



AN EXPERT SYSTEM OF RISK ASSESSMENT ON INTERNAL AUDIT OF SHARIA FINANCIAL INDUSTRY IN INDONESIA

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ABSTRACT

To improve the level of performance of sharia financial industry, Bank of Indonesia as a regulator issued a regulation number 9/1/PBI/2007 about the Rating System for Commercial Banks Based on Sharia Principles, which the sharia financial industry should make a self - risk assessment. The purpose of this research was to produce an expert system application to detect the presence of risks on the internal audit department of sharia financial industry. The research was divided into four stages: (a) the determination of the context, (b) the risk identification, (c) the risk analysis and evaluation, (d) the design of expert systems. Analysis of the risk assessment to sharia financial industry used the Composite Risk Index (CRI) technique. In this research, the context was to determine the probability of risk occurrence based on the scale of importance for each indicator from each sharia financial industry that would make a risk assessment. Identification was carried out to all risk variables either inside or outside the organization. There were 10 assessment variables and 54 risk indicators, consisting of 17 types of risk indicators on internal audit process of sharia financial industry. System and software design used ASP (active server pages), and in the client side (rule base) used java script language. The expert system named IPO-Srisk was designed to simplify the model operation of risk assessment on sharia financial industry. The features on the main page consisted of "Home" and "Expert System". "Home" provided an explanation for expert systems application. "Expert System" covered "initialization" and "assessment". Initialization process was useful to determine the risk indicator used in sharia financial industry and the variable groups. "Assessment" included scale determination of risk impact, scale of the risk occurrence-probability, risk level, and recommendation alternative for risk mitigation.

Keyword: expert system, risk assessment, sharia financial industry, composit risk index (CRI).

1. INTRODUCTION

In 2010, Moody's Investors Services stated that sharia financial industry assisted to put the global economy back on its feet at that time. Global economic crisis was regarded as the key factor which developed sharia financial industry. Also, the Islamic Bank of Britain claimed that there was a significant improvement from the customers after the financial crisis hit Britain. In running a business, the bank relied on public confidence. Besides, the sharia financial industry were expected to have good performance to enable to compete within the Indonesian national banking market [5].

To conduct its operations, sharia financial industry implemented the principle of profit and loss sharing. Because of the importance of the role of sharia financial industry in carrying out its functions, it was very important to know the performance of health. It aimed to maintain customer confidence to system of the sharia financial industries.

The profit and loss sharing notions were applied to conduct sharia financial industry's operations. Because of the significance role of sharia financial industry in carrying out its functions, it was crucial to know how well its performance. It was intended to keep customers' assurance to the financial system.

To improve the level of performance of sharia financial industry, Bank of Indonesia as a regulator issued a regulation number 9/1/PBI/2007 about the Rating

System for Commercial Banks Based on Sharia Principles, which the sharia financial industry should make a self-assessment for its rating system [3]. The assessment focused on risk assessment as one of the important factors for a company and good management was required to reduce the risk. The policy aimed to produce a resilient banking performance conducted through an internal control process [4].

A comprehensive process of risk assessment in a sharia financial industry needed to be conducted to 10 types of risks that might occur, such as credit risk, market, operational, liquidity, legal, strategic, reputation, compliance risk, the risk of yield risk, and investment risk [2]. The problem was most research about the process of risk assessment on Sharia financial industry dealing with the conceptual level, as mentioned in [1], which resulted in a need of a standard assessment on Sharia financial industry in harmony with other Islamic financial institutions. Moreover, research on risk assessment process on sharia financial industry were generally partial and done manually, as mentioned in [6] about the identification of indicators of credit risk assessment in UAE's Sharia financial industry. Research on risk assessment using an expert system approach was also done by [7], but it was still partially discussed about credit risk.

Based on these problems, it needed to do research comprehensively on the risk assessment process on sharia financial industry through an expert system development



that was able to facilitate efficient, effective, and user friendly process. The purpose of this research was to produce an expert system application to detect the presence of risks on the internal audit department of sharia financial industry.

2. THE EXPERT SYSTEM

The expert system is the application system (software) that used computer science, facts, and thinking in decision-making techniques to solve the problems that typically could only be resolved by experts in the relevant field.

Expert system focused on application-specific systems that rely on obtaining the knowledge of human experts in an area and programming that knowledge into a system.

The components of expert system consist of knowledge base, inference engine program, user interface programs, workstation, and user. Knowledge base developed from knowledge acquisition program using expert or knowledge engineer information [11].

As mentioned in [8], process design of expert system consisted of requirement definition, system and software design, implementation and unit testing, integration and system testing, operation and maintenance.

3. METHODOLOGY

The study was divided into four stages: (a) the determination of the context, (b) risk identification, (c) risk analysis and evaluation, (d) the design of expert systems.

Determination of the context of risks in sharia financial industry included the risk appetite of the financial industry against risk. Risk appetite was the risk tolerance level of management in created value for the owners of the financials.

The identification was made to all risk variables, either inside or outside the organization. Risk analysis of the sharia financial industry used Composite Risk Index/CRI model [12]:

$$CRI = \text{scale of risk impact} \times \text{scale of probability of risk occurrence} \quad (1)$$

The impact of the risk occurrence was assessed on a scale of 1 to 5, where 1 represented the minimum and 5 represented the maximum of loss impact that might occur over a risk. The probability of occurrence was also on a scale of 1 to 5, where 1 represented a very low probability of occurrence and 5 represented a very high probability of occurrence.

The process of application planning on risk assessment of sharia financial industry used an expert system approach. The expert system was built by using Visual Basic programming language, because it provided simple and user-friendly Graphical User Interface facilities.

The expert system was designed to simplify the model operation of risk assessment on sharia financial

industry. Expert system configuration consisted of (i) data base management system such as variable identification and indicators which caused loss risk, (ii) model base management system, and (iii) knowledge base management system.

The stages of data-base design encompassed the identification process of loss risk indicators on sharia financial industry and the identification of strategy recommendations. The stages of model-base design consisted of algorithm reduction, model of risk level assessment, diagnosis model, and recommendations of risk mitigation. The stages of knowledge-base design covered expert's knowledge of variables and risk indicators based on a standard threshold value for each indicator [12]. The output of risk assessment process was the level of loss risk in sharia financial industry. By using an expert system approach, the risk level would be the input to make a diagnosis and recommendations to mitigate the level of loss risk in sharia financial industry.

The expert system development used the eckenrode weighted technique. The concept of this weighted was by changing a sequence to be a value, where sequence 1 was the highest value while sequence 2 was below the highest one. To set out an alternative with some decision criteria (e.g. a number of k criteria), then sequence 1 had a value of : k - 1, sequence 2 had the value of: k - 2, and so on. Thus:

$$Value = \text{number of criteria} - \text{sequence} \quad (2)$$

Weighting formula as follows:

$$\text{for } e = 1, 2, \dots, k \quad (3)$$

Where: λ_{ej} = value destination of λ to e by an expert to j and n = number of expert

4. RESULT AND DISCUSSIONS

a. Determination of context

Determination of context was determination of probability scale of the risk occurrence based on scale of importance for each indicator by a bank that conducted risk assessment.

On the other hand, the research output was expected to be used by the internal audit section of sharia financial industry to diagnose the occurrence of risk level. Because the internal audit process was specific to each sharia financial industry that the context of the research was to determine probability scale of the risk occurrence based on the importance scale for each indicator by any sharia financial industries that would conduct a risk assessment.

b. Risk identification

As mentioned in [9], there were 10 variables in the risk management of sharia financial industry, such as credit, market, operation, liquidity, legal, strategic, reputation, compliance, yield and investment risk. These



10 variables were classified by 54 risk indicators in the internal audit process of loss risk in sharia financial industry consisting of 17 types of risk indicators, namely total assets, financing facilities, third-party funds, asset quality, non-performing financing, financing target, operating expenses/operating income, new realization of delinquent debtors, financing to deposit ratio, return on assets, violation of liquidity, number of personnel, the claims, the frequency of findings, follow-up findings, fraud, and the case number.

c. Risk analysis and evaluation

Risk analysis and assessment were carried out by using Composite Risk Index, generating 5 levels of risk: Scale 1 = low risk, Scale 2 = rather low risk, Scale 3 = medium risk, Scale 4 = high risk, and Scale 5 = very high risk.

d. Design of expert system

Process design of expert system consisted of requirement definition, system and software design, implementation and system testing, operation and maintenance.

Requirement definition

The expert system configuration was designed into three main components as mentioned in [11]: Data-Based Management System (DBMS), Model-Based Management System (MBMS), and Knowledge-Based Management System (KBMS), equipped by the inference engine and the Dialog Management System (DMS) to provide friendly user and system interactions as shown at Figure-1.

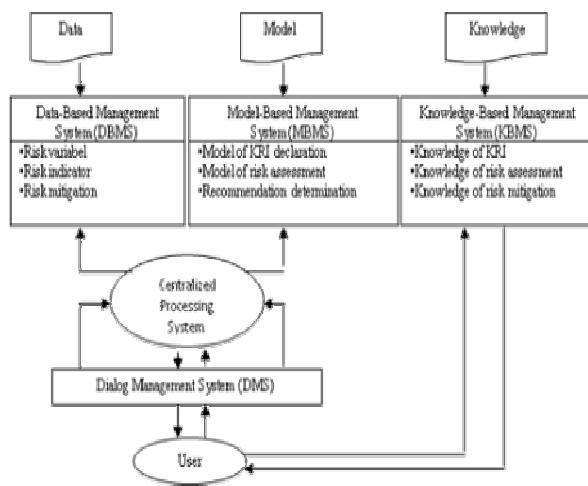


Figure-1. Configuration of expert system of risk assessment.

System and Software Design

System and software design used ASP (Active Server Pages), and in the client side (rule base) used JavaScript language. The expert system named IPO-Srisk,

was designed to simplify the model operation of risk assessment on sharia financial industry.

Program operations

The features on the main page consisted of "Home" and "Expert System". The first feature was "Home", provided an explanation for expert systems application. (Figure-2).

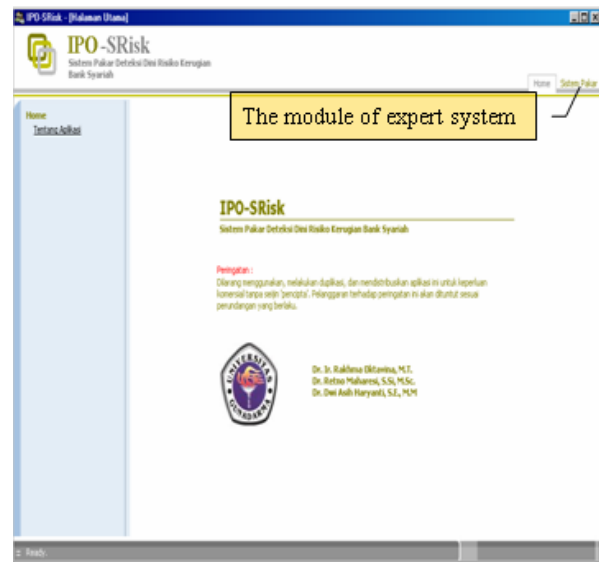


Figure-2. Main page of expert system of risk assessment of sharia financial industry.

The second features "Expert System" consisted of initialization and assessment, containing the process of assessment consisted of. inialisasi (initialization), penilaian (assessment) and recommendation. The initialization process could be done at scripting menu, as shown at Figure-3.

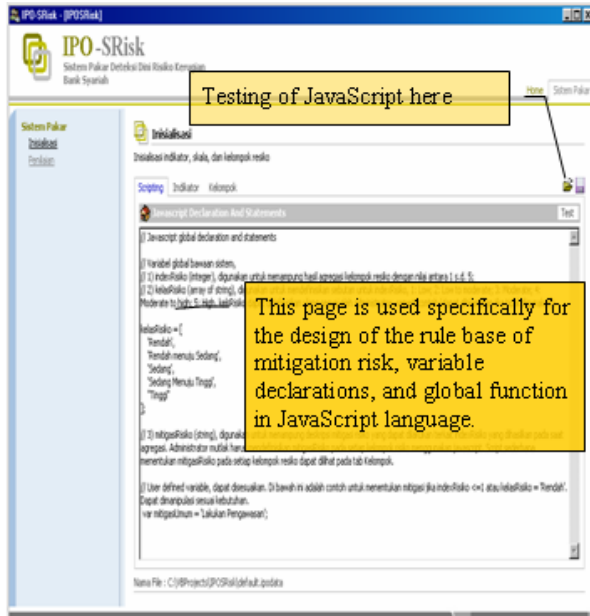


Figure-3. Sub menu inisialisasi (initialization).

The next step was the determination procedure of key risk indicator (KRI) started by registration to KRI. In this process, each indicator was classified by kelompok (the variables group) that could be selected and used in the assessment process (Figure-4 and Figure-5).

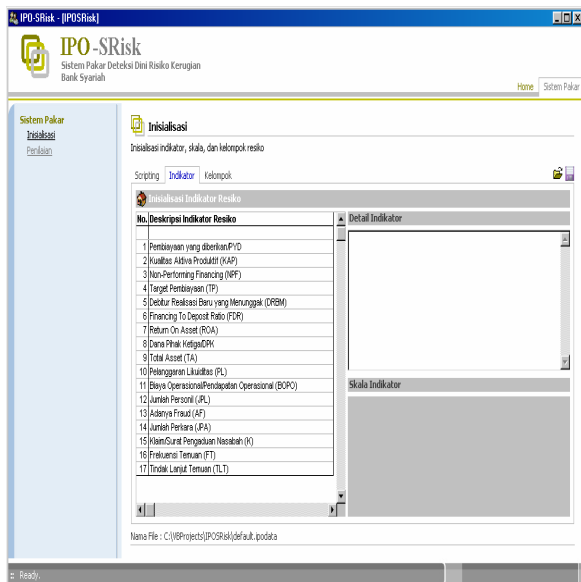


Figure-4. Sub menu KRI's registration.

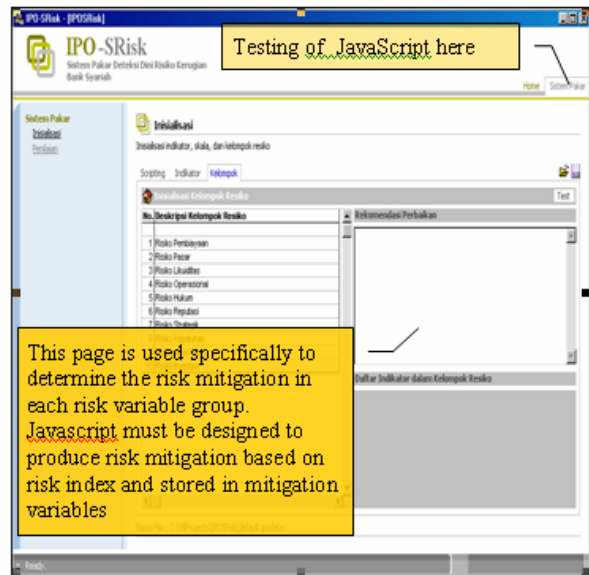


Figure-5. Registration of variables and risk mitigation.

The next step was penilaian (the assessment process) that would be carried out for each selected indicator for each expert involved. The assessment used a scale of 1 to 5 in eckenrode techniques indicating the level of risk of sharia financial industry (Figure-6).

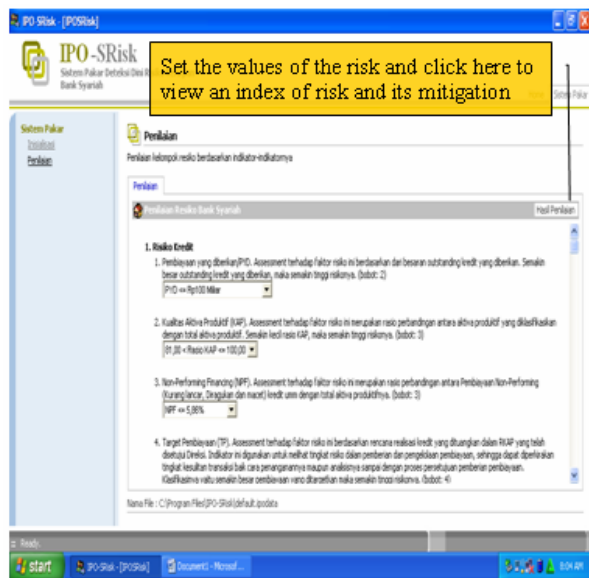


Figure-6. Risk level assessment sub menu Sharia Financial Industry Losses.

The final step showed the results of aggregation of risk assessment and its recommendations. Recommendations were given for each risk group variable (Figure-7).

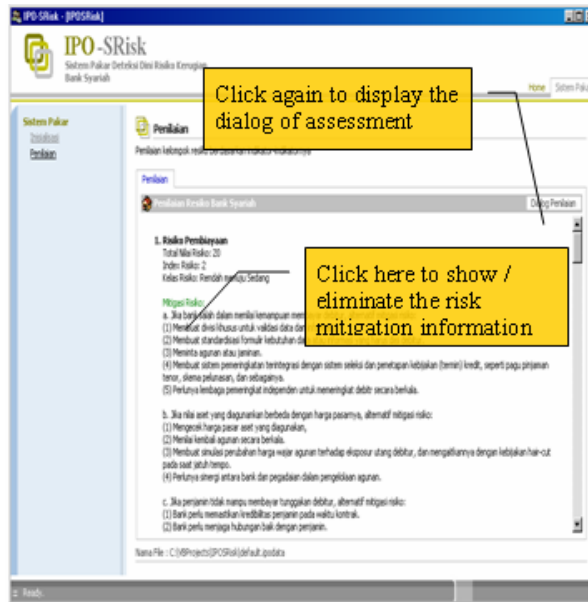


Figure-7. Aggregation results of risk assessment.

Implementation and system testing

The expert system was implemented at sharia financial industry in Indonesia and it showed that the system was able to run properly and fast provided a risk assessment in accordance with the manual calculations.

It happened as a consequence of the expert systems designed to simplify risk assessment model operation in sharia financial industry. A likely explanation for this result was that due to significant complexity of sharia financial industries, hence they needed to adjust their risk monitoring system according to their rapid growth developments. Consequently, as the scale of the sharia financial industry operation grew, monitoring and assessment of risk became much more complex [10].

5. CONCLUSIONS

IPO-SRisk expert system was designed to facilitate the operation of the risk assessment model of Sharia financial industry. The assessment process useful to determine of the valuation impact of occurrence risk scale, scale of the probability of occurrence, level of risk, and alternative recommendations for risk mitigation.

The expert system has been implemented in a sharia financial industry in Indonesia and demonstrated that the system could run well and more quickly able to produce a risk assessment in accordance with the manual calculation. That was as a consequence of an expert system designed to simplify the risk assessment model of the Islamic finance industry.

Because the internal audit process was so specific to each sharia financial industry that the context of the research was to determine probability scale of the risk occurrence based on the importance scale for each indicator by any sharia financial industries that would conduct a risk assessment.

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