

Function Point Estimation and Demonstration on Website Projects

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Abstract

Compared with software projects, the estimation of website projects is not mature enough without any methods for size or workload estimation. This paper researched Function Point Analysis (FPA), the most important size estimation method in software projects and then constructed Commerce Website Function Point Analysis (CWFPFA) by introducing principles of FPA into commerce website projects. The paper reserved the basic definitions of software FPA for CWFPFA and researched some key factors combined with characteristics of commerce website projects including the functional complexity, function point weight and value adjustment factor. In the end, a commerce website project PET was given as a demonstration of CWFPFA.

Keywords: website projects, software projects, size estimation, Function Point Analysis, demonstration

1. Introduction

According to IT project work breakdown structure, IT projects can be divided into four types: website project, communication engineering project, system integrated project and software project (Feng et al., 2009). Software projects and website projects have something in common in project management (Mustafa & Bingunath, 2003; Alshawi, 2000; Leonard-Barton & Sinha, 1993). However website project management is less regular than software projects (Judian, 2002). IT project size estimation is an important part of IT project valuation. At present, software projects have already had systematic size estimation methods, the most typical of which is Function Point Analysis (FPA). Web pages are usually adopted as the measure unit of website project for it is the web pages linked by several hyperlinks that are directly presented in front of users in website projects. So far, website projects don't have systematic estimation methods. In the early phases, website projects and software projects can only obtain the function requirements of owners thus they can be estimated from the perspective of owners. The ultimate functions of website projects and software projects have a lot in common (Mustafa & Bingunath, 2003; Leonard-Barton & Sinha, 1993), so if we introduce FPA into website projects estimation and make research combined with the characteristics of website projects, maybe an effective size estimation method of website projects can be constructed. This paper introduces the principles of FPA into commerce website projects and constructs the Website Function Point Analysis (CWFPFA) with detailed research on some key factors in function point estimation in commerce website projects. In the end, a pet website is given as a demonstration of CWFPFA.

2. Principles and Definitions of CWFPFA

2.1 Principles of CWFPFA

The workload of commerce website projects and software projects is intangible, which can be divided into function points. Therefore the function point estimation of website projects can take example by the principles of FPA. FPA is a function-oriented estimation model for software firstly brought forward by Allan Albrecht (1979). Meanwhile website projects can use principles of improved FPA for reference including Feature Point (Jones,

1987), NESMA (Netherlands Function Point User Group, 1997), 3D Function Points (Whitmire, 1995) and so on. According to the principles of software project FPA, Website Function Point Analysis (CWPPFA) can be constructed as Figure 1.

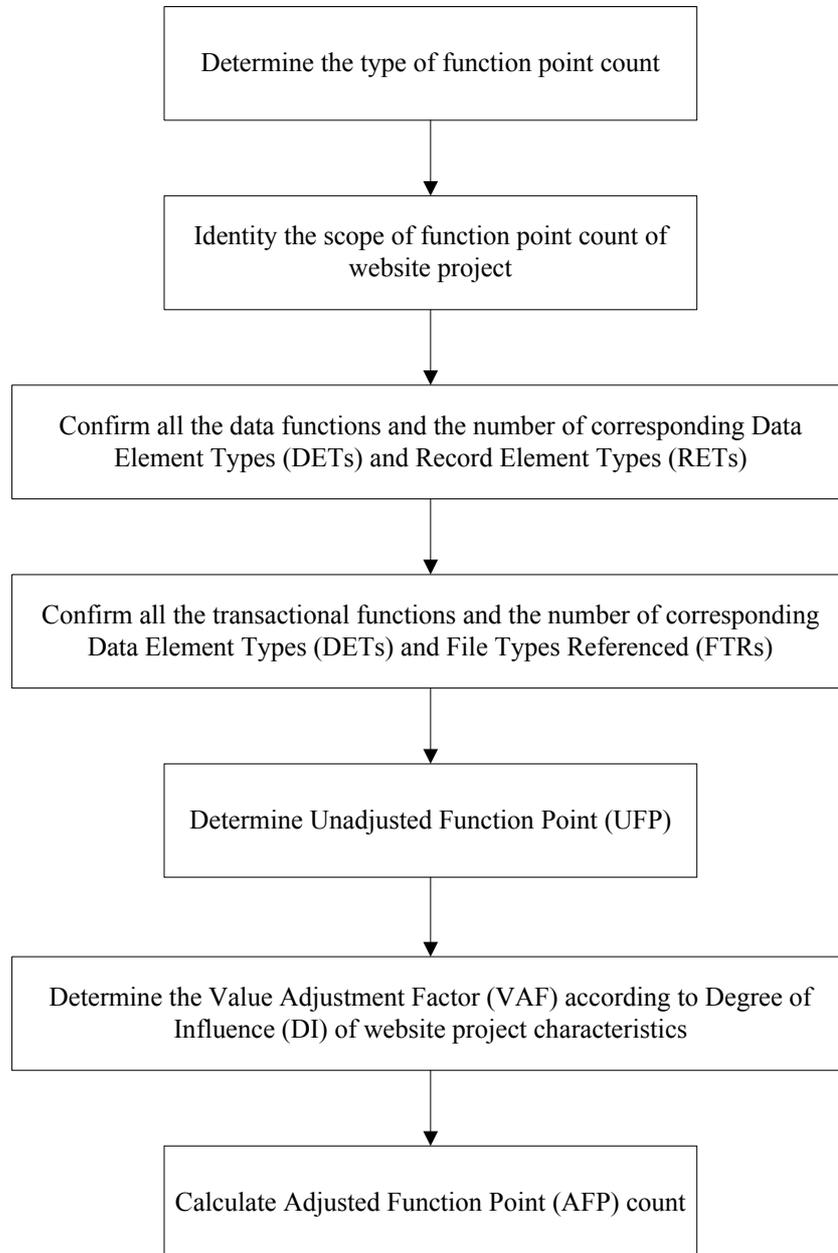


Figure 1. Procedures of CWPPFA

2.2 Definitions of CWPPFA

Commerce website projects and software projects have a lot of similarities, so function point estimation of website projects can borrow the basic definitions of software FPA.

(1) Function type and functional complexity. Commerce website project function points have two types including data functions and transactional functions. Data functions are either internal logical files (ILFs) or external interface files (EIFs), while transactional functions are either external inputs (EIs), external outputs (EOs) or external inquiries (EQs). These five function types have a certain complexity. The ILF and EIF

complexity depends on the count of corresponding DET and RET, while the EI, EO and EQ complexity lies on the count of corresponding DET and FTR.

(2)Function point weight. Every complexity of every function type is given one corresponding weight. The purpose of setting function type weight is to translate the function points of different complexity into ones of unified scaling, thus obtaining UFP count.

(3)Value Adjustment Factor (VAF). Every characteristic of commerce website project are given a Degree of Influence (DI) ranged on a scale of zero to five, which represents the contribution of each characteristic to the whole project. The Total Degree of Influence (TDI) of all the characteristics can be calculated by DI. TDI can directly decide the VAF. The product of UFP and VAF is AFP, which is shown as Formula (1).

$$AFP = UFP \times VAF \quad (1)$$

3. Key Factors of CWFPA

Although CWFPA reserves parts of the basic definitions of FPA in software projects, the treatment or calculation of these basic definitions depends on the characteristics of commerce website projects. Compared with software FPA and other improved FPA, CWFPA has a largely different treatment or calculation on some key factors including the functional complexity, function point weight and VAF.

3.1 Functional Complexity of Commerce Website Projects

In software FPA and other improved FPA, functional complexity mostly depends on the range of DET and RET (or FTR) (Garmus & Herron, 2003). The range of DET and RET (or FTR) has only three levels including low, average and high. For each function type, when one of DET and RET (or FTR) remains unchanged and the other changes a lot, its functional complexity remains unchanged; while when one of DET and RET (or FTR) remains unchanged and the other changes between two adjacent numbers, its functional complexity changes. The above analysis shows that the setting of functional complexity in software FPA and improve FPA has obvious shortages.

As the number of DER and RET (or FTR) determines the functional complexity while functional complexity determines the function point weight, it is considered that the function point weight can be directly determined by the number of DER and RET (or FTR) in CWFPA. That is to say, there is no need to determine the functional complexity. The detailed setting of function point weight is discussed in the following section.

3.2 Function Point Weight of Commerce Website Projects

In software FPA and other improved FPA, function point weight depends on its functional complexity. Therefore the setting of function point weight has the same problems as functional complexity. It is necessary to discuss the setting of function point weight in CWFPA. Take ILF as an example. According to the complexity matrix and unadjusted function point table of ILF, the corresponding relationship between the number of DET and RET and function point weight can be shown in Table 1.

Table 1. The corresponding relationship between the number of DET and RET and function point weight for ILF (before data processing)

Function point weight		The number of DET		
		1~19	20~50	≥51
1	1	×7	×7	×10
The number of RET	2~5	×7	×10	×15
	>5	×10	×15	×15

This table is based on International Function Point Users Group (1999).

In order to obtain the relationship between the function point weight and the number of DET and RET, we adjust the values in Table 1 into Table 2 according to the principles as follows: (1) for the number of DET and RET, take the median of each range as its value; (2) for ranges without upper limit, take the lower limit as its value; (3) for function type weight, transfer it into the median value.

Table 2. The corresponding relationship between the number of DET and RET and function point weight for ILF (after data processing)

Function point weight		The number of DET		
		10	35	51
0.5	The number of RET	7	8.5	10
		3.5	10	12.5
5		10	12.5	15

Suppose the number of DET is x , the number of RET (or FRT) is y , the function point weight is z . There is a function $z = f(x, y)$, with its specific relation unknown. In the function $z = f(x, y)$, we only know its value z_{ij} in (x_i, y_j) , $(i = 0, 1, 2; j = 0, 1, 2)$. As can be seen in Table 3, ILF has nine known numbers.

Table 3. Known numbers of ILF

z_{ij}		x_i		
		10	35	51
0.5	y_j	7	8.5	10
		3.5	10	12.5
5		10	12.5	15

Then the problem is to seek for an approximate function $P(x, y)$ to make it satisfied with the condition $P(x_i, y_j) = z_{ij}, (i = 0, 1, 2; j = 0, 1, 2)$. The paper introduces interpolation method in numerical analysis to this problem. Fixing x , considering $f(x, y)$ to be the function of y , make parabolic interpolation of y for $P(x, y)$ with interpolation nodes y_0, y_1, y_2 . Recording $u_j(y)$ as the interpolation cardinal function, use Lagrange Interpolation, and the interpolation function obtained is $P_y f(x, y)$ as Formula (2).

$$P_y(x, y) = \sum_{j=0}^2 f(x, y_j)u_j(y) = f(x, y_0)u_0(y) + f(x, y_1)u_1(y) + f(x, y_2)u_2(y) \tag{2}$$

Thereinto,

$$\begin{cases} u_0(y) = \frac{(y - y_1)(y - y_2)}{(y_0 - y_1)(y_0 - y_2)} \\ u_1(y) = \frac{(y - y_2)(y - y_0)}{(y_1 - y_2)(y_1 - y_0)} \\ u_2(y) = \frac{(y - y_0)(y - y_1)}{(y_2 - y_0)(y_2 - y_1)} \end{cases} \tag{3}$$

Based on Formula (2), make parabolic interpolation of x for $P_y(x, y)$ with interpolation nodes x_0, x_1, x_2 . Recording $w_i(x)$ as the interpolation cardinal function, use Lagrange Interpolation, and the interpolation function obtained is $P_x P_y f(x, y)$ as Formula (4).

$$\begin{aligned}
 P_x P_y(x, y) &= \sum_{i=0}^2 [f(x_i, y_0)u_0(y) + f(x_i, y_1)u_1(y) + f(x_i, y_2)u_2(y)]w_i(x) \\
 &= [f(x_0, y_0)u_0(y) + f(x_0, y_1)u_1(y) + f(x_0, y_2)u_2(y)]w_0(x) \\
 &\quad + [f(x_1, y_0)u_0(y) + f(x_1, y_1)u_1(y) + f(x_1, y_2)u_2(y)]w_1(x) \\
 &\quad + [f(x_2, y_0)u_0(y) + f(x_2, y_1)u_1(y) + f(x_2, y_2)u_2(y)]w_2(x)
 \end{aligned} \tag{4}$$

Thereinto,

$$\begin{cases}
 w_0(x) = \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)} \\
 w_1(x) = \frac{(x-x_2)(x-x_0)}{(x_1-x_2)(x_1-x_0)} \\
 w_2(x) = \frac{(x-x_0)(x-x_1)}{(x_2-x_0)(x_2-x_1)}
 \end{cases} \tag{5}$$

$P_x P_y f(x, y)$ is $P(x, y)$ the approximate function that we seek for. It approximately expresses the function relation that (x, y) is mapped to z .

For ILF, combined with Formula (3)~(5) using the data in Table 3, the relationship between z and (x, y) of ILF can be obtained as Formula (6).

$$z = \frac{-228x^2y^2 + 1362x^2y + 15508xy^2 + 105x^2 - 33880y^2 - 82282xy + 57595x + 735820y + 5563550}{885600} \tag{6}$$

Similarly, the relationship between z and (x, y) of EIF, EI, EO and EQ can be shown in Formula (7)~(10).

$$z = \frac{114x^2y^2 + 681x^2y + 7754xy^2 + 174x^2 - 540y^2 - 41141xy + 32186x + 376110y + 4055940}{885600} \tag{7}$$

$$z = \frac{-1950x^2y^2 + 6975x^2y + 40575xy^2 - 4800x^2 - 28500y^2 - 135788xy + 104550x + 204750y + 345750}{182250} \tag{8}$$

$$z = \frac{-488x^2y^2 + 1784x^2y + 15214xy^2 - 1272x^2 - 89700y^2 - 54427xy + 40371x + 326490y - 124200}{29070} \tag{9}$$

$$z = \frac{-128x^2y^2 + 524x^2y + 3514xy^2 - 780x^2 + 330y^2 - 13477xy + 20505x + 11490y + 47250}{29070} \tag{10}$$

By Formula (6)~(10), the function point weight can be determined by the number of DET and RET (or FTR) of each function type in commerce website project, thus obtaining the UFP of the commerce website project.

3.3 VAF of Commerce Website Projects

In software FPA and improved FPA, VAF depends on the DI of General System Characteristic (GSC). But some GSCs have lost the functions borne in the initial definition thus losing its contribution as adjustment factors. In the mean time, some new characteristics have revealed in the function point estimation of commerce website projects as the development of technology and the movement of network environment. Therefore, the existing FPA can not effectively calculate the VAF in commerce website projects.

3.3.1 General Module Characteristics of Commerce Website Projects

(1) The concept of General Module Characteristics of commerce website projects. The paper puts forward the concept of General Module Characteristics (GMCs) of commerce website projects by subdividing the concept of GSCs in software projects according to the existing problems in software FPA. The commerce website project GMCs refer to the characters that can reflect the different attributes of commerce website project modules. There into, commerce website modules refer to the subsystems with complete code and independent functions in one commerce website project.

(2) The setup principles of commerce website project GMCs. Commerce website projects accord with the common characteristics of IT project. For example, it is a one-time activity with a certain task range, quality requirement, schedule requirement and resource limit. Besides, commerce website project has its own characteristics including the universality of involved areas, the inaccuracy of target, the intensity of intelligence, the uncertainty of web style, and the frequency of requirements changes and so on. Therefore, the setup of website project GMCs should obey the following principles:

- a. If the meaning of GSC is suitable for commerce website project module and its name is suitable for modules, take it as GMC;
- b. If the meaning of GSC is suitable for commerce website project module while its name is not fit for modules, take it as GMC after modifying its name suitable for commerce website modules;
- c. If the GSC has lost its meaning as an adjustment factor to different commerce website modules in the present system environment, delete it;
- d. If there is a characteristic that does not exist in software FPA but has great influence on commerce website projects in the present network or system environment, add it to GMC.

(3) The determination of commerce website project GMCs. According to the setup principles of commerce website project GMCs, nine GMCs can be obtained by the adjustment of the fourteen GSCs in software FPA combined with the characteristics of commerce website projects. These nine GMCs include Data Communications, Performance, Transaction Rate, Online Update, Complex Processing, Maintenance Ease, New Technology Use, Security and Exploitation Level. Thereinto, New Technology Use, Security and Exploitation Level are newly-added GMCs with their descriptions to determine DI shown as Table 4~ Table 6. Other six characteristics still adopt the descriptions in software FPA.

Table 4. Descriptions to determine DI of new technology use

Score As	Descriptions to determine DI
0	None of the above.
1	Any one of the above.
2	Any two of the above.
3	Any three of the above.
4	Any four of the above.
5	All five of the above.

*These new technologies include cookie, SSI, Flash, XML, XHTML.

Table 5. Descriptions to determine DI of security

Score As	Descriptions to determine DI
0	No security restrictions for specific screens, windows or fields are included
1	There are security restrictions for less than 20% of the input & update of specific fields and scan of windows or screens
2	There are security restrictions for 20%~40% of the input, update and searches of specific fields. For example, the commerce website project considered confidential by the government
3	There are security restrictions for 40%~60% of the input, update and searches of specific fields.
4	There are security restrictions for 60%~80% of the input, update and searches of specific fields.
5	There are strict security restrictions and it must maintain the audit data produced by visitors and specific data they access.

Table 6. Descriptions to determine DI of exploitation level

Score As	Descriptions to determine DI
0	More than 80% of developers are highly-skilled
1	60%-80% of developers are highly-skilled and only a few part are novices
2	40%-60% of developers are highly-skilled and nearly a half are novices
3	20%-40% of developers are highly-skilled and most are novices
4	Less than 20% of developers are highly-skilled
5	Almost all developers are novices

3.3.2 GMCs Weight of Commerce Website Projects

When calculating VAF, software FPA and improved FPA simply sum up all the DIs and gain TDI in which way all the GSCs are of the same importance that is the same weight. In Fact, different GMCs in commerce website project have different importance. It is not true to give the same weight. Therefore, the weight of different GMCs needs to be worked out.

There are differences in different commerce website project modules, so different modules should have different weights. The paper just puts forward the idea to solve the problem with detailed calculation of GMCs weights in the demonstration part.

3.3.3 Calculation of VAF

Suppose the number of commerce website project modules is n and the modules are marked M_1, M_2, \dots, M_n .

For any one of $M_p (p = 1, 2, \dots, n)$, the TDI of $M_p (p = 1, 2, \dots, n)$ can be calculated as Formula (11).

$$TDI_p = 9 \times \sum_{q=1}^9 W_{pq}^0 DI_{pq} \quad (11)$$

In Formula (11), TDI_p means the TDI of $M_p (p = 1, 2, \dots, n)$; W_{pq}^0 means the weights of nine GMCs of

$M_p (p = 1, 2, \dots, n)$ and $\sum_{q=1}^9 W_{pq}^0 = 1$; $DI_{pq} (q = 1, 2, \dots, 9)$ means the DIs of nine GMCs of

$M_p (p = 1, 2, \dots, n)$.

In practical application, VAF can adjust UFP in the range of $\pm 22.5\%$. Then the VAF of $M_p (p = 1, 2, \dots, n)$ can be adjusted as Formula (12).

$$VAF_p = TDI_p \times 0.01 + 0.775 = 0.09 \times \sum_{q=1}^9 W_{pq}^0 DI_{pq} + 0.775 \tag{12}$$

4. A Case Study

This chapter will give a demonstration of CWFPA combined with an electronic commerce website project. The author has participated in the requirement analysis and detailed design as well as coding work of this commerce website project thus familiar with the overall project. That is why this commerce website project is chosen. This commerce website project is called PET. All the statistics here are reported at most two decimal places.

4.1 Background of PET

The core function of PET is the online sales of pets. By inquiring can scanning the pet information, the client can buy pets on line. Meanwhile, PET also has other functions such as providing various kinds of information. PET has four modules, as is shown in Figure 2.

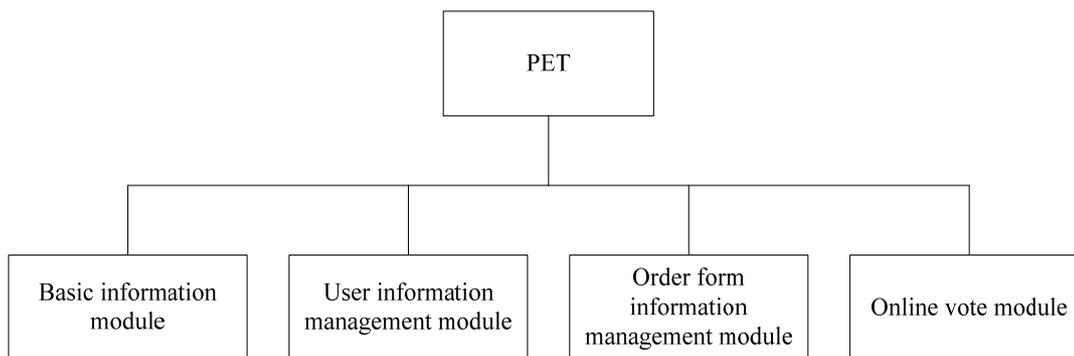


Figure 2. Structure of PET

Thereinto, basic information module provides services for user browse. Basic information refers to some elementary information in the website including best new information, news information, goods information and pet hospital information.

There are eight datasheets of PET, the main information of which is shown in Table 7. Fields in different datasheets vary.

Table 7. Main information of datasheets of PET

No.	Title of the datasheet	Fields	Primary Key	Foreign Key
tb_1	tb_bestnew	ID, title, content, time1	ID	
tb_2	tb_news	ID, title, content, timel	ID	
tb_3	tb_goods	ID, goodsname, introduce, price, nowPrice, picture, INTime, newGoods, sale	ID	
tb_4	tb_hospital	id, title, content, Time1	id	
tb_5	tb_user	ID, username, pwd, namel, city, address, postcode, telephone, email	ID, username	

tb_6	tb_order	OrderID, username, Truename, address, postcode, tel, pay, carry, rebate, OrderDate, enforce, bz	OrderID	username, tb_5 cited
tb_7	tb_order_detail	ID, orderID, goodsID, price, number	ID	ordered, tb_6 cited; goodsID, tb_3 cited
tb_8	tb_vote	Option1, Option2, Option3, Option4	none	

4.2 Function Type Analysis of PET

Through analyzing the information in PET datasheets, the data functions and transactional functions of different modules of PET can be obtained as Table 8~Table 11.

Table 8. Functional type analysis of basic information module

Function types	Data or transactional items	Classification	DET	RET or FTR	
Data functions	Best new information	ILF	4	1	
	News information	ILF	4	1	
	Goods information	ILF	9	4	
	Pet hospital information	ILF	4	1	
Transactional functions	Page initialization	EQ	5	1	
	Pages for best new information	Add-best new	EI	5	1
		Update-best new	EI	5	1
		Delete-best new	EI	1	1
		Save-best new	EI	6	1
	Pages for news information	Page initialization	EQ	5	1
		Add-news	EI	5	1
		Update-news	EI	5	1
		Delete-news	EI	1	1
		Save-news	EI	6	1
	pages for goods information	Page initialization	EQ	10	1
		Add-goods	EI	10	1
Update-goods		EI	10	1	
Delete-goods		EI	1	1	
Save-goods		EI	11	1	
pages for pet hospital information		Page initialization	EQ	5	1
		Add-hospital	EI	5	1
		Update-hospital	EI	5	1
	Delete-hospital	EI	1	1	
	Save-hospital	EI	6	1	

Table 9. Function type analysis of user information module

Function type	Data or transactional items	Classification	DET	RET or FTR
Data functions	User information	ILF	9	1
Transactional functions	Page initialization	EQ	10	1
	Add-user	EI	10	1
	Update-user	EI	10	1
	Delete-user	EI	2	1
	User-login	EQ	2	1
	Save-user	EI	11	1

Table 10. Function type analysis of order information management module

Function type	Data or transactional items	Classification	DET	RET or FTR
Data functions	Order information	ILF	12	1
	Detail order information	ILF	5	2
	User information	EIF	9	1
	Goods information	EIF	9	2
Transactional functions	Page initialization	EQ	17	4
	Add-order	EI	17	4
	Delete-order	EI	2	2
	Save-order	EQ	18	2

Table 11. Function type analysis of online vote module

Function type	Data or transactional items	Classification	DET	RET or FTR
Data functions	Online vote	ILF	4	1
Transactional functions	Page initialization	EQ	5	1
	Add-vote	EI	2	1
	Save-vote	EQ	3	1
	Vote-report	EQ	5	1

4.3 Function Point Calculation of PET

4.3.1 Function Point Calculation Based on CWFPA

(1) Calculation of UFP count. According to the function type analysis of PET modules, the UFP count of PET modules is shown in Table 12 combined with CWFPA.

Table 12. UFP count of PET based on CWFPA

	Sum of data functions	Sum of transactional functions	UFP count
Basic information module	30.10	63.43	93.53
User information module	7.09	19.86	26.95
Order information management module	25.13	27.06	52.19
Online vote module	7.06	12.16	19.22

(2) Calculation of VAF. PET has four modules and each module has nine GMCs. In order to obtain the VAF in WFPFA, the paper has made a questionnaire to gain the weight and DIs of GMCs of PET modules according to Formula (12). This survey put out one hundred copies of questionnaire and took back ninety-two copies with experienced project developers as its object. All the data used in this paper is from the statistic results of this survey. The paper use square law method to deal with the result of paired comparison to obtain the weight of the GMCs.

a. VAF of basic information module. According to the result of the survey, the weight of the nine GMCs of PET’s basic information module (W_{1q}^0) and their DIs is as Table 13.

Table 13. The weight of the nine GMCs of PET’s basic information module (W_{1q}^0) and their DIs

q	1	2	3	4	5	6	7	8	9
GMCs	Data Communications	Performance	Transaction Rate	Online Update	Complex Processing	Maintenance Ease	New Technology Use	Security	Exploitation Level
W_{1q}^0	0.31	0.14	0.12	0.07	0.04	0.11	0.07	0.09	0.05
DI_{1q}	0	3	2	2	0	1	1	0	4
$W_{1q}^0 DI_{1q}$	0	0.41	0.25	0.15	0	0.11	0.07	0	0.20
$\sum_{q=1}^9 W_{1q}^0 DI_{1q}$					1.19				

The VAF of basic information module can be calculated according to Formula (12):

$$VAF_1 = 0.09 \times \sum_{q=1}^9 W_{1q}^0 DI_{1q} + 0.775 = 0.88$$

That is to say, the VAF of basic information module is 0.88. By the Consistency Check of paired comparison matrix of this module, its consistency rate $C.R. = 0.04 < 0.1$, so it passes the Consistency Check.

- b. VAF of user information management module. Its calculation is the same as that of basic information module. By calculation, the VAF of user information management module is 0.94. By the Consistency Check of paired comparison matrix of this module, its consistency rate $C.R. = 0.04 < 0.1$, so it passes the Consistency Check.
- c. VAF of order information management module. Its calculation is the same as that of basic information module. By calculation, the VAF of order information management module is 1.02. By the Consistency Check of paired comparison matrix of this module, its consistency rate $C.R. = 0.04 < 0.1$, so it passes the Consistency Check.
- d. VAF of online vote module. Its calculation is the same as that of basic information module. By calculation, the VAF of online vote module is 0.91. By the Consistency Check of paired comparison matrix of this module, its consistency rate $C.R. = 0.01 < 0.1$, so it passes the Consistency Check.
- e. Calculation of AFP count. AFP count of basic information module $AFP=UFP*VAF=82.48$; AFP count of user information management module $AFP=UFP*VAF=25.42$; AFP count of order information management module $AFP=UFP*VAF=53.23$; AFP count of online vote module $AFP=UFP*VAF=17.44$.

4.3.2 Function Point Calculation Based on FPA

(1) Calculation of UFP count. According to the function type analysis of PET modules, the UFP count of PET modules is shown in Table 14 combined with FPA.

Table 14. UFP count of PET based on FPA

	Sum of data functions	Sum of transactional functions	UFP count
Basic information module	28	60	88
User information module	7	18	25
Order information management module	28	19	47
Online vote module	7	12	19

(2) Calculation of VAF. Grading the present fourteen GSCs according to the actuality of PET, we can obtain the following result shown as Table 15.

Table 15. DIs of fourteen GSCs in FPA according to the actuality of PET

No.	GSC	DI	No.	GSC	DI	No.	GSC	DI
1	Data Communications	3	6	Online Data Entry	11	11	Installation Ease	2
2	Distributed Data Processing	0	7	End-User Efficiency	5	12	Operational Ease	3
3	Performance	3	8	Online Update	4	13	Multiple Sites	0
4	Heavily Used Configuration	0	9	Complex Processing	5	14	Facilitate Change	3
5	Transaction Rate	4	10	Reusability	4			

According to FPA, $TDI = \sum_{n=1}^{14} DI = 40$, $VAF=0.65+0.01*40=1.05$.

(3) Calculation of AFP count. AFP count of basic information module $AFP=UFP*VAF=88*1.05=92.4$; AFP count of user information management module $AFP=UFP*VAF=25*1.05=26.25$; AFP count of order information management module $AFP=UFP*VAF=47*1.05=49.35$; AFP count of online vote module $AFP=UFP*VAF=19*1.05=19.95$.

4.4 A Comparative Analysis of the Results

The function points and function points count of PET can be calculated as Table 16 based on CWFPA and FPA combined with the actual exploitation of PET.

Table 16. A comparative analysis of the results of function points and Man-hour cost

	FPA		CWFPFA		Actual Function points count
	Function count	points	Function count	points	
PET modules					
Basic information module	92.4		82.48		80
User information module	26.25		25.42		20
Order information management module	49.35		53.23		60
Online vote module	19.95		17.44		16

As can be seen in Table 16, compared with actual function points count, the results obtained according to the CWFPFA is more exact. Compare with the results of present FPA, the veracity of basic information module using CWFPFA is 12.4% higher, user information management module 4.2% higher, order information management module 6.45% higher and online vote module 15.75% higher. It is obvious that pure information browse have more differences in function point estimation. Take basic information module for example, the difference lies in that the number of DET and RET (or FTR) of function types are less thus the function type weight is lower in CWFPFA than in present FPA; while the function types of user information management module, order information management module and online vote module are more complex. CWFPFA is more suitable for actual exploitation.

5. Conclusions

(1) The unique of commerce website projects has unique estimation requirement. Commerce website project has its own characteristics including the universality of involved areas, the inaccuracy of target, the intensity of intelligence, the uncertainty of web style, and the frequency of requirements changes and so on. These characteristics reveal that the present FPA and improve FPA can not satisfy the demand of commerce website projects estimation. Meanwhile, CWFPFA makes up the present FPA in theory and has a larger application scope.

(2) In allusion to the problems that existed in the setup of functional complexity and function point weight in software FPA, the paper wiped off the determination of functional complexity and obtained an approximate function between function point weight and the number of DET and RET (or FTR) for one specific function type, thus eliminating the sudden change of weights when the number of DET and RET (or FTR) changes.

(3) Compared with the concept of GSC, website project is more suitable to adapt the concept of GMC. By reviewing the applicability of the former characteristics, commerce website project is given nine GMCs including Data Communications, Performance, Transaction Rate, Online Update, Complex Processing, Maintenance Ease, New Technology Use, Security and Exploitation Level combined with the characteristics of commerce website projects. The weights of these nine GMCs need to be determined according to the reality.

(4) The demonstration part made a compared analysis of CWFPFA and the present FPA. CWFPFA theory analysis fill the defect of the existing function point analysis method, and expand the range of application. The empirical part of this paper proves the feasibility and accuracy of CWAFP. In CWFPFA, the paper obtained five approximate functions through binary function interpolation method in numeric analysis. These approximate functions are not perfect and need a further research.

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