UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
January 2008**

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own concept as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

A handwritten signature in black ink, appearing to read 'Shirlene', is written over a horizontal line. The signature is fluid and cursive.

(SHIRLENE MEREDITH ANAK JOHN EDAN)

ABSTRACT

This document will examine the need of visualisation in assisting in decision making in the financial world. Observation is comprehension. This principle is central to all visualisation. Here, the necessary for visualisation is explained and the process involved in this project. People have difficulty making optimal decisions about their financial future, this is due to investment decisions are very difficult because they involve money and can impact our quality of life.

This project will focus on the research paper about Argument–as Metaphor in Decision–Making Visualisation. As an innovative alternative way in understanding the financial data, this report describes by using application developed based on the research paper may assist decision–maker specifically, the investors, in decision–making on their respective investment.

ACKNOWLEDGEMENT

First of all, thanks to God for allowing me to finish this project. Without His blessings, this project should be unable to reach the current progress and accomplishment. All the devotion and effort were dedicated to my family especially my parents, John Edan Uban and Siah Edward Nanang for their endless supports in encouraging me in many ways to stay focus in order to reach the goal of the project and other study to complete the degree.

Thank you to cooperative lecturers of Universiti Teknologi PETRONAS for their support and part of main contributor in this project. To name a few here, started with Dr Mohamed Nordin Zakaria as the most supportive and optimistic supervisor and also Ms. Emy Elyanee as the coordinator for Final Year Project II, Dr. P.D Dominic, Ms Shakirah, Mrs. Nazleeni, Mr Yew Khang Hooi, Mrs. Rohiza Ahmad, and Dr Wan Fatimah who also supports and gave resources and critics on the project.

Thank you also to classmates and friends who were willingly to lend their ear and spare of their precious time to listen on draft idea of the project. I appreciate their building critics and supports during project research and implementation. Lastly, thanks again to all the people involved in this project directly or indirectly. Thank you for all the efforts and ideas that contributes to the completion of this report and very much appreciated.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

When the word ‘Investment’ is mentioned, the first understanding that pops into any sane mind is, ‘We invest to make money!’ It is common knowledge too that by investing, it is an act of money making money. Investing has two ending, it’s either the investors makes more money or loses more money; the higher the investment, the higher the risk and vice versa. These are the kind of risk that any investors should bear in their mind.

Investors are being deluged with information, and they must learn how to sift through and evaluate this information overload. Living in this fast paced, ever changing world, being able to carefully analyse and evaluate investment opportunities is an upper hand for investors.

According to *Charles P. Jones* ^[1], an investment can be defined as the commitment of the funds to one or more assets that will be held over some future time period. In the book that he had written too he mentioned that investment is concerned with the management of an investor’s wealth, which are the sum of current income and the present value of all future income.

Observation is comprehension. This principle is central to all visualisation. This project will be based closely on the paper ‘The Argument-as Metaphor in Decision-making Visualisation’ by John McGinn and Richard Picking.

In their paper, *McGinn and Picking* ^[2] describes ‘*argument-as*’ metaphors and how they may be used as a vehicle to visualise decision support information. They also argue that their approach is useful for users who may not have advanced computer skills, who have little time to dedicate to in-depth analysis of the information. By using this metaphorical approach, they believe that it is simple to understand, easy to manipulate, and transparent in its display of underlying reasoning.

1.2 Problem Statement

In financial world, it is important that every data is capture and translated into decision making steps. Visualisation can help with the better understanding of the financial data. With the increase of economic globalisation and evolution of information technology, financial data are being generated and accumulated at a preference pace. As a result, there has been a critical need for automated approaches to effective and efficient utilisation of massive amount of financial data to support companies and individuals in strategic planning and investment decision-making.

To date, most systems for the visualisation of stock market data have concentrated on effective methods for showing time series data, particularly trying to capture share price fluctuation and market share. Traditionally this has been achieved through simple charts and histograms. Charting is a standard technique used in financial decision-making.

Through charts and histograms, an analyst may missed a valuable data that is crucial in the decision-making process which would lead to lost in any of the investment

and parties who involves in the investment. This could lead to stress in making decision. Hence, would lead to wrong decision.

Dealing with a large multi-dimensional dataset is not an easy task; to differentiate valuable data from the invaluable data cluster. This may takes ages to analyse and these analyst are busy professionals, non-expert computer users, who need to make decision every day and be confident with the decision they have made with little room for mistakes. Nowadays, people rely on computers and software to assist them in reaching any decision.

1.3 Objectives and Scope of Study

1.3.1 Objectives

- ❖ To develop a data visualisation tool that offers an intuitive way to shorten decision-making cycles.
- ❖ Making data and information collected into a system that can be manipulated.

1.3.2 Scope of Study

In this paper, as discussed with my supervisor, the focus will be on one paper which is 'The Argument-as Metaphor in Decision-making Visualisation' and the scope of my studies will focus on individual investment, from there onward all the research and analysing the information will be done.

To help the investors in making crucial decision, this application is hoped that it could assist investors in making decisions and evaluate the multiple choices of decisions they can have and assess the effects of their decisions.

By using the application being developed, it is also hoped that it could give investors the overview affects of numerous decisions they make. This application is targeted to assist investors as an alternative in decision-making, in other word this application is design to lessen the hassle and the effort to search and research info on investment.

CHAPTER 2

LITERATURE REVIEW

Information visualisation is the key in assisting decision-maker in making their decision. By using visualisation, it is targeted that it could help in numerous ways in decision making such as giving the visualised version of the problem and making it easier to decide. This allows decision-maker to separate the needed information from the unwanted information.

2.1 Research Paper ‘Argument-as Metaphor in Decision-making Visualisation’

I was advised to focus on one paper to work on. I took time to understand the paper, *The Argument-as Metaphor in Decision-making Visualisation*, written by McGinn and Picking thoroughly. Basically the paper works on assumption data. With the linguistic metaphor, one may find that a simple sentence may be interpreted into many different meanings. At some point it may be harmless; at times it means the other way around. The paper expresses that the metaphor is very powerful tools which can facilitate dialogue and convey complex idea.

There are two ways in application of the linguistic metaphor. Firstly, *argument-as-war metaphor*, which is as argumentation; meaning that, there must be a hard prove to what we are saying. The other is, *argument-as-balance metaphor*, where rational argument is understood as a twin-pan balance of weights, where the weight on either side represents the strength of the arguments on either side of a question, for example: the

debater *built up a weighty* argument; the jury *weighed* the merits of both sides; more facts might *tip the scale* [3].

In the paper, they introduced a sample of visualisation method called DAVE (Decision and Argumentation Visualisation Explorer). Figure 1 is showing the visual representation of the factors affecting a risk or a decision. Individual factors can be dragged along the balance bar to indicate their relative importance and the size of a weight can be adjusted with a slider to indicate the magnitude of that particular factor. The angle of rotation of the bar from the horizontal then suggests the strength of argument in one direction or the other. In this form, the model is a useful argumentation tool [2].

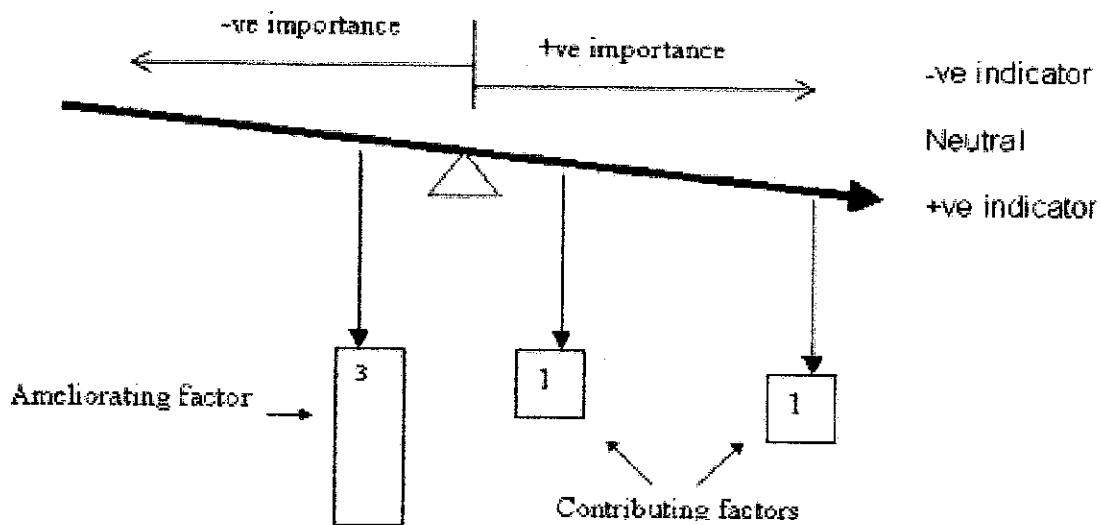


Figure 1

Using the size of the weights to represent the magnitude of factors may require different scales.

The limitation of this approach is that it will only work with if the underlying algorithm supports the identification of the contribution of each factor. Another limit is the ability to simultaneously displaying the numbers of factors.

Again, to show the importance of visualising, a research report done by *William Wright* ^[4], says that the 3 - dimensional computer graphics can be extremely expressive. With the correct approach to the visual design of the layout, massive amounts of information can be quickly and easily comprehended by the human observer. Visualisation works because the visual cortex dominates perception, and because key aspects of the perception process occur rapidly without conscious thought.

This human visualisation power can be harnessed to allow the presentation of the massive amounts of data and to highlight patterns hidden in that data. Used effectively, visualisation can accelerate perception of data. By designing visualisation with human strengths and weaknesses in mind, it is possible to exploit people's natural ability to recognise structure and patterns, and circumvent human limitations in memory and attention.

Powerful visualisation is designed to enlist both pre-attentive and attentive processes. A pre – attentively encoded attribute may be used to identify a region in the visualisation which demand further attentive scrutiny. It was also mentioned that the ease of use and the user interface design are crucial to application success. Information animation or visualization is a new way of working with the information and requires innovative user interface techniques.

Information animation has an important role within organisation. With significant investments made in computing infrastructure over the last decade, organisations have vast amounts of business data available to support decision making. So much data, in fact, that some current conditions might be described as information overload. Used effectively, information animation or visualisations can accelerate the perception, provide

insight and control, and allow this flood of valuable data to be harnessed for competitive advantage in business decision making.

In another paper, it is stressed that by visualisation, one can make more effective and correct decision. In *Communication Association for Information Systems, 2006*, David P. Tegarden ^[5] says that in a cognitive fit theory shows that decision making is improved when the information representation matches the problem-solving task. Representing data suitably in a visual manner, improves the efficiency and effectiveness of the decision-maker, and thus, allows them to separate the important info from the chunks of info.

The tutorial mentioned that the visualisation allows:

- ❖ Exploiting the human visual system to extract information from data
- ❖ Provides an overview of complex datasets
- ❖ Identifies structure, patterns, trends, anomalies, and relationship in data, and
- ❖ Assists in identifying the areas of “interest”

Business decision-maker suffers from information overload while at the same time underutilising large amount of relevant information. Among the reasons for this is, key information is difficult to find or recognize and time-sensitive responsiveness is required.

2.2 Investor's Investment

As the paper I based on in developing this application, it mentioned that how a word or a sentence can be interpreted in many ways by different reader. In individual investment, investor has the tendencies in interpreting the news in stock market news or business news in their own understanding. Which could lead do wrong decision-making and ending with losses in investment. Either positive or negative information or news can exacerbate an irrational response from investor, as the news swept along, a herd mentality prevails and good judgement takes a back seat.

Currently, a number of informal data suggests that large numbers of individual investor lose money in the market even when investing in those mutual funds that outperform. As for this situation, we noticed that individual investors tends to buys on rumours and hot tips, believe too many gurus, are not disciplined enough, lack of consistent approach to the market, and almost frequently misjudge management of their companies or mutual funds.

Increasing number of baby boomers turning to the stock market to secure their long-term financial survival, it became increasingly clear that the investor's personal psychology affects their decision-making process. The investor's personal psychology proves that the argument-as metaphor plays a crucial part in decision-making cycles. The personal psychology will be the factors in the decision-making application.

2.3 Factors Affects Investment Decision Making

In investing, human behavioural plays an important role in decision-making. There are a few factors that can be considered as the contributing and improving factors. Everyone have their own goals and different level of risk tolerance in investment. Both improving and contributing factors can be categorised into a series of factors according to end users research on reasons that concern most of the investors the most. These factors may affect the decision-making in various aspects in investment.

2.3.1 Gender

Statistics show that women live, on average, six years longer than men, earn two-thirds the salary of men, and pay between 50 - 70% more for goods and services like haircuts and dry cleaning.

According to an article in *BNET Business Network* titled '*Does Gender affect investment decision?*' ^[6], there are still lots of brokers out there who continue to see women in this role. One study showed that brokers were more likely to insist that women go home and discuss their financial choices with a spouse before making any final decisions.

Brokers also spent significantly more time discussing investment choices with men, while focusing only on low-risk choices with women. This perception builds the uncertainties in female investors, doubting their own abilities in decision-making regarding investment.

In areas such as finance, men are more overconfident than women. Thus, men will trade more excessively than women. Women are more likely to feel cautious and overwhelmed. An increasing number of financial studies conclude

that women invest their asset portfolios more conservatively than their male counterparts [7]. A survey done by *Seattle PI*, 'Sharebuilder and Investing Women 2007', the results are shown in the figure below.

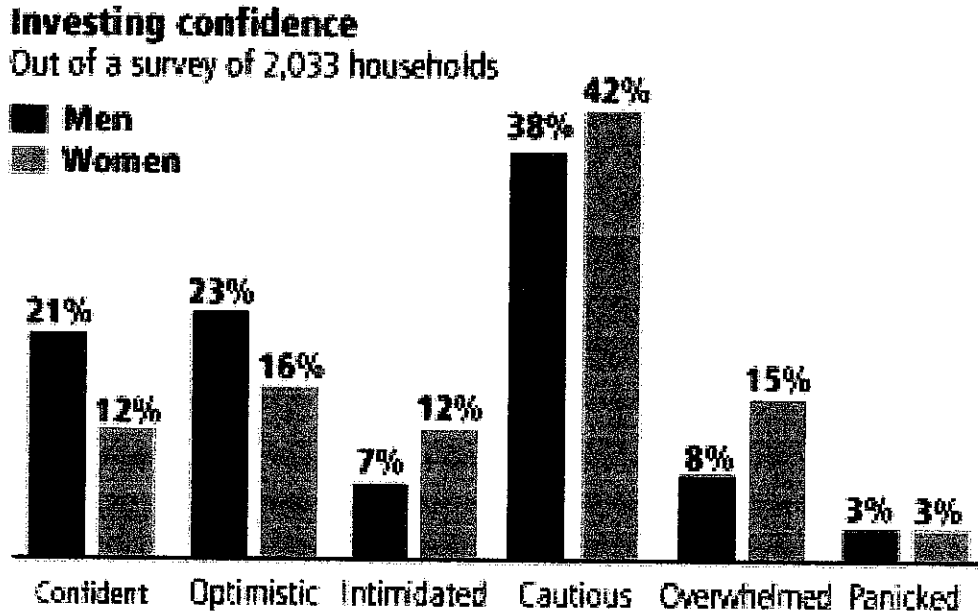


Figure 2

The survey done, had a 2 percentage-point margin of error. Women are more likely to be intimidated by financial language, the survey showed. To many women, terms such as "positions" and "exchange traded funds" sound like jargon. Knowledge is also an important factor when it comes to investing and trading online. Simply perceiving oneself as knowledgeable is a critical step toward becoming a successful investor.

Currently men are more knowledgeable than women with respect to investing. At the same time, it was found that men tend not to want too much detail while women want more information. Women tend to really want to understand what's being suggested and why. What's more, they tend to be less impulsive and less inclined to act on a hot tip than men are.

Investing knowledge

When it comes to investing, how would you describe yourself?

- Not knowledgeable
- Barely knowledgeable
- Somewhat knowledgeable
- Very knowledgeable

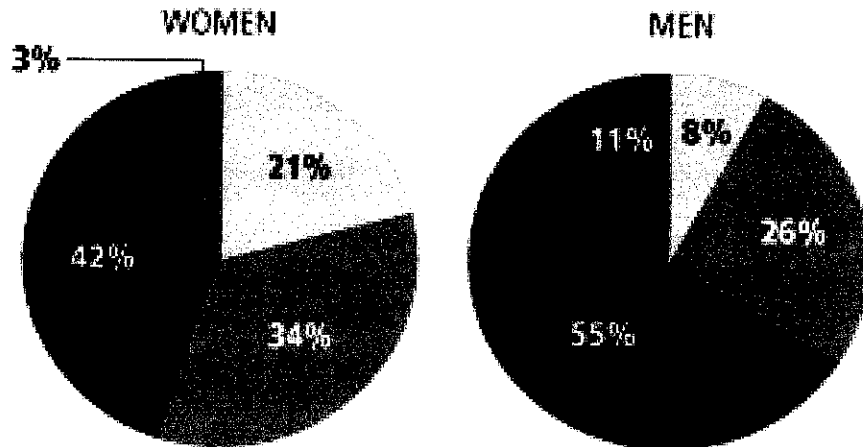


Figure 3

Men and women both have different level of priorities in life. These priority ranges from food to electronic gadgets. The survey also shows that the willingness for both men and women of cutting certain areas of their expenses in order to do investment. To do so, both gender must practise a certain level of self – restraint in expenses and reward them self later by getting high return in the investment portfolio.

Financial priorities

Where would you be least willing to cut back each month?

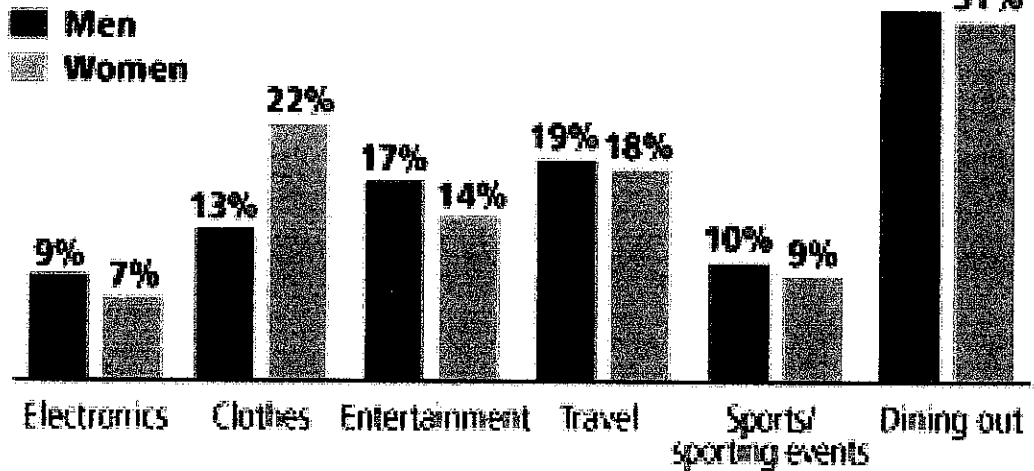


Figure 4

2.3.2 Age

To date, any decision varies for each age group. This is due to different group has its own needs at different time.

❖ 20's group

This group range from those who just graduated, job seeker, and those who just started their work and life. Their priority is to get steady job, going into investment is rather the last thing on their mind. Undergraduates do not have any saving. Those ho just started to work have difficulties in starting their live and trying to put things together.

❖ 30's group

This group range from those who just started a family life and they have a steady job. Normally this group have their children welfare and education to worry about. But they are willing to invest in assets such as cars and house.

❖ 40's group

This is the range of age group that would really invest. This is due to their steady income and if any loss occurs, they are able to recover because of the steady income. They know how and where and when to invest due to their experience and have larger network of friends and information.

❖ 50's group and above

This is the least age group that would invest. Most of this group are unemployed and live entirely on their retirement fund. These funds are translated into their health needs instead of into investment in the markets.

2.3.3 Profession

Each profession differs in their level of knowledge in investment. The higher the rank of the person in the society, the more likely they are willing to invest in the markets. Being at the higher level in the society gives them the upper hand by knowing where to invest in more secure markets and invest in a large sum.

Investors at the lower income ends, they tend to invest in a smaller sum because their income level and the ability to get loan for investment is lower compared to the higher rank people in the society.

For those who works in the financial world, the tendencies to invest is much higher than those who works in the government sectors or those who are from the lower income. The financial people know how in the matter of investment assist their ability of decision making in when to invest and where.

2.3.4 Social Status/Lifestyle

Married and partnered people are also the most confident -- 68 percent say they will achieve their investment goals versus 61 percent of single people and 60 percent of those who are separated, divorced or widowed.

Three in four people said that their financial situations were better in marriage than in singledom. Women are better at knowing what they're marrying into -- they were more likely to know their partner's financial situation before getting hitched.

2.4 Tools and Equipments Required

The tools that are used throughout this project also must be identified. Basically, the tools used are divided into three parts which software, hardware and documents. As for this project, Microsoft Visual Studio 2005 will be used to develop this application. This is because faster development (less to do, the system handles more)

- ❖ Lots of built-in functionality through a rich object model
- ❖ A variety of ways to interface and integrate with the outside world
- ❖ More reuse
- ❖ Easy to integrate different languages into one system
- ❖ Easier deployment
- ❖ Scalability
- ❖ Easy to build sophisticated development tools
- ❖ Interfaces well to existing software

CHAPTER 3

METHODOLOGY

3.1 Methodology

In the beginning of the project, mainly the method of gaining the information needed is by doing research and reading materials based on the project. As the project goes on, the project will be developed based on the Spiral Model and Prototype Model.

By using these two models, it is an effective tool in assisting the requirements specification process. Taking advantage of the fact that development projects work best when they are both incremental and iterative, where the project was able to start small and benefit from enlightened trial and error along the way. That is the reason I chose to develop this project using spiral model.

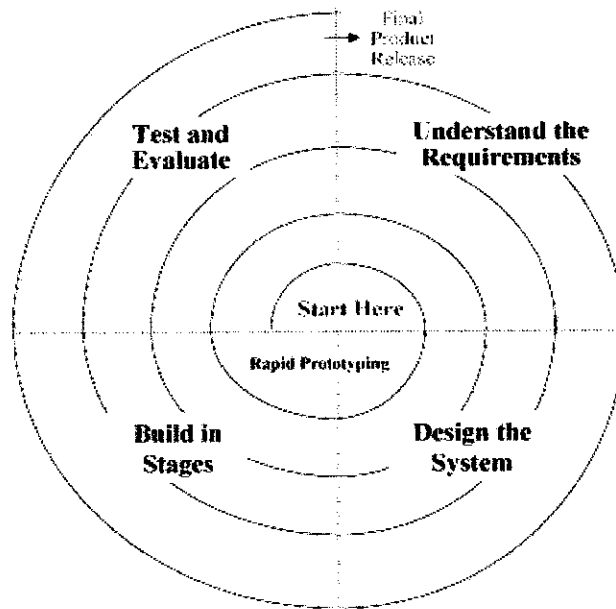


Figure 5

The spiral methodology reflects the relationship of tasks with rapid prototyping, increased parallelism, and concurrency in design and builds activities. Indirectly, leads to prototyping model. In each cycle of process, a prototype is being design and being tested for any error. After a round in the cycle, the same process will be done only with the enhanced version of the prototype.

The system requirements are define as much as possible in the initial stage to ensure that the system will be developed accordingly to the timeline. After all the system requirements are collected, the preliminary design is created. From there onwards, the 1st prototype is constructed from the preliminary design.

According to this model, each prototype will be labelled as version 0.x until the system is ready and labelled version 1.0. By doing this, each version will be created slowly in stages. In each version, the system will be developed in increment method. The higher the version, more add-ons will be added in the system.

3.2 System Workflow

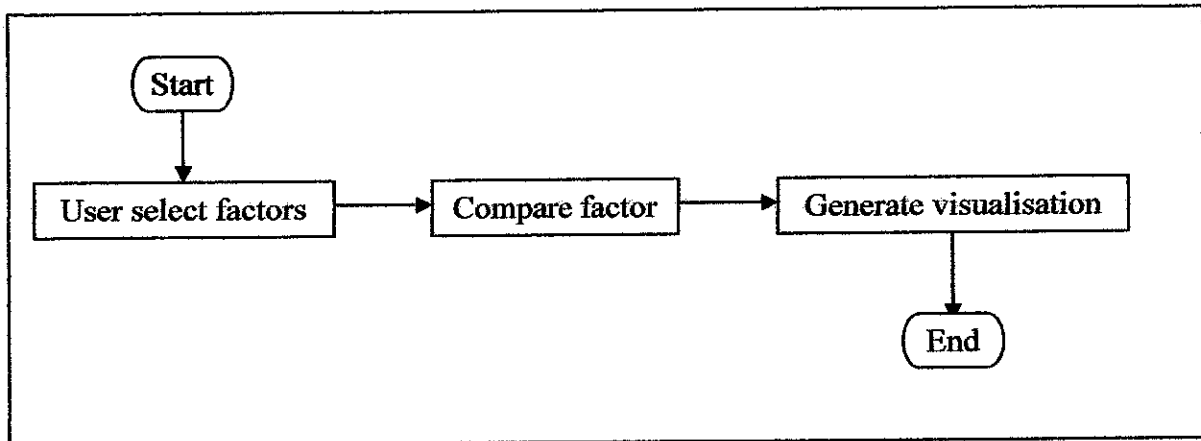


Figure 6

CHAPTER 4

RESULTS AND DISCUSSION

This section will discuss the result from this project. The result can be achieved from the research that has been made earlier by the author. In this section also there is some discussion about the related issues for this project. Basically, the result will be the evaluation of the end product, which is the Decision-Making Visualisation Application Based on Argument-as Metaphor.

The research and findings must meet the requirement to fulfil the objectives of the project. The expected end result of this project is to enable the end user of this system to find that the system helps in many ways in decision-making. The application is expected to be used in the future in assisting investors in decision-making in a fast-paced financial world.

Research scientists historically have been attracted to develop visualisation software to aid decision-makers. The technology will enable universities and research institutions to share information on the plus side of developing visualisation software and finding the most accurate way in creating the suitable visualisation for any situation especially in the financial world.

However, financial information visualisation is a new research area that focuses on the use of visualisation techniques to help the financial professionals and financial illiterate in understanding and analyse the financial data to their own benefit and enjoyment.

4.1 Result

The system developed was able to achieve it objectives which are :

- ❖ To develop a data visualisation tool that offers an intuitive way to shorten decision-making cycles.
- ❖ Making data and information collected into a system that can be manipulated.

Though the second objective is not fully achieved but still the system had met its minimum requirement. Below shown are the screenshots of the application developed :

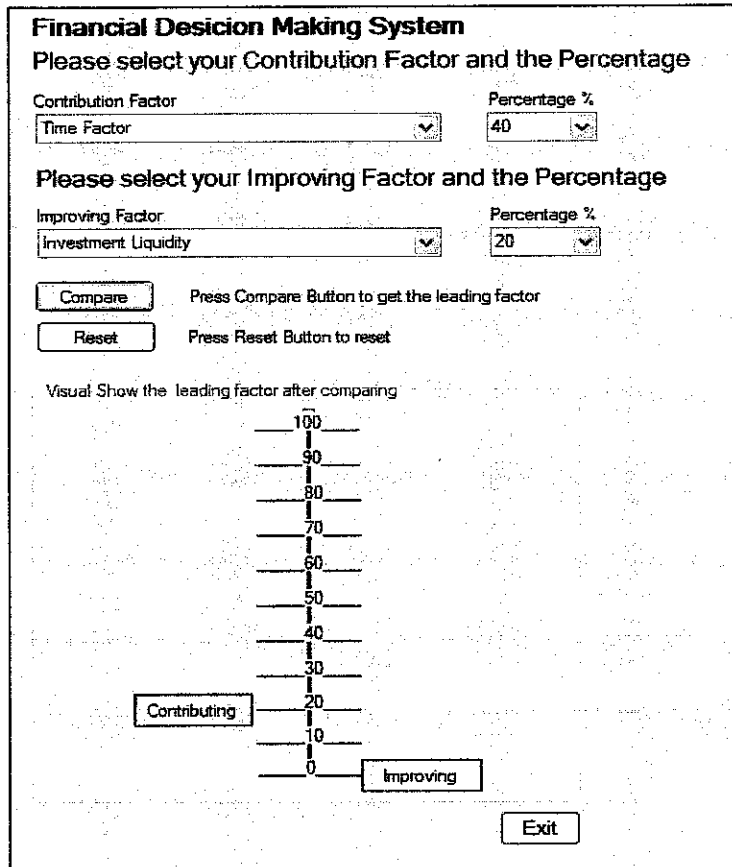


Figure 7

Financial Decision Making System

Please select your Contribution Factor and the Percentage

Contribution Factor: Tax Chargers
 Percentage %: 10

Please select your Improving Factor and the Percentage

Improving Factor: Diversified Investment
 Percentage %: 60

Press Compare Button to get the leading factor

Press Reset Button to reset

Visual Show the leading factor after comparing

100
90
80
70
60
50
40
30
20
10
0

Contributing

Improving

Figure 8

4.2 Discussion

During the period of developing the system, a number of problems were encountered. Originally, the system would have been developed using Java. After much of self learning and trying in developing the system, in the end it did not turn out well. Having problems in mastering the language with weak basic in the language create problem in understanding the concept of the system.

Later, the developments of the system were switch to using Microsoft Visual Studio 2005. The difficulties I came across were the programming of the system's algorithm to fit the system's requirement although the interface of the system looks simple. After much discussion, I realised that for the weighing of the factors, I should not

use percentage, instead using score system that would be much easier to calculate. Research on ways to calculate the weighing method that can be use to ensure that the weighing of each factors is accurate must be done continuously.

4.3 Code Sample

```
Public Class Form1

    Private Sub Form1_Load(ByVal sender As System.Object, ByVal e As
System.EventArgs) Handles MyBase.Load
        'Label3.Text = "Please select your contribution factor and the
percentage"
        'Label2.Text = "Percentage %"
        'lblContributePerce.Text = "Contribution Factor"
        lblEnterContribute.Text = "Please select your Contribution
Factor and the Percentage"
        lblContribute.Text = "Contribution Factor"
        lblContributePercentage.Text = "Percentage %"

        lblEnterImprove.Text = "Please select your Improving Factor and
the Percentage"
        lblImprove.Text = "Improving Factor"
        lblImprovePercentage.Text = "Percentage %"

        lblBtnCompare.Text = "Press Compare Button to get the leading
factor"
        lblBtnReset.Text = "Press Reset Button to reset"

        lblFinancial.Text = "Financial Desicion Making System"

        btnImp1.Visible = True
        btnImp2.Visible = False
        btnImp3.Visible = False
        btnImp4.Visible = False
        btnImp5.Visible = False
        btnImp6.Visible = False
        btnImp7.Visible = False
        btnImp8.Visible = False
        btnImp9.Visible = False
        btnImp10.Visible = False
        btnImp11.Visible = False

        btnCtn1.Visible = True
        btnCtn2.Visible = False
        btnCtn3.Visible = False
        btnCtn4.Visible = False
        btnCtn5.Visible = False
        btnCtn6.Visible = False
        btnCtn7.Visible = False
        btnCtn8.Visible = False
    End Sub
End Class
```



```
btnCtn9.Visible = False
btnCtn10.Visible = False
btnCtn11.Visible = False
```

```
End Sub
```

```
Private Sub btnCompare_Click(ByVal sender As System.Object, ByVal e
As System.EventArgs) Handles btnCompare.Click
```

```
Dim lngContribute As Long
Dim lngImproving As Long
Dim lngCompare As Long
Dim strCompare As String
```

```
If comboContribute.Text = "....." Or comboImprove.Text =
"....." Then
    MsgBox("Please enter your contribution and improving
factor")
```

```
End If
```

```
lngContribute = CLng(Trim(comboContributePercentage.Text))
lngImproving = CLng(Trim(comboImprovePercentage.Text))
```

```
lngCompare = lngContribute - lngImproving
```

```
strCompare = CStr(lngCompare)
```

```
If strCompare = "10" Then
    btnCtn1.Visible = False
    btnCtn2.Visible = True
ElseIf strCompare = "20" Then
    btnCtn1.Visible = False
    btnCtn3.Visible = True
ElseIf strCompare = "30" Then
    btnCtn1.Visible = False
    btnCtn4.Visible = True
ElseIf strCompare = "40" Then
    btnCtn1.Visible = False
    btnCtn5.Visible = True
ElseIf strCompare = "50" Then
    btnCtn1.Visible = False
    btnCtn6.Visible = True
ElseIf strCompare = "60" Then
    btnCtn1.Visible = False
    btnCtn7.Visible = True
ElseIf strCompare = "70" Then
    btnCtn1.Visible = False
    btnCtn8.Visible = True
ElseIf strCompare = "80" Then
    btnCtn1.Visible = False
    btnCtn9.Visible = True
ElseIf strCompare = "90" Then
    btnCtn1.Visible = False
    btnCtn10.Visible = True
ElseIf strCompare = "100" Then
    btnCtn1.Visible = False
    btnCtn11.Visible = True
```

```

ElseIf strCompare = "-10" Then
    btnImp1.Visible = False
    btnImp2.Visible = True
ElseIf strCompare = "-20" Then
    btnImp1.Visible = False
    btnImp3.Visible = True
ElseIf strCompare = "-30" Then
    btnImp1.Visible = False
    btnImp4.Visible = True
ElseIf strCompare = "-40" Then
    btnImp1.Visible = False
    btnImp5.Visible = True
ElseIf strCompare = "-50" Then
    btnImp1.Visible = False
    btnImp6.Visible = True
ElseIf strCompare = "-60" Then
    btnImp1.Visible = False
    btnImp7.Visible = True
ElseIf strCompare = "-70" Then
    btnImp1.Visible = False
    btnImp8.Visible = True
ElseIf strCompare = "-80" Then
    btnImp1.Visible = False
    btnImp9.Visible = True
ElseIf strCompare = "-90" Then
    btnImp1.Visible = False
    btnImp10.Visible = True
ElseIf strCompare = "-100" Then
    btnImp1.Visible = False
    btnImp11.Visible = True
ElseIf strCompare = "0" Then
    btnImp1.Visible = True
    btnCtn1.Visible = True
    MsgBox("You did not select the contributing and improving
percentage")
End If

```

End Sub

```

Private Sub btnReset_Click(ByVal sender As System.Object, ByVal e
As System.EventArgs) Handles btnReset.Click
    comboContribute.Text = "....."
    comboContributePercentage.Text = "0"
    comboImprove.Text = "....."
    comboImprovePercentage.Text = "0"

    btnImp1.Visible = True
    btnImp2.Visible = False
    btnImp3.Visible = False
    btnImp4.Visible = False
    btnImp5.Visible = False
    btnImp6.Visible = False
    btnImp7.Visible = False
    btnImp8.Visible = False
    btnImp9.Visible = False
    btnImp10.Visible = False
    btnImp11.Visible = False

```

```
btnCtn1.Visible = True
btnCtn2.Visible = False
btnCtn3.Visible = False
btnCtn4.Visible = False
btnCtn5.Visible = False
btnCtn6.Visible = False
btnCtn7.Visible = False
btnCtn8.Visible = False
btnCtn9.Visible = False
btnCtn10.Visible = False
btnCtn11.Visible = False
```

```
End Sub
```

```
Private Sub btnExit_Click(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles btnExit.Click
```

```
End
```

```
End Sub
```

```
Private Sub comboContribute_SelectedIndexChanged(ByVal sender As System.Object, ByVal e As System.EventArgs) Handles comboContribute.SelectedIndexChanged
```

```
End Sub
```

```
End Class
```

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Information visualisation technology provides the information systems developer with a new set of tools in which to support the business decision-maker. Visualisation technologies have been used in many areas of business, e.g. finance, marketing, and training, and they have been used to support many different types of task in decision-making.

With the existence of visualisation technology, this leads to numbers of new approaches in problem solving. It is the decision-maker's decision to decide whether to use or not any of the visualisation technologies in assisting them in making decision for any risky or crucial information.

However, in the mean time, there are many opportunities in doing research in visualisation technologies to address a few questions that may arise, such as, the complexity of the financial data to be extracted and visualised accordingly. Any research done, in the end the results of the research will benefit all the decision-makers in any area of the financial world.

5.2 Recommendation

There are a few recommendations for the system to be developed better :

- ❖ Factors should be able to be calculated in collective manner and shown in the visualisation
- ❖ Better algorithm to be used to ensure the accuracy of the calculations involves
- ❖ A more accurate weighing method to be used to weigh the factors

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