

# An Efficient Algorithm for PC Purchase Decision System

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*Abstract:* - In this paper, we propose an efficient algorithm for PC purchase decision model of PC hardware. Many people use computers in this decade, therefore, how to purchase the PC that meets individual requirements becomes crucial. According to the results of literature review, we propose the four phases theory basis those construct the process of PC purchase decision model. The four phases are: Phase I- Hardware Environment, Phase II- Future System Expansion, Phase III- System Support and Phase IV- Price Evaluation. Furthermore, we list the detailed factor items for the PC purchase decision model.

*Key words:* Efficient algorithm, hardware environment, future system expansion, system support, price evaluation

## 1 Introduction

### 1.1 Research Background

The rapid improvement on Technology widely changes the living environment and education environment in this decade. Today, we live in a highly informational and technical world. Our learning environment is constructed by the digital environment, network, and virtualization and integration technique. The activity of purchasing PC occurs frequently today.

### 1.2 Motivation

Many people use computers in this decade. Therefore, how to purchase the PC that meets individual requirements becomes crucial. Especially, there are different characteristics of all kinds of PC Brands. For example, Hardware functions, system support service, hardware expansion ability and PC price. Therefore, how to help the consumers make a reasonable decision while various kinds of decision factor items are around them.

### 1.3 Research Purpose

We propose a Statistical Method helping the consumers making the final purchasing decision among different brands of PC.

### 1.4 Paper Organization

In Section 2, we submit the Literature Review. In

Section 3, we list the Research Methodology. And the Practical Research is listed in Section 4. Finally, we make a brief conclusion in Section 5.

## 2 Literature Review

In this section, we introduce the following subject: The Hardware Phase of PC vs. Purchase Decision Model, The Future Expansion Phase of PC vs. Purchase Decision Model, The System Supporting Phase and The Price Phase vs. Purchase Decision Model.

### 2.1 The Hardware Phase of PC vs. Purchase Decision Model

#### 2.1.1 The Specification of Hardware Panel

As to the Hardware Panel, we need to introduce the chips. The types of INTEL chip are [1]:

- i865G/ (DDR400/333)
- i915P (DDR400/333)
- i945P(DDR-2 667/533/400)
- i955X/( DDR2 800/667/533)
- i975X/( DDR2 800/667/533)
- nVIDIA nForce4 SLI IntelR (DDR-2 667/533)

#### 2.1.2 The Functions of Hardware Panel

The principle of Hardware Panel selection depends on personal requirements. If there is no extra needs, the basic function will fit. That is the 'Word-processing type'. Therefore, the chip-i945X will be needed for integrating function. And the PCI-E16X is also needed for expanding function.

**2.1.3 The Best Assembling Method of INTEL**

There are three different levels of INTEL system Hardware. Each level cost different. The detailed introduction [2] of each level is as following:

**i. High-level**

- Processor: Core 2 Duo E6300/1.86GHz/1066 Socket 775(LGA775) 1.86GHz, 1066, 65nm, L2:2MB, Conroe, Intel Extended Memory, 64-bit computing  
Pentium D-930 with VT / 3.0G / 800 Socket 775 (LGA775)  
NetBurst 800MHz, L2:2MB\*2, 65nm, 800, 200Double Core, 15 Frequency, FC- LGA4, PRESCOTT, Support 128-bits SSE2 Extends MMX
- Memory: DDR2-667 1G \*2, DDR2-667 512MB\*2

**ii. Middle-level**

- Processor: Pentium 4 631 with HT /3.0G/ 800 Socket 775(LGA775)  
NetBurst 800MHz, L2:2MB, 65nm, EM64T, Enhanced Intel Speed Step, HT Technology,SSE3,XD
- Memory: DDR2-667 512MB\*2

**ii. Word-processing**

- Processor: Celeron D 331+ /2.66G/533 Socket 775(LGA775)  
NetBurst 533MHz, L2:256K,90nm, PRESCOTT, 133MHz,MMX/ SSE/ SSE2/ SSE3, 64bit
- Memory: DDR2-667 512MB\*2

**2.1.4 The Best Assembling Method of AMD**

AMD owns two updated functions: The 940 feet and the DDRII Memory Mode. In AM2, the High-level Hardware is the serial of X2 Double Core; the Middle-level Hardware is Athlon; the Word-processor is Sempron. The Memory is DDRII. And the Hardware Panel requirements depends on the budget [3].

**2.2 The Future Expansion Phase of PC vs. Purchase Decision Model**

**2.2.1 The Compatibility Status of 64bit**

The 64bit arithmetic platform breaks through the 4GB memory limitation of 32bit processor. The 64bit arithmetic platform can nearly expand unlimited physical memory quantities [4]. Besides that, comparing to 32bit, 64bit processor can process and execute double amount of data and command.

Based on the tremendous excellent effectiveness of 64bit platform, the IT organizations faces the critical point to carefully evaluate and select the best solution [5]. The evaluation plan would include the solution for the IT and the commercial environment where occur the computer usage total cost and added value.

**2.2.2 The Supporting Status of New Hardware Equipments**

The evaluation and classification should be based on the key tasks. Based on personal appropriate requirement evaluation, such as computer operating total cost, risk and the commercial variables those change the management mechanisms [6]. The structure of the platform must be set to support 64bit for further growth space where the 64bit server can solve the problems in various types of businesses and science arithmetic environment [7].

**2.2.3 The Extra Equipments of Hardware Panel**

To adopt random IT structure to optimize the operation efficiency of the business. The selection of the Intel® server skills would randomly grow, expand and effectively management the change the management structure. One of the strengths of the Intel® is the widely operating system, applied program and tools for selection. The Intel skill server provides overall 64bit business computer system [8].

**2.3 The System Supporting Phase**

**2.3.1 The Supporting Status of VISTA**

The supporting status of Microsoft Windows VISTA is described in Fig.1:



Fig. 1 Windows VISTA

**2.3.2 The System Compatibility of Low-level Equipments**

The Vista versions classify into Home, Small Businesses, Large Businesses and New Markets. The

Brand Computer and Notebooks' Vista Hardware Compatibility Certification of the Microsoft Classifies into the Basic 'Windows Vista Capable' and the Advanced 'Windows Vista Premium Ready'. The minimum requirements of the Computer that owns Vista Cable certification is low. The computer that has 512MB memory can match the requirements of Vista Cable as shown in Fig.2.



Fig. 2 Windows Vista Capable

**2.3.3 The Usage Speed of the Software**

The basic requirements of Windows Vista Capable PC are:

- CPU – modern processor is 800MHz (min)
- RAM –system memory is 512 MB
- GPU – graph processor owns DirectX 9

The level of Windows Vista Capable PC that reaches XP normal effectiveness are:

- 2.0GHz, Double core CPU, 1GB DDR2\*2, high-level independent display card (X1600、GeForce 7600up)

**2.4 The Price Phase vs. Purchase Decision Model**

The Price Phase would be the critical point while comparing the different Brands of PC. Especially for the Hardware Environment, the price variation appears clearly for the consumers to make the decision.

**3 The Research Methodologies**

In this section, we would like to submit the research steps and the research methodologies.

**3.1 Research Process**

The Research Process is listed in Fig. 3.

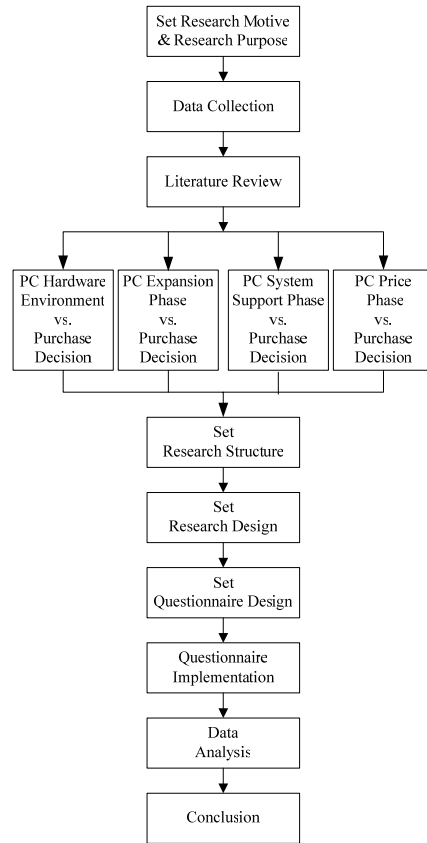


Fig. 3 Research Structure

**3.2 Statistical Model**

We submit the efficient algorithm to solve the following problem: For that PC purchase decision factor ( $P_k$ ) Items, the minimum distance principal of the efficient algorithm would be applied to find out the optimal match decision  $b^i$  of PC brand purchase decision. It is like:

$$\min_{m^i} d_{Lm^i}^E = [\sum_{k=1}^K (P_k - b_k^i)^2]^{1/2}, i=1, 2, \dots, I.$$

Among this,

$I$  : Represents the total numbers of PC Purchase Decision Factor Items.

$P_k$  : Represents the Item k's SD (Standard Deviation) Value of the assigned PC Purchase Decision Factor Items ( $P$ ).

$b^i$  : Represents the Item  $i$  of PC Purchase Decision Factor Items.

$b_k^i$  : Represents the Item k's SD (Standard Deviation) Value of the assigned Brand # $i$  PC Purchase Decision Factor Items ( $b^i$ ).

$d_{Lm^i}^E$  : Represent the Minimum Distance between the PC Purchase Decision Factor Items ( $P$ ) and the Brand # $i$  PC Purchase Decision Factor Items ( $b^i$ ).

The efficient algorithm steps are as following:

- 
- Step ∘ 0 Given ( $P$ ) as the PC Purchase Decision Factor Items. Given  $I$  items different PC Purchase Decision Factor Items ( $b^i, i=1, 2, \dots, I$ ). Given PC Purchase Decision Factor Items.
- 
- Step ∘ 1 Get  $P_k$  and  $b_k^i$  from  $P$  and  $b^i$  by using SD (Standard Deviation) Method.
- 
- Step ∘ 2  $i=1, 2, \dots, I$ .
- 
- Step ∘ 3 Extract  $i$  and then order  $i$  by descending order.  
And then becomes a new set  $\tilde{b}^j, j=1, 2, \dots, J$ .
- 
- Step ∘ 4 Calculate  $d_{P\tilde{b}^j}^E = [\sum_{k=1}^K (P_k - \tilde{b}_k^j)^2]^{1/2}, j=1, 2, \dots, J$ .
- 
- Step ∘ 5 Find out  $\tilde{b}^j$  of the minimum  $d_{P\tilde{b}^j}^E$ . The  $\tilde{b}^j$  is the Optimal Brand for PC Purchase Decision Making
- 

### 3.3 Questionnaire Design

In this Section, we introduce the questionnaire implementation process and the PC purchase decision factor items.

#### 3.3.1 The Questionnaire Implementation Process

In our research, the questionnaire implementation process is as following:

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- Step ∘ 1 Implement the Questionnaire of the following Subject:  
The 'Weighing Evaluation' of the Decision Factor Items Toward PC Hardware Purchase
- 
- Step ∘ 2 Implement the Questionnaire of the following Subject:  
The 'Weighing Evaluation' of the Decision Factor Items Toward 'Brand#1 PC' Hardware Purchase
- 
- Step ∘ 3 Implement the Questionnaire of the following Subject:  
The 'Weighing Evaluation' of the
- 

- 
- Decision Factor Items Toward 'Brand#2 PC' Hardware Purchase
- 
- Step ∘ 4 Implement the Questionnaire of the following Subject:  
The 'Weighing Evaluation' of the Decision Factor Items Toward 'Brand#3 PC' Hardware Purchase
- 
- Step ∘ 5 Summarize the Collected Data and Create the following Table:  
The Summary Table of the 'Weighing Evaluation' of the Decision Factor Items Toward PC Hardware Purchase
- 
- Step ∘ 6 Summarize the Collected Data and Create the following Table:  
The Summary Table of the 'Weighing Distance' Between each Brand PC and Decision Factor Items Toward PC Hardware Purchase
- 
- Step ∘ 7 Create the following Graph:  
An Embedded Optimal Algorithm for Establishing the Purchase Decision Model of PC Hardware – The Final Decision on the Sub-Optimal Selection of PC Hardware Brand
- 
- Step ∘ 8 Create the following Graph:  
An Embedded Optimal Algorithm for Establishing the Purchase Decision Model of PC Hardware – The Final Decision on the Optimal Selection of PC Hardware Brand
- 
- Step ∘ 9 Evaluate the Results and Make the Final Decision
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#### 3.3.2 The PC Purchase Decision Factor Items

After Literature Review, we classify the PC purchase decision factor items into four phases: Phase I, the Hardware Environment. Phase II, the Future System Expansion. Phase III, the System Support. Phase IV, the Price Evaluation. And the detailed decision factor items of each phase are listed in the following Table 1.

### 3.4 Data Collection

After the Questionnaire is created, we invite the consumers who want to purchase PC to attend the questionnaire implement program. The questionnaire implement program has two parts. Each consumer should complete two parts interview. In this research, we collect the data successfully.

Table 1 The PC Purchase Decision Factor Items

PHASES		DECISION FACTOR ITEMS
I	Hardware Environment	The Specification of Hardware Panel
		The Functions of Hardware Panel
		The Best Assembling Method of INTEL
		The Best Assembling Method of AMD
II	Future System Expansion	The Compatibility Status of 64Bit
		The Supporting Status of New Hardware Equipments
		The Expansion Equipment of Hardware Panel
III	System Support	The Supporting Status of VISTA
		The System Compatibility of Low-level Equipments
		The Usage Speed of Software
IV	Price Evaluation	The Users Evaluation of PC Price

### 4 Practical Analysis

In this Section, we submit the analysis base of this research—the analysis of decision factor items again. Then, we would like to list the analyzed statistical analysis of questionnaire data, the “Summary Table” of the Statistical Analysis of Questionnaire Data, the Statistical Analysis of Questionnaire Data-- The Final Decision on the Sub-Optimal Selection of PC Hardware Brand and the Statistical Analysis of Questionnaire Data-- The Final Decision on the Optimal Selection of PC Hardware Brand.

#### 4.1 The Analysis of Decision Factor Items

The Practical Analysis is on the basis of the PC Purchase Decision Factor Items, as listed in Table 2.

Table 2 The PC Purchase Decision Factor Items

PHASES		DECISION FACTOR ITEMS
I	Hardware Environment	The Specification of Hardware Panel
		The Functions of Hardware Panel
		The Best Assembling Method of INTEL
		The Best Assembling Method of AMD
II	Future System Expansion	The Compatibility Status of 64Bit
		The Supporting Status of New Hardware Equipments
		The Expansion Equipment of Hardware Panel
III	System Support	The Supporting Status of VISTA
		The System Compatibility of Low-level Equipments
		The Usage Speed of Software
IV	Price Evaluation	The Users Evaluation of PC Price

### 4.2 The Statistical Analysis of Questionnaire Data

We made numerous Statistical Analysis of Questionnaire to analyze the ‘Weighing Evaluation’ of the Decision Factor Items Toward PC Hardware Purchase, the ‘Weighing Evaluation’ of the Decision Factor Items Toward ‘Brand#1 PC’ Hardware Purchase, the ‘Weighing Evaluation’ of the Decision Factor Items Toward ‘Brand#2 PC’ Hardware Purchase and the ‘Weighing Evaluation’ of the Decision Factor Items Toward ‘Brand#3 PC’ Hardware Purchase.

### 5 Conclusions

In this paper, we proposed an efficient algorithm for PC Purchase Decision Model of PC Hardware. Consumers can rely on this method to decide the Optimal PC Brand while they are purchasing the PC. This efficient Algorithm was based on the four phases of PC Purchase Factor Decision Items and Optimal Algorithm Method. The four phases are: Phase I- Hardware Environment, Phase II- Future System Expansion, Phase III- System Support and Phase IV- Price Evaluation. We made numerous Statistical Analysis of Questionnaire to analyze the proposed four Phase theory basis and obtain some successful results.

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