

Decision Support System On Operating System

Anne Yuliyanti
Bismar Junatas & Vega Valentine
Gunadarma University
Faculty of Industrial Technology
Indonesia
anne_sweetacoholic@yahoo.com
bismar_lepen@yahoo.com
slaved_jepun@yahoo.com

I Wayan Simri .W
Gunadarma University
Jl. Margonda Raya 100 Depok
Indonesia
iwayan@staff.gunadarma.ac.id

Abstract

The micro-computing world of the 90s is more volatile ever, not only having choices on which hardware to buy (and the brands to choose from seem to be endless). Nowadays, many stuff based on computer technology. Computer needs an operating system to handle the task. Open source gave paradigm in operating system developing. Now, we have to decide which operating system (OS) we are going to run on our computers. MS Windows is a leader operating system in desktop, Linux will be a leader operating system in server of internet. Currently, Linux give high effort to bring the operating system to desktop and entertainment. Many platform of hardware also were produced to fulfill the need of IT activities. A lot of applications have highly increased since twenty years ago. Many application can run in more operating system and hardware platform. The user need to consider which operating system appropriate to his system and purpose. In this paper, we will demonstrate matrix decision approach for decision support system (DSS) in choosing operating system. Section one will look at the relations between applications and hardware platform which related to operating system. Methodology of decision based on matrix decision will discuss in section two. Section three will look at some example scenarios in choosing operating system.

Keywords : Operating system, hardware platform, matrix decision, DSS

1 Introduction

An operating system (OS) is the program that, after being initially loaded into the computer by a boot program, manages all the other programs in a computer. The other programs are called applications programs.

We also can define an operating system based on its own role in a computer[2]:

1. Operating System as a Layer in a Computer System Architecture

As a layer in a computer system architecture, O/S controls and coordinate the use of the hardware among the various application programs for the various users. In other words, O/S is a program that acts as an intermediary between a user of a computer and the computer hardware. According to Tanenbaum, the layered was classified O/S as a part of system programs together with compilers, editors, and command interpreter. While Stalling placed O/S between utilities and computer hardware, as the programmer's task to handle with.

2. Operating System as a Convenient User Interface

There are several services that O/S provides to user applications. Those are program executions, access to I/O device, controlled access to files, communications, and error detection and response. Viewed from the user side, the operating system is like a 'mandatory middleman' that provides excellent services and simplifies work.

3. Operating System as an Efficient Resource Manager

As a resource manager, O/S performed some resource allocator, operation control program, system access,

accounting and statistics. There is no obvious separation between the services of an operating system as an application interface and its duties as a hardware manager. The distinction is rather between what an O/S has to offer and how it does the performance. For example, resolving concurrency is both a user service and a resource management technique.

4. Operating System as a Program that Can Evolve

O/S is a program like any other program. It functions in the same way as ordinary computer software, it is also a set of instructions executed by the processor, and it also relinquishes control of the processor. But, as a critical program, the O/S must be able to evolve such as provides hardware upgrades, new services, fixes, etc.

Review to above paragraphs, an operating system is the most important program on a computer because it runs all of the other programs. The most commonly-used contemporary desktop and laptop (notebook) OS is Microsoft Windows. More powerful servers often employ Linux, Free BSD, and other Unix-like systems. However, these Unix-like operating systems, especially Mac OS X, are also used on personal computers. The major operating systems are Microsoft Windows, Mac OS X, Linux, and Unix. The operating system is essential to the computer, and so extreme care should be taken when choosing an operating system. Whatever operating system one chooses, it needs to be the system that will best fit the needs of user. All operating systems have good and bad elements. Understanding how each system works, and the systems pros and cons is a must for anyone deciding on a computer and operating system. An operating system selection based on research and understanding will certainly yield the highest satisfaction.

1.1 Applications on Multiple Operating System and Multi Hardware Platform

Nowadays, number of application is incredible increasing in number and type. The technology and need bring the computer application is more mature than before. One of interesting point is many applications can run in multiple operating system. The main question is how the performance of an application in many operating system? This question is important to know in choosing the right operating system. Some application which can run in many application actually start in an operating system then ported to other operating system. Therefore, the performance of the application can be very different in different operating system.

In relation to hardware, platform often describes the set of hardware components that make up the computer itself, that the software is written to target (often just described as "written for an architecture"). Pure assembly language can

be run on this hardware platform, but most commonly, operating system software is written to target it. The hardware platform can be from big machine such as main frame to very small machine in embedded system. Previously, every hardware platform has specific operating system but this approach has changed which some operating systems can run on some hardware platforms.

The paper talk about the background in section one. Discussion of methodology in decision support is described in section two. Section three explain about running example. Conclusion is stated in the last section.

2 Decision Support System

Comparison of many operating systems has become a common topic of discussion among their users. For example, MS Windows is the most prominent operating system released under a proprietary software license (though selected business partners may receive a shared source license), whereas Linux is the most prominent operating system released under open source software license. However, most Linux distributions distribute proprietary components. The two operating systems compete for user-base in the personal computer market as well as the server market, and are used in government offices, schools, business offices, homes, intra-net and internet servers, supercomputers, and embedded systems. The paper will demonstrate an approach based on decision matrix to choose an operating system based on some factors. We will discuss what reasons to choose decision matrix, how to use decision matrix, and what enhancement of decision matrix.

2.1 Decision Matrix

Before we focus on "Why decision matrix", we go back to the means of decision matrix. The decision matrix is a decision-support tool allowing decision makers to solve their problem by evaluating, rating, and comparing different alternatives on multiple criteria[8].

The main characteristics of decision matrix are:

- The decision matrix evaluates and prioritizes a list of options. The team first establishes a list of weighted criteria and then evaluates each option against those criteria. This is a variation of the Lshaped matrix.
- The decision matrix is basically an array presenting on one axis a list of alternatives, also called options or solutions, that are evaluated regarding, on the other axis, a list of criteria, which are weighted dependently of their respective importance in the final decision to be taken. The decision matrix is, therefore, a variation of the 2-dimension, L-shaped matrix.

- The decision matrix is an elaborated version of the measured criteria technique in which options are given, for each criterion, satisfactory or compliance points up to a maximum (usually from 0 to 100) that is predefined per criterion and may vary between criteria depending on its relative importance in the final decision.

Reason in implementation[8] [7] [5] [3] of decision matrix based on:

- When to Use a Decision Matrix
- When a list of options must be narrowed to one choice.
- When the decision must be made on the basis of several criteria.
- After the list of options has been reduced to a manageable number by list reduction.
- Typical Situation
- When one improvement opportunity or problem must be selected to work on.
- When only one solution or problem-solving approach can be implemented.
- When only one new product can be developed.

2.2 Implementation of Matrix Decision

In this part, we will focus on ways to use matrix decision. Using matrix decision, there are a lot of things that we need to be considered such as procedure of decision matrix or how to use decision matrix.

Procedure of Decision Matrix or How to Use Decision Matrix[8] [7] [5] [3] as follow:

1. Brainstorm the evaluation criteria appropriate to the situation. If possible, involve customers in this process
2. Discuss and refine the list of criteria. Identify any criteria that must be included and any that must not be included. Reduce the list of criteria to those that the team believes are most important. Tools such as list reduction and multivoting may be useful here
3. Assign a relative weight to each criterion, based on how important that criterion is to the situation. Do this by distributing 10 points among the criteria. The assignment can be done by discussion and consensus. Or each member can assign weights, then the numbers for each criterion are added for a composite team weighting

4. Draw an Lshaped matrix. Write the criteria and their weights as labels along one edge and the list of options along the other edge. Usually, whichever group has fewer items occupies the vertical edge.

5. Evaluate each choice against the criteria. There are three ways to do this:

- Method 1: Establish a rating scale for each criterion.
- Method 2: For each criterion, rank-order all options according to how well each meets the criterion. Number them with 1 being the option that is least desirable according to that criterion
- Method 3, Pugh matrix: Establish a baseline, which may be one of the alternatives or the current product or service. For each criterion, rate each other alternative in comparison to the baseline, using scores of worse (-1), same (0), or better (+1). Finer rating scales can be used, such as 2, 1, 0, 1, 2 for a five-point scale or 3, 2, 1, 0, 1, 2, 3 for a seven-point scale. Again, be sure that positive numbers reflect desirable ratings

6. Multiply each options rating by the weight. Add the points for each option. The option with the highest score will not necessarily be the one to choose, but the relative scores can generate meaningful discussion and lead the team toward consensus description in using decision matrix.

We use 4 things as a measurement. There are 3 value that we take and there are the implementation (how to use O/S), security, and pros and cons. There is weight as a score to operating system. There is rating scale as a scale to measured the ability, prices, etc. Last of four things is options which measuring values from all of three things that we have compared. The fourth things have rates and scores each operating system that we have been compared. After we have had the results of measurement, there will be easily to get the conclusion which is the best one.

2.3 Approach of Decision Matrix

1. Top Three Parameters in Choosing Operating System
Difficulties of choosing operating system have made us need a tool or method. This also made us thinking more than 100 times[4]. It is caused by compatible and ability even capability of operating system that we want to use. There are a lot of things that we have to compare. Of all comparison, there are three factors based on Josef Delinga[1] as the most determining factors in choosing which one user want to use:

(a) Utilization Purpose

Consider what O/S will be used for. If the O/S is for a business, an O/S that can handle important business data should be selected. If the O/S is for a college student, one might consider an O/S that is optimal for gaming, yet still has a nice word processor. Finally, if the O/S were for a new computer user, then a user-friendly, simple O/S would be best. Knowing this, one must also consider what software is available for the O/S. Some software is only available on certain computers. This often leaves Mac OS X, Linux, and UNIX in the dark, because most of the computer market runs on Microsoft O/S. Most computers come standard with a certain O/S (Apple computers have Mac OS X and most PC has Windows XP). Therefore, it is sometimes important to consider the O/S even when selecting a computer.

To define the purpose of operating system can be based some points as follow:

- Identify alternatives. Depending upon the team's needs, these can be product/service features, process steps, projects, or potential solutions. List these across the top of the matrix.
- Identify decision/selection criteria. These key criteria may come from a previously prepared affinity diagram or from a brainstorming activity. Make sure that everyone has a clear and common understanding of what the criteria mean. Also ensure that the criteria are written so that a high score for each criterion represents a favorable result and a low score represents an unfavorable result. List the criteria down the left side of the matrix.
- Assign weights. If some decision criteria are more important than others, review and agree on appropriate weights to assign (e.g., 1, 2, 3).
- Design scoring system. Before rating the alternatives, the team must agree on a scoring system. Determine the scoring range (e.g., 1 to 5 or 1, 3, 5) and ensure that all team members have a common understanding of what high, medium, and low scores represent.
- Rate the alternatives. For each alternative, assign a consensus rating for each decision criterion. The team may average the scores from individual team members or may de-

velop scores through a consensus-building activity.

- Total the scores. Multiply the score for each decision criterion by its weighting factor. Then total the scores for each alternative being considered and analyze the results.

(b) Security

Security is the biggest priority for many computer users, especially businesses. Some O/S have stronger security than others. Macintosh has been called the iron man of O/S because of its ability to keep hackers out, while Windows has been criticized for being easy to hack. Do not let security completely deter you, however. Most O/S can be hardened and with constant security updates, made safer from hackers.

(c) Pros and Cons of The Big Four

Every O/S has its positive and negative elements. There is no perfect O/S. Keep this in mind, consider the most common O/S as the big four (Mac OS X, Windows, Linux, and Unix).

Mac OS X is great for keeping out hackers and for graphic design. However some problems are the fact that certain software is not available for Macs. If the O/S is for a college student who would rather play Half Life 2 than study, then Mac OS X is not the best choice.

Windows is very good in compatibility, since most costumers use Windows. Windows also comes in applications like Microsoft Word, Power Point, Excel, and Internet Explorer. Unfortunately, Windows is weak against viruses and can get bogged down easily.

Unix is good for networks, especially if for business. Unix has also been around for almost 30 years, so it is quite dependable. One drawback of Unix is the cost, which can sometimes be a bit expensive. Unix is also complicated, which can confuse beginners.

The final O/S, Linux, free and completely customizable. However, one major drawback is the extreme scarcity of applications for Linux. Microsoft and other software developers are often very reluctant to release their product for Linux.

3 Running Example

We have two cases to show DSS application in choosing O/S. First one is the case of a company choose an O/S main consideration based on economic factors. The second one is a company choose an O/S many factor based on multiplatform system cause of there are many hardware in the

organization. We will show refer to the cases, with similar factors but in different priority can bring to different decision. The parameter that used in table 1 and 2 based on some factors such as:

- Parameter Cost/Price
 1. Free
 2. Low
 3. Medium
 4. High
- Ease of Installation
 1. Easier
 2. Easy
 3. Medium
 4. Hard
- Other Parameter
 1. Poor
 2. Good
 3. Very Good
 4. Excellent

3.1 Case 1: Cost-Based Company

An example which related to cost-based company in choosing an operating system. In this table, we have compared and calculated from related resources and our experiences in using a operating system. Parameters based on[6].

Table 1, Linux has the hight total result (2.39) compare to others. Mac OS result (2.37) is very close to Linux. Refer to the highest result, Linux is the priority candidate of operating system.

3.2 Case 2: Multiplatform-Based Company

An example related to multiplatform-based company in choosing an O/S. In this table, we have compared and calculated from related resources and our experiences in using a operating system.

Table 2 show Linux is the highest value (2.4). Refer to table 1, Linux is the main candidate but the value of result is different. From the two tables present the result of decision can be provided different value of result in different priority.

Table 1. Example of Cost-Based Company

Priority of Parameters	Weight	Linux	Mac	UNIX	Win
Cost/price	20%	4	2	3	1
License	16%	1	2	2	2
After sell services	15%	1	2	2	2
User interface	13%	2	4	1	2
Security	11%	3	2	4	1
Stability	9%	3	3	2	1
Ease of installation	7%	2	3	1	4
Software compatibility	5%	1	1	1	3
System crash	3%	4	2	2	2
Credibility	1%	4	2	2	2
Total		2.39	2.37	2.17	1.79

Table 2. Example of Multiplatform-Based Company

Priority of Parameters	Weight	Linux	Mac	UNIX	Win
Software compatibility	24%	1	1	1	3
System crash	18%	4	2	2	2
User interface	15%	2	4	1	2
Security	11%	3	2	4	1
Stability	10%	3	3	2	1
Ease of installation	8%	2	3	1	4
Cost/price	6%	4	2	3	1
License	5%	1	2	2	2
After sell services	2%	1	2	2	2
Credibility	1%	4	2	2	2
Total		2.40	2.24	1.81	2.13

4 Conclusions

Using a decision support system method in selection the light O/S has been very useful to help us choosing an O/S. In this paper we use matrix decision as tool to choose an O/S. In matrix decision, we use value and weight as a measure to choose O/S. Using value and weight as a measure are more reliable to us and easy to compare.

In our example in section 3, we compare and calculate parameters between open-source O/S and proprietary O/S as a measurement. The next research is to develop a web services application for decision system in many aspects including choosing of operating system. Because many users in developing country have not appropriate knowledge to make a decision, therefore many decision based on vendor driven.

References

- [1] J. Delinga. Suggestions for choosing an operating system. *Ezine Articles*.
- [2] R. Doursat. Principles of operating systems. *Department of Computer Science and Engineering University of Nevada, Reno., 2006*.
- [3] H. Galinsky. study of children in family child care and relative care:highlights of findings. 1994.
- [4] A. Howard. Choosing the right operating system for your pc. *The CPA Journal Online*, 1991.
- [5] C. Kagan. Not by chance (the quality 2000 initiative). 1997.
- [6] B. Musielak. Why linux. 2007.
- [7] G. Rooney. Child care policy options. 1998.
- [8] N. R. Tague. *The Quality Toolbox*. ASQ Quality Press, second edition, 2005.