APPLICATION METHOD *FAILURE MODE AND EFFECT ANALYSIS* IN SYSTEM PROJECT RISK MANAGEMENT IN CV BELLVANIA JAYA MANDIRI

Solita Saragih[1], Sufa'atin[2]

[1,2] Teknik Informatika-Universitas Komputer Indonesia
Jl.Dipatiukur 112-116, Bandung 40132, Indonesia.
E-mail : solitasaragih@gmail.com[1], sufaatin@email.unikom.ac.id2[2]

ABSTRACT

CV.BELLVANIA JAYA MANDIRI is companies operating in the field of construction. Based on interviews that have been done explain that the implementation of the project there is a mismatch between project planning and project implementation. As happened in the project to improve Ex.Toilet, Mushola and Ruang Sack Building Dahlan II. In the implementation of this project, there was a delay in the first week of the demolition work . The planning explained that the demolition work had been completed in the first week, but in the work of dismantling the cellessay in week 2. This delay causes the cost to be inflated that is not in accordance with rab, because the company must increase the working hours of each worker. The disruption of security in the project location caused the project to suffer losses.of the problems described above it is necessary to project risk management system in CV.Bellvania Jaya Mandiri. This system helps the project run according to plan. Knowing the critical path of work using the *C ritical Path Method,* helping to make rab using the *Earned Value Method,* helping to manage risk using the *Failre Mode and Effect Analysis* method .

Based on the results of tests that have been carried out, the conclusion is that the project's risk management system can assist in scheduling, rab, and identifying risks.

Keywords : Risk Management, *Critical Path Method, Earned Value, Failure Mode and Effect Analysis,*

1. INTRODUCTION

CV.BELLVANIA JAYA MANDIRI is a company engaged in construction located in East Jakarta.

Based on the results of interviews conducted with Mr. Edy Maruli Jaya as ur director explained that in implementing projects there are often inconsistencies between project planning and project work. As happened in the project Ex Repair Toilet and Building Room Snack Room Dahla II Building. In the course of this project, there was a delay. In the planning explained that in the first week of dismantling work was completed, but in the implementation of the demolition work completed in week 2. The delay was caused by the supervisors asking that the demolition work be delayed 5 days in order to maintain teaching and learning activities of students at school. This delay requires the company to increase the work hours of each worker so that the demolition work can be completed quickly. Adding hours to the working room results in a mismatch between the budget plan and the implementation. This results in losses for the company. The above problems occur because of the risk of security disturbances at project locations not identified previously.

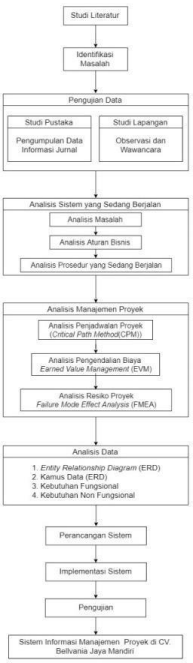
Based on the problems outlined above, a solution is needed to help the person in charge of scheduling so that the critical work can be identified, and can help arrange the rab to fit the current needs , and help in processing and identifying risks. occur in project work. Therefore a system will be built which can be accessed wherever the user is, namely the Project Risk Management System in CV. Belania. It is expected that this system can help the person in charge of overcoming the project's problems in CV .ELLVANIA JAYA MANDIRI.

.

2. RESEARCH CONTENTS

2.1 Research Methodology

The following is the methodology used in this study



Research Methodology

2.2 Project Planning Analysis

Project planning analysis is filled with scheduling analysis, cost analysis, and identification of risks that occur in the Ex Toilet and Mushola Room Snack Room Building project, Dahlan Building II.

2.2.1 An Analysis of Scheduling (*Critical Path Method*)

Critical path method is one of the scheduling methods used to find the fastest critical path of every work or project activity [1]

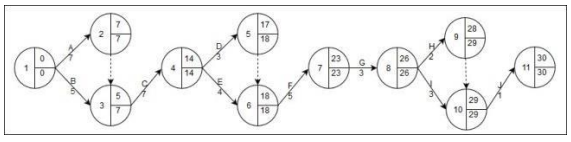
No	Uraian Pekerjaan	Durasi (Hari)	Kode Pengerjaan	Kode Pendahuluan
1	Pekerjaan Pendahuluan	7 Hari	A	-
2	Pekerjaan Bongkaran	5 Hari	B	-
3	Pekerjaan Pasang lantai, keramik dan dinding	7 Hari	C	A,B
4	Pekerjaan Pasang Pintu Kusen	3 Hari	D	C
5	Pekerjaan Pasang Jendela Kusen	4 Hari	E	C
6	Pekerjaan Atap	5 Hari	F	D,E
7	Pekerjaan Platfond	3 Hari	G	F
8	Pengecetan	2 Hari	H	G
9	Instalasi Listrik	3 Hari	I	G
10	Pekerjaan Pembersihan	1 Hari	J	H,I

Based on the table of activities of the Ex Toilet and Mushroom Room Improvement Project for Dahlan II Building Snack Room, it can be illustrated in the network diagram.

No	Uraian Pekerjaan	Durasi (Hari)	Kode Pengerjaan	Kode Pendahuluan
1	Pekerjaan Pendahuluan	7 Hari	A	-
2	Pekerjaan Bongkaran	5 Hari	B	-
3	Pekerjaan Pasang lantai, keramik dan dinding	7 Hari	C	A,B
4	Pekerjaan Pasang Pintu Kusen	3 Hari	D	C
5	Pekerjaan Pasang Jendela Kusen	4 Hari	E	C
6	Pekerjaan Atap	5 Hari	F	D,E
7	Pekerjaan Platfond	3 Hari	G	F
8	Pengecetan	2 Hari	H	G
9	Instalasi Listrik	3 Hari	I	G
10	Pekerjaan Pembersihan	1 Hari	J	H,I

Using forward and backward calculations to determine the time to complete project work using the CPM method [5].

Here are the results of the analysis of the cpm calculation



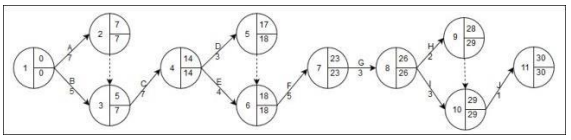
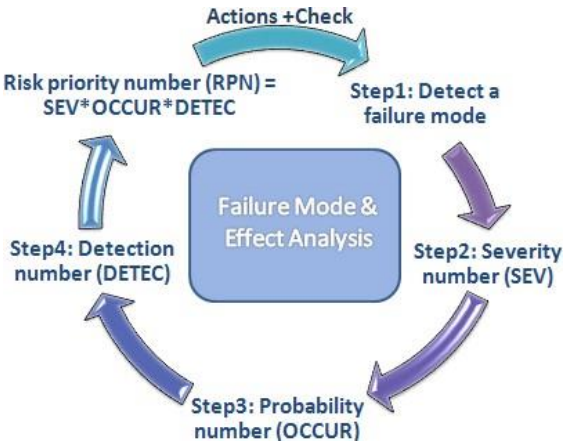


Figure 3 Diagram of CPM Networks with Critical Paths

2.2.2 Risk Management Analysis (*Failure Mode and Effet Analysis*)

FMEA was formalized in 1949 by the United States armed forces with the introduction of MIL-P 1629. Procedure for carrying out the mode of failure and criticality analysis. The aim is to classify failures "according to their impact on the mission of success and safety of personnel / equipment. Then adopted in the Apollo space program to reduce the risk due to the size of the sampe too small the use of FMEA gained momentum during the 1960s FMEA can identify and deal with security issues before there is potential for disaster [2].

FMEA is a method designed for:



1. Identify and fully understand the modes of potential failure and the causes and effects of failure. on the system or end users for certain products or processes .
2. Assess the risks associated with identified failures. modes , effects, and causes and prioritize problem corrective actions . [7]

Table 3 Severity Scale

Effect	Kriteria Kejadian	Skala
Sangat Tinggi	Efek kegagalan yang sangat parah	5
Tinggi	Efek kegagalan yang parah	4
Sedang	Efek kegagalan yang jarang parah	3
Kecil	Efek kegagalan yang sedikit parah	2
Sangat Kecil	Efek kegagalan yang tidak parah	1

Based on the FMEA analysis and the results of an interview with Mr. Edy Maruli Jaya explaining the level of events for the risks that occur as follows:

Table 4 Occurrence scale

Effect	Kriteria Kejadian	Skala
Sangat sering terjadi	Kegagalan yang tidak dapat dihindarkan	5
Sering terjadi	Kegagalan yang sering terjadi berulang-ulang	4
Biasa terjadi	Kegagalan yang biasa terjadi	3
Jarang terjadi	Kegagalan yang terjadi beberapa kali saja	2
Sangat jarang terjadi	Kegagalan yang sangat jarang terjadi	1

Table 5 Detection Scale

Effect	Kriteria Kejadian	Skala
Tidak terdeteksi	Kemungkinan kegagalan terdeteksi lebih awal : tidak terdeteksi	5
Jarang terdeteksi	Kemungkinan kegagalan terdeteksi lebih awal : sangat rendah	4
Biasa terdeteksi	Kemungkinan kegagalan terdeteksi lebih awal : rendah	3
Terdeteksi	Kemungkinan kegagalan terdeteksi lebih awal : tinggi	2
Sangat terdeteksi	Kemungkinan kegagalan terdeteksi lebih awal : sangat tinggi	1

No	Risiko	Kode Risiko	*Severity*	*Occurance*	*Detection*	RPN
1	Kehilangan alat dan bahan	R1	3	2	4	24
2	Kerusakan Alat	R2	3	3	3	27
3	Keterlambatan bahan material	R3	4	4	4	**64**
4	Cuaca yang tidak dapat diprediksi	R4	4	4	4	**64**
5	Terjadi bencana alam	R5	5	5	2	**50**
6	Gangguan Keamanan di lokasi proyek	R6	4	3	4	48
7	Kenaikan harga material	R7	3	3	4	36
8	Pekerja Sakit	R8	4	4	4	64
9	Penanggung jawab berhalangan hadir	R9	3	3	4	48
10	Kecelakaan tenaga kerja	R10	4	5	4	**60**
11	Pengulangan pekerjaan	R11	5	5	2	**50**

Based on the FMEA analysis and the results of an interview with Mr. Edy Maruli Jaya explained the level of detection for risks that occur as follows:

RPN calculation :

RPN = *Severity x Occurance x Detection*

= 48.72

After getting the total RPN value, then the average RPN is obtained as the calculation above. The average RPN value is 48.72. Then the information obtained is the risks that produce values above the average value of 48.72 is a list of risks that have a high priority level is kois who has a risk code **R4, R5, R10, R11** so that appropriate mitigation or treatment is needed to reduce the level riisko's high priority. The following are mitigations that can reduce high levels of risk.

Table 6 Classification of Risk Rates

No	Risiko	Kode Risiko	Level Risiko	Penanganan Risiko
1	Kehilangan alat dan bahans	R1	Rendah	Mencari tempat penyewaan alat lain, dengan perbandingan harga yang tidak boleh lebih dari anggaran.
2	Kerusakan Alat	R2	Rendah	Retur segera barang yang disewa agar digantihkan dengan barang yang berfungsi.
3	Keterlambatan bahan material	R3	Tinggi	Melakukan komunikasi yang baik degan supplier
4	Cuaca yang tidak dapat diprediksi	R4	Tinggi	Mengikuti laporan cuaca yang akurat, termasuk cuaca pada pelaksanaan proyek.
5	Terjadi bencana alam	R5	Sedang	Melakukan perlindungan keamanan saat proyek
6	Gangguan Keamanan di lokasi proyek	R6	Rendah	Melakukan perlindungan keamanan
7	Kenaikan harga material	R7	Rendah	Melakukan kesepakatan harga kepada supplier
8	Pekerja Sakit	R8	Tinggi	Meminta pekerja untuk menjaga kesehatan
9	Penanggung jawab berhalangan hadir	R9	Rendah	Team Leader akan memperingatkan Tenaga Ahli untuk datang selama jadwal yang sudah ditentukan
10	Kecelakaan tenaga kerja	R10	Sedang	Memberikan arahan kepada pekerja agar mengutamakan

2.3 Analysis of Project Cost Control (*Earned Value Management*)

The project control analysis contains steps to assist in evaluating the project by controlling project costs and time. Project control uses the *Earned Value Management* method [3]

2.3.1Calculation of Job Weight

To be able to do a project evaluation, the first thing to do is to calculate the weight of the work.

.

Table 7 Calculation of Job Weight

No	Kegiatan	Harga Pekerjaan	Bobot (%)
1	Pekerjaan Pendahuluan	Rp. 14.416.380	7,53%
2	Pekerjaan Bongkaran	Rp. 11.134.816	5,82%
3	Pekerjaan Pasang lantai, keramik dan dinding	Rp. 63.380.020	33,1 %
4	Pekerjaan Pasang Pintu Kusen	Rp. 11.550.000	6,03%
5	Pekerjaan Pasang Jendela Kusen	Rp. 10.890.550	5,69 %
6	Pekerjaan Atap	Rp. 45.999.030	24,02 %
7	Pekerjaan Platfond	Rp. 15.939.000	8,32 %
8	Pengecetan	Rp. 13.167.000	6,88%
9	Instalasi Listrik	Rp. 4.620.000	2,41%
10	Pekerjaan Pembersihan	Rp. 384.604	0,20 %
	Total	Rp. 191.481.400	100 %

2.3.2 Project Evaluation Analysis

Table 8 Work Weight Plans

Periode	Uraian Pekerjaan	Bobot	
		Rencana	Total
Minggu 1	Pekerjaan Pendahuluan	7,53%	13,35 %
	Pekerjaan Bongkaran	5,82%	
Minggu II	Pekerjaan Pasang Lantai, Keramik dan Dinding	33,1%	33,1%
Minggu III	Pekerjaan Pasang Pintu Kusen	6,03%	23,73 %
	Pekerjaan Pasang Jendela Kusen	5,69 %	
	Pekerjaan Atap	12,01 %	
Minggu IV	Pekerjaan Atap	12,01%	28,415 %
	Pekerjaan Platfond	8,32%	
	Pekerjaan Pengecetan	6,88 %	
	Instalasi Listrik	1,205 %	
Minggu V	Instalasi Listrik	1,205%	1,405 %
	Pekerjaan Pembersihan	0,20 %	

Table 9 Weight of Project Implementation Progress

Periode	Uraian Pekerjaan	Bobot	Bobot Rencana	Bobot Pelaksanaan
Minggu 1	Pekerjaan Pendahuluan	7,53%	13,35 %	100%
	Pekerjaan Bongkaran	5,82%		
Minggu II	Pekerjaan Pasang Lantai, Keramik dan Dinding	33,1%	33,1%	100%
Minggu III	Pekerjaan Pasang Pintu Kusen	6,03%	23,73 %	100%
	Pekerjaan Pasang Jendela Kusen	5,69 %		
	Pekerjaan Atap	12,01 %		
Minggu	Pekerjaan Atap	12,01%	28,415 %	100%

Table 10 Recapitulation of *Earned Value Management* Calculations

Minggu	Analisis Varian		Analisis Kinerja		Analisis Estimasi	
	Waktu SV	Biaya CV	Waktu SPI	Biaya CPI	Waktu ETC	Biaya EAC
Minggu ke 1	RP.0	Rp. 11.146.386	1,00	1,77	30 Hari	Rp. 108.181.581
Minggu Ke 2	RP.0	Rp. - 11.694.493	1,00	0,84	30 Hari	Rp. 226.812.194
Minggu ke 3	RP.0	Rp. -464	1,00	0,99	30 Hari	Rp. 191.483.355
Minggu ke 4	RP.0	Rp. 1.439	1,00	1,00	30 Hari	Rp. 191.476.335
Minggu ke 5	RP.0	Rp. 1.316	1,00	1,00	30 Hari	Rp. 191.387.734

2.5 Analysis Basis Data

Database analysis is a stage of analysis to describe the desired system in the form of relations between entities involved in the

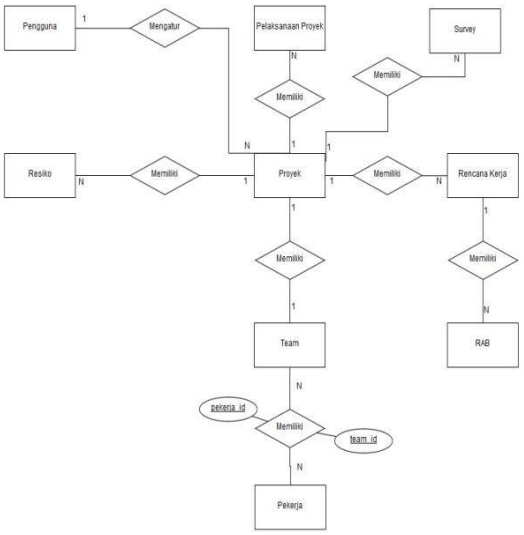


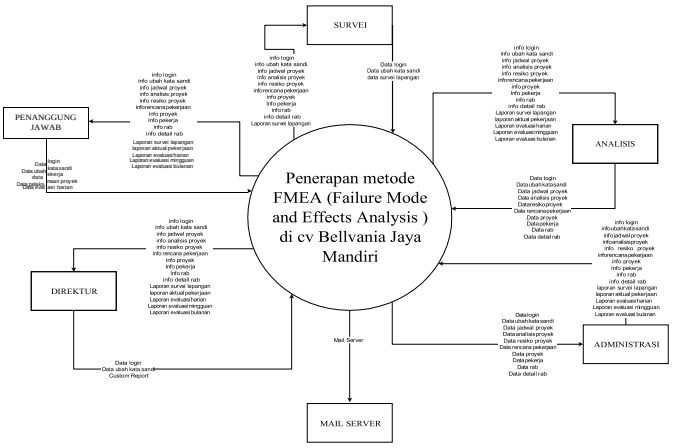
Figure 4 *Entity Relational Diagram*

Table 11 Description of Entity Attributes On ERD

No	Nama Entitas	Nama Atribut
1	Pengguna	id, nama, username, email, no_telp, password, jabatan
2	Resiko	id, risiko, proyek_id, skala_kejadian, skala_deteksi, skala_keparahan, rpn, solusi.
3	Pelaksanaan Proyek	id, proyek_id, minggu_ke, bobot, actual, biaya, catatan
4	Proyek	id, nama, alamat, tgl_mulai, tgl_selesai, team_id
5	Team	id, nama, manor_id
6	Pekerja	id, nama, no_telp, alamat, jabatan
7	Rencana Kerja	id, proyek_id, nama, durasi_hari, tgl_mulai,tgl_selesai, urutan, pendahulu_id, es,ef,sf,sl,ls,lf
8	Rab	id, renja_id, kuantitas, satuan, harga, total, deskripsi

2.6 Functional Requirements Analysis

Functional requirements analysis describes the process of activities that will be applied in the system and explains the needs needed for the system to run well and in accordance with needs



Gambar 5 Diagram Konteks

2.7 Sistem Design

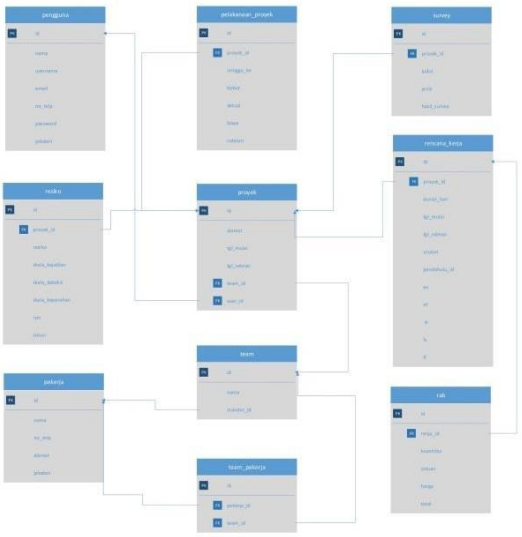
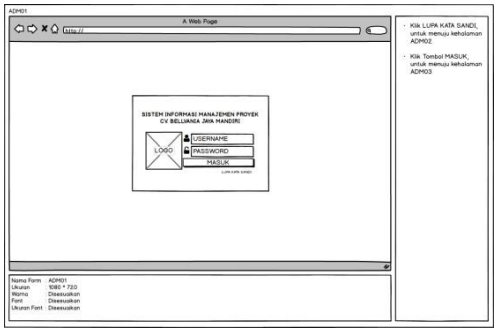


Figure 6 Skema Relasi.

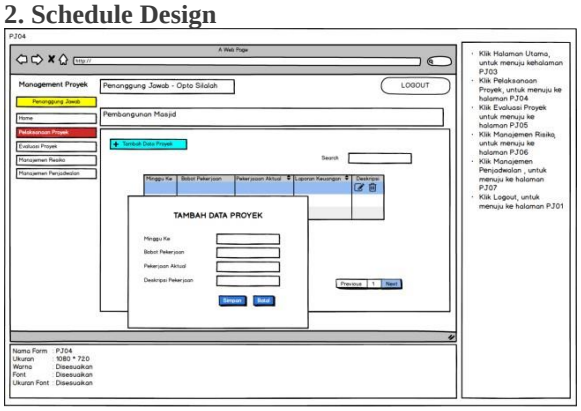
2.8 Interface Design

1. Login Menu

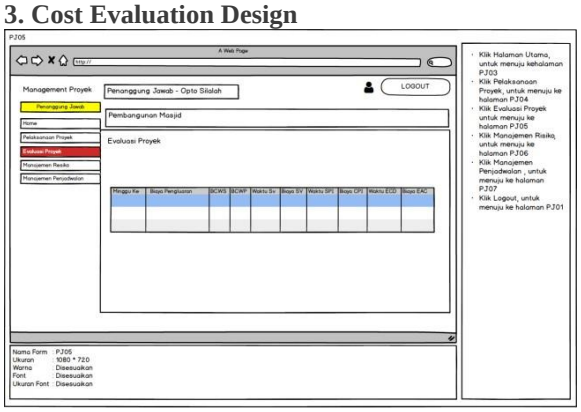
Interface



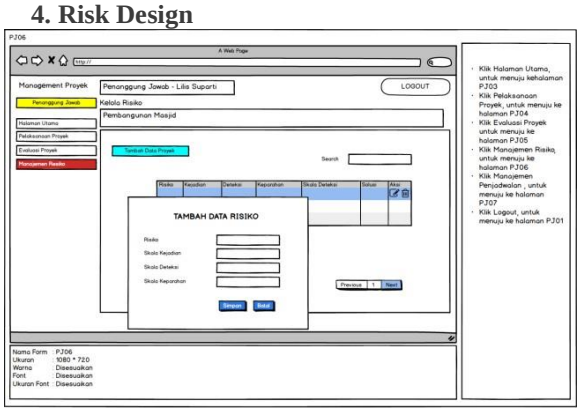
2. Schedule Design



3. Cost Evaluation Design



4. Risk Design



2.9 Testing

System testing is the most important thing that aims to find errors and deficiencies in the software being tested. Tests on software to know the software that created sudan meet the criteria or not

\

2.9.1 *Blackbox* Testing

Blackbox testing is performed on system functions to determine whether the function has run as expected or not.

3. CLOSING

The results of research and testing that have been done can be concluded that the system can help the person in charge in arranging schedules, rab and risk identification. Afa some suggestions that can be done for the development of this system, among others:

1. Repairing the interface for the mobile version of the web

DAFTAR PUSTAKA

[1] D.S.Sihabudin S, "Implementasi Critical Path Method dan Pert Analysiis pada Proyek Global Technology for Local Community, "*Teknologi Informasi dan Telematika, vol.5* pp 14-22 2012

[2] Carl S. Carlson, Understanding and Applying the Fundamentals of FMEAs, Tucson, Arizona 85710 USA:AR&MS Tutorial Notes, 2014.

[3] M. W. Laura B.R Balaka and R.Sriyani, "PENGAPLIKASIAN METODE EARNED VALUE PADA PENGENDALIAN WAKTU TERHADAP BIAYA (Studi Kasus : Proyek Penggantian Jembatan Sungai Langkolome Cs Kabupaten Muna),' *Stabilita*, vol 1, no.3, pp 359-372, 2013

[4] Labombang, Bastura, "Manajemen Resiko dalam Proyek Konstruksi," *Smartek 2011,* pp. 39-46,2017

[5] D.S.S.Sahid, "Implementasi Critical Path Method dan PERT Analysis pada Proyek Global Technology for Local Community," *Jurnal Teknologi Informasi dan Telematika*, vol 5, pp.14-22, 2012.

[6] Project Management Institute, A Guide To The Project Management Body of Knowledge (PMBOK Guide) – Fifth Edition, 2013.

[7] E. Sari, "ANALISIS RESIKO PROYEK PADA PEKERJAAN JEMBATAN SIDAMUKTI-KADU DI MAJALENGKA DENGAN METODE FMEA DAN DECISION TREE," Jurnal J-Ensitec, vol. 03, 2016.

[8] M.W. L. Bulo, R. Balaka dan R. Sriyani, "Pengaplikasian Metode Earned Value pada Pengendalian Waktu Terhadap Biaya," Stabilita, vol.1, p. 363, 2013

[9] T. Sutarbi, Analisi Sistem Informasi, Yogyakarta : Andi, 2012.

[10] A. Solichin, Pemrograman Web dengan PHP dan MySQL, Jakarta: Universitas Budi Luhur, 2016.

[11]