Utilization of function point method for measuring software project complexity

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Abstract. The purpose of this study is to know the complexity of a project so that the time and cost of project work in accordance with the needs and the company can complete the project on time. The complexity of a project can be defined as something consisting of so many interrelated sections that can be operated in the context of difference and interdependence. The method used to achieve research objectives using the Function Point Method. Function point method is a method used to estimate the complexity of a software project, providing project volume estimates in the form of development resources required before the project is undertaken. This estimate provides an important basis for providing estimates of the resources required by software companies to prepare tender proposals and project plans. One of the problems encountered in software project development is that the project experiences delays in its completion due to errors in estimating the complexity of the project undertaken and impacting the time and cost of the project. Function point method can prevent or reduce the error of project cost plan. By using the Function Point method, the complexity of software projects can be known so that the time and cost of project work in accordance with the needs and the company can complete the project on time.

1. Introduction

The project is a combination of resources such as people, materials, equipment, and capital / costs gathered in a temporary organizational container to achieve goals and objectives [1]. Project Management is all the planning, implementation, control and coordination of a project from the beginning (the idea) to the end of the project to ensure timely, timely and cost-effective implementation [2]. To estimate the complexity of a project can use several methods in project management, one such method is the Function Point method [3]. Function point method is a method that can be used to estimate the complexity of a software project, providing project volume estimates in the form of development resources required before the project is undertaken. This estimate provides an important basis for providing estimates of the resources required by software companies to prepare tender proposals and project plans. This method can also prevent or at least reduce the error of the project cost plan [4].

Some previous research using the function point analysis method is a study conducted by Albrecht who examined the business estimates made by IBM companies since 1983 [5] and then developed rapidly into an international association called IFPUG (International Function Points User Group) and evolved into standard ISO / IEC 20926 [6]. Other studies have shown that business estimation by function point method is directly proportional to actual effort [3] [4].

In this study, researchers will try to use the function point method used to estimate the business in software projects. By using the Function Point method, the complexity of software projects can be known so that the time and cost of project work in accordance with the needs and the company can complete the project just in time.

2. Methodology

Research methodology used in this research is descriptive research methodology is a research method that aims to create descriptions, images and information in the situation or events investigated systematically, factually and accurately. The methodology of this study started from conducting literature studies and continued with secondary data collection. After collecting secondary data, the next step calculates the value of Crude Function Point (CFP). After the CFP value is obtained, the next step calculates the Relative Complexity Adjustment Factor (RCAF) value and the last one calculates the Fuction Point value and the final step is to draw the conclusion of the function point value.

3. Results and discussion

3.1. Secondary data collection

The data used as research material is project data Online Test System (Prospective Income Taruna) By CV.XYZ. This system will be implemented to simultaneously select candidates across Indonesia consisting of registration, payment, examination and announcement. In the case study taken there is a project Exam Chart Online system one of which there is a rough time calculation of completion of the project is 5 Months, calculation of the project's crude cost of 150,000,000, - and wages of workers every week of 7.500.000, -

3.2. Calculating Crude Function Point (CFP)

The first step in estimating project complexity using function point is to calculate Crude Function Point. There are several components involved in CFP calculations [3]. These components have "simple", "medium" or "complex" categories depending on the characteristics of their complexity. Simple, medium and complex categories are derived from the complexity standards set by CV.XYZ. as for the standard complexity CV.XYZ can be seen in table 1.

Table 1. Complexity Standard of Project CV.XYZ.

Complexity Level	Poin FP
Simple	Poin < 400
Medium	400 poin < 700
Complexity	> 700

In addition to depending on the project complexity standard as in table 1, CFP also involves five components in system analysis such as: number of input application, number of output applications, number of online query applications - applications related to queries against stored data, number of logic files / tables involved, number of external output interfaces or inputs that can be related to a computer via flashdisk data communications, CDs, floppy disks and others.

The first step in performing CFP calculations is to identify the components in the system design and then grouped into simple, medium and complex based on their complexity. The number of each component that has been grouped can be entered into the CFP table. Here are the details of the complexity assignment on each component of the Online Test System (Admission Taruna) in CV.XYZ can be seen in table 2.

Table 2. Giving complexity values.

Explanation System	Components	Complexity Level			Total CFP
		Simple	Medium	Complexity	
Input	Account management Input	5 x 3 =25			15
	Input Employee Management	4 x 3 = 12			12
	Input HR Management	3 x 3 = 15			15
	Input Asset Management	4 x 3 = 12			12
	Input News Management	3 x 3 = 9			9
	Organizational Management Input		7 x 4 = 28		28
	Input education management		6 x 4 = 24	5 x 5 = 25	49
	Input of research management		4 x 4=16		16
	Input management of devotion	5 x 3 = 15			15
	Input of forum management	6 x 3 = 18			18
	Input poll management	5 x 3 = 15			15
	Input of agency management	4 x 3 = 12			12
	Input of complaints management			4 x 5 = 20	20
	Input payroll management			4 x 5 = 20	20
	Input budget management			5 x 5 = 25	25
	Input management of the journal			5 x 5 = 25	25
	Input tax management			4 x 5 = 20	20
Output	Output of Account Data			4x 6= 24	24
	Output Employee data			4 x 6 = 24	24
	Output of HR Data			4 x 6 = 24	24
	Output of Asset Data	4 x 3 = 12			12
	Output News data	4 x 3 = 12			12
	Organizational Data Output	5 x 3 = 15			15
	Output Educational data	4 x 3 = 12			12
	Output Research data	3 x 3 = 9			9
	Output Data devotion	4 x 3 = 12			12
	Output Data forum discussion			3 x 6 = 18	18
	Output Poll data		3 x 4= 12		12
	Output of Institution Data		4 x 4 = 16		16
	Output Complaint data		3 x 4 = 12		12
	Output Payroll data			3 x 6 = 18	18
	LRA Data Output			3 x 6 = 18	18
	Output of Journal Data			3 x 6 = 18	18
	Output Data ledger			3 x 6 = 18	18
	Output Balance data			3 x 6 = 18	18
	Output Tax data			3 x 6 = 18	18
	Output Financial data			3 x 6 = 18	18
File Logic	Database file			3 x 15= 45	45
	Entity class		**12x7=84**		84
	Controller class			**4x15=60**	60
	Interface class			**5x15=75**	75
Interface Eksternal	-	-	-	-	-
Inquery	Journal calculations			3 x 5 = 15	15
	Budget calculation			3 x 5 = 15	15
	The calculation of the ledger			3 x 5 = 15	15
	Balance sheet calculation			4 x 5 = 20	20
	Tax calculation			4 x 5 = 20	20
	Calculation of financial statements			4 x 5 = 20	20
				Total	1017

Here is the accumulation of the results of the calculation of the value in table 2, while the accumulated results of the calculation of the level of complexity values can be seen in table 3. Based on the calculation of complexity value in table 3 , total value of CFP is 1017 points.

Table 3. Calculation of complexity level values.

Explanation System	Complexity Level									Total CFP
	Simple			Medium			Complexity			
	A	B	C=AXB	D	E	DXE=F	G	H	I=GXH	CFP=C+F+I
Input	39	3	117	17	4	68	27	5	135	320
Output	24	3	72	10	4	40	36	6	216	328
Query	-	-	-	-	-	-	21	5	105	105
Online File Logic				12	7	84	12	15	180	264
Interface Eksternal	-	-	-	-	-	-	-	-	-	-
									Total CFP	1017

3.3. Calculating Relative Complexity Adjustment Factor (RCAF)

Relative Complexity Adjustment Factor (RCAF) is calculated based on the overall complexity of the system. RCAF is calculated using 14 General System Characteristic (GSC), where GSC scales zero up to five. The zero scale shows no effect and the scale of five indicates a broad influence on the whole project. GSC calculation serves to calculate the conclusions of complexity in which there are 14 points characteristics of the software system [9]. A scale assessment of zero to five is given to each of the most influential characteristics of the required development effort.

The 14 criteria for GSC calculation are as number one the level of data communication complexity: the level of communication needs directly between applications and processors. Number two the level of data processing complexity: the level of data transfer needs between application components. Number tree level of performance complexity: the level of response time and throughput to consider in application development. Number four level of configuration complexity: the level of need where the computer configuration settings affect the application development. Number five the system user frequency level: the level of business transaction speed that affects application development. Number six data input frequency level: the level of need for interactive data input. Number seven level of ease of use for the user: level of ease of use of the application. Number eight data frequency update rate: ILF requirement level is updated online. Number nine the level of complexity of data processing: the difficulty level of process logic affecting the development process. Number ten the level of possible reuse / reusable program code: the level of application needs and application program code designed and developed to be used in other applications. Number eleven level of ease of installation: the level of ease of conversion to new systems that affect the development process. Number twelve level of operational ease of software (backup, recovery, etc.): level of ease of application in operational aspects, such as start-up, backup, and recovery process. Number thirteen the level of software is made for multiple organizations / companies / clients: the level of application needs can be operationalized in different hardware and software environments and number fourteen level of complexity in following change / flexibility: Level of ease of application for process logic modification and data structur

The assessment of the complexity of 14 criteria for GSC calculations has a scale of zero to five where the value is zero = no effect, 1 = incidental, 2 = moderate, 3 = average, 4 = significant and 5 = essential. The results of the assessment of system complexity using GSC can be seen in table 4. By using the 14 GSC criteria as in table 4, the RCAF score in table 5 shows 66 points.

Table 4. Calculation of General Characteristic System (GSC).

No	General System Characteristic (GSC)	Value of Interest
1	The level of data communication complexity	5
2	The level of complexity of data processing	5
3	Level of performance complexity	5
4	The level of configuration complexity	5
5	Software user frequency level	5
6	Data input frequency level	4
7	Level of ease of use for the user	4
8	Data frequency update rate	4
9	The level of complexity of data processing	4
10	Level of possible reuse / reusable program cod	5
11	Level of ease in installation	4
12	Level of ease of operasinal software (backup, recovery, etc.)	4
13	The software level is made for multiple organizations / companies / clients	5
14	Level of complexity in following changes / flexible	3
	Total RCAF	66

3.4. Calculating Function Point (FP)

After performing GSC calculations the last step in calculating the complexity of a project is to calculate the function point (FP) [10] [11] [12]. Function point value for Online Test system can be calculated using the following formula: FP = CFP * (0.65 + 0.01 * RCAF)

Obtained function point value as follows: FP = 1017 * (0.65 + 0.01 * 66)

= 1332,27 FP

Based on the calculation of the function point, the estimated complexity obtained for the Online Testing System project is 1332.27, then based on table 1 of the Online Exam System Project included into the Complex project category as more than 700 points.

3.5. Estimated cost and project time

After going through several stages Function Point calculation, then obtained the total point function value of 1332.27 points and obtained calculation of the estimated time required to finish the project as follows [13]: Estimate Time = Total Function Point / (Number of Developers x 6 Fuction Point)

Estimate Time = 1332,27 / (9 x 6)

= 24,67 Week = (25 Week)

As for the estimated cost can be calculated by multiplying labor rates per week multiplied by the estimated amount of time. The calculation of the estimated cost required for the completion of the project as follows: Estimate Cost = labor rates x the estimated amount of time

Estimate Cost = 7.500.000 x 25

= 187.500.000, -

Based on the calculation of the function point obtained the level of project complexity and the estimated cost and time required for completion of the project. In the Online Exam System project that has been calculated the value of function point can be concluded that CV.XYZ targeting the cost and time of the work is too low where the targeted cost of 150,000,000 with a working time of 5 months, If calculated by the method function point obtained cost estimates amounting to 187,500,000 and the estimated time of completion of the project for 25 weeks. From the calculation, the cost difference is 37,500,000 and the difference of working time is 5 weeks.

3.6. Results and differences with previous research

In this study, researchers concluded that the development of public service applications have differences with the complexity factor that has been determined by Albrecht since 1983. Along with the development of technology, that the complexity factor is not only measured by the complexity of a system, but also pay attention to the cost and time of execution in the development of the system.

4. Conclusion

There are several conclusions obtained from the results of this study,the complexity of the project is either simple, medium or complex, can estimate the cost of the project so that the offer is not too high or too low and can estimate the time of project work so that not too fast or too long in project completion.

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References

[1] Heryanto I and Triwibowo T 2016 *Manajemen Proyek Berbasis Teknologi Informasi* (Bandung: Informatika)
[2] Ervianto W I 2005 *Manajemen Proyek Konstruksi* (Yogyakarta: Andi)
[3] Mittal H and Bhatia P 2002 A Comparative Study of Convertional Effort Estimation and Fuzzy Effort Estimation Based On Triangular Fuzzy Numbers *International Journal Computer Science Security* **4** p 36-47
[4] Gramus D and Dan Herron D 1996 *Measuring the Software Process – A Practical Guide to Functional Measurements* (New Jersey, US: Yourdon Press, Prentice Hall)
[5] Albrecht A E J G 1983 Software Function, Source Lines of Code, and Development Effort Prediction: A Software Science Validation *IEEE Transaction on Software Engineering* **9** 6 p 501–530
[6] Aguiar M 2009 Function Points or Use Case Points? *IFPUG Metricviews Summer* **4** 1 pp.14-15.
[7] Balaji N, Shivakumar and Ananth A A 2013 Software Cost Estimation Using Function Point With Non Algorithmic Approach *Global Journal of Computer Science and Technology Software 7 Data Engineering* **13** 8 p 1-6
[8] Dewi R, Sholiq and Subriadi A P 2017 A Modification Complexity Factor in Function Points Method for software Cost Estimation Towards Public Service Application *in 4th Information Systems International Conference (Draft)* Bali
[9] IEEE 2000 IEEE Std 1061-1998 2009 Standart for Software Quality Metrics Methodology (The Institute of Electrical and Electronics Engineers, New York, US)
[10] Caldiera G, Antoniol G, Fiuterm R and Dan Lokan C 1998 Definition and Exerimental Ecaluation of Function Points for Object-Oriented systems *Preceedings of The Fifth International software Metrics symposium* California US
[11] Cantono G, Pace D and Calavaro G 2004 Applying Function Point to Unified Modeling Language: Conversion Model and Pilot Study *In Proceeding 10th International Symposium on Software Metrics (METRICS'04)*
[12] Benton A and Bradly M 1999 The International Function Point User Group (IFPUG) *in Function Point Counting Practices manual – release* 4.2' (SA)
[13] Schatzberg D R 1993 Total Quality Management for Maintenance Process Improvement *Journal Software Maintenance, Res. Pract*. **5** 1 p 1-12

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