I hope this article will be of use to you and save your data and your company from some of the anxiety that I experienced when the disaster occurred. This book aims to make decisions that can help make certain parties make the best decisions in choosing a backup recovery strategy for business continuity plans. Please leave a comment and let me know if you find this post useful. And let me know if there are other craft fields that you want to see here. Thank you and congratulations on the writing.

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THE BACKUP RECOVERY STRATEGY

Pilang

Faisal Pilang

The Backup Recovery Strategy

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THE BACKUP RECOVERY STRATEGY

THE BACKUP RECOVERY STRATEGY

FAISAL
2019

THE BACKUP RECOVERY STRATEGY

PREFACE

All praise and thank God the Almighty for giving Mercy, Taufik and Hidayat to the author to be able to complete the book with the title of:

THE BACKUP RECOVERY STRATEGY

The book aims to make decisions that can help make certain parties take the best decision in choosing the backup recovery strategy selection. We would like to thank those who helped us in making this book. This book is a study of the backup recovery strategy selection to maintain the business continuity plan that is expected to function as a medium of education and learning to maintain the company's business continuity plan.

THE BACKUP RECOVERY STRATEGY

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THE BACKUP RECOVERY STRATEGY

CHAPTER I
INTRODUCTION

1.1. BACKGROUND

Located in the pacific rings of the Pacific (a region with much tectonic activity), Indonesia must continue to face the risks of volcanic eruptions, earthquakes, floods as well as tsunamis, and destruction of its land areas (including many infrastructures resulting in economic losses). Here are some events that have occurred:

- A volcanic eruption in Central Java November 3rd, 2010;
- Earthquake in Sumatra December 26th, 2004 with casualties of 283,106; floods and landslides in many parts of Indonesia; and
- Earthquake in the Indian Ocean that was preceded by the tsunami, killing 167,000 people in Indonesia (mainly Aceh) in 2004.[1]

These disasters have enormous power and scale of damage resulting in unplanned power outages resulting in damage to client and server computer systems. Damage can also occur due to a virus attack on the information technology as the vital records because the data exchange through the internet that is connected with the worldwide database so that it also resulted in economic losses. Konsa, K and Kaie Jeeser, 2017, say although natural disasters and different types of emergencies are relatively uncommon, they can nevertheless cause extensive damage, the consequences of which are usually very expensive to recover from.[2] Otair, Mohammed and Aiman Al-Refaei, 2015, suggested that although cybercrimes are radically different from other kinds of crimes, the damage caused by cybercrimes cannot be separated from the damage that results from other kinds of crimes, and so it should not be underestimated.[3]

[1] Indonesia Investments, 2017.
[2] Konsa, K and Kaie Jeeser, 2017.
[3] Otair, Mohammed and Aiman Al-Refaei, 2015.

Given these conditions have alerted the information technology management in Trilogi University to immediately implement a disaster recovery strategy or known as the disaster recovery plan. A disaster recovery plan can be used as a guide if the company's business is paralyzed, unable to operate properly when a disaster occurs. Bryan C. Martin, 2002 suggests that this disaster recovery plan is designed to ensure the continuation of vital business processes in the event that a disaster occurs.[4] This disaster recovery plan will provide an effective solution that can be used to recover all vital business processes within the required timeframe (maximum acceptable outage time) using vital records that are stored off-site.

The System Information Academic Trilogi is one of the important application systems and the vital records in the Trilogi University, which includes:

- Student data;
- Lecturer data; and
- Academic data.

Besides, there are other data transactions that are very important, very critical and very complex such as:

- Financial data; and
- Human resource data.

The information technology used and the disaster recovery plan implementation at Trilogi University will be used as a reference in measuring the feasibility of applying disaster recovery plan on vital business supporting applications so that business operations can continue to run normally in the event of a disaster or system failure.

With the increasing complexity of academic processes that exist in the Trilogi University, the demand for the availability and performance of information technology becomes high. Information technology components that do not work will be able to cause huge economic losses because the components of the system have become an integral part of the company's operations. In addition, with the higher level of dependence on an information technology then to avoid the risk of disruption in operational performance needs a good and maximal disaster recovery plan implementation and supported by reliable technology so that business processes can continue to run because the necessary data can be saved.

[4] Bryan C. Martin, SANS Institute, 2002.

1.2. PROBLEM FORMULATION

1.2.1. PROBLEM

System Information Academic Trilogi is one of the important application systems and the vital records in the Trilogi University, which is a system that manages:

- Student data;
- Lecturer data; and
- Academic data;

Besides, there are other data transactions that are very important, very critical and very complex such as:

- Financial data, and
- Human resource data.

The backup recovery strategy will be conducted to measure the feasibility of the backup recovery strategy for applications that support this vital business so that business operations can continue to run normally, develop and improve the system.

With the increase of business and academic processes in the Trilogi University, the demand for the System Information Academic Trilogi performance in the Trilogi University is getting higher. These cause the system components that are not functioning properly will cause large losses because the system components have become an integral part of the company's operations. In addition, with a higher level of dependence on the System Information Academic Trilogi, to avoid the risk of disruption in operational performance there needs to be a good and maximum backup recovery strategy and supported by reliable technology so that business processes can continue because the required data has been stored.

1.2.2. FORMULATION

Based on problem identification, problem formulation is the best way to choose a backup recovery strategy in the Trilogi University based on the benefit ratio to the cost ratio so as to minimize business losses that will be caused by application system failures.

1.3. AIMS

The book aims to make decisions that can help make certain parties take the best decision in choosing the backup recovery strategy selection for business continuity plan in the Trilogi University, based on:

- The BENEFIT ratio and
- The COST ratio

so as to minimize business losses that will be caused by application system failures.

1.4. SITES

Analysis, retrieval, and management data were generated from experts using interviewing and discussion techniques, also using focus group discussion methods around the Trilogi University environment.

1.5. BOOK TYPES

This book uses descriptive analytical methods by presenting interview summaries and survey results in the form of questionnaires. The method used in this book is the multi-criteria decision making and analytical hierarchy process using expert choice software computer. With this method, we will explain the backup recovery strategy selection to maintain the business continuity plan.

THE BACKUP RECOVERY STRATEGY

CHAPTER II
MATERIAL

2.1. MATERIAL

The following are theories that will explain the backup recovery strategy selection to maintain the business continuity plan.

2.1.1. THE BACKUP RECOVERY

Backup is used to maintain the continuity of the operating system, applications, and other facilities when unexpected events occur. In Information Security Management BS 7799.2:2002 stated that:

- Whether the Information processing service is protected from natural and man-made disaster.
- Whether there is any potential threat from neighboring premises.
- Whether controls were adopted to minimize risk from potential threats such as theft, fire, explosives, smoke, water, dist, vibration, chemical effects, electrical supply interfaces, electromagnetic radiation, and flood.
- Whether back-up of essential business information such as production server, critical network components, configuration backup etc., were taken regularly. Example: Monday-Thursday: Incremental Backup and Friday: Full Backup.
- Whether an Incident Management procedure exist to handle security incidents.
- Whether the procedure addresses the incident management responsibilities, orderly and quick response to security incidents.

- Whether the procedure addresses different types of incidents ranging from denial of service to breach of confidentiality etc. and ways to handle them.

- Whether the backup media along with the procedure to restore the backup are stored securely and well away from the actual site.

- Whether the backup media are regularly tested to ensure that they could be restored within the time frame allotted in the operational procedure for recovery.[5]

The location of the transfer when the disaster occurs must also be considered based on the alternatives as follows:

- Hot Standby is a fully prepared environment, including hardware, software, data, communication, and other supporting facilities.

- Warm Standby is a ready-made environment. It has almost all recovery needs except for a number of needs that can be given in the maximum acceptable outage time span, such as hardware.

- Cold Standby is a location that is ready for use, which is only equipped with supporting infrastructures such as electricity, water, and air conditioning.[6]

2.1.2. THE BUSINESS CONTINUITY PLAN

Based on the International Organization for Standardization and the British Standards Institute, the business continuity plan is included in "ISO / IEC 17799: 2000 Code of Practice for Information Security Management" and "BS 7799 Information Security". The International Organization for Standardization is an international organization that produces industrial or commercial standards. ISO / IEC 17799: 2000 The Code of Practice for Information Security Management was issued by the International Organization for Standardization in 2005 which contained information security standards, which consisted of twelve parts relating to information security, including Business Continuity Management. BS

[5] SANS Institute, 2002.
[6] Wulandari, D.A., 2008.

7799 Information Security is a standard issued by the British Standards Institute adopted by ISO 17799.[7]

In Information Security Management BS 7799.2:2002 stated that:

- Whether there is a managed process in place for developing and maintaining business continuity throughout the organization.
- This might include Organisation wide Business continuity plan, regular testing, and updating of the plan, formulating and documenting a business continuity strategy.
- Whether events that could cause interruptions to the business process were identified example: equipment failure, flood, and fire.
- Whether a risk assessment was conducted to determine the impact of such interruptions.
- Whether a strategic plan was developed based on the risk assessment results to determine an overall approach to business continuity.
- Whether plans were developed to restore business operations within the required time frame following an interruption or failure to business process.
- Whether the plan is regularly tested and updated.
- Whether there is a single framework of a Business continuity plan.
- Whether this framework is maintained to ensure that all plans are consistent and identify priorities for testing and maintenance.
- Whether this identifies conditions for activation and individuals responsible for executing each component of the plan.[8]

[7] Information Security Management, 2001.
[8] SANS Institute, 2002.

2.1.3. THE DISASTER RECOVERY PLAN

The disaster recovery plan is defined as an anticipatory planning process for unpredictable events and no organization knows when it occurs and its effect on the continuity of existing business processes.[9] The disaster recovery plan is also defined as planning that focuses on information systems to restore operability target system, applications, and computer facilities at alternative locations in emergency conditions.[10] The causes that can be a threat of system failure include flooding; earthquake; fire; tsunami; acts of terrorism; acts of sabotage; the action of war; electrical power failures; failure of uninterruptible power supply. This will cause the malfunctioning system without being predictable first.

The following are computer equipment that can and will be carried out in the recovery process in the event of a disaster.

- Student data;
- Lecturer data;
- Academic data;
- Financial data;
- Human resource data;
- Application academic support;
- Software academic support;
- Source code; and other
- Installers.

[9] Carl, Neumann, 2003.
[10] Sharing Vision, 2008.

2.1.4. THE ANALYTICAL HIERARCHY PROCESS

Analytical hierarchy process was developed by Dr. Thomas L. Saaty of the Wharton School of Business in the 1970_s to organize information and judgment in choosing the most preferred alternative.[11;12;13] The working principle of the analytical hierarchy process is criteria and alternative assessments are assessed through pairwise comparisons. According to Saaty, 1983, for a variety of issues, the scale 1 to 9 is the best scale in expressing opinions.[14;15] The value and definition of qualitative opinion from the comparison scale of Saaty can be seen in table 2.1 below.

Table 2.1. Comparison Scale Saaty

GRADE	EXPLANATION
1	Criterion / Alternative A is equally important with criterion/alternative B
3	A is slightly more important than B
5	A is clearly more important than B
7	A is clearly more important than B
9	A is absolutely more important than B
2,4,6,8	When in doubt between two adjacent grades

Source: Saaty, 1983; Marimin, 2005[16;17;18]

[11] Saaty, T.L., 2004.
[12] Marimin, 2005.
[13] Faisal, 2015.
[14] Saaty, T.L., 2004.
[15] Faisal, 2015.
[16] Saaty, T.L., 2004.
[17] Marimin, 2005.
[18] Faisal, 2015.

The value of comparison A with B is 1 (one) divided by the value of comparison B with A.

Some of the benefits obtained when solving decision-making problems use the analytical hierarchy process.

- The analytical hierarchy process provides a single model that is easy to understand, flexible for a variety of unstructured problems;
- The analytical hierarchy process combines a deductive approach and a systems-based approach to solving complex problems;
- Interdependence the analytical hierarchy process can handle the interdependence of elements in a system and does not impose linear thinking;
- The analytical hierarchy process reflects the natural tendency of the mind to sort system elements at different levels and classify similar elements at each level;
- The analytical hierarchy process provides a scale for measuring things and realizing methods for setting priorities;
- The analytical hierarchy process tracks the logical consistency of the considerations used to set priorities;
- The analytical hierarchy process leads to a comprehensive assessment of the goodness of each alternative;
- The analytical hierarchy process considers the relative priorities of various system factors and allows organizations to choose the best alternative based on their goals;
- The analytical hierarchy process does not impose consensus but synthesizes representative results from different judgments;
- The analytical hierarchy process enables organizations to improve their problem definition and increase their consideration and understanding through repetition.[19;20]

[19] Marimin, 2005.
[20] Faisal, 2015.

2.2. PREVIOUS ASSESSMENT

Assessment of the previous book related to this model can be seen below.

1. Konsa, K and Kaie Jeeser, 2017. Preparing Museum Disaster Plan: Risk Ranking through the Analytical Hierarchy Process.[21]

   Comment:
   Analytical hierarchy process-based risk assessment methods allow estimating the significance of key risk factors in a variety of storage and exhibition facilities. The analytical hierarchy process application facilitates relative risk ranking and allows input from all museum employees.

   The equation is to use the analytical hierarchy process approach.

   The difference is the risk rating of this disaster in the museum.

2. Soedarmaji, Mas Mokhamad. 2000. *Perencanaan* Disaster Recovery Center *Berdasarkan Kerugian Usaha Akibat Kegagalan Sistem Komputer Pada Salah Satu Perusahaan Pengelolaan Pasar Modal*, *Studi Kasus* PT. Bursa Efek Jakarta.[22]

   Comment:
   The purpose is to measure the loss of business, both real and unreal, to determine the optimal alternative configuration of the disaster recovery plan for application systems that includes strategic business functions and according to needs. The study has identified the impact of system failure, namely loss of income, loss of customers, loss of market share, loss of public image, and loss of enthusiasm of employees if the planning of the disaster recovery center is not done properly.

   The equation is planning disaster recovery centers due to system failure.

   The difference is the disaster recovery center in the capital market.

[21] Konsa, K and Kaie Jeeser, 2017.
[22] Soedarmaji, Mas Mokhamad, 2000.

3. Cahyadi, Eddy, 2006. *Kajian* Business Continuity Plan *Berdasarkan Kuantifikasi Nilai Ekonomis Sistem Aplikasi pada Industri Penerbangan*: *Studi Kasus pada* PT. Garuda Indonesia.[23]

   Comment:
   The purpose is to analyze the approach in measuring economic value arising from the failure or failure of the information technology application system function as a basis for evaluating and measuring information technology investments that are expected to be used as part of the implementation of the advanced business plan. The study has measured the value of real and unreal benefits from the application system to determine business losses and potential costs that will arise if the system does not function and the cost of applying alternatives to the business continuity plan approach.

   The equation is a plan for business continuity.

   The difference is to discuss business continuity plans at PT. Garuda Indonesia.

4. Wulandari, Dyah Asrining, 2008. *Strategi* IT Disaster Recovery Plan *pada* Core Banking System *dengan Pendekatan* Analytical Hierarchy Process: *Studi Kasus pada* PT. Bank Mega Tbk.[24]

   Comment:
   The purpose is to minimize business losses that will result from application system failures. In addition, this study also provides recommendations for decision-makers to be weighed based on the level of interest of the company in implementing disaster recovery plan information technology in the core banking system. The method used in this study uses the analytical hierarchy process approach with the expert choice 2000 tool as software for analyzing data processing.

   The equation is a disaster recovery plan with an analytical hierarchical process approach.

   The difference is the disaster recovery plan at PT. Bank Mega Tbk.

[23] Cahyadi, Eddy, 2006.
[24] Wulandari, D.A., 2008.

2.3. CONCEPTUAL FRAMEWORK

The conceptual framework can be seen in the following description. The following is an overview that provides an explanation of the conceptual framework.

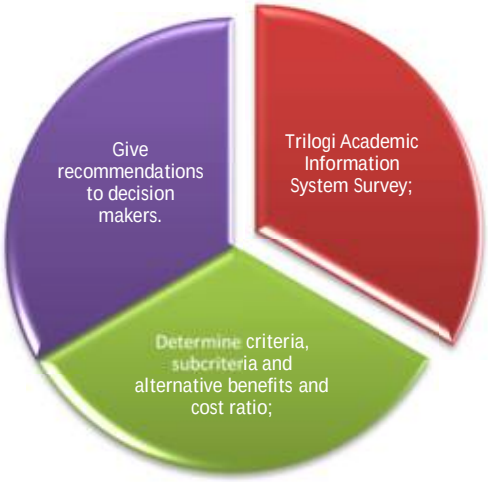

Figure 2.1. Conceptual Framework
Source: Self Proceed

The conceptual framework of the book starts by conducting the System Information Academic Trilogy survey. The process is continued by determining:

i. The benefits ratio of the backup recovery strategy;

ii. The cost ratio of the backup recovery strategy;

iii. The criteria;

iv. The sub-criteria; and

v. The alternative.

Then the weighing results of each criterion are used to provide recommendations to decision makers.

2.4. ROADMAP

The description of the book roadmap is shown in the following description.

1. Analyze the BACKUP RECOVERY STRATEGY selection at the Trilogi University;

   Get respondent's feedback from analysis, surveys, interviews, and discussions with expert respondents in the Trilogi University;

   The objective is to get an idea about using a backup recovery strategy selection in the Trilogi University;

   The approach taken is a focus group discussion with expert respondents;

   The expected output is the process of selecting a backup recovery strategy at the Trilogi University.

2. Determine features on the BENEFIT ratio criteria;

   Feedback gets data from the results of questionnaires distributed to expert respondents;

   The objective is to determine the criteria on the benefit ratio;

   The approaches taken are a focus group discussion with expert respondents and Cochran Q test approach;

   The outputs are RISK; RELIABILITY AND MAINTENANCE; as well as TRUST.

3. Determine features on the COST ratio criteria;

   Feedback gets data from the results of questionnaires distributed to expert respondents;

   The objective is to determine the criteria on the cost ratio;

   The approaches taken are a focus group discussion with expert respondents and Cochran Q test approach;

The outputs are DISASTER RECOVERY CENTRE; INFRASTRUCTURE AND TRAINING; BACKUP; as well as TESTING.

4. Determine features on the RISK ratio sub-criteria;

   Feedback gets data from the results of questionnaires distributed to expert respondents;

   The objective is to determine the risk ratio sub-criteria;

   The approaches taken are a focus group discussion with expert respondents and Cochran Q test approach;

   The outputs are HARDWARE; SOFTWARE; INFRASTRUCTURE AND PROCEDURE; BACKUP; as well as TEST.

5. Determine features on the RELIABILITY AND MAINTENANCE sub-criteria;

   Feedback gets data from the results of questionnaires distributed to expert respondents;

   The objective is to determine the sub-criteria on the Reliability and Maintenance;

   The approaches taken are a focus group discussion with expert respondents and Cochran Q test approach;

   The outputs are HARDWARE; SOFTWARE; INFRASTRUCTURE; as well as BACKUP.

6. Determine features on the Benefit ratio alternatives;

   Feedback gets data from the results of questionnaires distributed to expert respondents;

   The objective is to determine the alternatives on the benefit;

   The approaches taken are a focus group discussion with expert respondents and Cochran Q test approach;

   The outputs are HOT STANDBY; WARM STANDBY; as well as COLD STANDBY.

7. Determine features on the Cost ratio alternatives;

   Feedback gets data from the results of questionnaires distributed to expert respondents;

   The objective is to determine the alternatives on the cost;

   The approaches taken are a focus group discussion with expert respondents and Cochran Q test approach;

   The outputs are HOT STANDBY; WARM STANDBY; as well as COLD STANDBY.

8. The process of selecting a backup recovery strategy for business continuity plans that are in accordance with the conditions of the Trilogi University;

   Feedback gets data from paired comparison questionnaires from each criterion, sub-criteria, and alternatives in terms of benefits and cost;

   The objective of this process is to provide recommendations for decision makers about alternatives;

   The approaches taken are a focus group discussion and expert choice implementation;

   The output is the backup recovery strategy selection for business continuity plans.

THE BACKUP RECOVERY STRATEGY

CHAPTER III
METHODS

3.1. METHOD

The framework mentioned above illustrates a study that starting with searching for references through literature studies, company surveys, interviews and discussions with expert respondents using focus group discussion methods. Data and information were collected from expert respondents using interview and observation techniques at the Trilogi University. Then proceed to determine the attribute benefit ratios; cost ratios criteria, sub-criteria, and alternative distributed to respondent experts using the focus group discussion method and the Q Cochran test.

Term contained in this book is risk identification:

- The identifying and determining possible tangible and intangible risks process;
- Performance and reliability of the system is the performance and reliability of the system maintained;
- Maintenance and system changes are that during maintenance activities and system changes will not affect business processes; and
- Customers trust is the customer's trust in the company can remain well established because it already has disaster management procedures.

In order to avoid inconsistencies in the model, focus group discussion with expert respondents to determine the stages of making a valid model with elements that significantly affect the model. The results obtained from the focus group discussion questionnaire to determine the attribute benefit ratios; cost ratios criteria, sub-criteria, and alternative. This method uses an iterative approach in which the improper attributes through the analysis process are discarded so that the attributes that are left are really the attributes that are important to be researched.

The model begins with observations of the studies. This model uses a descriptive-analytic method by presenting the summary of interviews and survey results in the form of questionnaires. With this method will be described the current conditions. The questionnaire was given to several respondents who acted as experts, namely:

- The head of the information technology section,
- Four staff information technology staff,
- The dean of the faculty of creative industries and telematics,
- The head of the information systems study program, and
- Four lecturers of information system courses at the Trilogi University.

The model also used the multi-criteria decision making and analytical hierarchy process method using expert choice software computer.

Furthermore, a secondary data search was conducted in the field through various media, such as internet, literature book and journals and articles to obtain accurate information about the model. In addition, the identification of the system by considering the variables supporting the model by conducting interviews and giving questionnaires to experts. This is an important step because the model must be accurate and accountable.

The next strategic step that should be done based on the results of interviews with the respondents expert on the data processed by using an analytical hierarchy of the process. Decisions should be immediately followed up in the form of action or can also be reviewed if the decision was obtained new information that can affect the results to reduce uncertainty, and then the new decision will be obtained.

According to Marimin, 2005 steps determine the size of weight as follows.[25;26]

Step 1:

$$\frac{w_i}{w_j} = a_{ij} \qquad (1)$$

[25] Marimin, 2005.
[26] Faisal, 2010.

$_{i,j}$ = 1, 2, 3, ... , n
w_i = weights of inputs in rows
w_j = weights of input on the lane

Step 2:

$$w_i = a_{ij} \cdot w_j \qquad (2)$$

$_{i,j}$ = 1, 2, 3, ... , n

For common cases have a form:

$$w_i = \frac{1}{n}\sum_{j=i}^{n} a_{ij} w_j \qquad (3)$$

w_i = average of $a_{i1}.w_1 , ..., a_{in}.w_n$

Step 3: If the estimate a_{ij} is good, it will tend to close to $\frac{w_i}{w_j}$ ratio. If b also changes, then n is converted to λ_{maks} so obtained

$$w_i = \frac{1}{\lambda_{maks}} \sum_{j=i}^{n} a_{ij}.w_j \qquad (4)$$

$_{i,j}$ = 1, 2, 3, ... , n

The measure of consistency of answers that will affect the validity as follow:

$$CI = \frac{\lambda_{\max} - n}{n-1} \qquad (5)$$

The consistency ratio is considered well if CR ≤ 0.1. The Consistency Ratio formula as follows:

$$CR = \frac{CI}{RI} \qquad (6)$$

Consistency ratio is a parameter used to check whether pairwise comparisons have been done consequently or not. The value of RI is the

random index value released by *Oakridge* Laboratory as shown in the following table.

Table 3.1. Index Random Value Scale the Oakridge Laboratory Index

N	**1**	**2**	**3**	**4**
RI	0	0	0.58	0.9
N	**5**	**6**	**7**	8
RI	1.12	1.24	1.32	1.41
N	**9**	**10**	**11**	**12**
RI	1.45	1.49	1.51	1.48
N	**13**			
RI	1.56			

Source: Marimin, 2005; Faisal, 2010[27;28]

[27] Marimin, 2005.
[28] Faisal, 2010.

3.2. INSTRUMENT DEVELOPMENT

The instrument development can be seen in the following description.

3.2.1. THE BENEFIT RATIO CRITERIA

Table 3.2. Benefit Ratio Criteria

FOCUS	BACKUP RECOVERY		
Criteria	Benefit		
Sub-criteria	Risk	Reliability and Maintenance	Trust
	Hardware	Hardware	
	Software	Software	
	Infrastructure and Procedure	Infrastructure	
	Backup	Backup	
	Testing		
Alternative	Hot standby	Hot standby	Hot standby
	Warm standby	Warm standby	Warm standby
	Cold standby	Cold standby	Cold standby

Source: Self Proceed

Description of the above table:

1. The model focus is BACKUP RECOVERY.

   The focus is to discuss the backup recovery strategy selection to maintain the company's business continuity plan due to the disaster.

2. The BENEFITS criteria.

   The benefit criteria that must be explained the backup recovery strategy to maintain the company's business continuity plan due to the disaster.

3. The benefit sub-criteria that must be explained from the benefit criteria are:

   i. RISK.

      Risks faced by disasters occur, and recovery plans for the following facilities.

      - HARDWARE.

        What hardware must be provided in the recovery plan?

      - SOFTWARE.

        What software must be provided in the recovery plan?

      - INFRASTRUCTURE AND PROCEDURE.

        What must be done for infrastructure and procedures in the recovery plan?

      - BACKUP.

        The necessary data, system, and documents will be recovered in the event of a disaster.

      - TESTING.

Test all available facilities to ensure that all facilities operate properly in the event of a disaster.

ii. RELIABILITY AND MAINTENANCE.

To ensure the reliability of all existing facilities and carry out maintenance on all existing facilities.

- HARDWARE.

  What hardware must be provided in the recovery plan?

- SOFTWARE.

  What software must be provided in the recovery plan?

- INFRASTRUCTURE.

  What must be done for infrastructure in the recovery plan?

- BACKUP.

  The necessary data, system, and documents will be recovered in the event of a disaster.

iii. TRUST.

Build trust in all customers, that their data or documents are safe and not damaged by the disaster.

4. The benefit alternative.

A benefit alternative backup model proposed in the recovery strategy selection is ready to maintain business continuity plans.

i. HOT STANDBY.

Hot Standby is a fully prepared environment, including:

- Hardware;
- Software;
- Data;

- Communication; and other
- Supporting facilities.

ii. WARM STANDBY.

Warm Standby is a ready-made environment. It has almost all recovery needs except for a number of needs that can be given in the maximum acceptable outage time span, such as:

- Hardware; and other
- Supporting facilities.

iii. COLD STANDBY.

Cold Standby is a location that is ready for use, which is only equipped with supporting infrastructure such as:

- Electricity,
- Water, and
- Air conditioning.

3.2.2. THE COST RATIO CRITERIA

Table 3.3. Cost Ratio Criteria

FOCUS	**BACKUP RECOVERY**			
Criteria	Cost			
Sub-criteria	Disaster Recovery Center	Infrastructure and Training	Backup	Testing
Alternative	Hot standby	Hot standby	Hot standby	Hot standby
	Warm standby	Warm standby	Warm standby	Warm standby
	Cold standby	Cold standby	Cold standby	Cold standby

Source: Self Proceed

Description of the above table:

1. The model focus is BACKUP RECOVERY.

   The focus is to discuss the backup recovery strategy selection to maintain the company's business continuity plan due to the disaster.

2. The COST criteria.

   The cost criteria that must be explained the backup recovery strategy to maintain the company's business continuity plan due to the disaster.

3. The cost sub-criteria that must be explained from the cost criteria are:

i. DISASTER RECOVERY CENTER.

Build and empower disaster recovery centers for backup recovery plans for the continuity of the company's business due to disasters.

ii. INFRASTRUCTURE AND TRAINING.

Fulfillment of the infrastructure needed in choosing a backup recovery strategy to maintain the company's business continuity plan for disasters.

Create and run training a backup recovery strategy to maintain the company's business continuity plan for disasters.

iii. BACKUP.

The necessary data, system, and documents will be recovered in the event of a disaster.

iv. TESTING.

Test all available facilities to ensure that all facilities operate properly in the event of a disaster.

4. The cost alternative.

A cost alternative backup model proposed in the recovery strategy selection is ready to maintain business continuity plans.

i. HOT STANDBY.

Hot Standby is a fully prepared environment, including:

- Hardware;
- Software;
- Data;
- Communication; and other
- Supporting facilities.

ii. WARM STANDBY.

Warm Standby is a ready-made environment. It has almost all recovery needs except for a number of needs that can be given in the maximum acceptable outage time span, such as:

- Hardware; and other
- Supporting facilities.

iii. COLD STANDBY.

Cold Standby is a location that is ready for use, which is only equipped with supporting infrastructure such as:

- Electricity,
- Water, and
- Air conditioning.

3.2.3. THE BENEFIT HIERARCHY DIAGRAMS

The benefits hierarchy diagrams can be seen in the following figure.

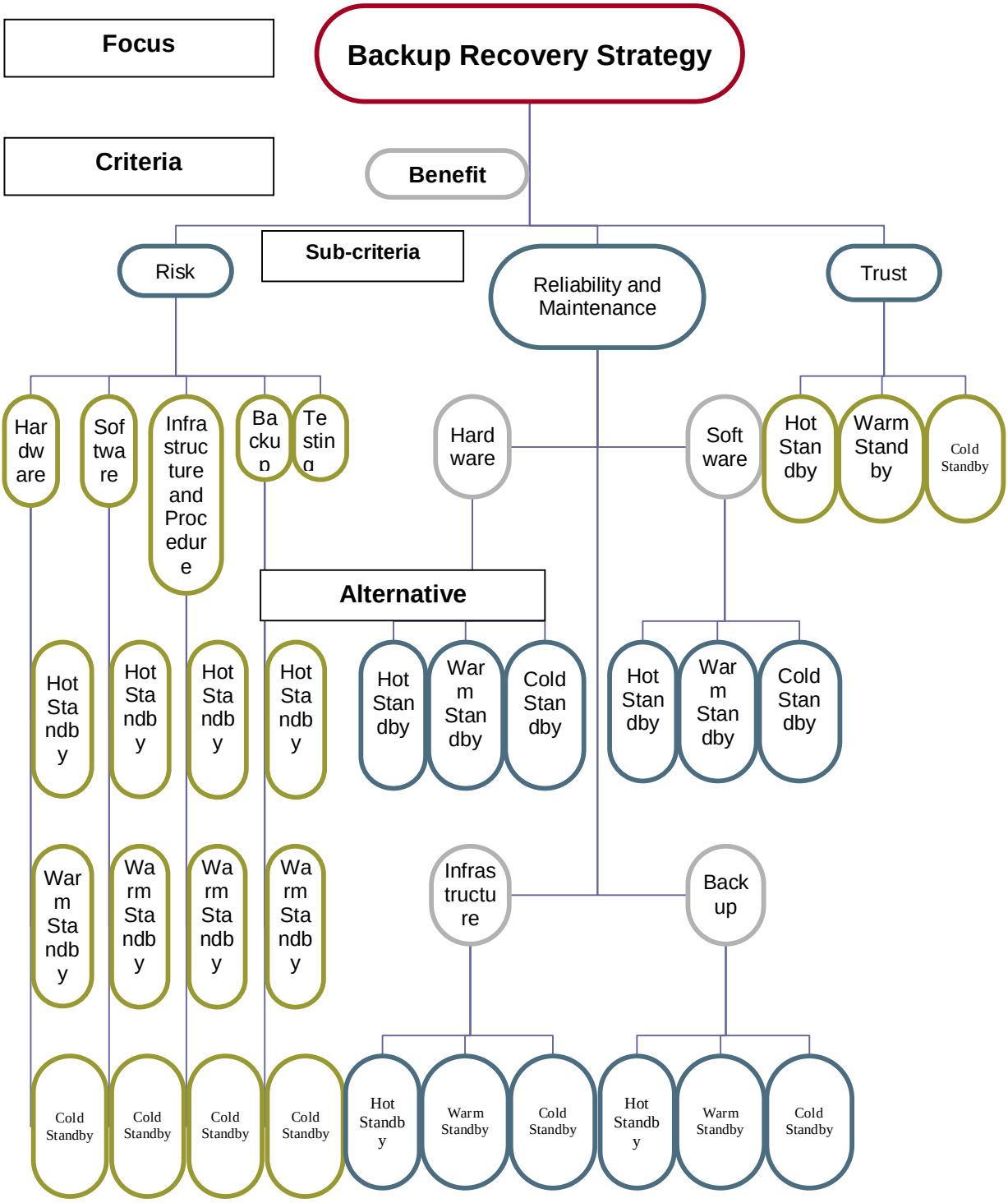

Figure 3.1. Benefit Criteria Hierarchy Diagram
Source: Self Proceed

Description of the figure above:

1. The model focus is BACKUP RECOVERY.
2. The BENEFITS criteria.
3. The benefit sub-criteria that must be explained from the benefit criteria are:
   i. RISK.
      - HARDWARE.
      - SOFTWARE.
      - INFRASTRUCTURE AND PROCEDURE.
      - BACKUP.
      - TESTING.
   ii. RELIABILITY AND MAINTENANCE.
      - HARDWARE.
      - SOFTWARE.
      - INFRASTRUCTURE.
      - BACKUP.
   iii. TRUST.
4. The alternatives:
   i. HOT STANDBY.
   ii. WARM STANDBY.
   iii. COLD STANDBY.

3.2.4. THE COST HIERARCHY DIAGRAMS

The cost hierarchy diagrams can be seen in the following figure.

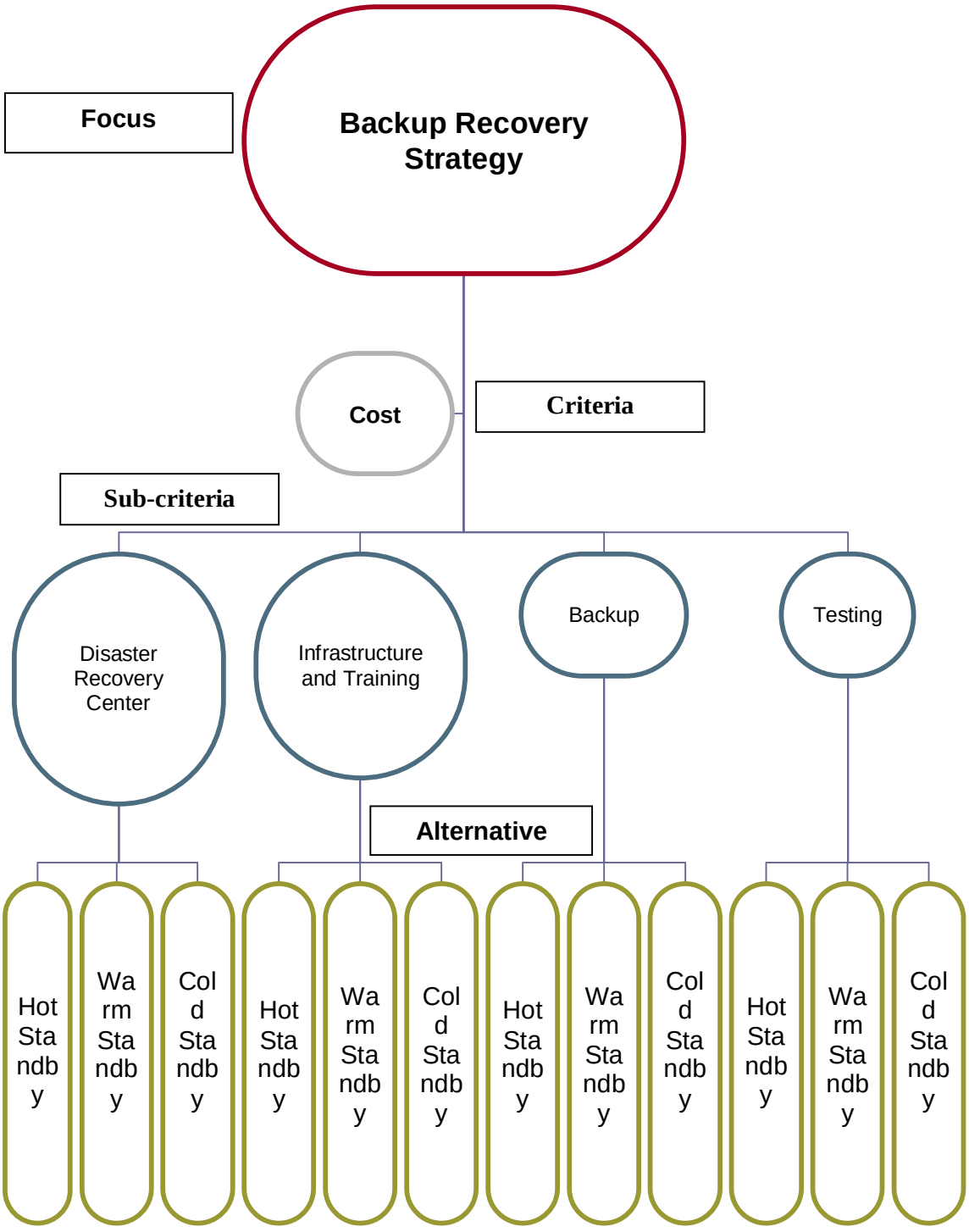

Figure 3.2. Cost Criteria Hierarchy Diagram
Source: Self Proceed

Description of the above figure:

1. The model focus is BACKUP RECOVERY.
2. The COST criteria.
3. The cost sub-criteria that must be explained from the cost criteria are:
    i. DISASTER RECOVERY CENTER.
    ii. INFRASTRUCTURE AND TRAINING.
    iii. BACKUP.
    iv. TESTING.
4. The cost alternatives:
    i. HOT STANDBY.
    ii. WARM STANDBY.
    iii. COLD STANDBY.

3.3. SCHEDULING DATA ANALYSIS

The scheduling data analysis can be seen in table 3.1 below.

Table 3.4. Scheduling Data analysis

Step	Jul				Aug				Sep				Oct				Nov				Dec			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Analyze the backup recovery strategy selection at the Trilogi University.																								
Determine features on the Benefit ratio criteria.																								
Determine features on the Cost ratio criteria.																								
Determine features on the Risk Sub-criteria																								
Determine features on the Reliability and Maintenance Sub-criteria.																								
Determine features on the Benefit Alternatives.																								
Determine features on the Cost Alternatives.																								
The process of selecting a backup recovery strategy for business continuity plans.																								

Source: Self Proceed

THE BACKUP RECOVERY STRATEGY

CHAPTER IV
ANALYSIS AND DISCUSSION

4.1 DATA ANALYSIS AND INTERPRETATION

Processing, analysis, and interpretation of data are preceded by determining the important element in choosing a backup recovery strategy to maintain the company's business continuity plan due to disaster. The following are important elements that influence the backup recovery strategy selection to maintain the company's business continuity plan.

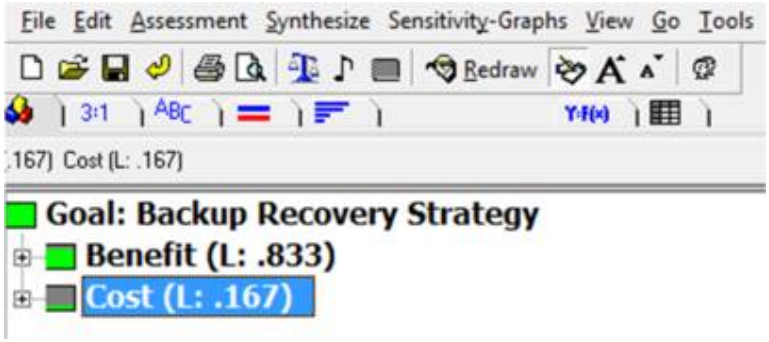

Figure 4.1. The Element Data
Source: Self Proceed

The important elements that influence the selection of a backup recovery strategy to maintain the company's business continuity plan are:

a. BENEFIT criteria, and

b. COST criteria.

Then the literature study is carried out to answer the problem formulation proposed based on the analytic hierarchy process. Based on the results of data processing will be discussed in answering existing problems. From these results, it is expected that theoretical findings and empirical facts can be revealed so that new theories to develop and | or develop existing theories are obtained. The following are the results of the weighting process, analysis, and interpretation of data for benefit ratios and cost ratios that influence the

results of summary interviews and questionnaire results from expert respondents.

4.1.1. THE BENEFIT CRITERIA

Data analysis of benefit criteria can be seen in the following description.

a. Level 1 is the determination of the BENEFITS criteria.

b. Level 2 determines benefit sub-criteria in the form of:

   - RISK;
   - RELIABILITY AND MAINTENANCE; and
   - TRUST.

c. Level 3 is the determination of RISK sub-criteria in the form of:

   - HARDWARE;
   - SOFTWARE;
   - INFRASTRUCTURE AND PROCEDURES;
   - BACKUP; and
   - TESTING.

d. Level 3 is the determination of RELIABILITY AND MAINTENANCE sub-criteria in the form of:

   - HARDWARE;
   - SOFTWARE;
   - INFRASTRUCTURE; and
   - BACKUP.

e. Level 4 is an alternative determination.

Elements at each level in terms of benefit criteria can be seen in the figure below.

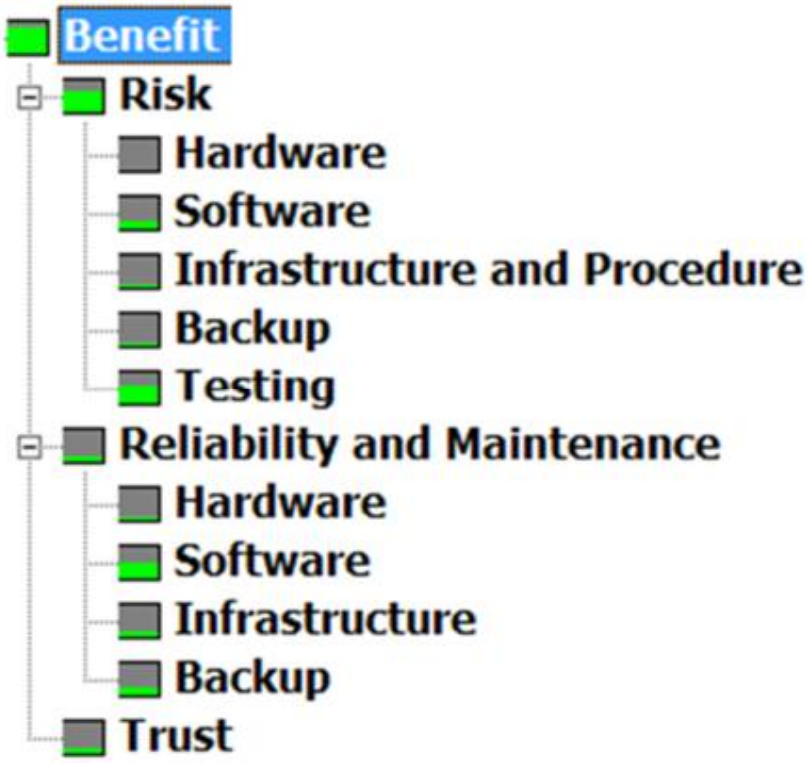

Figure 4.2. The Benefits Criteria
Source: Self Proceed

4.1.2. THE COST CRITERIA

Data analysis of cost criteria can be seen in the following description.

a. Level 1 is the determination of the COST criteria.

b. Level 2 is the determination of cost sub-criteria in the form of:

- DISASTER RECOVERY CENTER;
- INFRASTRUCTURE AND TRAINING;
- BACKUP; and
- TESTING.

c. Level 3 is an alternative determination.

Elements at each level in terms of cost criteria can be seen in the figure below.

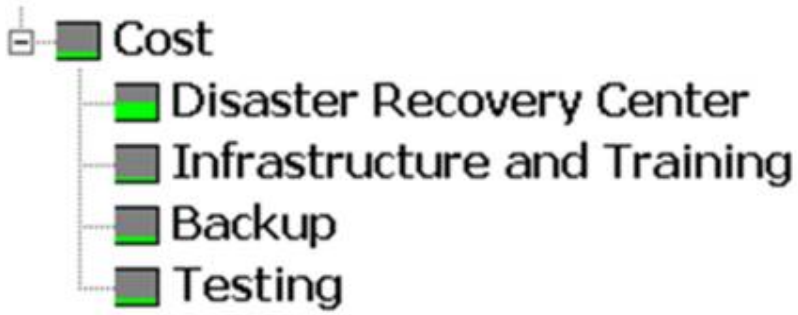

Figure 4.3. The Cost Criteria
Source: Self Proceed

4.1.3. THE ALTERNATIVE ELEMENT

Alternative elements can be seen in the picture below.

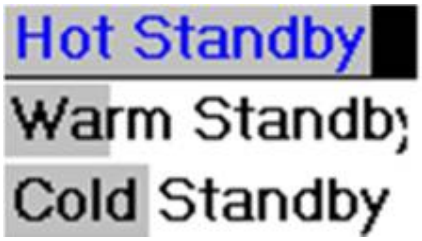

Figure 4.4. Alternative Elements
Source: Self Proceed

Data analysis of alternative elements can be seen in the following description.

a. HOT STANDBY.

b. WARM STANDBY.

c. COLD STANDBY.

4.2 PAIRWISE COMPARATIVE ANALYSIS

The results of the questionnaire from expert respondents with a focus group discussion approach to matching the comparison between elements at each level for the benefit criteria and the cost criteria can be seen in processing data using the expert choice application below.

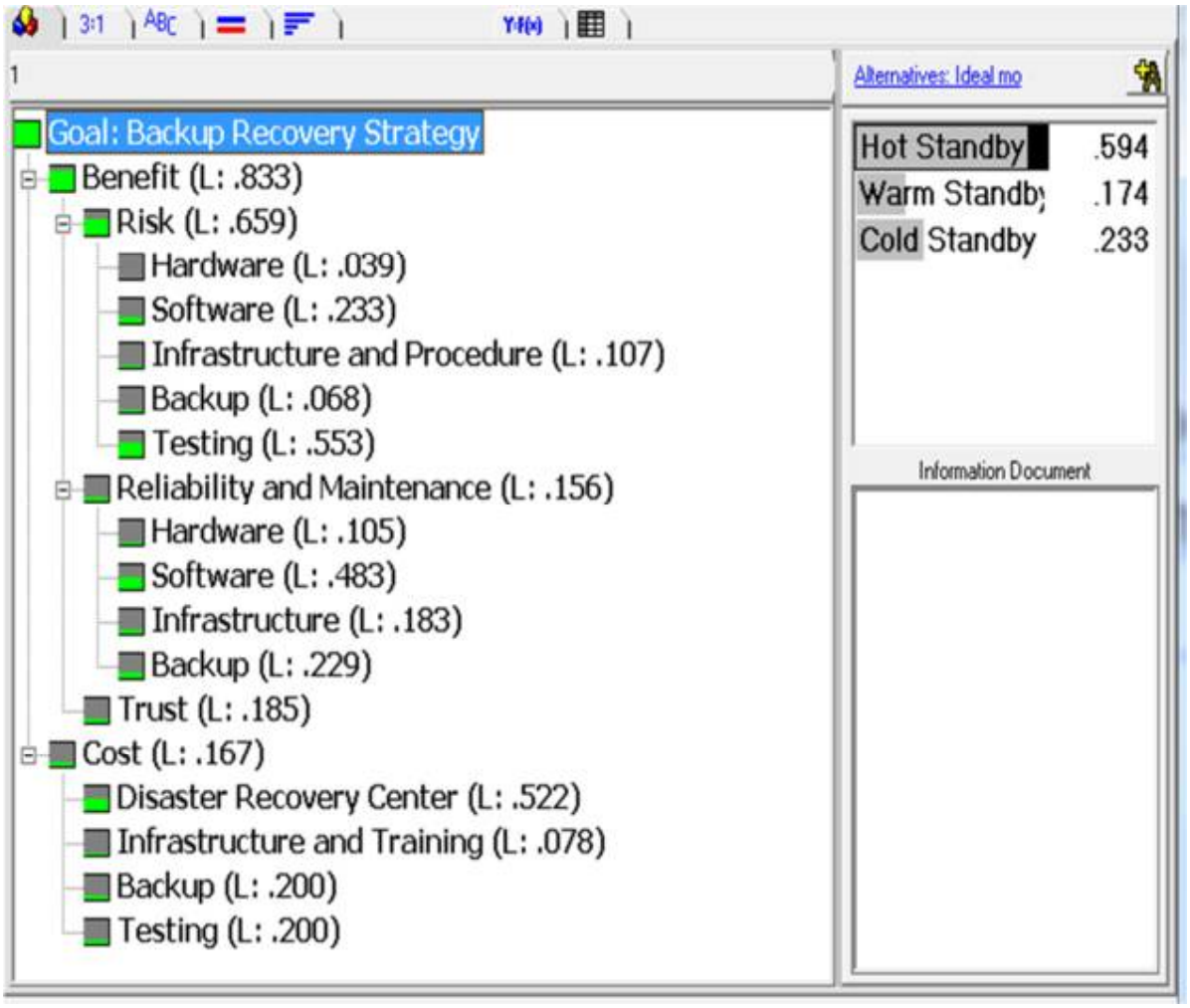

Figure 4.5. Backup Recovery Strategy Model
Source: Self Proceed

4.2.1 GOAL PRIORITIES

The priorities with respect to pairwise comparison results and goal backup recovery strategy can be seen in the following figure.

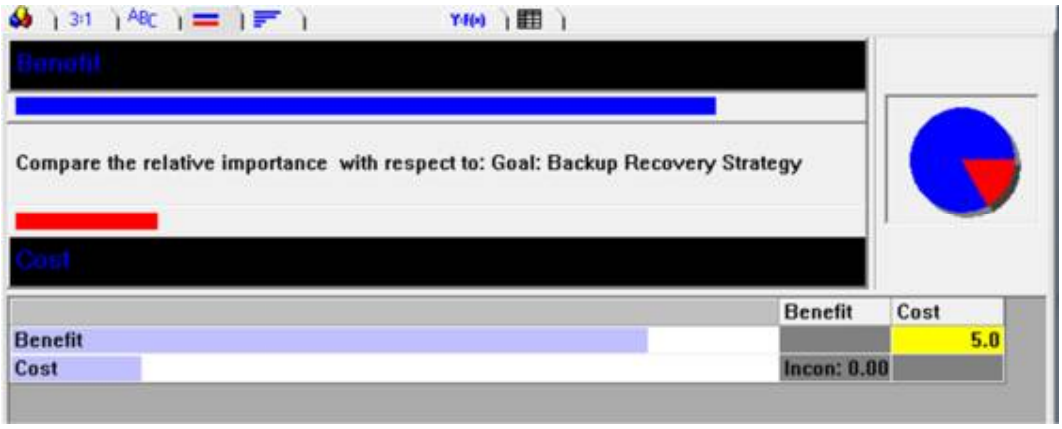

Figure 4.6. Goals Pairwise Comparison
Source: Self Proceed

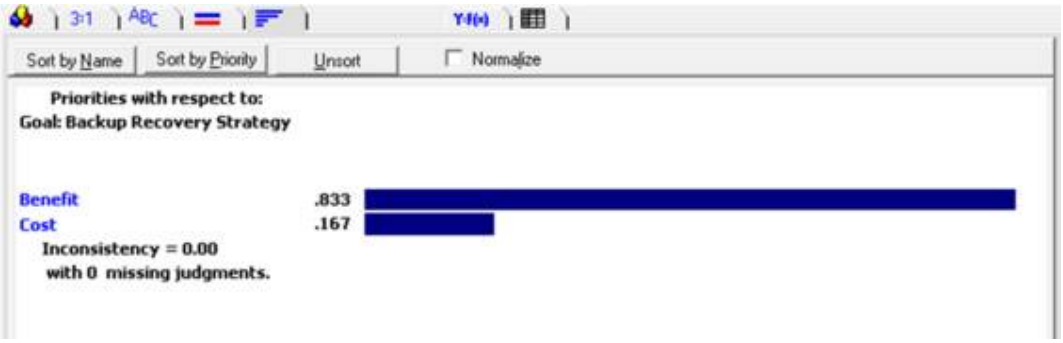

Figure 4.7. Goals Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 83.3% BENEFIT criteria;

b. 16.7% COST criteria; and

c. Inconsistency ratio of 0.00 or 0%.

4.2.2 BENEFIT CRITERIA

The priorities with respect to pairwise comparison results and goal backup recovery strategy in benefit criteria can be seen in the following figure.

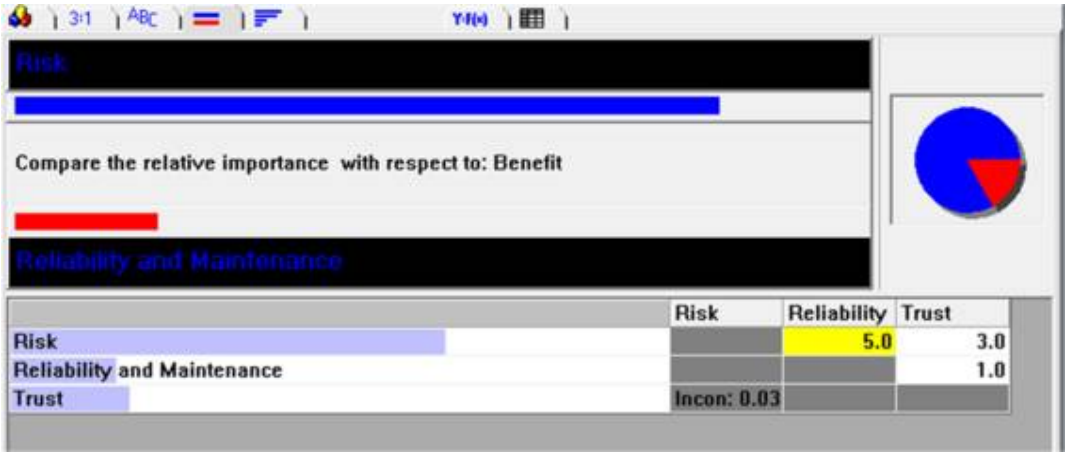

Figure 4.8. Benefit Criteria Pairwise Comparison
Source: Self Proceed

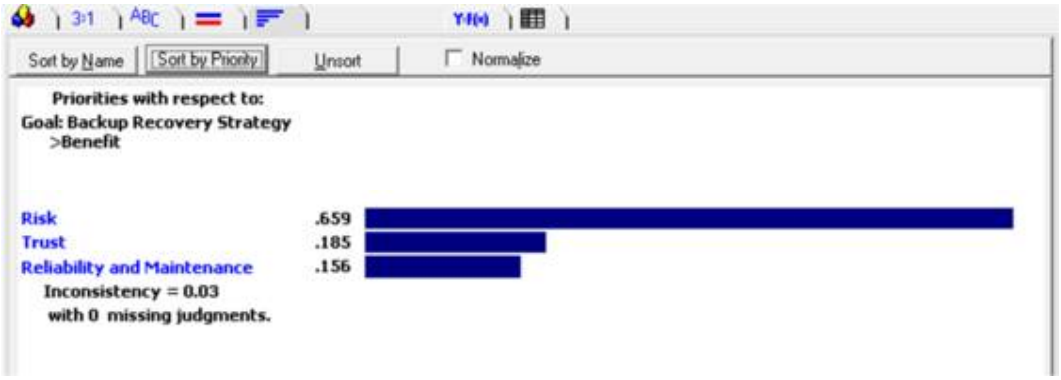

Figure 4.9. Benefit Criteria Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 65.9% RISK sub-criteria;

b. 18.5% TRUST sub-criteria;

c. 15.6% RELIABILITY AND MAINTENANCE sub-criteria;

d. Inconsistency ratio of 0.03 or 3%.

i. Benefit \Risk

The priorities with respect to pairwise comparison results and goal backup recovery strategy in risk sub-criteria can be seen in the following figure.

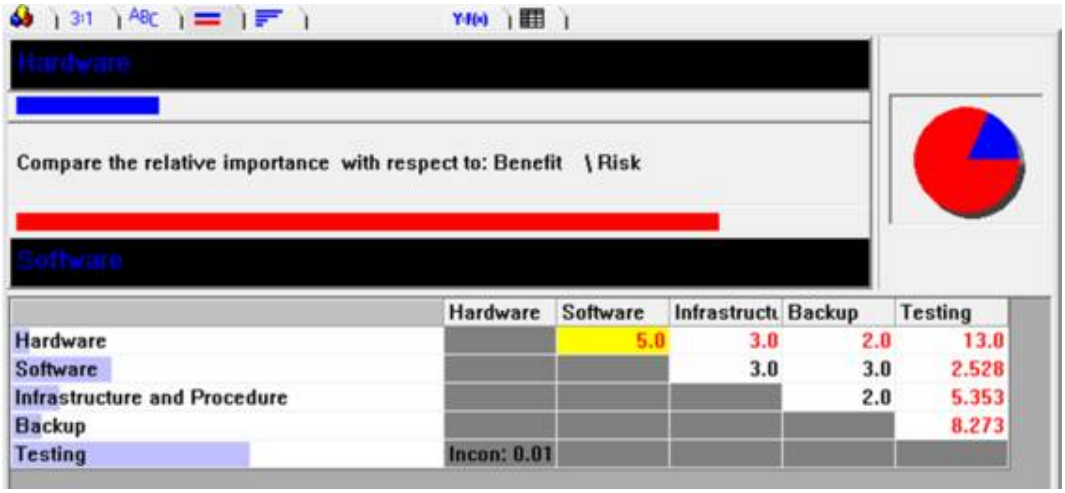

Figure 4.10. Risk Pairwise Comparison
Source: Self Proceed

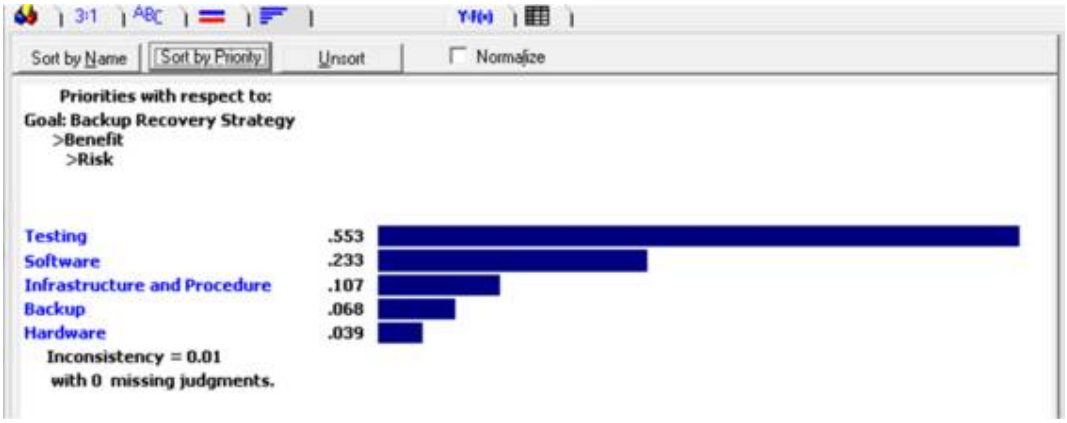

Figure 4.11. Risk Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 55.3% TESTING;
b. 23.3% SOFTWARE;
c. 10.7% INFRASTRUCTURE AND PROCEDURE;
d. 6.8% BACKUP;
e. 3.9% HARDWARE;
f. Inconsistency ratio of 0.01 or 1%.

Benefit \Risk \Hardware

The priorities with respect to pairwise comparison results and goal backup recovery strategy in risk hardware can be seen in the following figure.

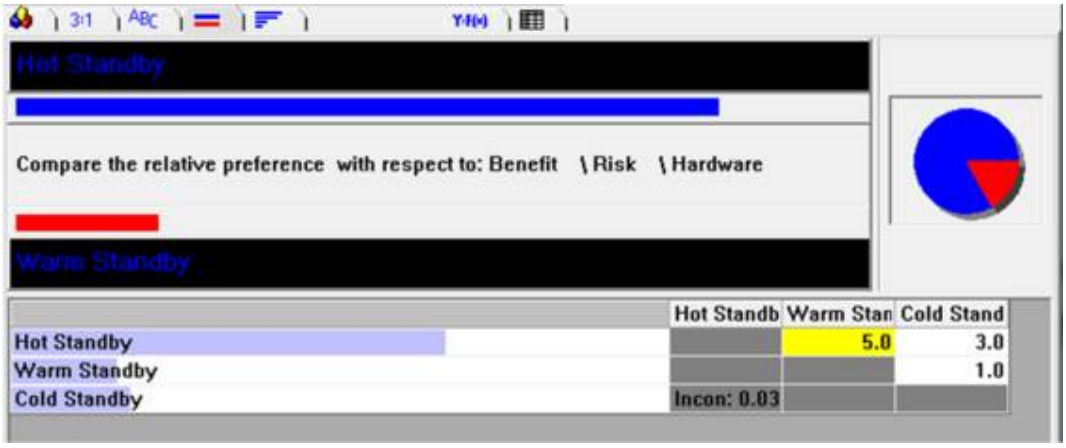

Figure 4.12. Risk-Hardware Pairwise Comparison
Source: Self Proceed

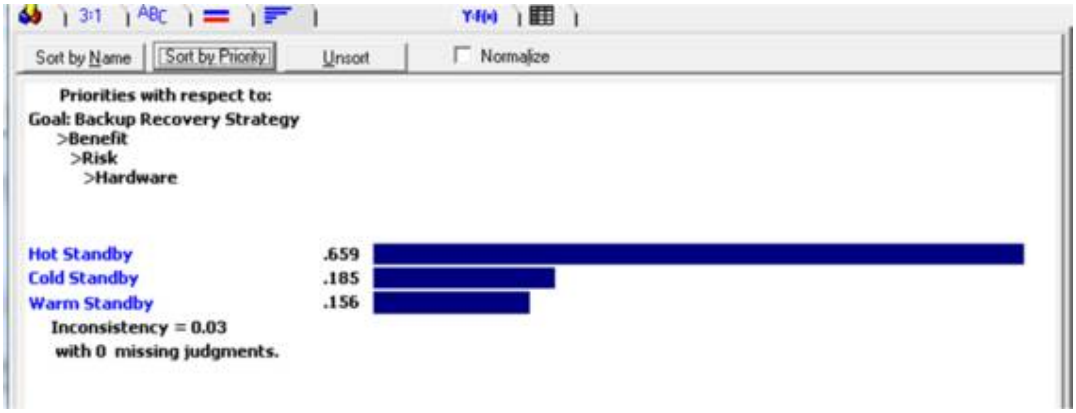

Figure 4.13. Risk-Hardware Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 65.9% HOT STANDBY;

b. 18.8% COLD STANDBY;

c. 15.6% WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

Benefit \Risk \Software

The priorities with respect to pairwise comparison results and goal backup recovery strategy in risk software can be seen in the following figure.

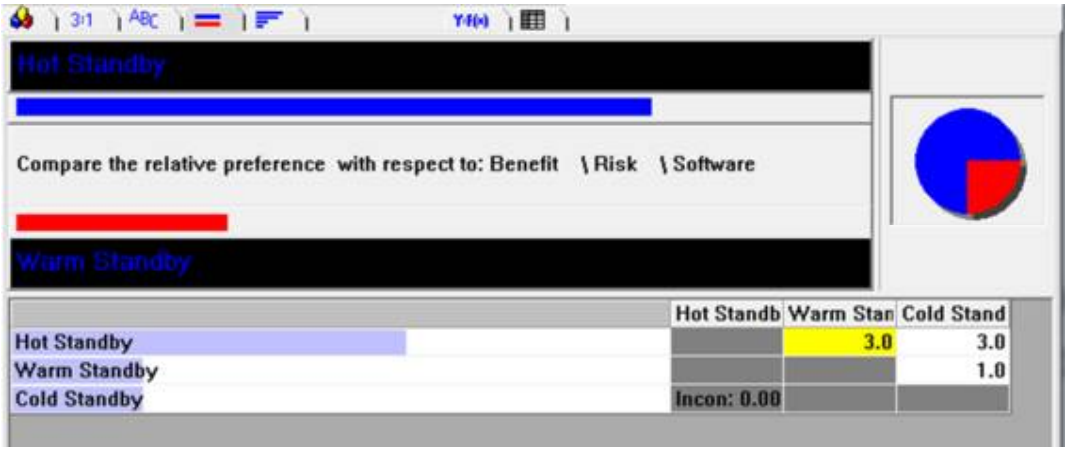

Figure 4.14. Risk-Software Pairwise Comparison
Source: Self Proceed

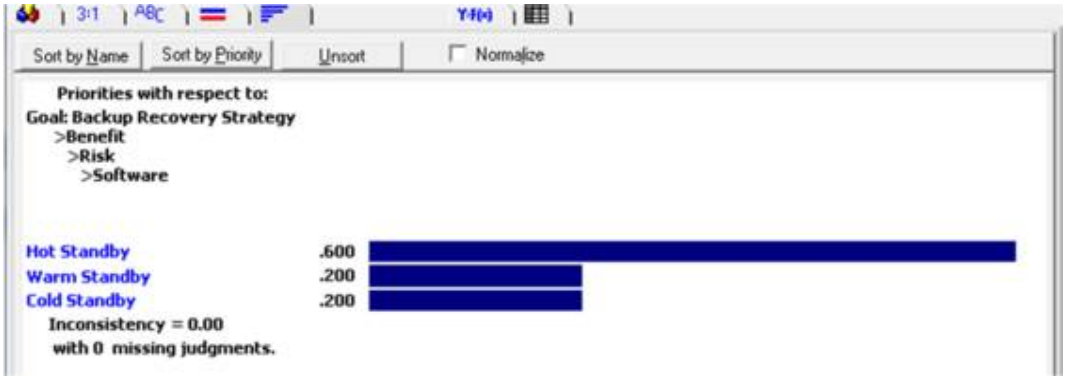

Figure 4.15. Risk-Software Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 60% HOT STANDBY;

b. 20% WARM STANDBY;

c. 20% COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Benefit \Risk \Infrastructure and Procedure

The priorities with respect to pairwise comparison results and goal backup recovery strategy in risk infrastructure and the procedure can be seen in the following figure.

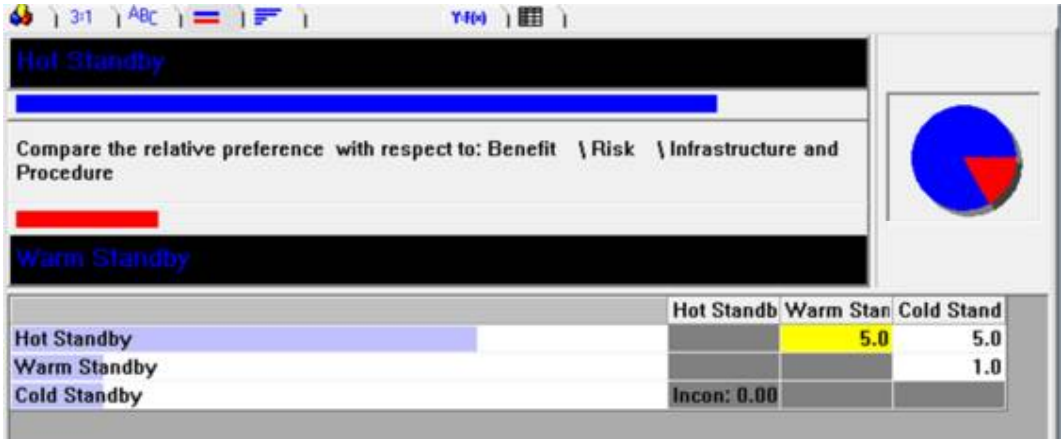

Figure 4.16. Risk-Infrastructure and Procedure Pairwise Comparison
Source: Self Proceed

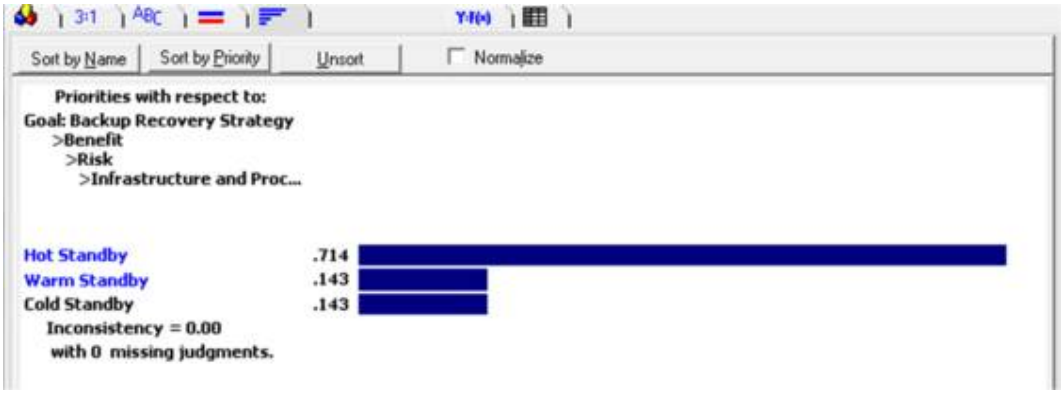

Figure 4.17. Risk-Infrastructure and Procedure Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 71.4% HOT STANDBY;

b. 14.3% WARM STANDBY;

c. 14.3% COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Benefit \Risk \Backup

The priorities with respect to pairwise comparison results and goal backup recovery strategy in Risk-Backup can be seen in the following figure.

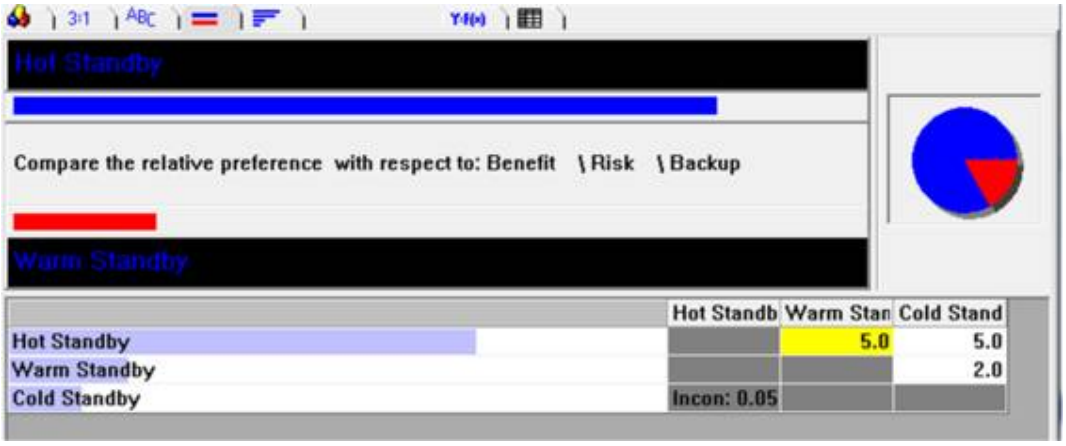

Figure 4.18. Risk-Backup Pairwise Comparison
Source: Self Proceed

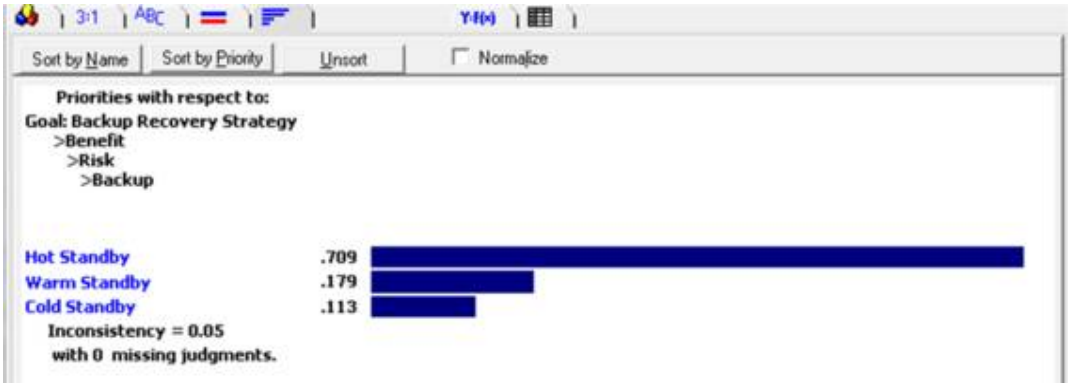

Figure 4.19. Risk-Backup Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 70.9% HOT STANDBY;

b. 17.9% WARM STANDBY;

c. 11.3% COLD STANDBY;

e. Inconsistency ratio of 0.05 or 5%.

Benefit \Risk \Testing

The priorities with respect to pairwise comparison results and goal backup recovery strategy in risk testing can be seen in the following figure.

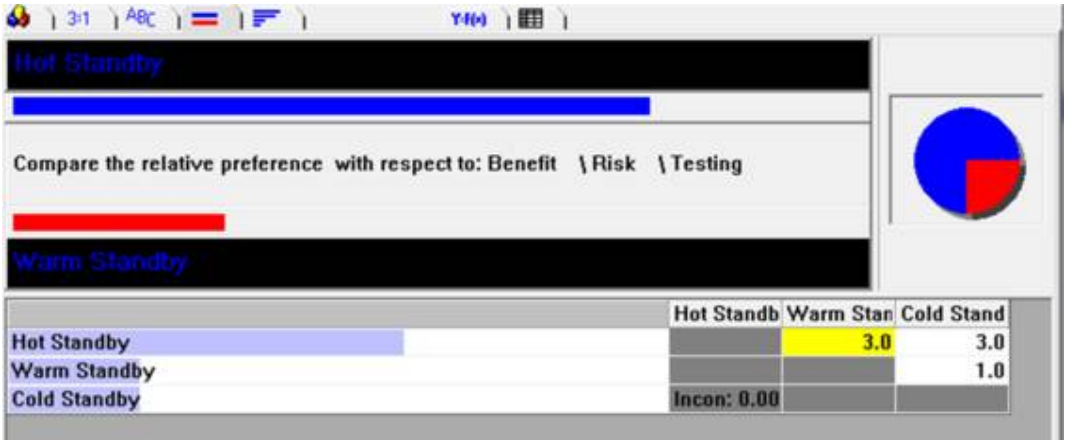

Figure 4.20. Risk-Testing Pairwise Comparison
Source: Self Proceed

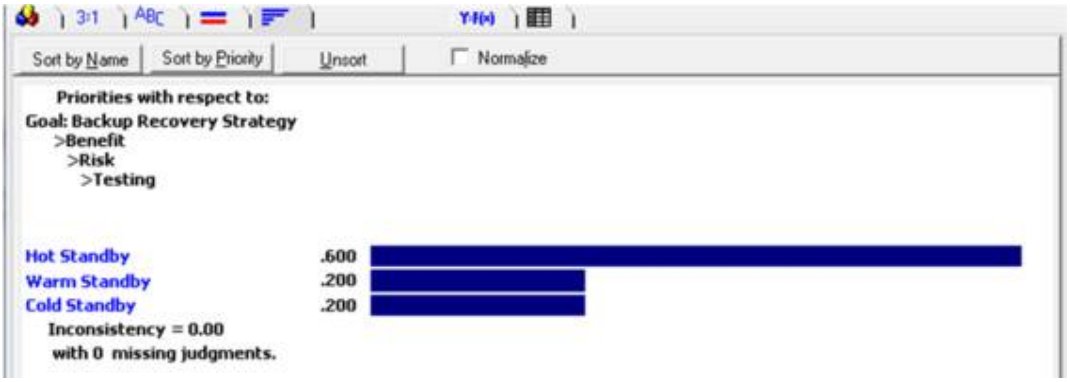

Figure 4.21. Risk-Testing Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 60% HOT STANDBY;

b. 20% WARM STANDBY;

c. 20% COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

ii. Benefit \Reliability and Maintenance

The priorities with respect to pairwise comparison results and goal backup recovery strategy in reliability and maintenance sub-criteria can be seen in the following figure.

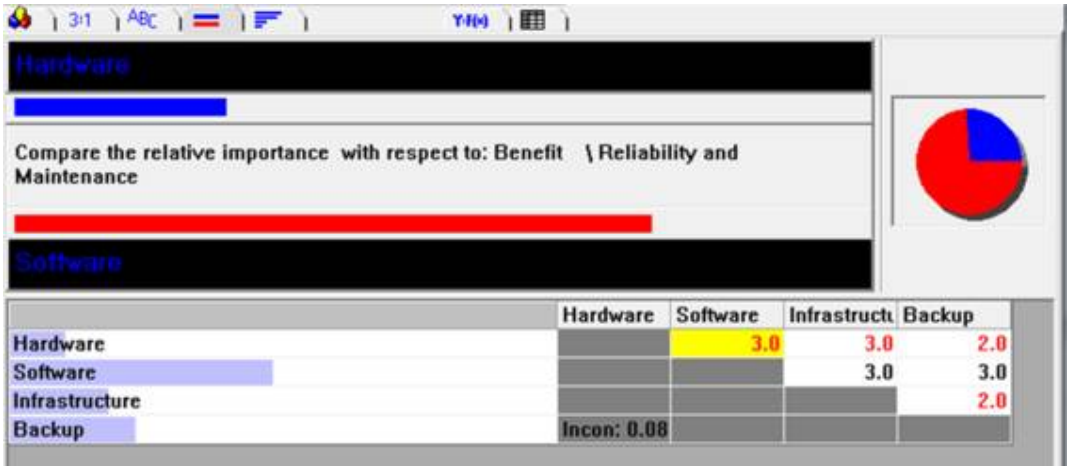

Figure 4.22. Reliability and Maintenance Pairwise Comparison
Source: Self Proceed

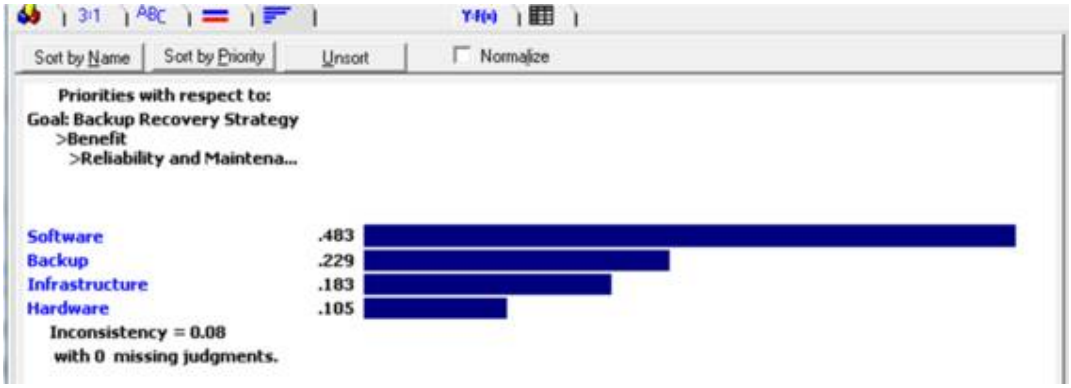

Figure 4.23. Reliability and Maintenance Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 48.3% SOFTWARE;

b. 22.9% BACKUP;

c. 18.3% INFRASTRUCTURE;

d. 10.5% HARDWARE;

e. Inconsistency ratio of 0.08 or 8%.

Benefit \Reliability and Maintenance \Hardware

The priorities with respect to pairwise comparison results and goal backup recovery strategy in reliability and maintenance-hardware can be seen in the following figure.

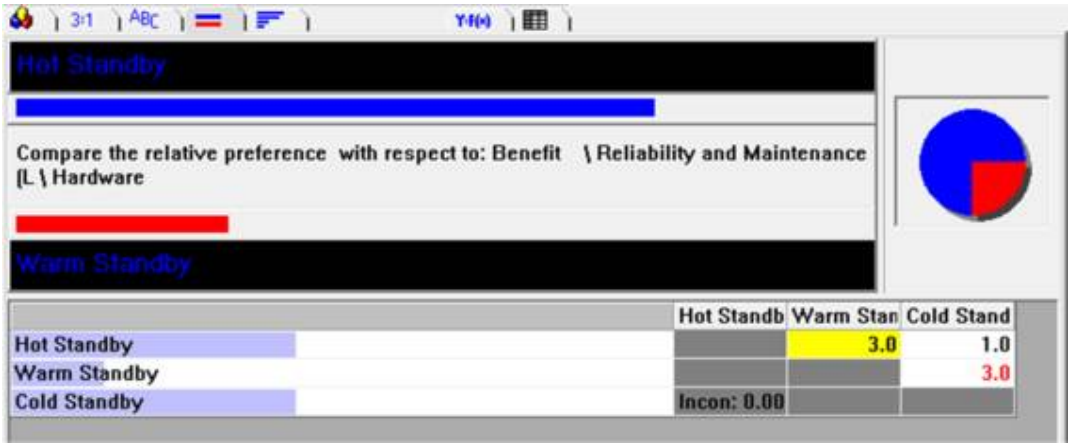

Figure 4.24. Reliability and Maintenance-Hardware Pairwise Comparison
Source: Self Proceed

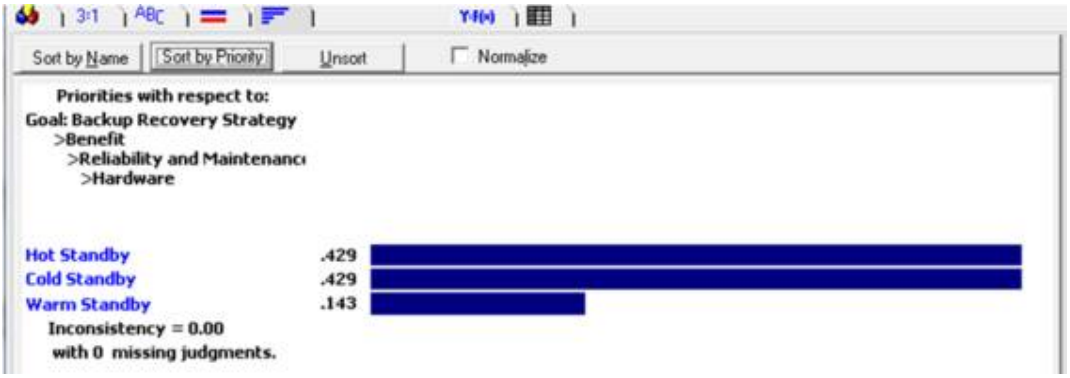

Figure 4.25. Reliability and Maintenance-Hardware Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 42.9% HOT STANDBY;

b. 42.9% COLD STANDBY;

c. 14.3% WARM STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Benefit \Reliability and Maintenance \Software

The priorities with respect to pairwise comparison results and goal backup recovery strategy in reliability and maintenance-software can be seen in the following figure.

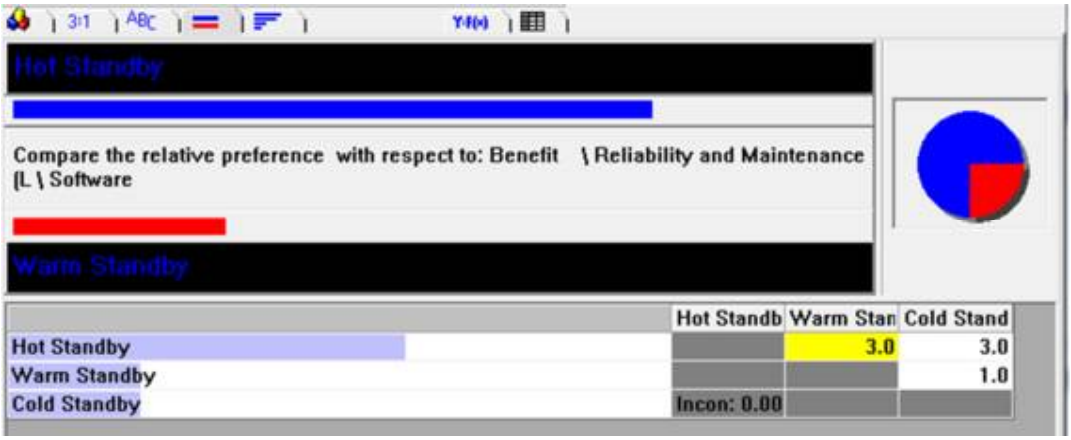

Figure 4.26. Reliability and Maintenance-Software Pairwise Comparison
Source: Self Proceed

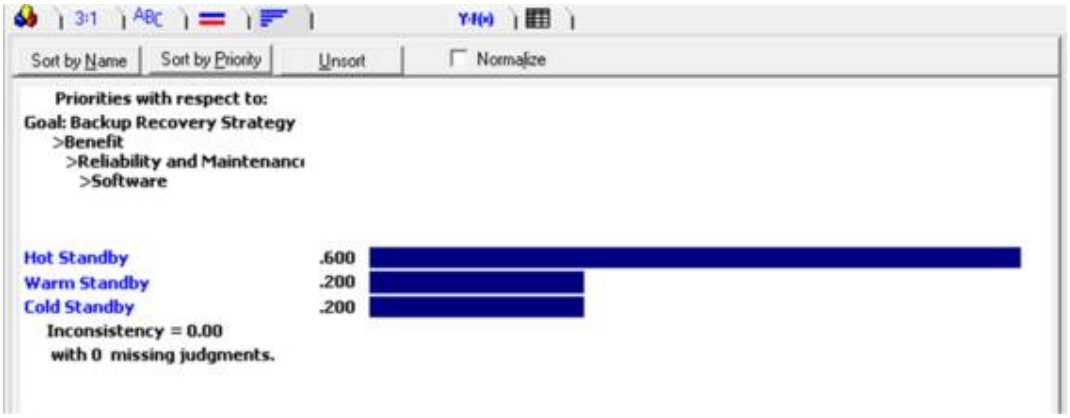

Figure 4.27. Reliability and Maintenance-Software Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 60% HOT STANDBY;

b. 20% WARM STANDBY;

c. 20% COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Benefit \Reliability and Maintenance \Infrastructure

The priorities with respect to pairwise comparison results and goal backup recovery strategy in reliability and maintenance-infrastructure can be seen in the following figure.

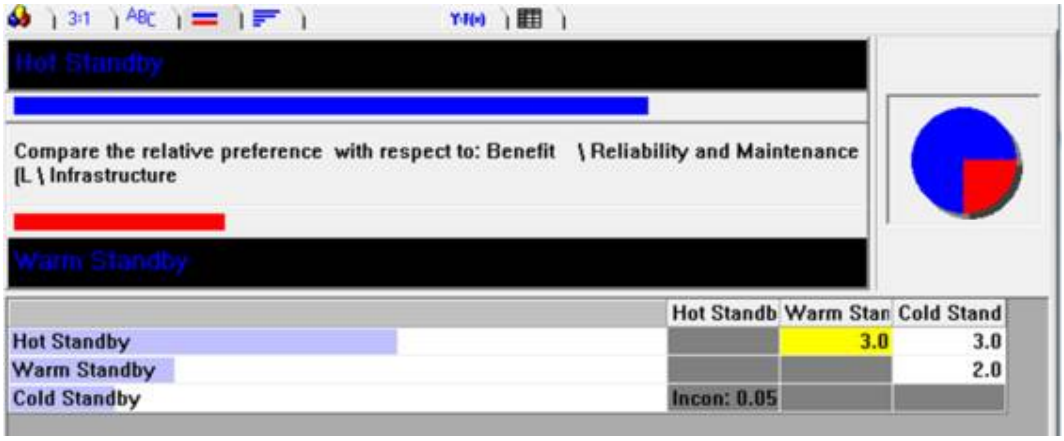

Figure 4.28. Reliability and Maintenance-Infrastructure Pairwise Comparison
Source: Self Proceed

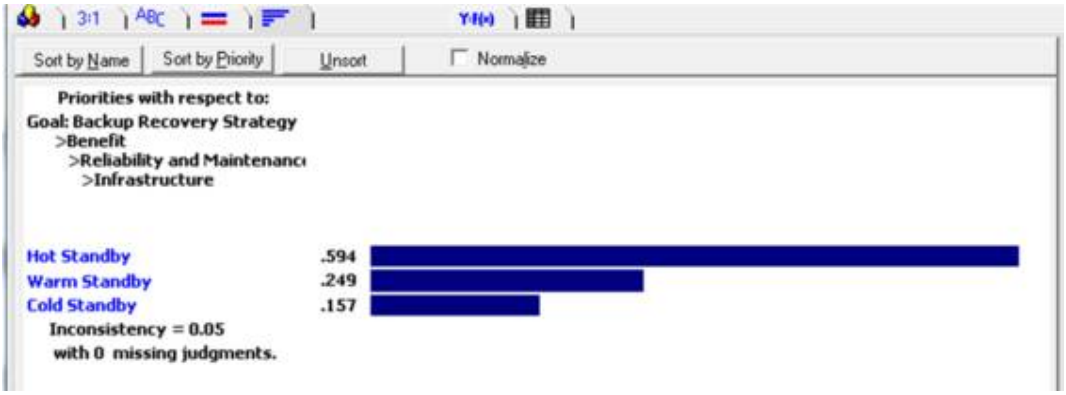

Figure 4.29. Reliability and Maintenance-Infrastructure Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 59.4% HOT STANDBY;

b. 24.9% WARM STANDBY;

c. 15.7% COLD STANDBY;

d. with an inconsistency ratio of 0.05 or 5%.

Benefit \Reliability and Maintenance \Backup

The priorities with respect to pairwise comparison results and goal backup recovery strategy in reliability and maintenance-backup can be seen in the following figure.

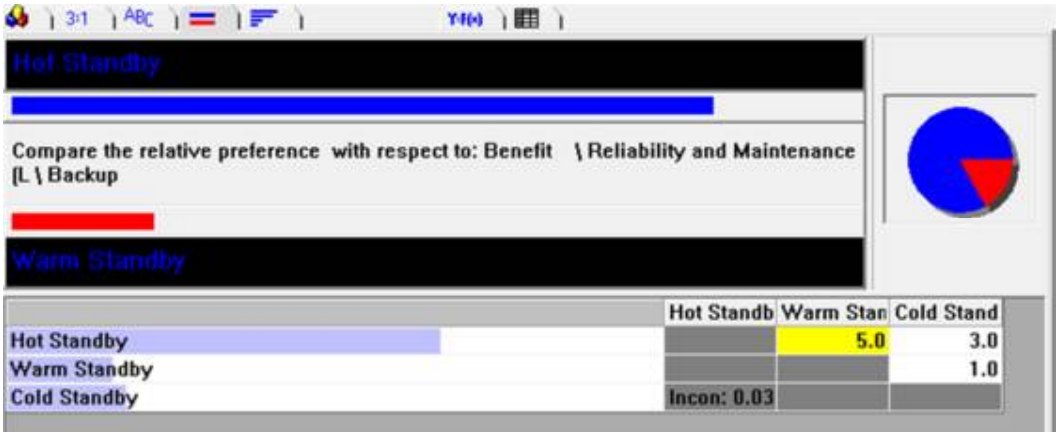

Figure 4.30. Reliability and Maintenance-Backup Pairwise Comparison
Source: Self Proceed

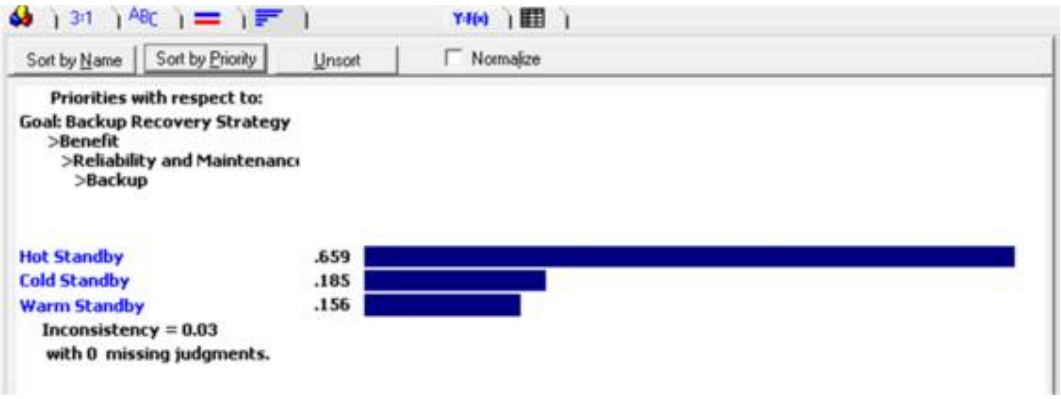

Figure 4.31. Reliability and Maintenance-Backup Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 65.9% HOT STANDBY;

b. 18.5% COLD STANDBY;

c. 15.6% WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

iii. Benefit \Trust

The priorities with respect to pairwise comparison results and goal backup recovery strategy in trust sub-criteria can be seen in the following figure.

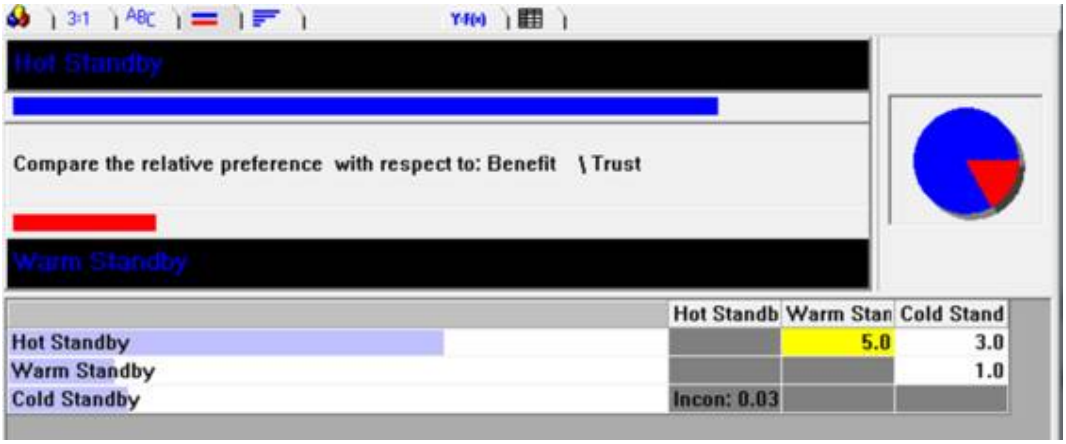

Figure 4.32. Trust Pairwise Comparison
Source: Self Proceed

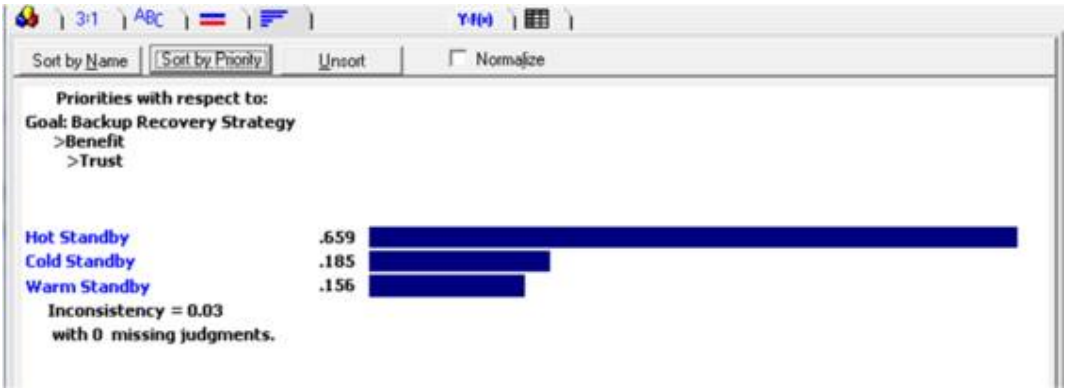

Figure 4.33. Trust Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 65.9% HOT STANDBY;

b. 18.5% COLD STANDBY;

c. 15.6% WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

4.2.3 COST CRITERIA

The priorities with respect to pairwise comparison results and goal backup recovery strategy in cost criteria can be seen in the following figure.

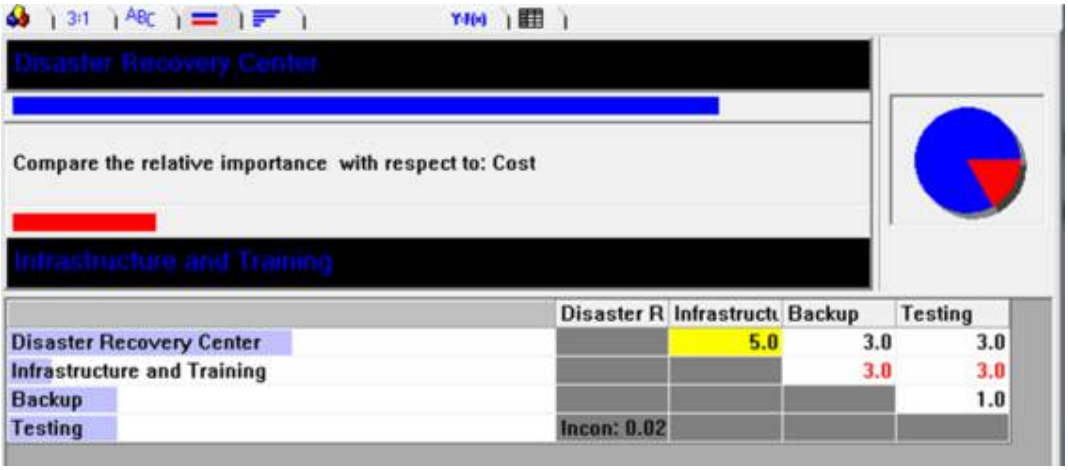

Figure 4.34. Cost Pairwise Comparison
Source: Self Proceed

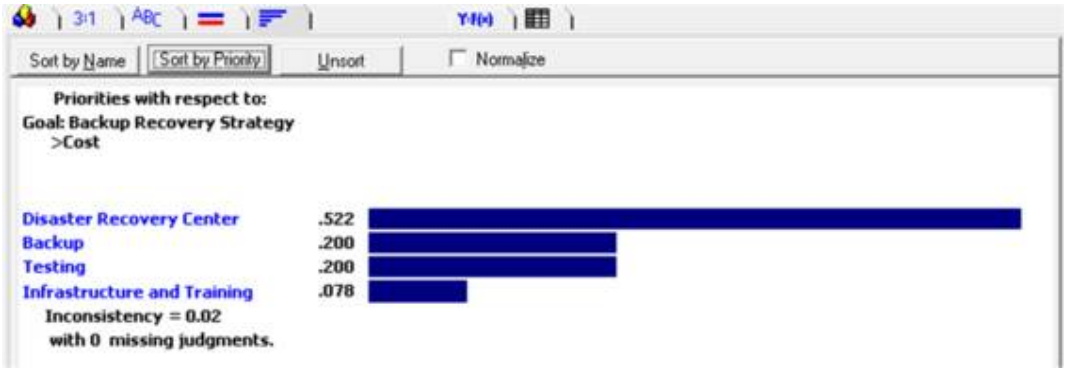

Figure 4.35. Cost Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 52.2% DISASTER RECOVERY CENTER sub-criteria;

b. 20% BACKUP sub-criteria;

c. 20% TESTING sub-criteria;

d. 7.8% INFRASTRUCTURE AND TRAINING sub-criteria;

e. Inconsistency ratio of 0.02 or 2%.

i. Cost \Disaster Recovery Center

The priorities with respect to pairwise comparison results and goal backup recovery strategy in disaster recovery center sub-criteria can be seen in the following figure.

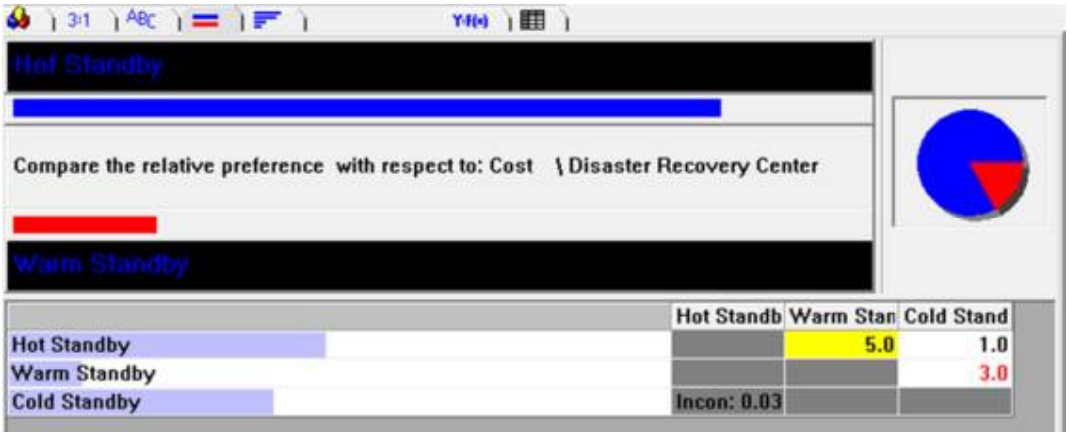

Figure 4.36. Disaster Recovery Center Pairwise Comparison
Source: Self Proceed

Figure 4.37. Disaster Recovery Center Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 48.1% HOT STANDBY;

b. 40.5% COLD STANDBY;

c. 11.4% WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

ii. Cost \Infrastructure and Training

The priorities with respect to pairwise comparison results and goal backup recovery strategy in infrastructure and training sub-criteria can be seen in the following figure.

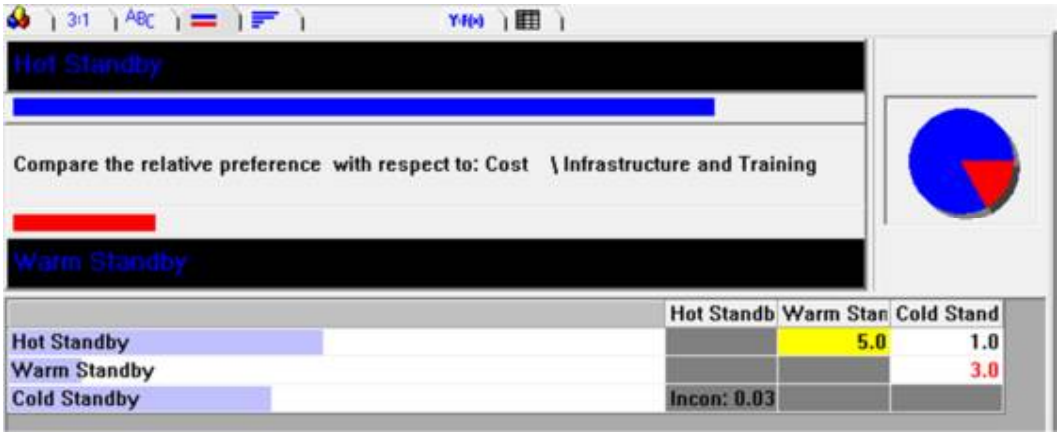

Figure 4.38. Infrastructure and Training Pairwise Comparison
Source: Self Proceed

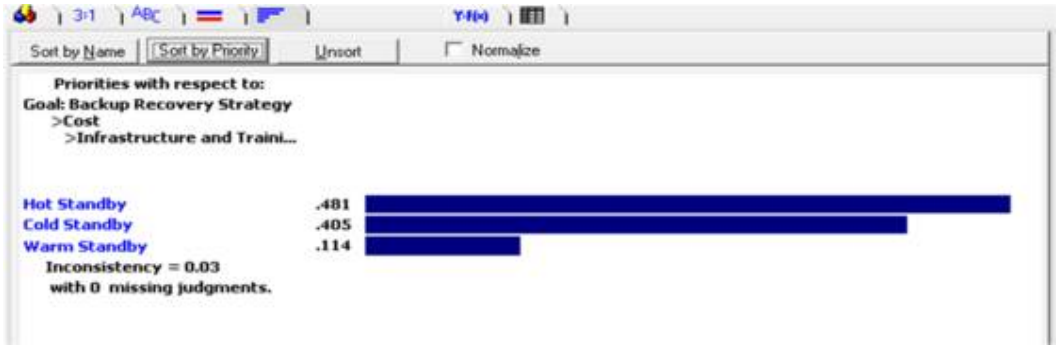

Figure 4.39. Infrastructure and Training Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 48.1% HOT STANDBY;

b. 40.5% COLD STANDBY;

c. 11.4% WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

iii. Cost \Backup

The priorities with respect to pairwise comparison results and goal backup recovery strategy in cost-backup sub-criteria can be seen in the following figure.

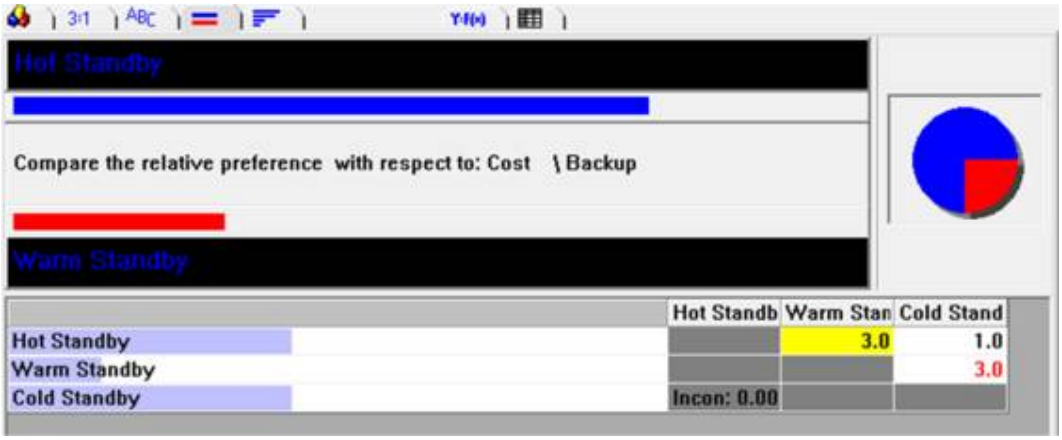

Figure 4.40. Cost-Backup Pairwise Comparison
Source: Self Proceed

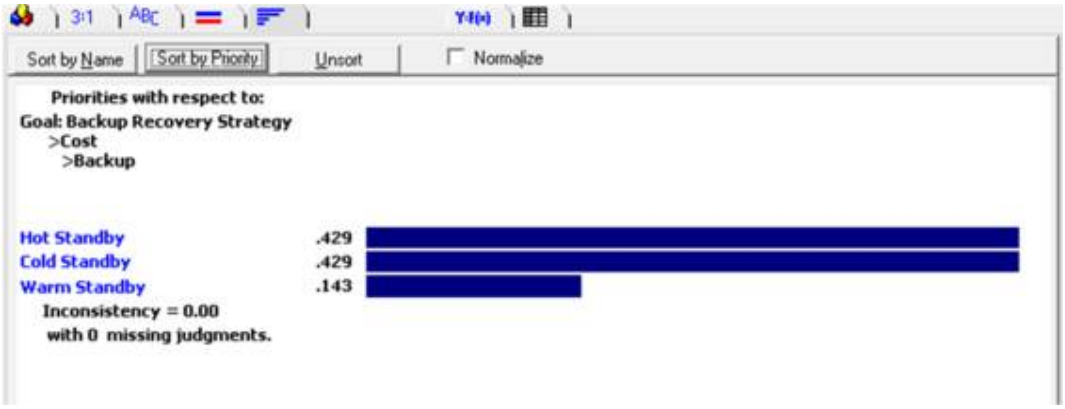

Figure 4.41. Cost-Backup Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 42.9% HOT STANDBY;

b. 42.9% COLD STANDBY;

c. 14.3% WARM STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

iv. Cost \Testing

The priorities with respect to pairwise comparison results and goal backup recovery strategy in cost-testing sub-criteria can be seen in the following figure.

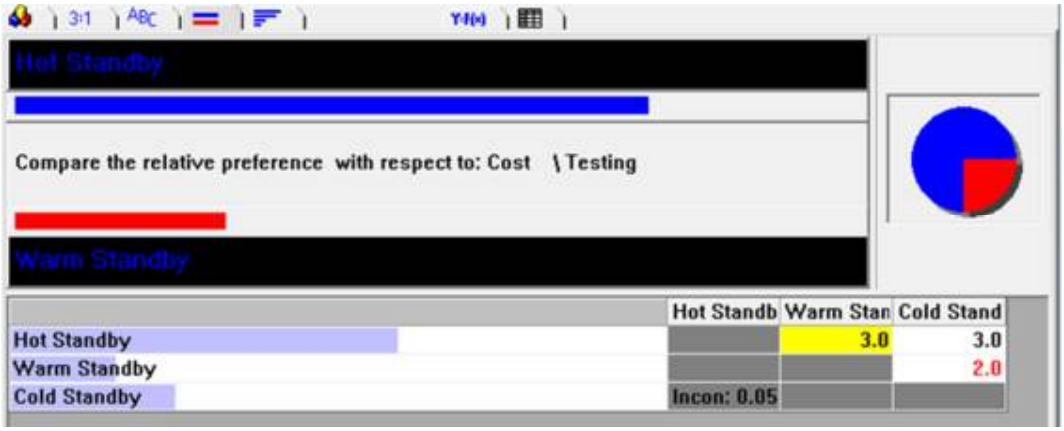

Figure 4.42. Cost-Testing Pairwise Comparison
Source: Self Proceed

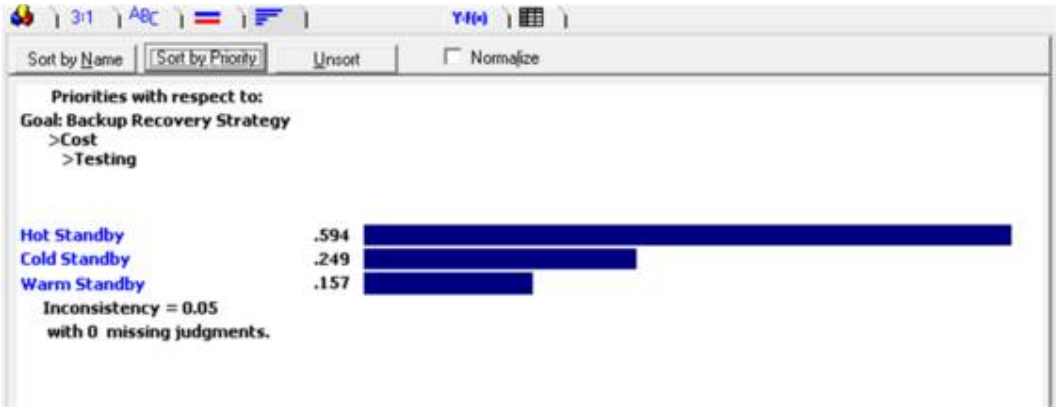

Figure 4.43. Cost-Testing Priority
Source: Self Proceed

The weighting results of expert respondents are:

a. 59.4% HOT STANDBY;

b. 24.9% COLD STANDBY;

c. 15.7% WARM STANDBY;

d. Inconsistency ratio of 0.05 or 5%.

4.3 SYNTHESIZE

The synthesize results of the backup recovery strategy from expert respondents with a focus group discussion can be seen in the following description.

4.3.1 SYNTHESIZE OF BENEFIT CRITERIA

The synthesis of benefit criteria can be seen in the following figure.

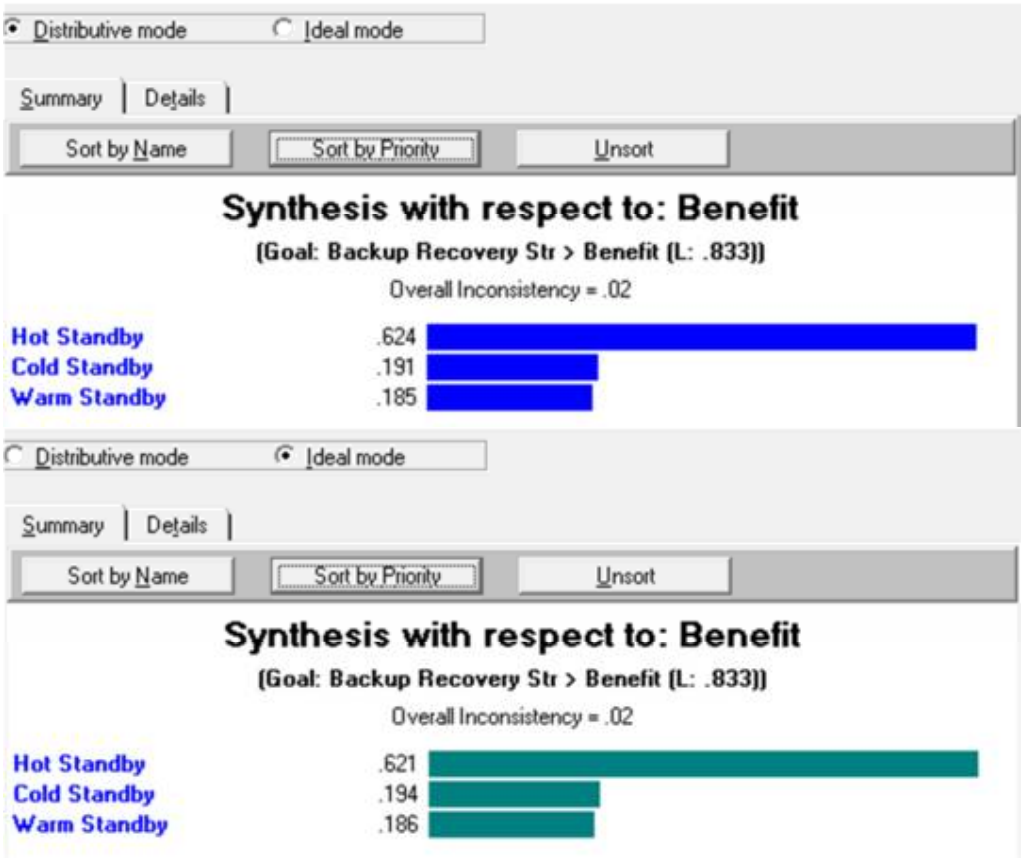

Figure 4.44. Synthesis of Benefit Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;
b. COLD STANDBY;
c. WARM STANDBY;
d. Inconsistency ratio of 0.02 or 2%.

i. Synthesis of Risk

The synthesis of risk sub-criteria can be seen in the following figure.

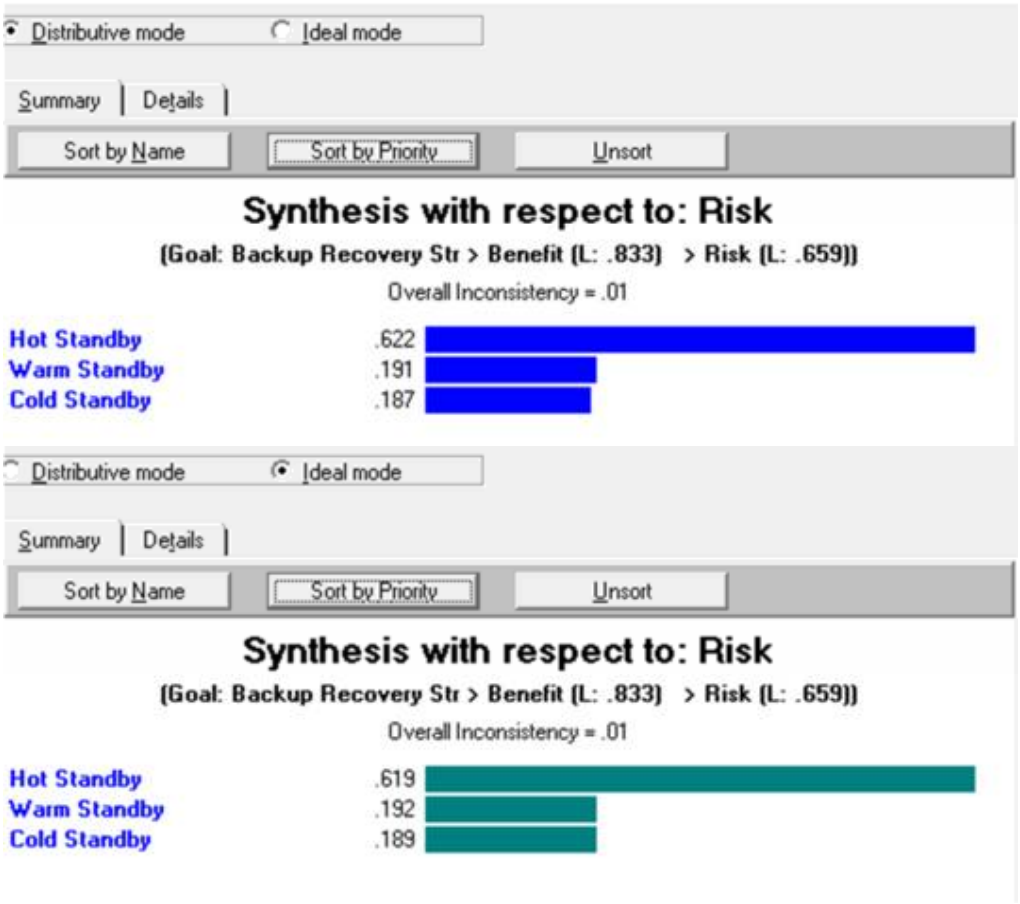

Figure 4.45. Synthesis of Risk Sub-Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.01 or 1%.

Synthesis of Benefit \Risk \Hardware

The synthesis of risk-hardware can be seen in the following figure.

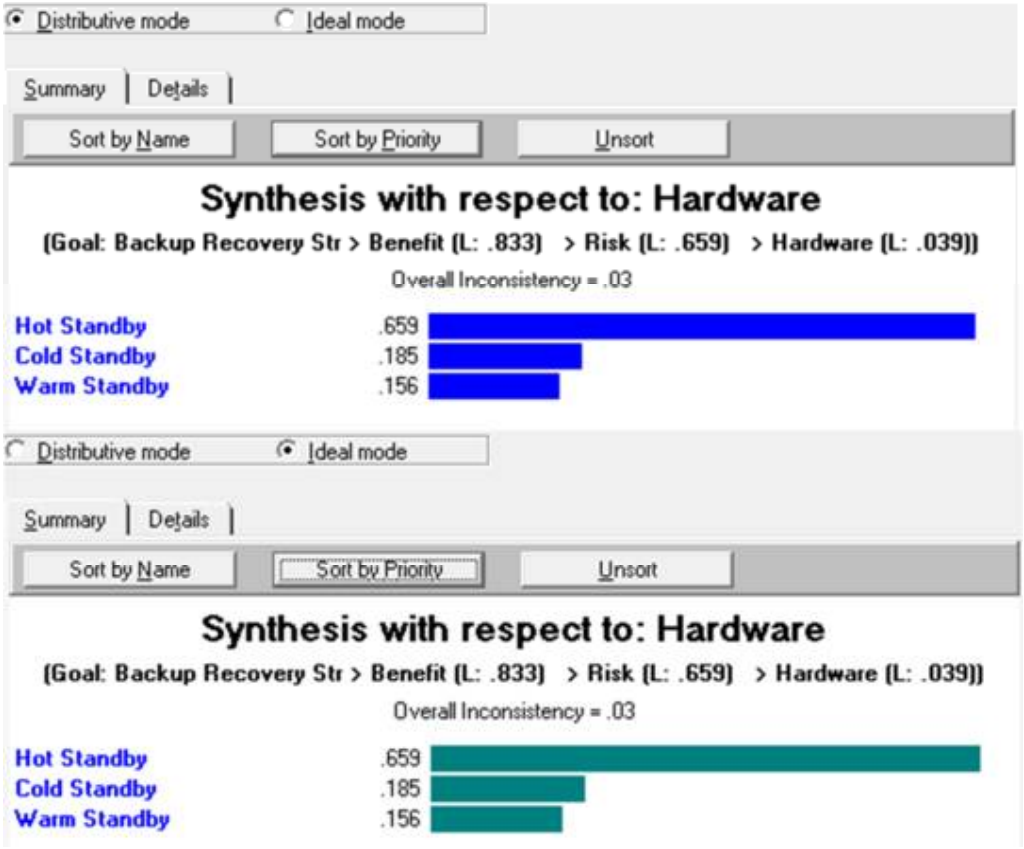

Figure 4.46. Synthesis of Risk-Hardware
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

Synthesis of Benefit \Risk \Software

The synthesis of risk-software can be seen in the following figure.

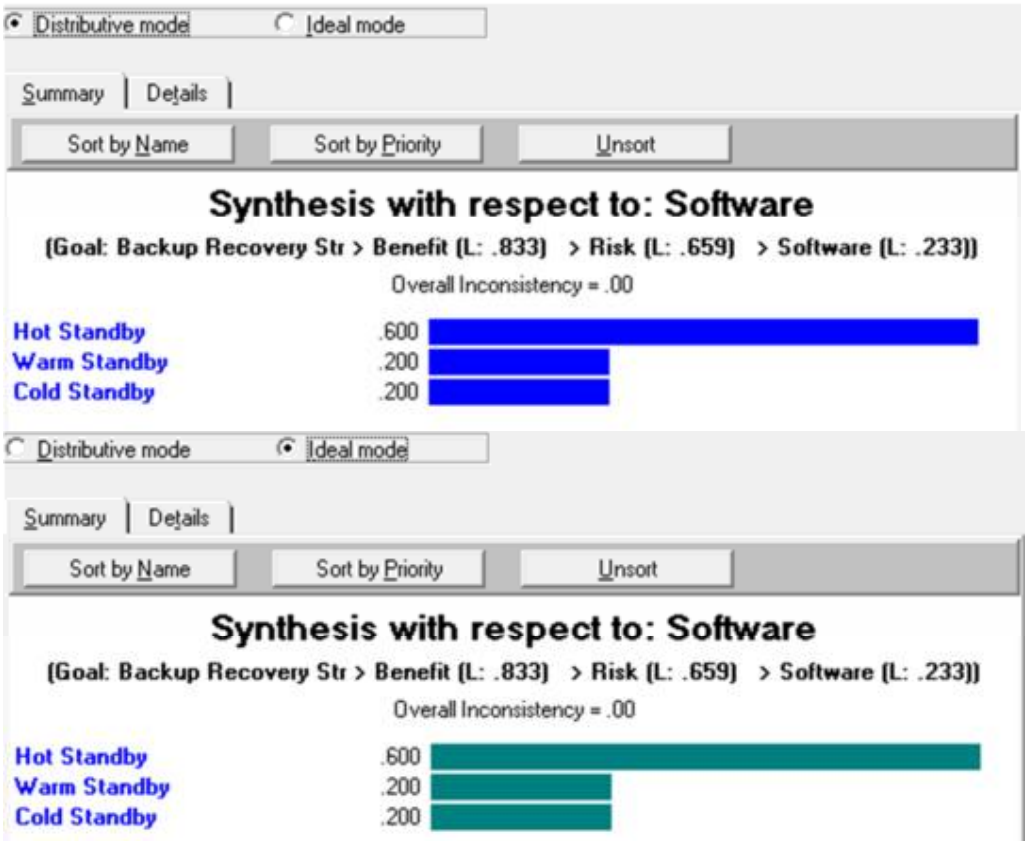

Figure 4.47. Synthesis of Risk-Software
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Synthesis of Benefit \Risk \Infrastructure and Procedure

The synthesis of risk-infrastructure and procedure can be seen in the following figure.

Figure 4.48. Synthesis of Risk-Infrastructure and Procedure
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Synthesis of Benefit \Risk \Backup

The synthesis of risk-backup can be seen in the following figure.

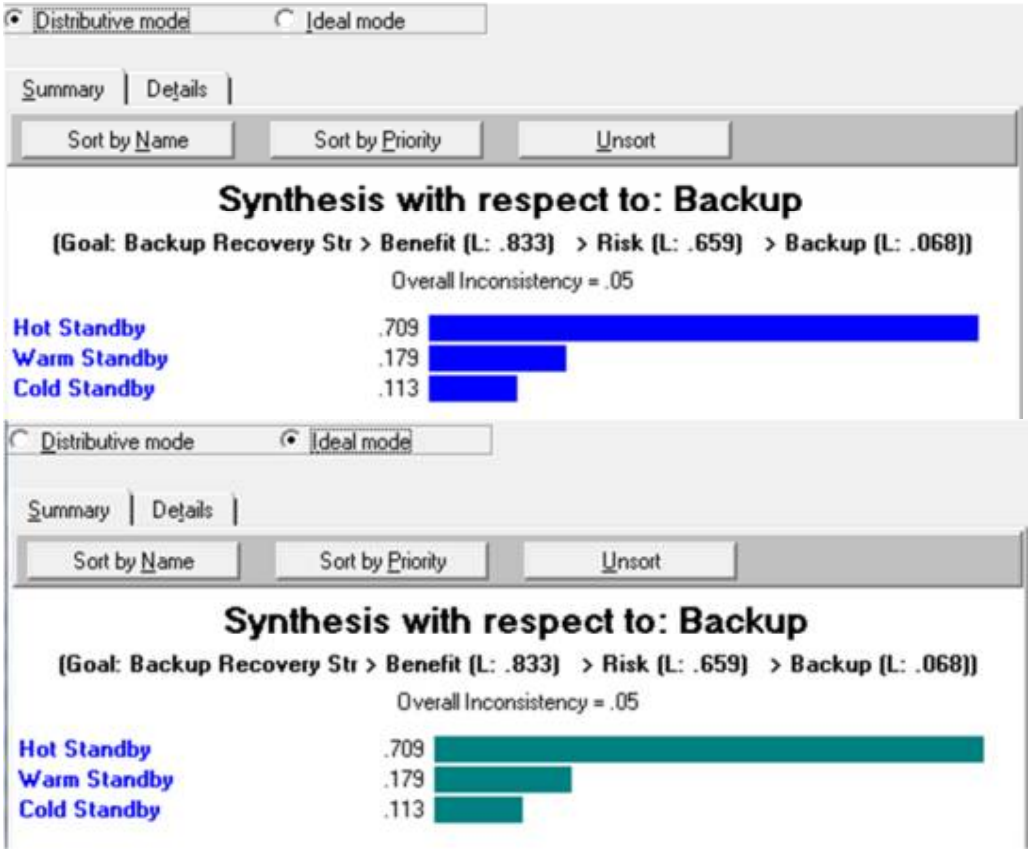

Figure 4.49. Synthesis of Risk-Backup
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.05 or 5%.

Synthesis of Benefit \Risk \Testing

The synthesis of risk-testing can be seen in the following figure.

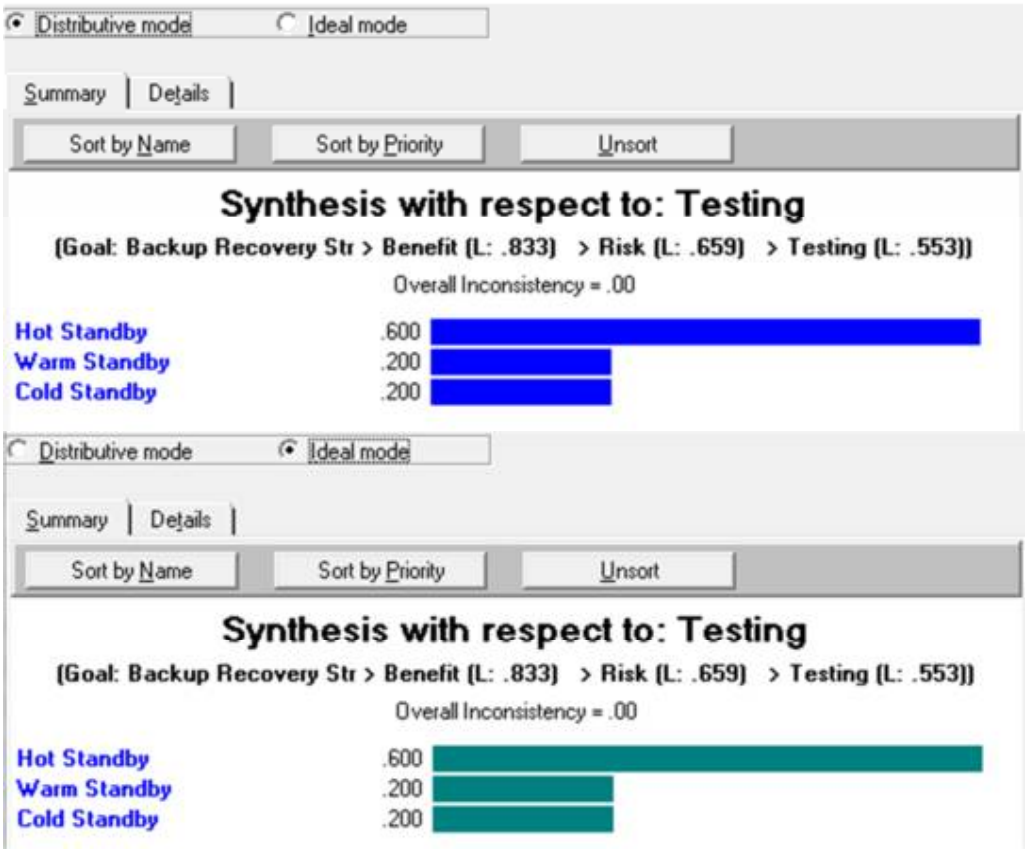

Figure 4.50. Synthesis of Risk-Testing
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

ii. Synthesis of Reliability and Maintenance

The synthesis of reliability and maintenance sub-criteria can be seen in the following figure.

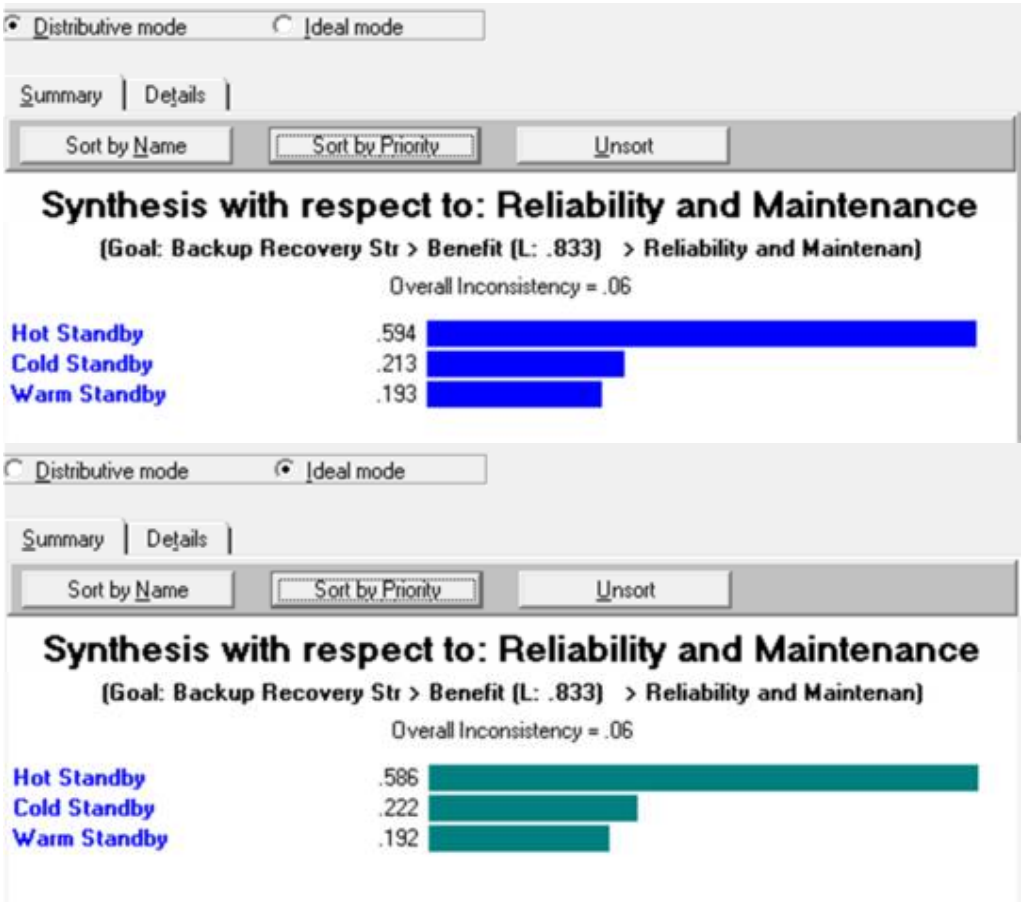

Figure 4.51. Synthesis of Reliability and Maintenance Sub-Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.06 or 6%.

Synthesis of Benefit \Reliability and Maintenance \Hardware

The synthesis of reliability and maintenance-hardware can be seen in the following figure.

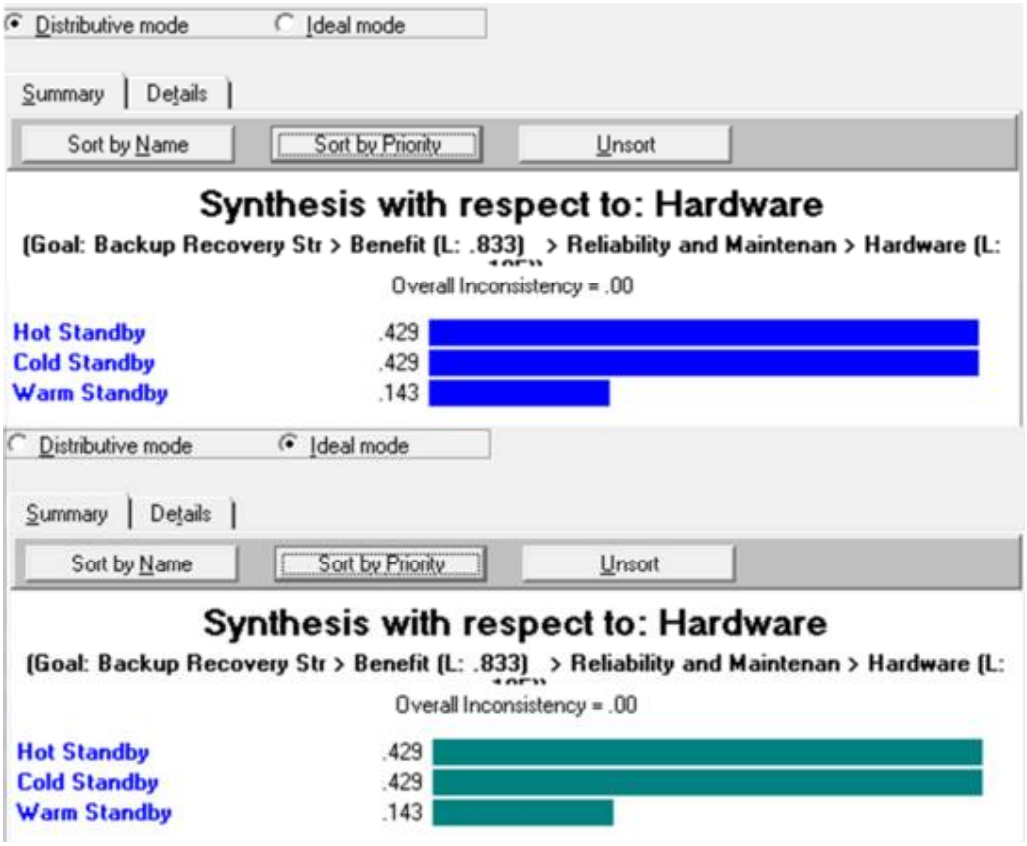

Figure 4.52. Synthesis of Reliability and Maintenance-Hardware
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Synthesis of Benefit \Reliability and Maintenance \Software

The synthesis of reliability and maintenance-software can be seen in the following figure.

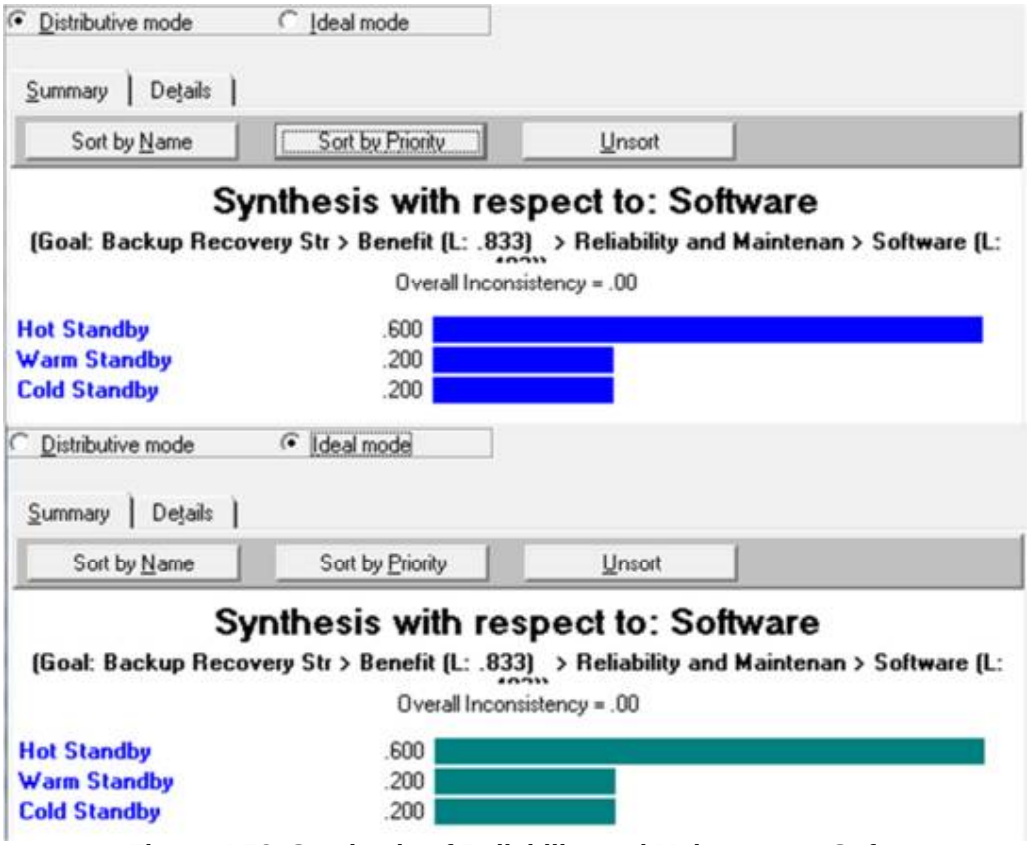

Figure 4.53. Synthesis of Reliability and Maintenance-Software
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

Synthesis of Benefit \Reliability and Maintenance \Infrastructure

The synthesis of reliability and maintenance-infrastructure and the procedure can be seen in the following figure.

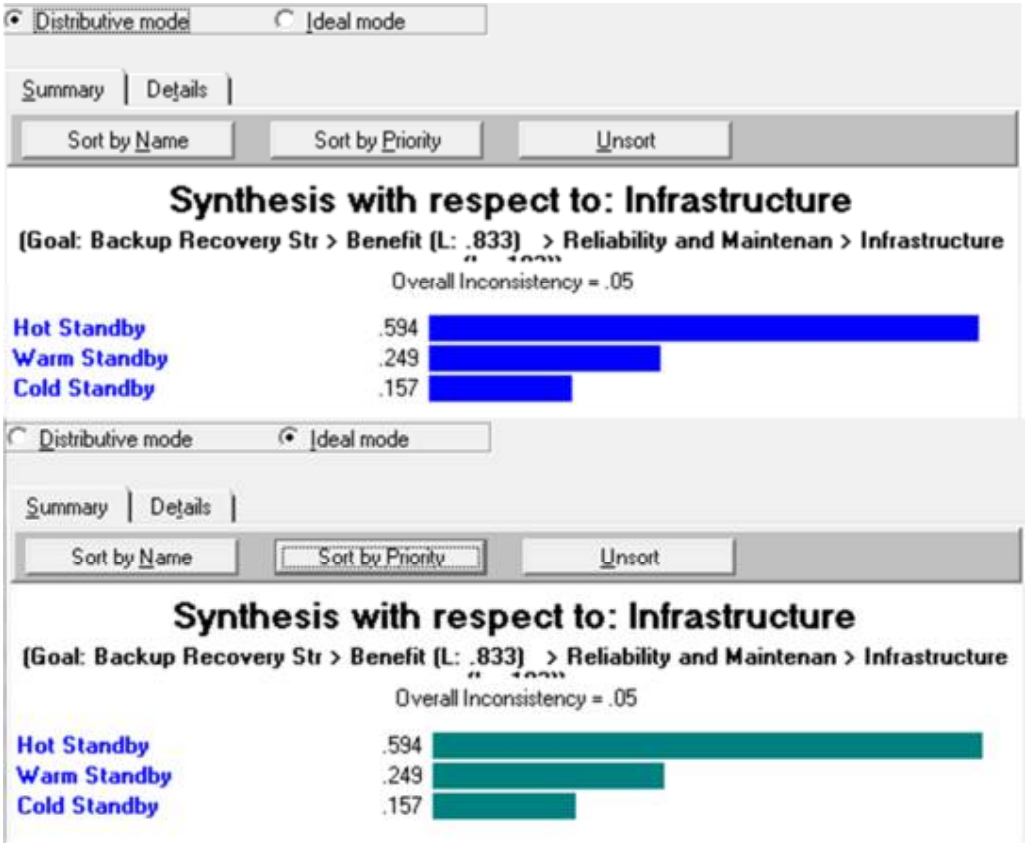

Figure 4.54. Synthesis of Reliability and Maintenance-Infrastructure
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.05 or 5%.

Synthesis of Benefit \Reliability and Maintenance \Backup

The synthesis of reliability and maintenance-backup can be seen in the following figure.

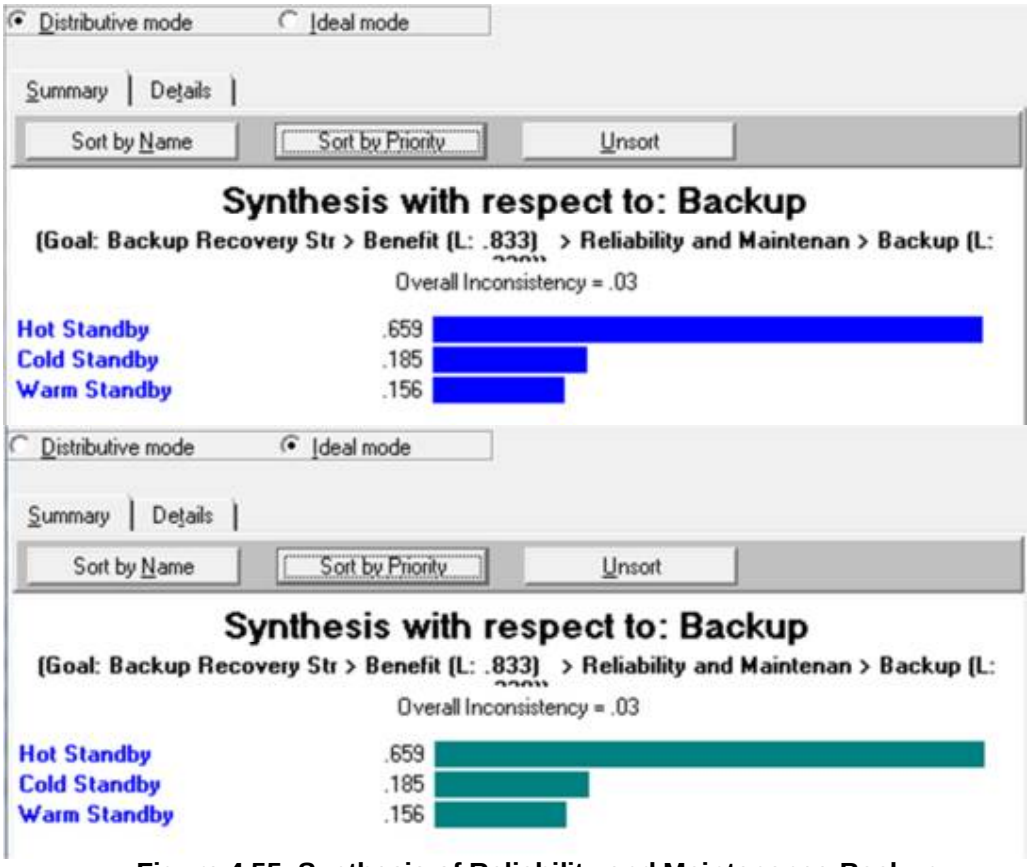

Figure 4.55. Synthesis of Reliability and Maintenance-Backup
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

iii. Synthesis of Trust

The synthesis of trust sub-criteria can be seen in the following figure.

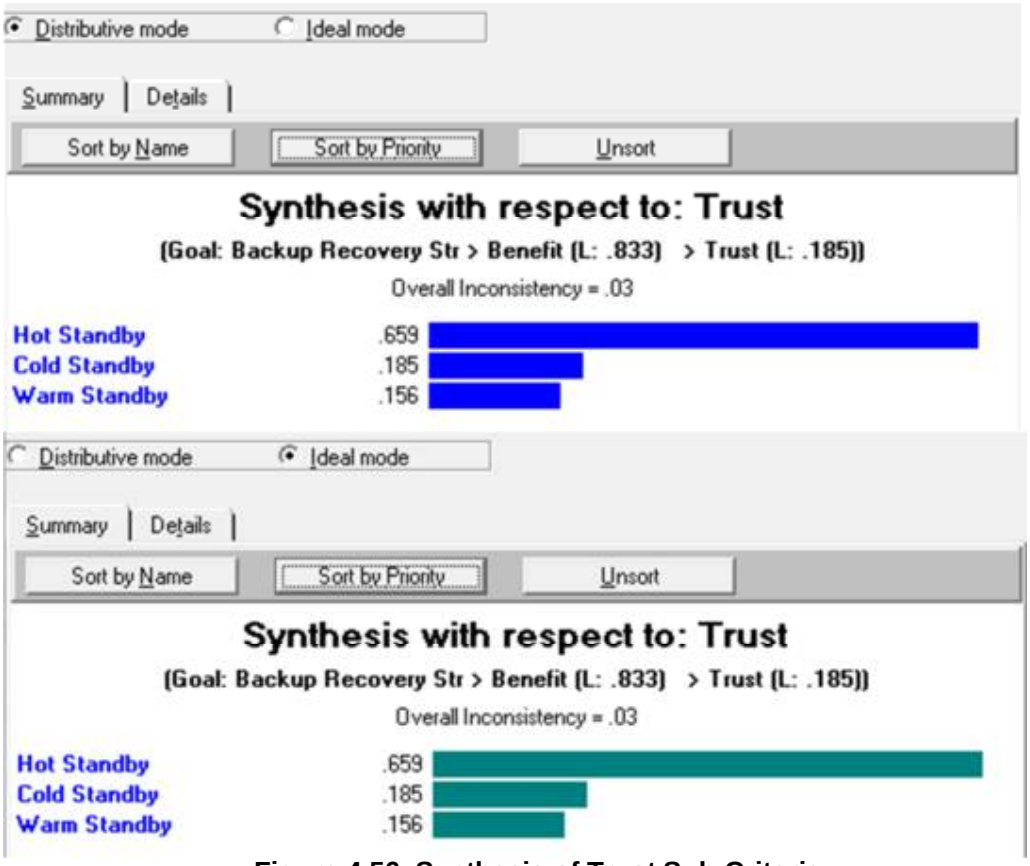

Figure 4.56. Synthesis of Trust Sub-Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

4.3.2 SYNTHESIZE OF COST CRITERIA

The synthesis of cost criteria can be seen in the following figure.

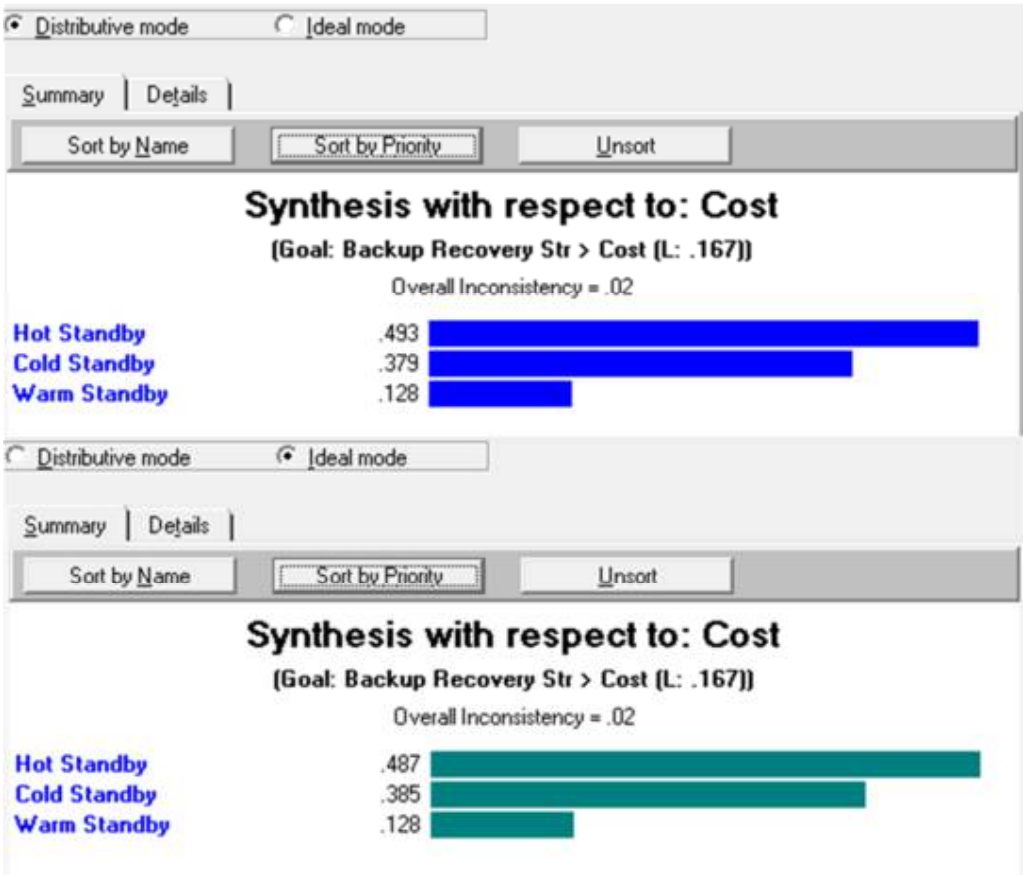

Figure 4.57. Synthesis of Cost Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

e. Inconsistency ratio of 0.02 or 2%.

i. Synthesis of the Disaster Recovery Center

The synthesis of disaster recovery center sub-criteria can be seen in the following figure.

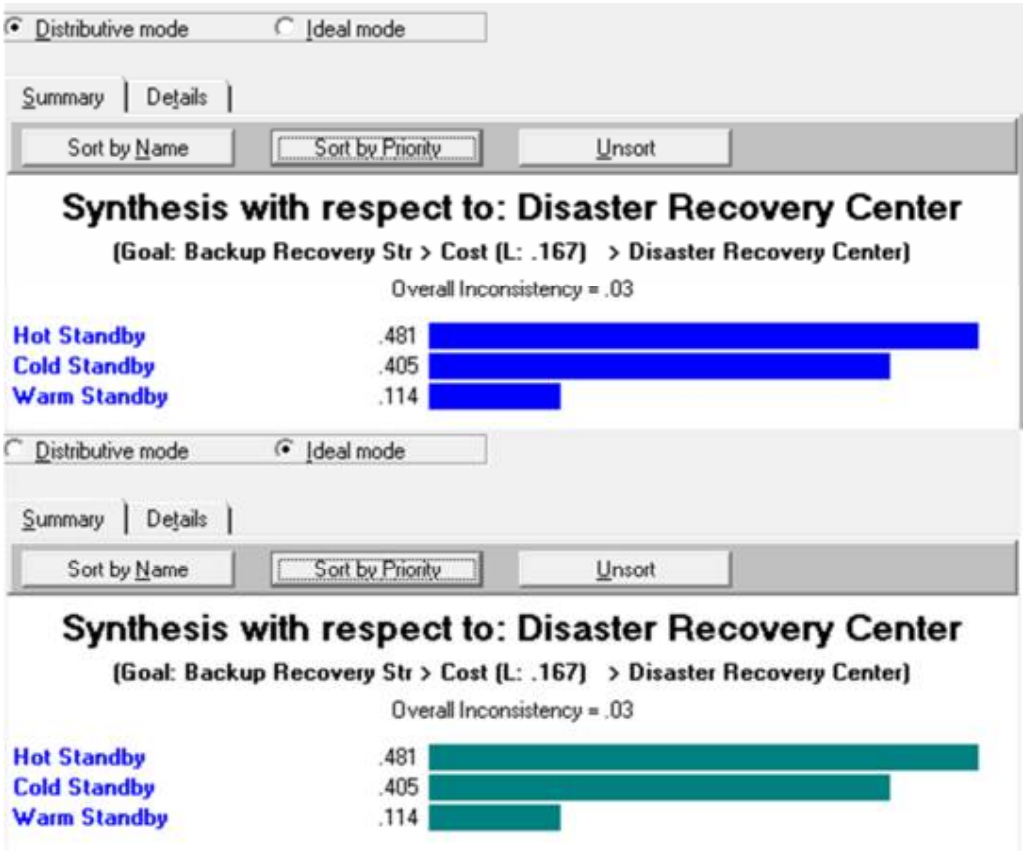

Figure 4.58. Synthesis of Disaster Recovery Center Sub-Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. WARM STANDBY;

c. COLD STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

ii. Synthesis of Infrastructure and Training

The synthesis of infrastructure and training sub-criteria can be seen in the following figure.

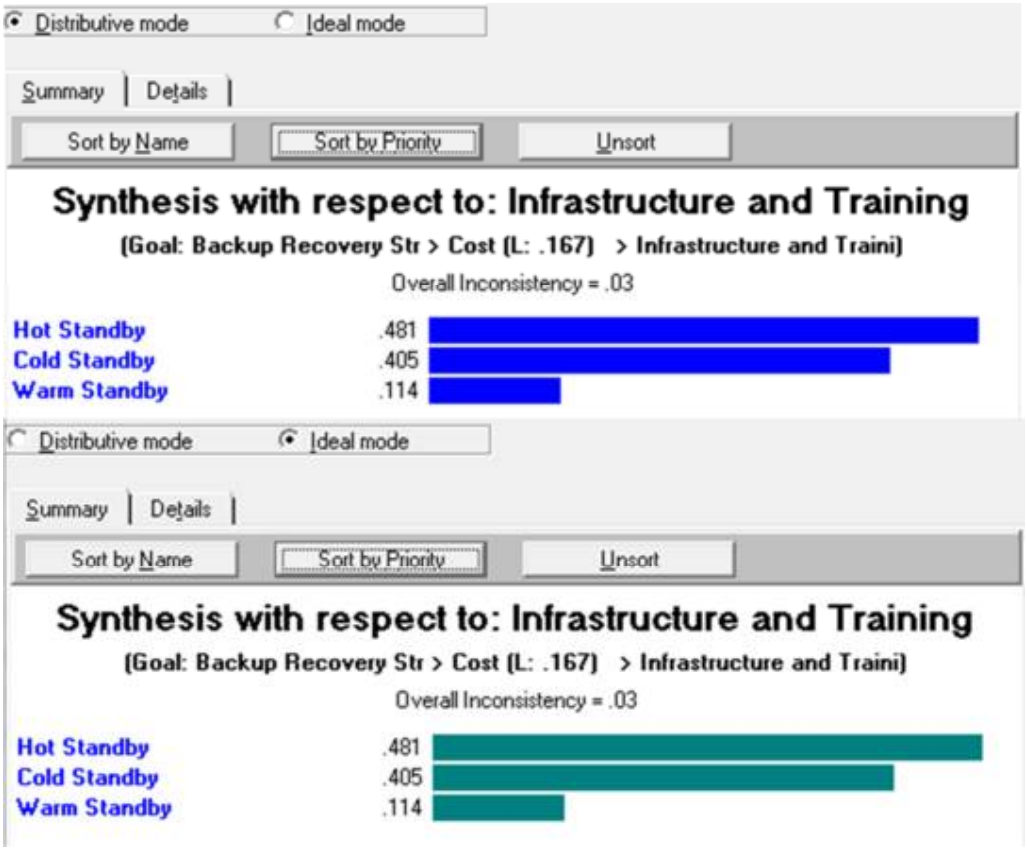

Figure 4.59. Synthesis of Infrastructure and Training Sub-Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.03 or 3%.

iii. Synthesis of Backup

The synthesis of backup sub-criteria can be seen in the following figure.

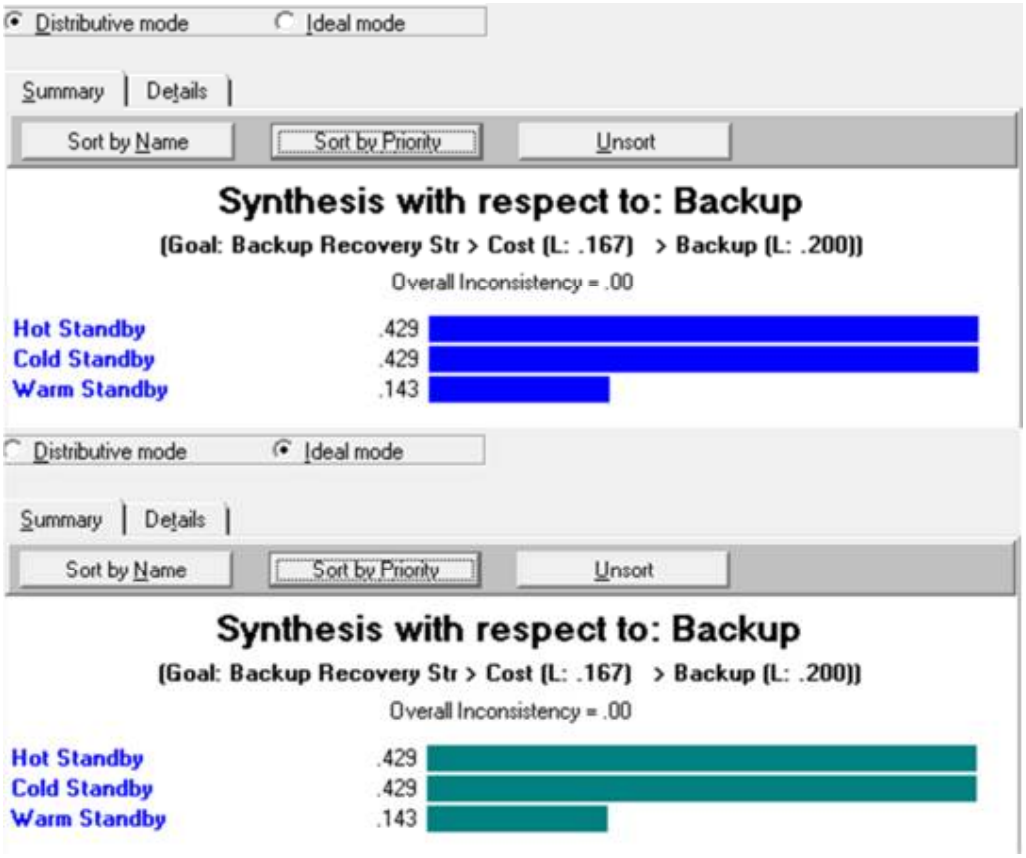

Figure 4.60. Synthesis of Backup Sub-Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.00 or 0%.

iv. Synthesis of Testing

The synthesis of testing sub-criteria can be seen in the following figure.

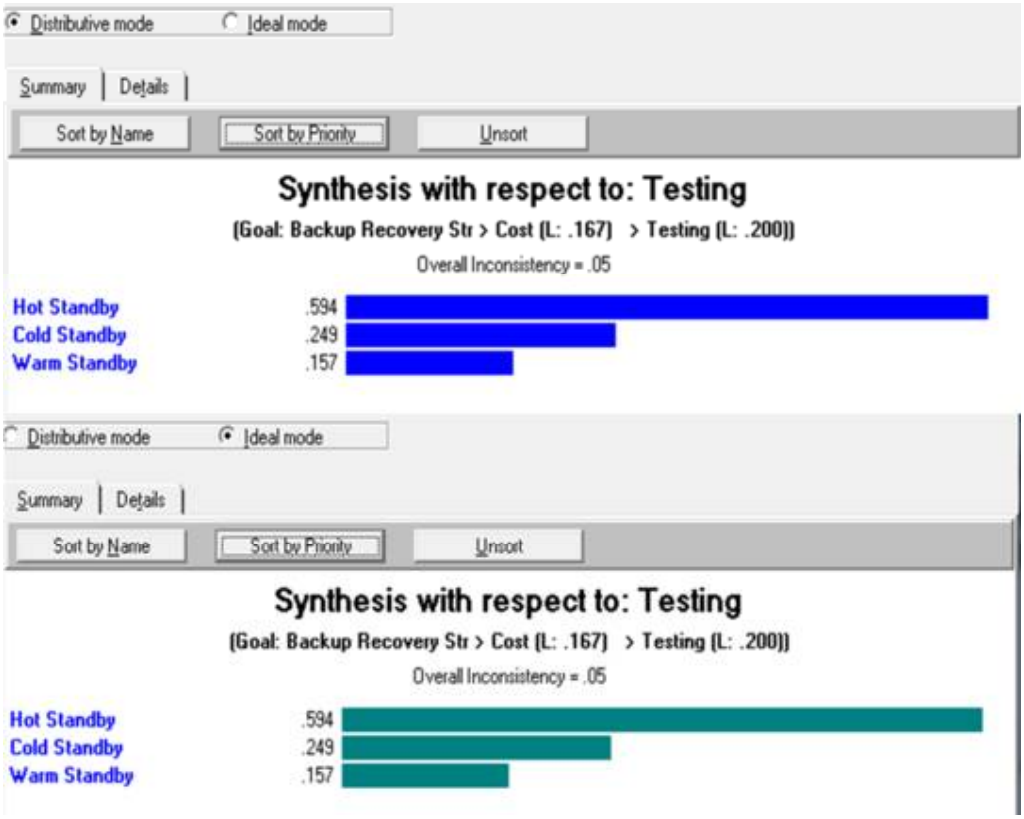

Figure 4.61. Synthesis of Testing Sub-Criteria
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.05 or 5%.

4.3.3 THE SYNTHESIS GOAL

The synthesis with respect to goal backup recovery strategy can be seen in the following figure.

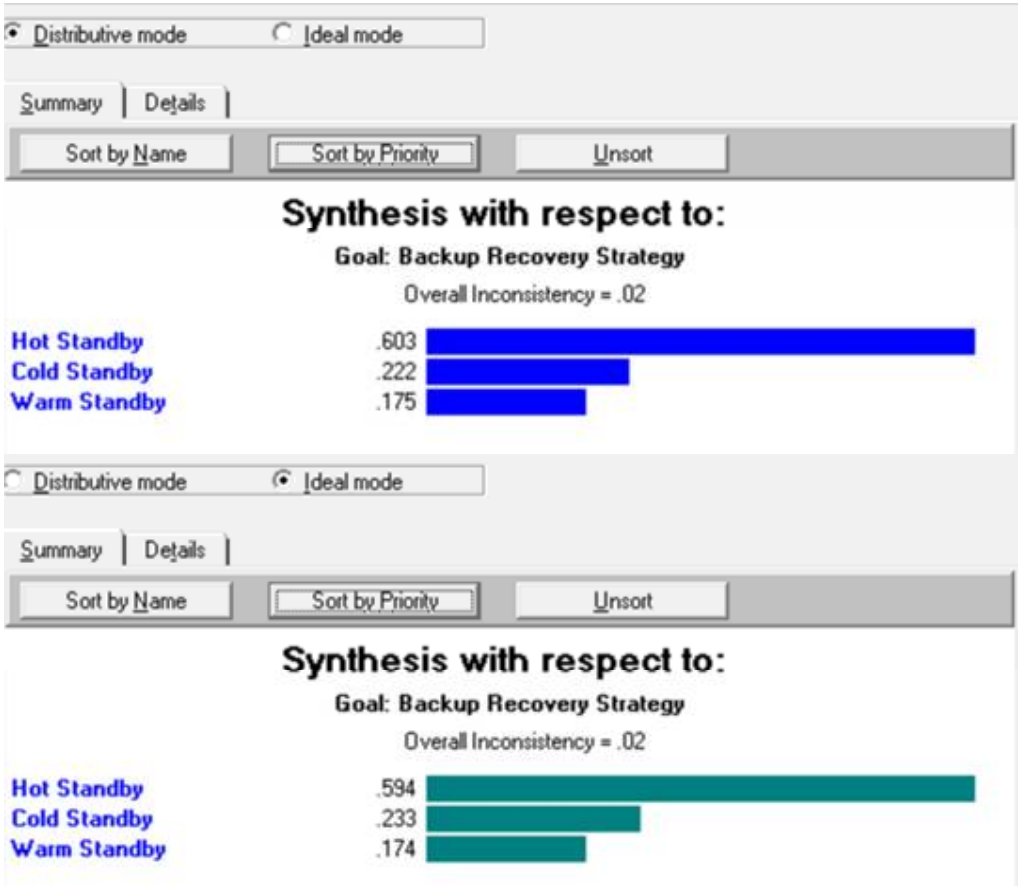

Figure 4.62. Synthesis with Respect to Goal
Source: Self Proceed

The weighting results of expert respondents are:

a. HOT STANDBY;

b. COLD STANDBY;

c. WARM STANDBY;

d. Inconsistency ratio of 0.02 or 2%.

4.4 SENSITIVITY GRAPHS

The results of sensitivity graphs for the benefit and cost criteria can be seen in processing data using the expert choice application below.

4.4.1 PERFORMANCE SENSITIVITY GRAPHS

The performance sensitivity graphs with respect to goal backup recovery strategy can be seen in the following figure.

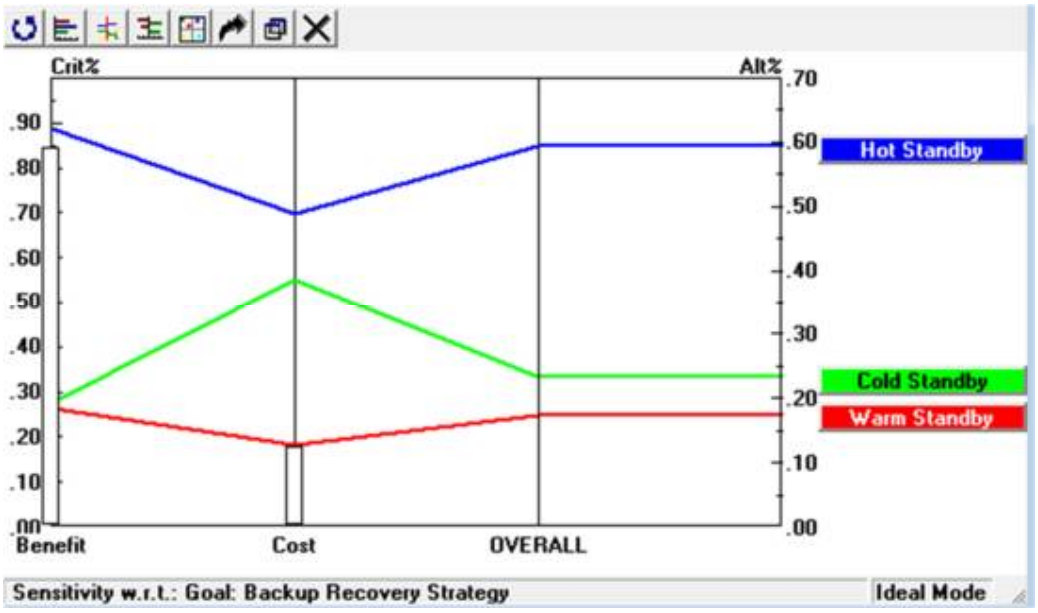

Figure 4.63. Performance Sensitivity Graphs
Source: Self Proceed

From the performance sensitivity graphic figure above, a sequence decision can be made by expert respondents:

a. HOT STANDBY;

b. COLD STANDBY; and

c. WARM STANDBY.

4.4.2 DYNAMIC SENSITIVITY GRAPHS

The dynamic sensitivity graphs with respect to goal backup recovery strategy can be seen in the following figure.

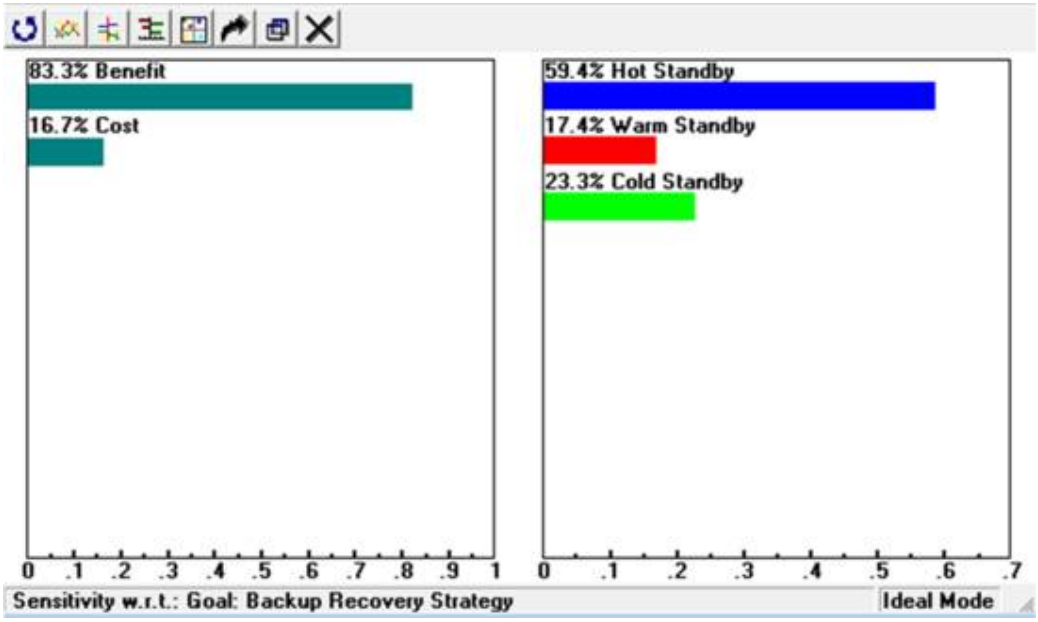

Figure 4.64. Performance Sensitivity Graphs
Source: Self Proceed

From the dynamic sensitivity graphic figure above, a sequence decision can be made by expert respondents:

a. BENEFIT 83.3%;

b. COST 16.7%;

c. HOT STANDBY 59.4%;

d. COLD STANDBY 23.3%; and

e. WARM STANDBY 17.4%.

4.4.3 GRADIENT SENSITIVITY GRAPHS

The gradient sensitivity graphs with respect to goal backup recovery strategy can be seen in the following figure.

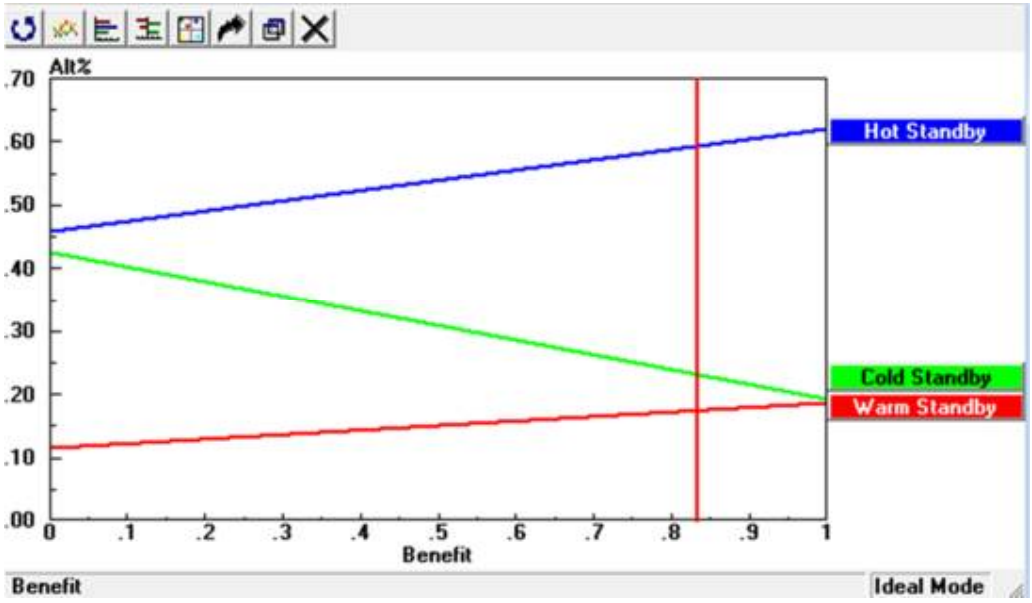

Figure 4.65. Gradient Sensitivity Graphs
Source: Self Proceed

From the gradient sensitivity graphic figure above, a sequence decision can be made by expert respondents:

a. HOT STANDBY;

b. COLD STANDBY; and

c. WARM STANDBY.

4.4.4 HEAD TO HEAD SENSITIVITY GRAPHS

The head to head sensitivity graphs with respect to goal backup recovery strategy can be seen in the following figure.

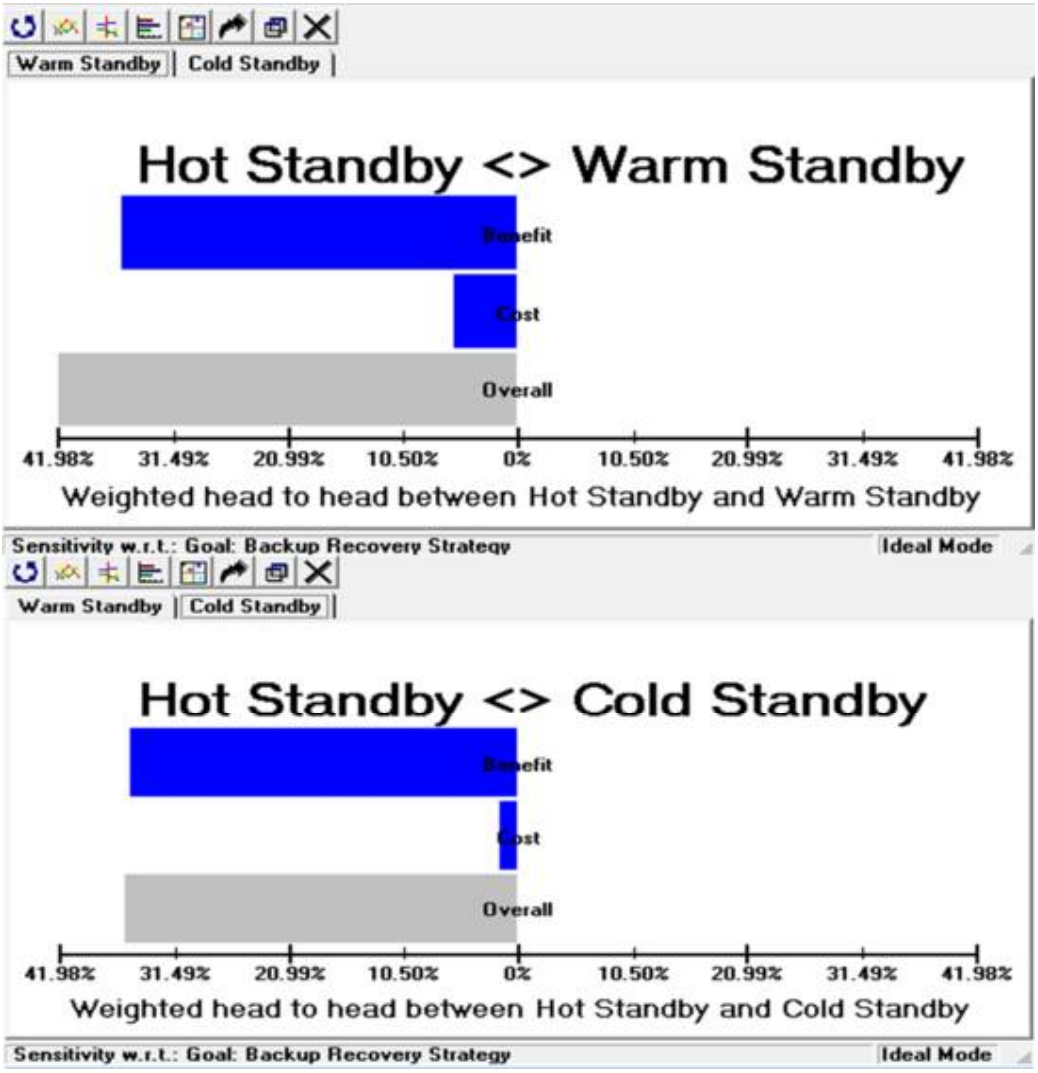

Figure 4.66. Head to Head Sensitivity Graphs
Source: Self Proceed

From the head to head sensitivity graphic figure above, a sequence decision can be made by expert respondents:

a. HOT STANDBY;

b. COLD STANDBY; and

c. WARM STANDBY.

4.4.5 TWO DIMENSIONAL SENSITIVITY GRAPHS

The two-dimensional sensitivity graphs with respect to goal backup recovery strategy can be seen in the following figure.

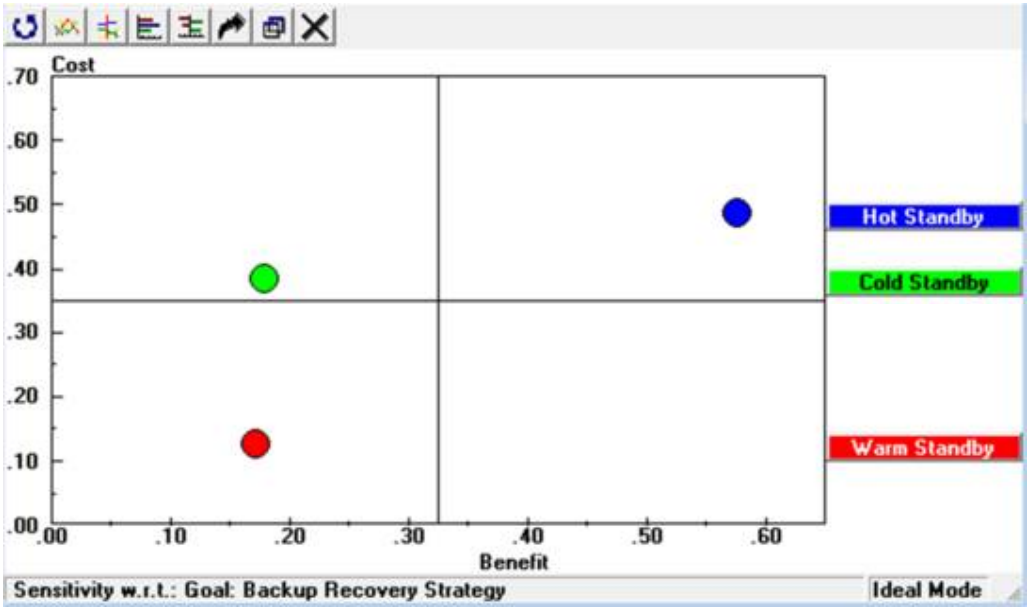

Figure 4.67. Two Dimensional Sensitivity Graphs
Source: Self Proceed

From the two-dimensional sensitivity graphic figures above, a sequence decision can be made by expert respondents:

a. HOT STANDBY;

b. COLD STANDBY; and

c. WARM STANDBY.

4.5 INCONSISTENCY RATIO

The weight value inconsistency ratio (CR) of the data collected from expert respondents is the parameter used to check whether the paired comparison has been done consistently or not. Data inconsistency ratios are considered good if the inconsistency ratio less than 0.1 (10 %).

4.5.1 BENEFIT INCONSISTENCY RATIO

The following is a table of inconsistency ratios of benefit criteria in the data collected from expert respondents can be seen in the following table.

Table 4.1. Inconsistency Ratio Table of Benefit Criteria

ELEMENT COMPARISON	THE CONSISTENCY RATIO (CR)
Benefit Criteria Priority	0.03
Risk Priority	0.01
Risk-Hardware Priority	0.03
Risk-Software Priority	0.00
Risk-Infrastructure and Procedure Priority	0.00
Risk-Backup Priority	0.05
Risk-Testing Priority	0.00

Reliability and Maintenance Priority	0.08
Reliability and Maintenance-Hardware Priority	0.00
Reliability and Maintenance-Software Priority	0.00
Reliability and Maintenance-Infrastructure Priority	0.05
Reliability and Maintenance-Backup Priority	0.03
Trust Priority	0.03
Synthesis of Benefit Criteria	0.02
Synthesis of Risk Sub-Criteria	0.01
Synthesis of Risk-Hardware	0.03
Synthesis of Risk-Software	0.00
Synthesis of Risk-Infrastructure and Procedure	0.00
Synthesis of Risk-Backup	0.05
Synthesis of Risk-Testing	0.00
Synthesis of Reliability and Maintenance Sub-Criteria	0.06

Synthesis of Reliability and Maintenance-Hardware	0.00
Synthesis of Reliability and Maintenance-Software	0.00
Synthesis of Reliability and Maintenance-Infrastructure	0.05
Synthesis of Reliability and Maintenance-Backup	0.03
Synthesis of Trust Sub-Criteria	0.03

Source: Self Proceed

From the benefit criteria inconsistency ratio table, collected from expert respondents can be concluded that the inconsistency ratio value is less than 0.1 (10 %), as the maximum inconsistency ratio value. So the inconsistency ratio value of the benefit criteria collected from expert respondents is consistent.

4.5.2 COST INCONSISTENCY RATIO

The following is a table of inconsistency ratios of cost criteria in the data collected from expert respondents can be seen in the following table.

Table 4.2. Inconsistency Ratio Table of Cost Criteria

ELEMENT COMPARISON	THE CONSISTENCY RATIO (CR)
Cost Criteria Priority	0.02
Disaster Recovery Center Priority	0.03
Infrastructure and Training Priority	0.03
Cost-Backup Priority	0.00
Cost-Testing Priority	0.05
Synthesis of Cost Criteria	0.02
Synthesis of Disaster Recovery Center Sub-Criteria	0.03
Synthesis of Infrastructure and Training Sub-Criteria	0.03
Synthesis of Backup Sub-Criteria	0.00
Synthesis of Testing Sub-Criteria	0.05

Source: Self Proceed

From the cost criteria inconsistency ratio table, collected from expert respondents can be concluded that the inconsistency ratio value is less than 0.1 (10 %), as the maximum inconsistency ratio value. So the inconsistency ratio value of the cost criteria collected from expert respondents is consistent.

4.5.3 GOALS PRIORITY INCONSISTENCY RATIO

The following is a table of inconsistency ratios of goals priority in the data collected from expert respondents can be seen in the following table.

Table 4.3. Inconsistency Ratio Table of Goals Priority

ELEMENT COMPARISON	THE CONSISTENCY RATIO (CR)
Goals Priority	0.02

Source: Self Proceed

From the goals, priority inconsistency ratio table, collected from expert respondents can be concluded that the inconsistency ratio value is less than 0.1 (10 %), as the maximum inconsistency ratio value. So the inconsistency ratio value of the goals priority collected from expert respondents is consistent.

THE BACKUP RECOVERY STRATEGY

CHAPTER V
SUMMARY

5.1 CONCLUSION

From processing, analyzing and interpreting the data, the important elements in the backup recovery strategy selection are determined to maintain the company's business continuity plan due to the disaster, namely the benefit criteria and cost criteria. The result of synthesis is related to the backup recovery strategy selection goal resulting from processing data from expert respondents using expert choice applications:

a. Distributive mode synthesis:
    - ✓ Hot Standby 60.3%;
    - ✓ Cold Standby 22.2%;
    - ✓ Warm Standby 17.5%.

b. Ideal mode synthesis:
    - ✓ Hot Standby 59.4%;
    - ✓ Cold Standby 23.3%;
    - ✓ Warm Standby 17.4%.

The sequence results of the sensitivity graph from the backup recovery strategy selection from expert respondents using expert choice applications:

a. Performance sensitivity graphs:
    - ✓ Hot Standby;
    - ✓ Cold Standby;
    - ✓ Warm Standby.

b. Dynamic sensitivity graphs:

- ✓ Hot Standby;
- ✓ Cold Standby;
- ✓ Warm Standby.

c. Gradient sensitivity graph

- ✓ Hot Standby;
- ✓ Cold Standby;
- ✓ Warm Standby.

d. Head to head sensitivity graph:

- ✓ Hot Standby;
- ✓ Cold Standby;
- ✓ Warm Standby.

e. Two-dimensional sensitivity graph:

- ✓ Hot Standby;
- ✓ Cold Standby;
- ✓ Warm Standby.

The inconsistency ratio of data collected from expert respondents:

a. The benefit criteria, the value of the inconsistency ratio is 0,03 (3 %), less than 0,1 (10 %), so the value of the inconsistency ratio is consistent.

b. The cost criteria, the value of the inconsistency ratio is 0,02 (2 %), less than 0,1 (10%), so the value of the inconsistency ratio is consistent.

c. The goals priority, the value of the inconsistency ratio is 0,00 (0 %), less than 0,1 (10%), so the value of the inconsistency ratio is consistent.

5.2 SUGGESTIONS

Some suggestions for backup recovery strategy selection are as follows:

a. The backup recovery strategy selection for business continuity plan using hot standby can be implemented in Trilogi University, in order to minimize the risks posed by the disaster.

b. This selection is related to Trilogi University condition at this time, so for different time and different condition need to do further study.

c. It requires commitment and understanding from top management in the implementation of a backup recovery strategy.

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TERMINOLOGY

CONDITION	ILLUSTRATION
Disaster Recovery Plan	Planning that focuses on information technology to restore the operation of computer systems, applications and facilities at alternative locations in an emergency.
Disaster Recovery Center	Company facilities that function to take over the functions of the unit when there is a serious disruption that afflicts one or several important work units in the company, such as data and information storage and processing centers.
Business Continuity Plan	A process to develop procedures that allow an organization to react to system failures so that it can be anticipated to vital business functions to continue its business operational processes where it has been estimated and planned in advance how many disruptions and consequences will occur.
Recovery	Activities are carried out as a recovery process when a disaster or system failure occurs.
Maximum Acceptable Outage Time	The maximum duration of termination of operation before affecting other operations or causing an insurmountable impact.
System information academic Trilogi (SIAT)	System information academic Trilogi (SIAT) which includes student data, lecturer data, academic data, and other important transactions, for example financial data, human resources data.

Analytical Hierarchy Process	The approach used in the decision-making process is a simplified problem in a regular mindset, enabling effective decision making on the problem.

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BIOGRAPHY

Faisal was born in Jakarta, Indonesia. He married and has got three children. He graduated from computer science programs in Indonesia. He had dedicated his time to an information technology department, both Local-Company and Multi-Company. He works as a faculty member of Trilogi University and as a researcher. He has several published books and articles in computer science.

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