

PROJECT RISK MANAGEMENT INFORMATION SYSTEM USING HOUSE OF RISK METHOD IN PT. HANA HUBERTA

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ABSTRACT

PT. Hana Huberta is a company engaged in construction services. In the implementation of the project the company experienced obstacles where the project carried out was not in accordance with the time or schedule that had been planned due to experiencing risks such as damaged heavy equipment and errors in material calculations. When the risk occurs, the company overcomes the risks that occur first and not the priority because the company does not know the severity of the risk, the result is that the company does not know which risks must be addressed first because it does not know which risks are the priority. Based on the problems that have been described, it takes a system that can control project risk, which means a system that can analyze the risks that may occur during project implementation and know the magnitude of the impact caused by risk, so that possible risks that can hamper the course of the project can be minimized. The method used to deal with the occurrence of risk is the House Of Risk (HOR) method in order to be able to determine the assessment of the existing risks and determine the priority of the risk to be mitigated. Based on the test results it can be concluded that this project management information system is sufficient to help determine which risks are the top priority and mitigate what is done for the priority risks.

Keywords : Project Risk Management, Information Systems, House Of Risk

1. INTRODUCTION

PT. Hana Huberta is a company engaged in the field of construction services located at Ruko Graha Mas Pemuda kec. Pulo Gadung East Jakarta. Founded in 1996 and founded by Drs. Sabar Maringan Tambunan. Every year, the company completes 1-2 projects, the project requested is building construction.

The results of an interview with Mr. Widiyanto Hendro Cahyono as Project Manager, in the implementation of the construction project for the Pasar Rebo Regional Hospital parking building, which is located on Tb. Simatupang No. 30 Pasar Rebo, East Jakarta. In the construction of the parking

building construction project at Pasar Rebo Regional Hospital, there are obstacles where the project is not in accordance with the time or schedule that was previously planned due to experiencing risk, one of which is the existence of damaged heavy equipment, where the company must replace the heavy equipment and so experience delays in progress projects, and companies must prepare equipment and manpower to cover delays.

In controlling risk, the company has planned risks in the form of K3 plans to be able to anticipate that risks do not occur accidents, when the risks occur, the company takes action to cope with the risks that occur in accordance with the K3 plan. However, the company overcomes the risk that first happened and not the priority because the company does not know the severity of the risk, the result is the company does not know which risks must be addressed first because it does not know which risks have a high severity, and the risks that occur not recorded in the weekly report.

Based on the problems that have been described previously, to overcome this we need a system that can control project risks, which means a system that can analyze the risks that may occur during project implementation and know the magnitude of the impact caused by risk, so that the possible risks that can occur hampering the course of the project can be minimized. The method used to handle the risk is the House of Risk (HOR) method. HOR is a method used to proactively analyze risks, whereby the risk agents identified as the cause of a risk event can be managed by giving a sequence based on the magnitude of the impact that might be caused [1]. In previous studies, researchers used the HOR method by dividing it into 2 stages, namely the first stage to determine risk, risk agent, severity, occurrence and correlation then look for the importance level and stage 2 looks for the degree of difficulty of mitigation from selected risk agents (Nurlela and Suprpto, 2014) [2].

The purpose of this research is to determine the severity of the risk agents found, and then to search for the difficulty level of the selected risk agent mitigation.

1.1. Research Methodology

The research method used in this research is descriptive analysis that is by collecting data, analyzing data, making a problem solving and

compiled to be able to draw conclusions from the problem to be solved. The research methodology in this study can be seen in Figure 1.

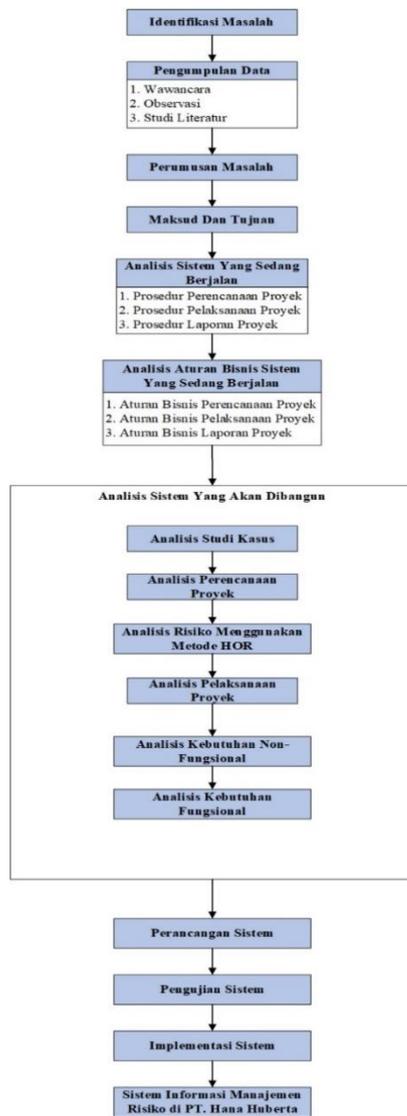


Figure 1 Research Methodology

2. RESEARCH CONTENTS

2.1 Project Management

Project management is the application of knowledge, expertise and skills to achieve the goals set with limited resources in order to obtain optimal results in cost performance, quality and time, and work safety [3].

2.2 Risk Management

Risk management is an approach to risk by understanding, identifying, and evaluating project risks that occur, then considering what will be done to the impact caused and the likelihood of risks or reduce the risks that occur. Risk management is all series of planning activities, assessments, handling or risk responses, and risk monitoring (Widianti et al., 2018) [4].

2.2.1 Risk Management With HOR

The House of Risk (HOR) method is a method for proactively managing risk, whereby the risk agent identified as the cause of a risk event can be managed by giving a sequence based on the magnitude of the impact that may occur [5].

At the stage of risk management using the House of Risk (HOR) method, including identifying risks and risk agents, determining occurrence, severity and correlation, and mitigating risk agents by interviewing the project manager of PT. Hana Huberta. HOR here is divided into two stages.

1. Risk Identification and Risk Agent (HOR 1)

Risk identification is the initial stage in the House of Risk method, where risk identification aims to find out what risks occur during project work, and next is to identify the agent / cause of risk and assess how often it is likely to happen to the agent / cause of risk [6]. In this case, the project which is a case study is the construction of the Pasar Rebo Regional Public Hospital parking building which can be seen in table 2 and the risk agent in table 3.

Table 2 Risk Identification

Kode Risiko	Kategori Risiko	Kejadian Risiko (<i>risk event</i>)
E1	Estimasi	Perubahan Lingkup Pekerjaan
E2		Keterlambatan Jadwal
E3		Kesalahan Dalam Perhitungan Material
E4	Personil	Pemogokan Tenaga Kerja
E5		Pekerja Tidak Dibayar

Table 3 Risk Agents Identification

Kode Agen Risiko	Agen/Penyebab Risiko (<i>Risk Agent</i>)
A1	Proses perencanaan proyek tidak matang
A2	Penundaan Jadwal Pekerjaan
A3	Adanya lingkup pekerjaan tambahan
A4	Permintaan <i>spek</i> yang ambigu
A5	Bangunan <i>existing</i> masih ada
A6	Kesalahan dalam melakukan perhitungan kebutuhan material

2. Determine Severity, Occurance and Correlation (HOR 1)

Determine Severity and Occurance used on a scale of 1-10. Determination was obtained from the results of interviews with the project manager of PT. Hana Huberta. In table 4 [7] explains the reference severity assessment.

Table 4 Severity Score

Bobot	Severity	Keterangan
1	Low	Risiko yang tidak berbahaya
2	Very Low	Risiko yang tingkatan bahayanya sangat sedikit

3	<i>Minor</i>	Risiko yang sedikit berbahaya tapi tidak berpengaruh besar
4	<i>Very Minor</i>	Risiko yang sedikit berbahaya dan memiliki sedikit pengaruh
5	<i>Moderate</i>	Risiko yang berbahaya dan agak berpengaruh
6	<i>Very Moderate</i>	Risiko yang berbaya dan berpengaruh
7	<i>High</i>	Risiko yang tingkat bahayanya tinggi dan berpengaruh
8	<i>Very High</i>	Risiko yang sangat berbahaya dan sangat berpengaruh
9	<i>Hazardous With Warning</i>	Risiko yang sangat berbahaya dan sangat serius
10	<i>Hazardous Without Warning</i>	Risiko yang sangat berbahaya dan dapat mengancam keselamatan perusahaan

In table 5 explains the reference assessment for occurrence [7].

Table 5 Occurance Score

Bobot	Occurance	Keterangan
1	<i>Remote</i>	Penyebab risiko hampir tidak pernah terjadi
2	<i>Very Low</i>	Penyebab risiko masih dapat dikontrol
3	<i>Low</i>	Penyebab risiko masih amat sangat jarang terjadi
4	<i>Moderate</i>	Penyebab risiko jarang terjadi
5		
6		
7	<i>High</i>	Penyebab risiko sering terjadi
8		
9	<i>Very High</i>	Penyebab risiko sangat sering terjadi
10		

The severity assessment can be seen in table 6.

Table 6 Severity

E _i	Kejadian Risiko (<i>risk event</i>)	Severity
E1	Perubahan Lingkup Pekerjaan	8
E2	Keterlambatan Jadwal	9
E3	Kesalahan Dalam Perhitungan Material	6
E4	Pemogokan Tenaga Kerja	5
E5	Pekerja Tidak Dibayar	3
E6	Alat Kerja Rusak	6
E7	Keterlambatan Pengiriman Material	8
E8	Material Yang Hilang	7

The assessment for occurrence can be seen in table 7.

Table 7 Occurance

A _j	Agen/Penyebab Risiko (<i>Risk Agent</i>)	Occurance
A1	Proses perencanaan proyek tidak matang	9
A2	Penundaan Jadwal Pekerjaan	8
A3	Adanya lingkup pekerjaan tambahan	8
A4	Permintaan <i>spek</i> yang ambigu	3
A5	Bangunan <i>existing</i> masih ada	5
A6	Kesalahan dalam melakukan perhitungan kebutuhan material	6

To determine the correlation, a scale of 0, 1, 3, 9. The correlation assessment can be used in table 8 [7].

Table 8 Correlation Scale

Bobot	Keterangan
0	Tidak ada korelasi
1	Tingkat Korelasi Rendah
3	Tingkat Korelasi Sedang
9	Tingkat Korelasi Tinggi

The correlation assessment can be seen in table 9 [8].

Table 9 Correlation

Proses	(E _i)	A1	A2	A3	A4	A5
Estimasi	E1	3	9	3	3	3
	E2	9	9	9	3	3
	E3	1	1	3	0	0
Personil	E4	0	0	0	0	0
	E5	0	1	0	0	0

After determining the Severity, Occurance and correlation, the next process is to calculate the ARP value, weight and cumulative.

3. Determine ARP, Weight and Cumulative (HOR 1)

determine the priority of the risk agent handled in advance to be given precautionary measures against the risk agent. ARP has a formula

$$ARP_j = O_j \sum S_j R_{ij} \quad [7]$$

ARP value is obtained from the multiplication between Severity value, Occurance value and correlation value from risk events and risk agents.

$$\begin{aligned}
 ARP_1 &= O_1 \sum [(S_1.R_{1X1}) + (S_2.R_{2X1}) + (S_3.R_{3X1}) + \\
 &\quad (S_8.R_{8X1}) + (S_9.R_{9X1}) + (S_{14}.R_{14X1}) + \\
 &\quad (S_{15}.R_{15X1}) + (S_{16}.R_{16X1}) + (S_{19}.R_{19X1}) + \\
 &\quad (S_{20}.R_{20X1})] \\
 &= 9 \times \sum [(8.3) + (9.9) + (6.1) + (7.3) + (8.1) + \\
 &\quad (4.1) + (5.1) + (6.1) + (9.3) + (7.3)] \\
 &= 1827
 \end{aligned}$$

After calculating the ARP value, the next step is to calculate the weight value of the ARP that has been calculated using the formula:

$$B_i = (ARP_j / N * 100) \quad [7]$$

$$\begin{aligned} B_1 &= (ARP_1 / N * 100) \\ &= (2565 / 16870 * 100) \\ &= 15,20 \end{aligned}$$

After calculating the weight value, the next is to calculate the cumulative value of the weight that has been calculated using the formula:

$$K_i = \sum_{i=1}^n B_i \quad [7]$$

$$\begin{aligned} K_1 &= \sum_{i=1}^n B_i \\ &= 15,20 \end{aligned}$$

After calculating the ARP, weighting and cumulative risk agents, the next is to make a cumulative table% of ARP values that can be seen in table 10.

Table 10 Cumulative Calculation of ARP Percentage

Rank	Agen Risiko	ARP	Bobot (%)	Kumulatif (%)
1	A20	2565	15,71	15,20
2	A2	1560	9,55	26,03
3	A1	1287	7,88	35,28
4	A3	1224	7,50	42,54
5	A21	1152	7,05	49,36
6	A8	1134	6,94	56,09
7	A6	1038	6,36	62,24
8	A10	1032	6,32	68,36

Risks taken to be a priority are risks that have a cumulative percentage below 80% while those having a percentage above 80% will be ignored which can be seen in table 11.

Table 11 Selected Risk Agents

Rank	A _i	Agen/Penyebab Risiko (Risk Agent)	ARP	Kumulatif %
1	A20	Keterlambatan Penyelesaian Proyek	2565	15,20
2	A1	Proses Perencanaan Proyek Tidak Matang	1827	26,03
3	A2	Penundaan Jadwal Pekerjaan	1560	35,28

4. Determine Mitigation Actions (HOR 2)

After determining which risk agents are the priorities, the next step is to determine the mitigation actions of the selected risk agents that can be seen in table 12 [7].

Table 12 Risk Agent Mitigation

Strategi Penanganan	Kode Mitigasi
Mempercepat pekerjaan	PA1
Penggunaan tenaga kerja yang kompeten	PA2
Memantau perubahan jadwal dilapangan dan jenis pekerjaan yang mengalami perubahan jadwal	PA3

5. Determine Correlation, Total Effectiveness, Degree of Difficulty and Degree of Difficulty (HOR 2)

After determining the mitigation of the selected risk agent, the next step is to determine the correlation of the mitigation and the selected risk agent which can be seen in table 13.

Table 13 Correlation

Risk Agent (A _j)	PA1	PA2	PA3	PA4	PA5
A20	9	9	9	3	3
A1	3	1	9	9	3
A2	3	9	3	1	9

After determining the correlation, the next step is to determine the total effectiveness of each mitigation action. The total effectiveness of a mitigation action is calculated from the sum of the multiplication results of the correlation values between each risk agent and each handling strategy with the ARP value obtained from HOR Phase 1 using Formula :

$$TE_k = \sum ARP_j \cdot E_{jk} \quad [7]$$

$$\begin{aligned} TE_1 &= \sum [(ARP_1 \cdot E_{1x1}) + (ARP_2 \cdot E_{2x1}) + (ARP_3 \cdot E_{3x1}) \\ &\quad + (ARP_4 \cdot E_{4x1})] \\ &= \sum [(2565 \cdot 9) + (1827 \cdot 3) + (1560 \cdot 3) + (1224 \cdot 3)] \\ &= 23805 + 5481 + 4680 + 3672 \\ &= 37638 \end{aligned}$$

The results of total effectiveness can be seen in table 14.

Table 14 Hasil Perhitungan Total Efektifitas

No	Proactive Action (PA _k)	TE _k	Nilai TE _k
1	PA1	TE ₁	37638
2	PA2	TE ₂	47898
3	PA3	TE ₃	57546
4	PA4	TE ₄	29370
5	PA5	TE ₅	32491
6	PA6	TE ₆	48384

After calculating the total effectiveness the next step is to calculate the difficulty level of mitigation. The reference to assess the level of difficulty can be seen in table 15 [7].

Table 15 Assess Mitigation Difficulty Level

Bobot	Keterangan
3	Aksi Mitigasi Mudah Untuk Diterapkan
4	Aksi Mitigasi Sedikit Sulit Untuk Diterapkan
5	Aksi Mitigasi Sulit Untuk Diterapkan

The next step is to calculate the value of the degree of difficulty. The calculation of the effectiveness of the degree of difficulty aims to determine the priority ranking of all mitigation actions using the formula:

$$ETD_k = TE_k / D_k [7]$$

$$\begin{aligned} ETD_1 &= TE_1 / D_1 \\ &= 37638 / 3 \\ &= 12546 \end{aligned}$$

The results of the total degree of difficulty can be seen in table 16.

Table 16 Results of Calculation of Degree of Difficulty

No	Preventive Action (PA _k)	ETD _k	Nilai ETD _k
1	PA1	ETD ₁	12546
2	PA2	ETD ₂	11974
3	PA3	ETD ₃	14386
4	PA4	ETD ₄	7342
5	PA5	ETD ₅	10830
6	PA6	ETD ₆	16128

After calculating the degree of difficulty, a priority ranking of risk mitigation can be made which can be seen in table 17.

Table 17 Risk Mitigation Rating

Rank	Kode	ETD _k
1	PA6	16128
2	PA3	14386
3	PA1	12546
4	PA2	11974
5	PA4	10830
6	PA7	9223

2.3 Analysis of Non-Functional Needs

Non-functional requirements analysis is a description of the system requirements needed to run the application being built. The non-functional requirements for running a risk management information system include hardware requirements, software requirements, and the needs of users who will use the application.

2.3.1 Analysis of Hardware Requirements

The minimum hardware specifications required by the user to be able to run the project management system optimally can be seen in table 18.

Table 18 Analysis of Hardware Requirements

Perangkat Keras	Spesifikasi yang ada	Spesifikasi Minimum
Processor	Dual Core 2.3 Ghz	Dual Core 1.8 Ghz
Memori	RAM 4 GB	RAM 2 GB
Harddisk	500 GB	250 GB
Monitor	LCD VGA 14"	LCD VGA 14"
Perangkat Pendukung	Keyboard, mouse, dan modem	Keyboard, mouse, dan modem

2.3.2 Analysis of Software Requirements

The specifications of software requirements can be seen in table 19.

Table 19 Analysis of Software Requirements

Perangkat Lunak	Spesifikasi Saat Ini	Spesifikasi Minimum
Sistem Operasi	Windows 10	Windows XP
Web Browser	Mozilla Firefox, Google Chrome	Mozilla Firefox, Google Chrome
PDF	Adobe Reader 9	Adobe Reader 9
DBMS	Tidak Tersedia	Maria DB Versi 5.6.31
Web Server	Tidak Tersedia	Xampp Versi 7.2.7

2.3.3 Analysis of User Needs

User analysis is intended to find out the various users who will be involved in the use of software that will be built, so it is expected that users who use the software can understand or meet several criteria in using the software. The users who will be involved in using this software can be seen in table 20.

Table 20 Analysis of User Needs

Pengguna	Hak Akses	Tingkat Keterampilan
Administrasi & Financex	<ol style="list-style-type: none"> Mengelola data User Melihat data proyek Melihat jadwal proyek Melihat data rab Melihat laporan mingguan 	<p>Memahami pemakaian aplikasi berbasis web dan</p> <p>Memahami Data Proyek</p>
Direktur	<ol style="list-style-type: none"> Melihat laporan proyek Melihat jadwal proyek Melihat data rab Melihat laporan mingguan 	<p>Memahami pemakaian aplikasi berbasis web dan</p> <p>memahami input laporan proyek.</p>
Project Manager	<ol style="list-style-type: none"> Mengelola jadwal proyek Mengelola data RAB Memanajemen Risiko Mengelola data proyek Melihat laporan proyek Mengelola Master Data 	<p>Memahami pemakaian aplikasi berbasis web dan</p> <p>memahami input laporan proyek.</p>
Site Manager	<ol style="list-style-type: none"> Mengelola laporan proyek Melihat data rab Melihat Jadwal Proyek 	<p>Memahami pemakaian aplikasi berbasis web dan</p> <p>memahami input laporan proyek.</p>

2.4 Analysis of Non-Functional Needs

Functional requirements analysis is a description of the process of activities that will be applied to the system to be built and explains the

needs needed so that the system can run well and in accordance with needs.

2.4.1 Use Case Diagram

Use case diagrams illustrate the expected functionality of a system. The Use Case Diagram can be seen in Figure 2 [9].

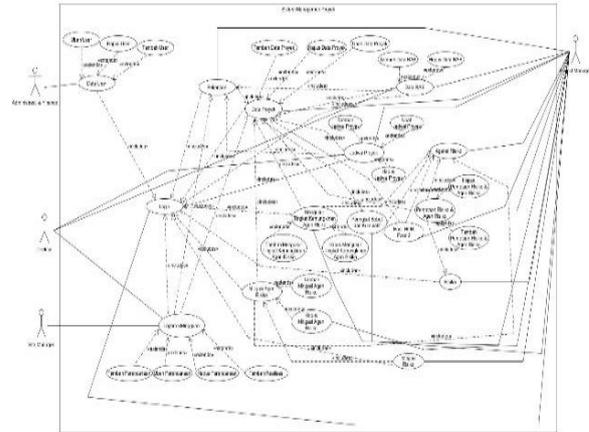


Figure 2 Use Case Diagram

2.4.2 Activity Diagram

Activity diagrams illustrate the various activity paths in the system that is being designed, how each flow starts, the decisions that might occur, and how they end. The Activity Diagram can be seen in Figure 3 [9].

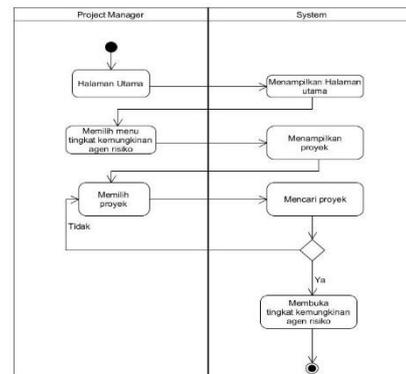


Figure 3 Activity Diagram

2.4.3 Sequence Diagram

Sequence diagrams depict interactions between objects in and around the system (including users, views, etc.) in the form of messages that are represented against time. The Sequence Diagram can be seen in Figure 4 [9].

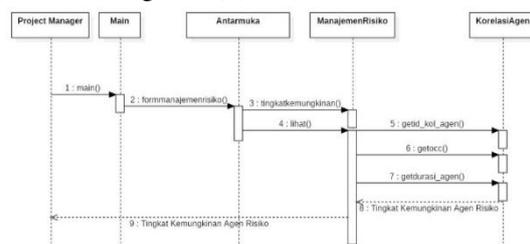


Figure 4 Sequence Diagram

2.4.4 Class Diagram

Class Diagram is a specification that if instantiated will produce an object and is the core of object-oriented development and design. The Class Diagram can be seen in Figure 5 [9].

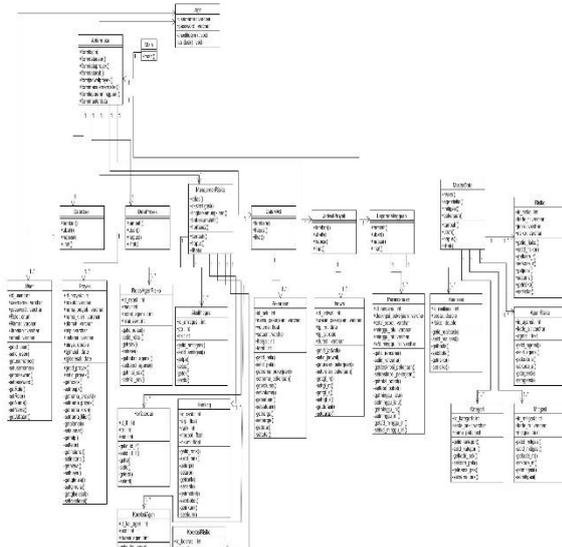


Figure 5 Class Diagram

2.5 Database Design

Database analysis is a stage to describe the data flow that will be built in the project risk management information system at PT. Hana Huberta. The relation is described in the form of a relation scheme which can be seen in Figure 6 [10].

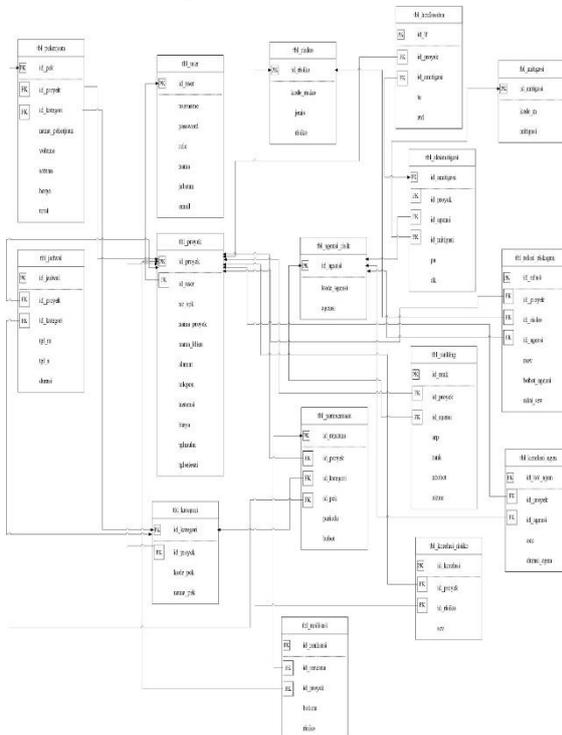


Figure 6 Relation Scheme

2.6 Interface Design

Interface design is a display that becomes a reference for the development of project risk management information systems at PT. Hana Huberta can be seen in Figures 7 and 8.

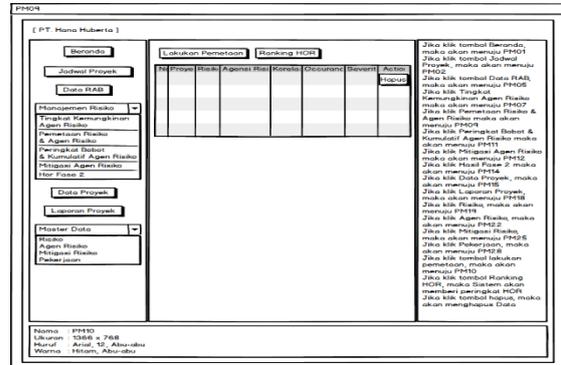


Figure 7 Designing the Risk Mapping Interface & Risk Agent

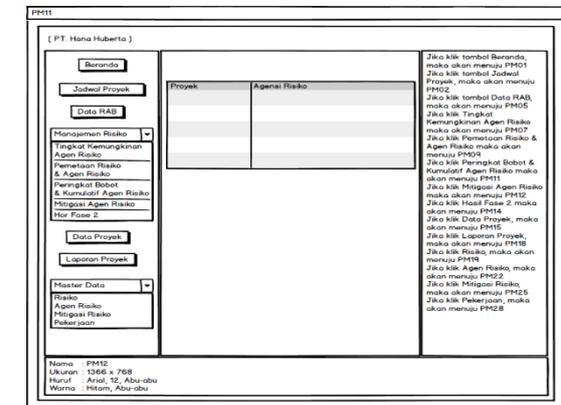


Figure 8 Ranking of Risk Agents

2.7 Testing

System testing is the most important thing that aims to find errors and deficiencies in a software that is being tested. Testing intends to find out software that has been made whether it meets the criteria that are in accordance with the design goals or not. Testing this software uses black box testing. Black box testing functions on the functional requirements of the software.

2.7.1 Black Box Testing

Black Box Testing to test software that has been built to find out whether the system is functioning properly or not.

2.7.2 Beta Testing

Beta testing is an objective test where the testing is done directly to the office of PT. Hana Huberta to ask system users about the satisfaction of the results of the development of this risk management information system.

3. CLOSING

Based on the research and results of tests conducted on the Project Risk Management Information System at PT. Hana Huberta can be concluded, namely the system can help to determine the severity of the risks faced.

Based on the results of the system test, obtained suggestions that can be used as a reference or consideration for further development, namely:

1. Future research is expected to improve the interface of this system and it will be better if the project schedule can display the s curve.
2. Future research is expected to improve the reporting interface of this system and even better if the project report has the option to print in the form of documents.
3. It is expected that in the future this system in terms of forms and processes are still not running as expected, hopefully in the future it can be further developed and refined.

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