Cost Estimation of Functional Requirements of Institute Examination System

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ABSTRACT
Function point analysis is a standard method to measure the functional size of software. The objective of this paper is to estimate the size of each requirement of Institute Examination System. For the elicitation of software requirements we have used goal oriented approach.

Keywords
Function Point Analysis, Institute Examination System.

1. INTRODUCTION
Cost plays a very important role in our life. Whenever we are making any software it is very necessary to measure the size of software. To measure the size of software we need function point. In this section, we discuss about the estimation of cost of functional requirements of institute examination system.

Cost Estimation is one of the most demanding tasks in project organization. It is accurately estimate needed resources and required schedules for software improvement projects. The software estimation process include estimating the size of the software product to be created and estimating the effort required, developing beginning project schedules, and at last, estimating overall cost of the project. We discuss the estimation of cost of all functional requirements that we have identified using goal oriented approach [6, 7, 8, 11]. Whenever we are making any software project then it is very necessary that we should know how much cost it will take and how much development time will it take for this estimates are needed before development is initiated. A number of estimation techniques have been developed and are having following attributes in common. Projects scope must be established in advance, Software metrics are used as a basis from which estimates are made, and the projects are broken into small pieces which are estimated individually.

To achieve reliable projects cost and schedule estimates, a number of options arise: Use simple decomposition technique generate project cost and schedule estimates, Develop empirical models for estimation, Acquire one or more automated estimation tools cost estimates must be provided up front. However, we should recognize that the longer we wait, more we know, and the less likely we are to make serious errors in our estimates [1].

2. FUNCTION POINT
Function point originated by Allan Albrecht in 1979 at IBM [9, 10]. Allan Albrecht's was the first to propose, over 33 years ago, a new way of quantifying software size based on the user's view of the software [12]. The function points help us to measure the amount of software produced or we can say function point as a measure of "functional size". Function point analysis is an international standard organization (ISO) which uses to find out the functional size of measurement. Function point will become the first software functional sizing methodology to be recognized as an international standard [5]. The functional user requirements of the software are identified and each one is categorized into one of five types: which are External Input (EI) - information entering the information, External Output (EO) – information leaving the system, External Inquiry (EQ) – requests for instant access to information, Internal Logical File – information held within the file system, External Interface Files – information held by other systems is used by the system being analyzed. The second part consists of assigning complexity weights to each component using the levels of simple, average and complex are described below in the table 2.1.

Table 2.1. Weights of each function types

Functional units	Low	Average	Complex
External Input(EI)	3	4	6
External Output(EO)	4	5	7
External Inquiries(EQ)	3	4	6
Internal Logical Files(ILF)	7	10	15
External Interface Files(EIF)	5	7	10

The third part consists of evaluating the general system characteristics of any software, which consists of technical complexity factors that give a clear view of internal complexity of any software. Finally the function point is calculated using the following relationship as

FP= UFP*VAF

Whereas the VAF i.e. value adjustment factor and is equal to

[0.65+0.01*∑fi]. The fi (i =1 to 14) are degrees of influence and are based on response to question noted below:

1. Does the system require reliable backup and recovery?
2. Is data communication required?
3. Are there distributed processing functions?
4. Is performance critical?
5. Will the system run in an existing heavily utilized operational environment?
6. Does the system require online data entry?

7. Does the online data require the input transition to be built over multiple screens or operations?
8. Are the masters files updated online?
9. Is the input, output, files or inquiries complex?
10. Is the internal processing complex?
11. Is the code designed to be reusable?
12. Are conversion and installation included in the design?
13. Is the system designed for multiple installations in different organizations?
14. Is the application designed to facilitate change and ease of use by the user?

The suggested score for degree of influence is as below in table 2.2 are as follows:

Table 2.2. Degree of influence

Scores as	Description to determine degree of influence
0	Non- Essential
4	Essential
5	Absolute Essential

The two constants 0.65 and 0.01 are essential parts of the formula [2]. The function point can be calculated and analyzed in different stages of software development in order to provide a mechanism to track control scope creep of software projects [3].

Advantage

- Function point help in software development cost estimation
- It also helps in improving product quality.
- Function point work well with use cases.

Disadvantage

- Function point suffers from size of a function is considered to be independent of its complexity.

3. REQUIREMENT ELICITATION OF FR OF INSTITUTE EXAMINATION SYSTEM

The objective of this section is to gather all functional requirements of institute examination system. This system is used to provide the facility to submit online examination form and generate the results of the students; display the news related to examination after submitting the examination form, the system will generate examination fee receipt and student will be able to take the print out of receipt. The system will also generate the patterns of the sitting arrangement. There are total ten functional requirements of institute examination system using goal oriented method. We gather functional requirements of institute examination system that are described below:

Functional Requirement 1: Login Modules;

fr1.1: User name

fr1.2: Password

fr1.3: Student

fr1.4: Admin

fr1.5: Other

fr1.6: Submit

Functional Requirement 2: printout of bank receipt of student's fee;

fr2.1: Payment mode through cash, cheque, draft or by card

fr2.2: Name of the student

fr2.3: Course Name

fr2.4: Account Number

fr2.5: Registration Code

fr2.6: Branch Name

fr2.7: Signature

fr2.8: Total amount

fr2.9: Verification and validation that is fee is paid or not.

fr2.10: Verified with Stamp and Signature on it.

Functional Requirement 3: view semester result;

fr3.1: Log on to APJAKTU site

fr3.2: Click on result

fr3.3: Result of M.Tech

fr3.4: APJAKTU Region or Noida Region

fr3.5: Result according to semester wise

fr3.6: Name of the student

fr3.7: Father Name of student

fr3.8: Roll number of student

fr3.9: Captcha

fr3.10: Click on submit button

fr3.11: Print out of result

Functional Requirement 4: generate examination sitting arrangement;

fr4.1: A room has at least 60 seats

fr4.2: Allocate one computer system to particular student with roll number and name

fr4.3: A room should be allocate for 3 hour

fr4.4: A room should be well ventilated and the atmosphere should be congenial for student

fr4.5: There should be investigator to check the details of the student

fr4.6: A room should have two faculty members in it.

Fr4.7: In case of problem in a computer system there should be a computer engineer

Functional Requirement 5: Online conduct of examination;

fr5.1: Each student is having a registration number and password with them

fr5.2: Instruction page is open.

fr5.3: After reading the instruction page student can click on start button

fr5.4: A timer button is available on the right hand side

fr5.5: An answer sheet is having different color options in it such as red color is used for not reading questions and green color is used for attending the question.

fr5.6: On upper right corner photo of student should be there

fr5.7: Scheme of Examination include

fr5.7.1: Aptitude

fr5.7.2: Reasoning

fr5.7.3: English

fr5.7.4: Professional Knowledge

fr5.8: Student has choice to start with which section he/she want to start either English, Aptitude, Reasoning and Professional knowledge
fr5.9: students have their own choice if she/he wants to switch in between
fr5.10: Student can also check his answer sheet
fr5.11: Student can also check that how many attempt questions and how many are left unattempt
fr5.12: At the end student have to click on submit button.

Functional Requirement 6: fill examination form; and after successful submission of the form system will generate the following information: (a) roll number, (b) name of the students,(c) gender (d) examination name, (e) subject code, (f) subject name(s), (g) number of backlogs, if any (h) examination fee(s) (i) date of birth (j) Mailing Address (k) upload Photograph (l) Upload Signature (m) examination name (n) No of attempts for this exam (o) father name (p) Submit.

Functional Requirement 7: upload any exam related activities;

fr7.1: Notify when the tentive date sheet schedule comes

fr7.2: Notify when the date of exam postponed

fr7.3: show when updated date sheet comes

fr7.4: Show whether it will morning shift or evening shift.

Functional Requirement 8: generate examination hall ticket;

fr8.1: Logon to examination site
fr8.1.1: Name of student
fr8.1.2: Email- Id of the student
fr8.1.3: Enter password
fr8.1.4: Captcha
fr8.1.5: Forget password
fr8.2: View Application form
fr8.3: Change Password
fr8.4: Click here to download hall ticket
fr8.5: Logout

Functional Requirement 9: Approve examination form;

fr9.1: If any details left then notifies it
fr9.2: Verify form and approve it
fr9.3: uploading of photograph and signature should be up to the mark

Functional Requirement 10: Online payment of examination fee.

fr10.1: Cash
fr10.1.1: Give slip with stamp
fr10.2: Draft
fr10.2.1: Fill detail on backside of draft and submit it to fee counter
fr10.2.2: Get slip with stamp
fr10.3: Cheque
fr10.3.1: Accepted
fr10.3.2: Bounce (maybe)
fr10.3.5: Add Penalty Charges
fr10.3.6: Get Slip with Stamp
fr10.4: Card
fr10.4.1: Payment Done

3.1 Cost Estimation of FR of Institute Examination System

The objective of this section is to apply cost estimation of institute examination system. We first of all gathered all the functional requirement of institute examination system then based on the above requirements we are able to calculate the function point and here we are using average weights to calculate function point that are described below:

Functional Requirements R1: for login module
External Input = 6*4 = 24

External Output = 1*5 = 5

External Inquiries = 2*4 = 8

Internal Logical File = 1*10 = 10

External Interface File = 1*7 = 7

Count Total = 54

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 54[0.65+0.01*14*4]

= 54*1.21

= 65.34

= 66

Functional Requirements R2: for Print out of bank receipt
External Input = 10*4 = 40

External Output = 1*5 = 5

External Inquiries = 2*4 = 8

Internal Logical File = 1*10 = 10

External Interface File = 1*7 = 7

Count Total = 70

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 70[0.65+0.01*14*5]

= 94.5

= 95

Functional Requirements R3: for View Semester Result
External Input = 11*4 = 44

External Output = 1*5 = 5

External Inquiries = 2*4 = 8

Internal Logical File = 1*10 = 10

External Interface File = 2*7 = 14

Count Total = 81

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 81[0.65+0.01*14*5]

= 109.35

= 110

Functional Requirements R4: for Generate examination sitting arrangement

External Input = 7*4 = 28

External Output = 1*5 = 5

External Inquiries = 2*4 = 8

Internal Logical File = 1*10 = 10

External Interface File= 1*7 = 7

Count Total = 58

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 58[0.65+0.01*14*4]

= 58*1.21

= 70.81

= 71

Functional Requirements R5: for Online conduct of Exam
External Input = 16*4 = 64

External Output = 1*5 = 5

External Inquiries = 3*4 = 12

Internal Logical File = 1*10 = 10

External Interface File= 1*7 = 7

Count Total = 98

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 98[0.65+0.01*14*5]

= 98*1.35

= 132.3

= 133

Functional Requirements R6: for Filling Examination Form
External Input = 16*4 = 64

External Output = 1*5 = 5

External Inquiries = 1*4 = 4

Internal Logical File = 1*10 = 10

External Interface File= 1*7 = 7 4

Count Total = 90

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 90[0.65+0.01*14*4]

= 108.9

= 109

Functional Requirements R7: for Uploading Examination related activities

External Input = 4*4 = 16

External Output = 1*5 = 5

External Inquiries = 1*4 = 4

Internal Logical File = 1*10 = 10

External Interface File= 0*7 = 0

Count Total = 35

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 35[0.65+0.01*14*4]

= 35*1.21

= 42.35

= 43

Functional Requirements R8: for Generating Examination hall ticket

External Input = 11*4 = 44

External Output = 1*5 = 5

External Inquiries = 1*4 = 4

Internal Logical File = 1*10 = 10

External Interface File= 0*7 = 0

Count Total = 63

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 63[0.65+0.01*14*4]

= 85.05

= 86

Functional Requirements R9: for Approving Examination Form

External Input = 3*4 = 12

External Output = 1*5 = 5

External Inquiries = 1*4 = 4

Internal Logical File = 1*10 = 10

External Interface File= 0*7 = 0 5

Count Total = 31

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 31[0.65+0.01*14*4]

= 31*1.21

= 37.51

= 38

Function Requirements R10: for Online payment of Examination Fee

External Input = 12*4 = 48

External Output = 1*5 = 5

External Inquiries = 1*4 = 4

Internal Logical File = 1*10 = 10

External Interface File= 1*7 = 7

Count Total = 74

Function Point1 = count total [0.65+0.01*Σ (fi)]

= 74[0.65+0.01*14*5]

= 74*1.35

= 99.9

=100

After calculating all of these function point for different functional requirements we estimated the cost in dollar by using table 3.1.1 from source [4] below:

Table 3.1.1. Countries with the lowest average per- unit costs (per 1 IFPUG FP) in USD

No.	Country	Per-unit cost(per 1 IFPUG FP)
1.	India	125
2.	Pakistan	145
3.	Poland	155
4.	Hungary	175
5.	Thailand	180
6.	Indonesia	185
7.	Venezuela	190
8.	Columbia	195
9.	Mexico	200
10.	Argentina	250

After calculated the function point we need to calculate the cost estimation that is described in table 3.1.2 below:

Table 3.1.2. Function point and cost estimation for different requirements

Requirements	Function Point	Cost Estimation
Login Module	66	8250 in dollar
Print out	95	11875 in dollar
View Semester Result	110	13750 in dollar
Generate Arrangements	71	8875 in dollar
Online Exam	133	16625 in dollar
Filling Exam	109	13625 in dollar
Upload Exam	43	5375 in dollar
Generate Exam	86	10750 in dollar
Approve Exam	38	4750 in dollar
Online Payment	100	12500 in dollar

4. CONCLUSION

In this paper we have estimated the cost of functional requirements of institute examination system. For the elicitation of functional requirement we have applied goal oriented method as a result we have identified ten functional requirements. Among these requirements online conducts of examination has highest cost value 16625 in dollar as compared to other.

5. REFERENCES

[1] Pressman Roger, 2000. Software Engineering, Mc Graw Hill Pub.

[2] Pressman, R.S., 2001. Software Engineering. A Practitioner's Approach,

[3] Longstreet, D. 2001. Function Point counting practices. Manual release 4.1. IFPUG.

[4] C. Jones. 2000. "Software Benchmarking: What Works and What Doesn't?", Boston SPIN, November 2000.

[5] IFPUG, 2002. Function Point Analysis Nears Approval As First International Standard For Software Functional Size. Technical report, available from<http://www.ifpug.org/about/ISOPress. htm>.

[6] Sadiq, Mohd and Jain, S.K. 2013. A fuzzy based approach for requirement prioritization in goal oriented requirement elicitation process. In international conference of software engineering and knowledge engineering. Page 54-58.

[7] Sadiq, Mohd and Jain, S.K. 2014. Applying fuzzy preference relation for requirements prioritization in goal oriented requirements elicitation process. In international journal of system assurance engineering and management vol.50, Issue.4, Page 711-723.

[8] Sadiq, Muhammad and Jain, S.K. 2014. Stakeholder's identification method in goal oriented requirements elicitation process. In requirement prioritization and communication, IEEE 5th international workshop.

[9] Sadiq. M and Ahmed, Shabbir. 2007. Computation of function point of software on the basis of average complexity. In proceeding of 2nd international conference on advanced computing and computing technologies, Panipat, Haryana. Page 591-594.

[10] Sadiq, Mohd and Ahmed, Shabbir. 2008. Estimation of the size of software projects with high complexity using function point. In proceeding of the 2nd national conference, India.

[11] Sadiq, Mohd and Jain, S.K. 2015. A fuzzy based approach for the selection of goals in goal oriented requirements elicitation process.In international journal of system assurance engineering & management. Vol.6, Issue.2, Page 157-164.

[12] Albrecht, A.J., 1979. Measuring application development productivity. Proceedings of IBM Appl. Develop. Symp., Montara, CA, USA, pp 83–92