باسمه تعالی

پروژه حسابداری خوابگاهی

محاسبه‌ی FP

نوع محاسبه fp: توسعه نرم‌افزار به طور کامل

نیازمندی‌های غیر عملکردی

راهنما:

0 Not present, or no influence
1 Incidental influence
2 Moderate influence
3 Average influence
4 Significant influence
5 Strong influence throughout

GENERAL SYSTEM CHARACTERISTIC	SCORE
DATA COMMUNICATIONS	3
DISTRIBUTED DATA PROCESSING	0
PERFORMANCE	2
HEAVILY USED CONFIGURATION	0
TRANSACTION RATE	4
ON-LINE DATA ENTRY	3
END-USER EFFICIENCY	1
ON-LINE UPDATE	5
COMPLEX PROCESSING	1
REUSABILITY	3
INSTALLATION EASE	2
OPERATIONAL EASE	0
MULTIPLE SITES	0
FACILITATE CHANGE	1

SUM	25

VAF = 0.65 + [($\sum_{i=1}^{14} Ci$)/100] = 0.65 + 25/100 = 0.65 + 0.25 = 0.90

نیازمندی‌های عملکردی:

راهنما:

EI:

Files Type Referenced (FTR)	Data Elements (DET's)		
	1-4	5-15	Greater than 15
Less than 2	Low (3)	Low (3)	Average (4)
2	Low (3)	Average (4)	High (6)
Greater than 2	Average (4)	High (6)	High (6)

EO:

File Types Referenced (FTR)	Data Elements		
	1-5	6-19	Greater than 19
less than 2	Low (4)	Low (4)	Average (5)
2 or 3	Low (4)	Average (5)	High (7)
Greater than 3	Average (5)	High (7)	High (7)

EQ

File Types Referenced (FTR)	Data Elements		
	1-5	6-19	Greater than 19
less than 2	Low (3)	Low (3)	Average (4)
2 or 3	Low (3)	Average (4)	High (6)
Greater than 3	Average (4)	High (6)	High (6)

ILF:

Record Element Types (RET)	Data Elements		
	1 to 19	20 - 50	51 or More
1 RET	Low (7)	Low(7)	Average (10)
2 to 5 RET	Low (7)	Average (10)	High (15)
6 or More RET	Average (10)	High (15)	High (15)

EIF:

Record Element Types (RET)	Data Elements		
	1 to 19	20 - 50	51 or More
1 RET	Low (5)	Low(5)	Average (7)
2 to 5 RET	Low (5)	Average (7)	High (10)
6 or More RET	Average (7)	High (10)	High (10)

ایجاد گروه

EI	FTR	1: group	FP = Low(3)
	DET	4: group name input, group image, group image add button, submit button	
EO	FTR	1: group	FP = Low(4)
	DET	1: group invite link	
ILF	RET	2: group, user	FP = Low(7)
	DET	5: group_id, user_id, balance, group_image, creation_date	

عضویت در گروه

EI	FTR	1: group	FP = Low(3)
	DET	2: group link input, submit button	
ILF	RET	2: group, user	FP = Low(7)
	DET	3: group_id, user_id, balance	

ویرایش گروه

EI	FTR	1: group	FP = Low(3)
	DET	4: group name input, group image, group image add/change button, submit button	
EQ	FTR	2: group, user	FP = Low(3)

	DET	6: group name, group image, group members, group invite link, members balance, user image	
ILF	RET	2: group, user	FP = Low(7)
	DET	8: group_id, group name, user_id, user name, user balance, group_image, userimage, group_invite_link	

افزودن خرج جدید

EI	FTR	3: group, expense, user	FP = High(6)
	DET	8: expense name input, expense price input, payer info radio button, shared members checkbox, datetime input, decription input, receipt image file input, submit button	
ILF	RET	3: group, expense, user	FP = Low(7)
	DET	7: group_id, user_id, balance, expense_id, expense_price, expense_receipt_image, expense_name, expense_desc	

ویرایش خرج

EI	FTR	3: group, expense, user	FP = High(6)
	DET	8: expense name input, expense price input, payer info radio button, shared members checkbox, datetime input, decription input, receipt image file input, submit changes button	
EQ	FTR	3: group, expense, user	FP = Average(4)
	DET	7: expense name input, expense price input, payer info radio button, shared members checkbox, datetime input, decription input, receipt image file input	
ILF	RET	3: group, expense, user	FP = Low(7)
	DET	7: group_id, user_id, balance, expense_id, expense_price,	

		expense_receipt_image, expense_name, expense_desc	

پرداخت بدهی

EO	FTR	1: group, user	FP = Low(4)
	DET	4: group name, group image, balance, pay button	
ILF	RET	1: group	FP = Low(7)
	DET	4: group_id, group_name, group_image, group_members	
EIF	RET	1: group	FP = Low(5)
	DET	5: payment_api, payment_amount	

محاسبه‌ی FP کلی

FP = UAF * VAF

Unadjusted Function Point:

Type of Component	Complexity of Components			
	Low	Average	High	Total
External Inputs	3 x 3 = 9	___ x 4 = ___	2 x 6 = 12	21
External Outputs	2 x 4 = 8	___ x 5 = ___	___ x 7 = ___	8
External Inquiries	1 x 3 = 3	1 x 4 = 4	___ x 6 = ___	7
Internal Logical Files	6 x 7 = 42	___ x 10 = ___	___ x 15 = ___	42
External Interface Files	1 x 5 = 5	___ x 7 = ___	___ x 10 = ___	5
		Total Number of Unadjusted Function Points		83

FP = UAF * VAF = 83 * 0.90 = 74.7

تخمین زمان کلی به کمک روش COCOMO:

در جدول QSM از ردیف avg زبان javascript(node.js) استفاده شده.

SLOC = FP*47 = 74.7*47 = 3510.9 = 3.5 KLOC

در روش cocomo با توجه به مشخصات پروژه از مدل ارگانیک استفاده شده.

E = effort = a_b (KLOC)^{bb} = 2.4 * (3.5)**1.05 = 8.942 PersonMonth

D = Deployment time = c_b (E)^{db} = 2.5* (8.942)**0.38 = 5.747 Month

SS = staff size = E/D persons = 8.942/5.747 = 1.5 Persons

P = productivity = KLOC/E = 3.5/8.942 = 0.391

تخمین زمان هر EP:

با توجه به زمان کلی به دست آمده، تصمیم بر این شد که تنها چهار EP از بین تمام EP ها برای پیاده سازی انتخاب شود: ایجاد گروه، عضویت در گروه، افزودن خرج جدید، پرداخت بدهی. سایر EP ها به فاز بتای پروژه تعلق خواهند داشت.

طبق روش Detailed کوکومو، باید ابتدا ضریبی به نام EAF را محاسبه کنیم. ۱۵ مورد (cost driver) در محاسبه‌ی EAF لحاظ می‌شود که این ۱۵ مورد در چهار دسته‌ی «ویژگی‌های برنامه»، «ویژگی‌های رایانه»، «ویژگی‌های کارکنان» و «ویژگی‌های پروژه» قرار داده شده‌اند. هر کدام از موارد بالا، عددی دارند که در دو جدول زیر آمده است:

Cost Drivers	Ratings					
	Very Low	Low	Nominal	High	Very High	Extra High
Product attributes						
RELY	0.75	0.88	1.00	1.15	1.40	-
DATA	-	0.94	1.00	1.08	1.16	-
CPLX	0.70	0.85	1.00	1.15	1.30	1.65
Computer attributes						
TIME	-	-	1.00	1.11	1.30	1.66
STOR	-	-	1.00	1.06	1.21	1.56
VIRT	-	0.87	1.00	1.15	1.30	-
TURN	-	0.87	1.00	1.07	1.15	-

Cost Drivers	Ratings					
	Very Low	Low	Nominal	High	Very High	Extra High
Personnel attributes						
ACAP	1.46	1.19	1.00	0.86	0.71	-
AEXP	1.29	1.13	1.00	0.91	0.82	-
PCAP	1.42	1.17	1.00	0.86	0.70	-
VEXP	1.21	1.10	1.00	0.90	-	-
LEXP	1.14	1.07	1.00	0.95	-	-
Project attributes						
MODP	1.24	1.10	1.00	0.91	0.82	-
TOOL	1.24	1.10	1.00	0.91	0.83	-
SCED	1.23	1.08	1.00	1.04	1.10	-

هر کدام از موارد پانزده‌گانه‌ی بالا که در پروژه‌ی ما، مورد نیاز باشد، به عنوان یک عامل در نظر گرفته شده و در نهایت، این عامل‌ها در یکدیگر ضرب می‌شوند. به غیر از عواملی که ارتباطی با پروژه ندارند، می‌توانیم از عواملی که عدد آن‌ها ۱ است نیز صرف‌نظر کنیم.

عواملی که در پروژه‌ی «حسابداری دانشجویی» مؤثرند در زیر آورده شده است.

- RELY->high
- DATA->low
- ACAP->low
- AEXP->low

با ضرب اعداد مربوط به عوامل بالا، مقدار EAF به دست می‌آید.

EAF = 1.15 * 0.94 * 1.19 * 1.13 = 1.45

طبق روش Detailed کوکومو، توسعه‌ی نرم‌افزار به پنج بخش تقسیم می‌شود:

۱. Plan/Requirements
۲. System Design
۳. Detail Design
۴. Programming and Test
۵. Integration and Test

ابتدا باید ضرایب هر بخش را طبق جدول زیر به دست آوریم.

Mode and code size	Plan and requirement	System design	Detail design	Module code and test	Integration and test
Lifecycle Phase Value of μ_b					
Organic Small S ≈ 2	0.06	0.16	0.26	0.42	0.16
Organic Medium S ≈ 32	0.06	0.16	0.24	0.38	0.22
Semidetached Medium S ≈ 32	0.07	0.17	0.25	0.33	0.25
Semidetached Large S ≈ 128	0.07	0.17	0.24	0.31	0.28
Embedded Large S ≈ 128	0.08	0.18	0.25	0.26	0.31
Embedded Extra Large S ≈ 320	0.08	0.18	0.24	0.24	0.34
Lifecycle Phase Value of □b					
Organic Small S ≈ 2	0.10	0.19	0.24	0.39	0.18
Organic Medium S ≈ 32	0.12	0.19	0.21	0.34	0.26
Semidetached Medium S ≈ 32	0.20	0.26	0.21	0.27	0.26
Semidetached Large S ≈ 128	0.22	0.27	0.19	0.25	0.29
Embedded Large S ≈ 128	0.36	0.36	0.18	0.18	0.28
Embedded Extra Large S ≈ 320	0.40	0.38	0.16	0.16	0.30

از آنجا که پروژه‌ی ما ارگانیک و کوچک بوده و محاسبات مربوط به هر بخش نیز جداگانه انجام می‌شود(و هر بخش کوچک‌تر نیز هست)، به خطوط Organic Small این جدول نیاز خواهیم داشت.

ایجاد گروه:

FP:

Unadjusted Function Point:

Type of Component	Complexity of Components			
	Low	Average	High	Total
External Inputs	1 x 3 = 3	___ x 4 = ___	___ x 6 = ___	3
External Outputs	1 x 4 = 4	___ x 5 = ___	___ x 7 = ___	4
External Inquiries	___ x 3 = ___	___ x 4 = ___	___ x 6 = ___	
Internal Logical Files	1 x 7 = 7	___ x 10 = ___	___ x 15 = ___	7
External Interface Files	___ x 5 = ___	___ x 7 = ___	___ x 10 = ___	
		Total Number of Unadjusted Function Points		14

FP = UAF * VAF = 14 * 0.90 = 12.6

تخمین زمان:

SLOC = FP * 47 = 12.6*47 = 592.2 = 0.592 KLOC

$E = a_i (KLOC)^{bi} * EAF = 3.2 * (0.592)^{1.05} * 1.45 = 2.675$ PersonMonth

$D = c_i (E)^{di} = 2.5 * (2.675)^{0.38} = 3.633$ Month

$E_p = \mu_p E$

Plan and requirements	2.675 * 0.06 = 0.16 PM = 5 PD
System Design	2.675*0.16 = 0.428 PM = 13 PD
Detail Design	2.675*0.26 = 0.6955 PM = 21 PD
Module Code and Test	2.675*0.42 = 1.12 PM = 34 PD
Integration and Test	2.675*0.16 = 0.428 PM = 13 PD

$D_p = \square_p D$

Plan and requirements	3.633*0.10 = 0.363 M = 11 D
System Design	3.633*0.19 = 0.69 M = 21 D
Detail Design	3.633*0.24 = 0.87 M = 26 D
Module Code and Test	3.633*0.39 = 1.41 M = 43 D
Integration and Test	3.633*0.18 = 0.65 M = 17 D

SS = E/D persons = 2.675 / 3.633 = 0.736

P = KLOC/E = 0.592 / 2.675 = 0.221

عضویت در گروه:

FP:

Unadjusted Function Point:

Type of Component	Complexity of Components			
	Low	Average	High	Total
External Inputs	1 x 3 = 3	___ x 4 = ___	___ x 6 = ___	3
External Outputs	___ x 4 = ___	___ x 5 = ___	___ x 7 = ___	
External Inquiries	___ x 3 = ___	___ x 4 = ___	___ x 6 = ___	
Internal Logical Files	1 x 7 = 7	___ x 10 = ___	___ x 15 = ___	7
External Interface Files	___ x 5 = ___	___ x 7 = ___	___ x 10 = ___	
		Total Number of Unadjusted Function Points		10

FP = UAF * VAF = 10 * 0.90 = 9

تخمین زمان:

SLOC = FP * 47 = 9*47 = 423 = 0.423 KLOC

$E = a_i (KLOC)^{bi} * EAF = 3.2 * (0.423)^{1.05} * 1.45 = 1.880$ PersonMonth

$D = c_i (E)^{di} = 2.5 * (1.880)^{0.38} = 3.177$ Month

$E_p = \mu_p E$

Plan and requirements	1.880 * 0.06 = 0.11 PM = 3 PD
System Design	1.880*0.16 = 0.300 PM = 9 PD
Detail Design	1.880*0.26 = 0.488 PM = 15 PD
Module Code and Test	1.880*0.42 = 0.789 PM = 24 PD
Integration and Test	1.880*0.16 = 0.300 PM = 9 PD

$D_p = \square_p D$

Plan and requirements	3.177*0.10 = 0.317 M = 10 D
System Design	3.177*0.19 = 0.76 M = 23 D
Detail Design	3.177*0.24 = 0.76 M = 23 D

Module Code and Test	3.177*0.39 = 1.23 M = 37 D
Integration and Test	3.177*0.18 = 0.57 M = 17 D

SS = E/D persons = 1.880 / 3.177 = 0.591

P = KLOC/E = 0.423 / 1.880 = 0.225

افزودن خرج جدید:

:FP

Unadjusted Function Point:

Type of Component	Complexity of Components			
	Low	Average	High	Total
External Inputs	___ x 3 = ___	___ x 4 = ___	1 x 6 = 6	6
External Outputs	___ x 4 = ___	___ x 5 = ___	___ x 7 = ___	
External Inquiries	___ x 3 = ___	___ x 4 = ___	___ x 6 = ___	
Internal Logical Files	1 x 7 = 7	___ x 10 = ___	___ x 15 = ___	7
External Interface Files	___ x 5 = ___	___ x 7 = ___	___ x 10 = ___	
		Total Number of Unadjusted Function Points		13

FP = UAF * VAF = 13 * 0.90 = 11.7

تخمین زمان:

SLOC = FP * 47 = 11.7*47 = 549.9 = 0.549 KLOC

$E = a_i (KLOC)^{bi} * EAF = 3.2 * (0.592)^{1.05} * 1.45 = 2.472$ PersonMonth

$D = c_i (E)^{di} = 2.5 * (2.472)^{0.38} = 3.526$ Month

$E_p = \mu_p E$

Plan and requirements	2.472 * 0.06 = 0.14 PM = 4 PD
System Design	2.472*0.16 = 0.39 PM = 12 PD
Detail Design	2.472*0.26 = 0.642 PM = 19 PD
Module Code and Test	2.472*0.42 = 1.03 PM = 31 PD
Integration and Test	2.472*0.16 = 0.395 PM = 12 PD

$D_p = \square_p D$

Plan and requirements	3.526*0.10 = 0.352 M = 11 D
System Design	3.526*0.19 = 0.66 M = 20 D
Detail Design	3.526*0.24 = 0.84 M = 25 D
Module Code and Test	3.526*0.39 = 1.37 M = 41 D
Integration and Test	3.526*0.18 = 0.63 M = 19 D

SS = E/D persons = 2.472 / 3.526 = 0.701

P = KLOC/E = 0.549 / 2.472 = 0.222

پرداخت بدهی:

FP:

Unadjusted Function Point:

Type of Component	Complexity of Components			
	Low	Average	High	Total
External Inputs	1 x 3 = 3	___ x 4 = ___	___ x 6 = ___	3
External Outputs	___ x 4 = ___	___ x 5 = ___	___ x 7 = ___	
External Inquiries	___ x 3 = ___	___ x 4 = ___	___ x 6 = ___	
Internal Logical Files	1 x 7 = 7	___ x 10 = ___	___ x 15 = ___	7
External Interface Files	1 x 5 = 5	___ x 7 = ___	___ x 10 = ___	5
		Total Number of Unadjusted Function Points		15

FP = UAF * VAF = 15 * 0.90 = 13.5

تخمین زمان:

SLOC = FP * 47 = 13.5*47 = 634.5 = 0.634 KLOC

$E = a_i (KLOC)^{bi} * EAF = 3.2 * (0.634)^{1.05} * 1.45 = 2.875$ PersonMonth

$D = c_i (E)^{di} = 2.5 * (2.875)^{0.38} = 3.734$ Month

$E_p = \mu_p E$

Plan and requirements	2.875 * 0.06 = 0.17 PM = 5 PD
System Design	2.875*0.16 = 0.46 PM = 14 PD
Detail Design	2.875*0.26 = 0.747 PM = 22 PD
Module Code and Test	2.875*0.42 = 1.20 PM = 36 PD
Integration and Test	2.875*0.16 = 0.46 PM = 14 PD

$D_p = \square_p D$

Plan and requirements	3.734*0.10 = 0.373 M = 11 D
System Design	3.734*0.19 = 0.70 M = 21 D
Detail Design	3.734*0.24 = 0.89 M = 27 D
Module Code and Test	3.734*0.39 = 1.45 M = 44 D
Integration and Test	3.734*0.18 = 0.67 M = 20 D

SS = E/D persons = 2.875 / 3.734 = 0.769

P = KLOC/E = 0.634 / 2.875 = 0.220