# An Analysis of Modeling Audit Quality Measurement Based on Decision Support Systems (DSS)

T. Husain,
School of Management and Computer Science – STMIK Widuri, South Jakarta, Indonesia

**Abstract.** Many research explicit to the state of difficulty by defining audit quality; they use modeling (theory deployment) from several empirical literature to formulate audit quality in terms of various aspects. The eventful of this research is doing a material or reference for beginner researchers and makes it easy to choose audit quality measurements into the framework that will be applied in his research. The approach used is decision support system (DSS). This type of research is exploratory, using a qualitative approach designed to be able to explain the audit quality measurement model. Data analysis methods adopted by the decision-making / modeling process through three steps i.e. intelligent, design and finally choice phases. The findings of this study show that decision support systems based on structural equation models developed into the audit quality measurement model can be used as recommendations for beginner researchers in formulating definitions, theoretical reviews and measuring audit quality using a specific approach. And the, the goodness-of-fit test in this study can be made recommendations based on each cut-off value criterion in the valuation model in making a fairly fast decision by looking at the output RMSEA score. These testing can be run on statistical software, such as IBM SPSS, AMOS, PLS-Graph, LISREL and others.

**Key words**: audit quality measurement, modeling, DSS.

## Introduction

Modeling is everything that is constructed through specific parameters that are measured both in structure, form, content, number and meaning with all limitations. This Model is usually used by practitioners to describe a tangible problem into a building in the process of decision making (Sharda et al., 2013: 8). For academicians, modeling having a meaning to simplify mapping important theory and make identification problems and the solution which in turn chosen as recommendations for solving the problem. Many researches that stated explicitly it difficult to define the audit quality, they are using modeling (development) theory of empirical some literature to formulate the audit quality that in terms of various aspects. The audit quality itself originally defined by the potential of a profession auditors will find a violation of company accounting system and report it (DeAngelo, 1981: 183-199) And then develop based on many factors, this measure released with very simple namely big-8 (n) considered to be based on quality from both sides of the market demands or input (clients) and suppliers market or the output (parties) auditor. If it is associated with a model, the measurement of the audit quality is important to use the application decision support system (DSS), by involving knowledge based. The use of model solution optimal of different combinations, forth, to analyze it was is implemented on an ad hoc do not irregular so that it can produce answer in the period based on the best solution known with the term model optimization (Abdou et al., 2010: 1027-1028).

Modeling can be used in the context of science to analyze, multi-discipline judge every model of measurement do meet the criteria or not, worthy test for instance by measuring the audit quality by using technical analysis (based the formulation and) technical calculations (Kirkpatrik's and Dahlquist, 2011: 9), primary on the these

assumption that is widest as trend the audit quality by big-n and non-big-n, which until now is still used academics to gauge the audit quality but many other researcher develop and modifying based on needs in the country order unable to formulate the measurement of audit in a model. For example, model summary audit covering company used construct survival, discretionary accruals, category big n and honorarium audit parameters input with the measurement of the characteristic an auditor, features an auditor parameters contract with clients while output, they covering any material communication an auditor, the financial reports quality and insight in a tabulation based (DeFond and Zhang, 2014: 275-326).

The measurement of the audit quality based professional audit approach with investors through each of framework audit the audit quality through the input, the process of output and opinions and after the opinion audit (Christensen et al., 2016: 1648-1684). The theoretical models construct of audit quality diagram with the concept of cause and effect, with the measurement of the audit quality literature major technical knowledge, confidence, job satisfaction, the environment and workload and multi-task, quality control and review company, communication management, and those from other parties task, as the internal auditor. Then, a measurement can be construct through element a relationship with the framework PCAOB like an audit and the process of an audit that finally added that other factors of literature main, called gender, level of experience and the size (Brown et al., 2016: 949-980).

The importance of the study is done as a reference for researchers budding and ease in choosing the measurement of the audit quality in a framework to be applied in their research. This research designed a model with parameter the measurement of adopting structural equation modeling to be tested feasibility for model to produce match the model will continue to the step of experiment hypothesis research.

**Theoritical Framework**

Analysis of single case approach regarded as a strategy should be selected by caution the case, making and analysis of data. Model to be represent new insight based on the empirical and solid theoretical (Holmlund, 2008: 32-62). Thus, it becomes clear that for certain conditions it is usually necessary to build a model that represents the real system and study it as a substitute for the real system (Fig. 1).

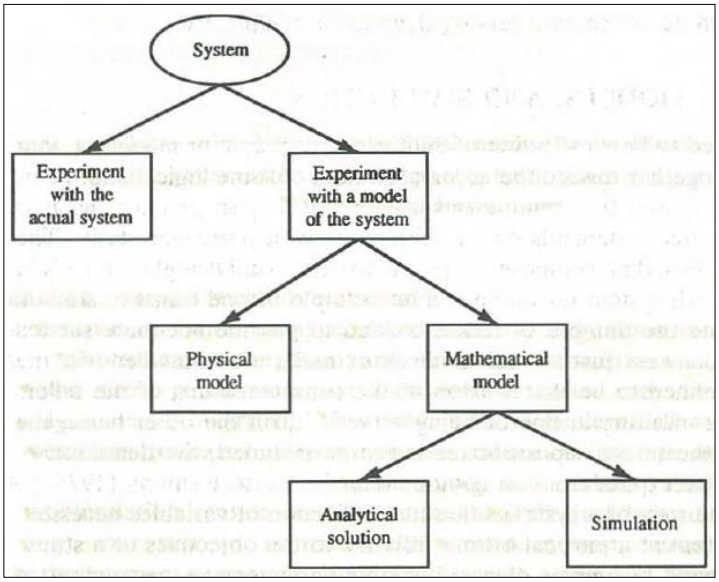


Fig. 1. Ways to Study a System (Source: Law and Kelton, 1991: 4)

Mathematical models are ideal representations of real systems expressed in the form of symbols and mathematical equations or represent a system in the form of quantitative and logical relations. The replica mathematical model of the phenomenon described through a set of mathematical equations. The suitability of the model for the natural phenomenon described depends on the accuracy of the formulation of the mathematical equation (Law and Kelton, 1991: 5). Decision support system (DSS) is a system intended to support managerial decision makers in semi-structured and structured decision situations. SPK aims to make decisions that require an assessment that can be processed technically or with an algorithm (Sharda et al., 2013).

Structural equation analysis is one type of mathematical model that functions in solving studies in special cases using a statistical model test approach. This model is expected to solve the problem of formulating an audit quality measurement equation based on certain approach. Structural Equation Modeling (SEM) is a strong alternative to the confirmation context rather than explaining with a more flexible assumption function and is able to reduce measurement errors with many manifest variables in a latent construct and has graphical modeling aimed at making it easier for users to interpret outputs analyzed (Sarwono, 2010: 173-182).

The measurement of audit quality must be guaranteed by the auditor in the form of output that is the opinion in the independent auditor's report whether the financial statements as a whole are free from material misstatements caused by fraud or errors (Tandiontong, 2016: 163). This measurement can be derived based on definitions, functions, objectives, processes, and various other approaches. Sub or derived from this definition should be made a mathematical modeling to answer the measured output with data in the form of numbers. Criteria or estimation of measurement results can use a statistical approach in the analysis of structural equations to confirm or develop models for applied theories on the future research order paper. Structural equation models must be test based on goodness-of-fit criteria, which is an indication of the comparison between the specified models with the analysis of covariance between indicators (observed variables). This test is intended to assess whether the proposed model has a fit criteria with the data or not. The testing of this model is classified based on 3 (three) measurement criteria, i.e. *absolute fit indices*, *incremental fit indices* and *parsimonious fit indices* (Hair et al., 2010: 666).

**Material and Methods**

This study of research is exploratory research, objective to see patterns, ideas or formulate hypotheses not to test hypotheses and previous studies are still rare on a problem in order to do further research that is more directed (Ali and Limakrisna, 2013: 33, 71). This study uses a qualitative approach designed to be able to explain (exploratory research) the audit quality measurement model. Next, a framework will be based on a decision support system approach or process modeling (Fig. 2).

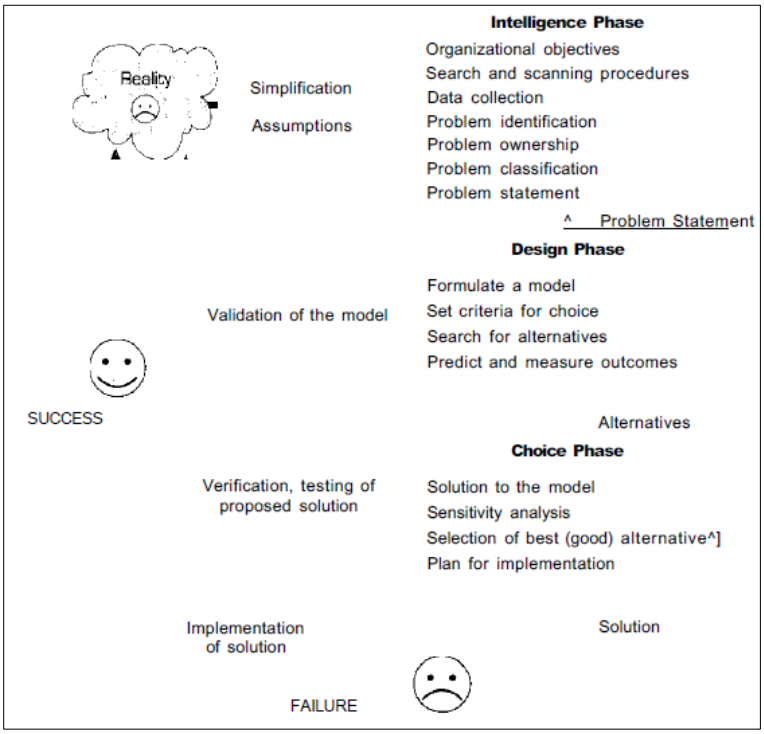


Fig. 2. The Decision Making / Modeling Process (Source: Sharda et al., 2013: 50)

*Intelligence Phases*

This phase begins by identifying the goals and objectives the organization related to the problem under research. Next determine the existence of a problem based on how, where and how important the problem there. Problem classification refers to the conceptualization of problems in an effort to place them into definable categories, and directed towards standardized solution approaches. An important approach is to classify problems based on structured approaches that are clearly visible them. Many complex problems can be divided into sub-problems. Solving sub-problems that are simpler can help solve complex problems including problems that look un-structured properly and sometimes even have very structured sub-problems (Sharda et al., 2013: 51, 54-55).

*Design Phases*

This phase involves discovers or develops and analyzes possible actions including understanding the problem and testing the feasibility solution. The decision-making model for overcoming problems must be construct, test, and validation (Sharda et al., 2013: 56). This research uses descriptive modeling that describes things as believed to be mathematically based which are useful in identifying the consequences of various alternative actions under different input configurations and processes. The choice of optimization model can be generated automatically by the model. However, most of management control situations, alternatives need to be made manually. This research involves analysis of search and creativity so as to produce the best alternative model with enough time so that the excess information obtained will interfere in the decision-making process. Measurement of the results of an alternative will be evaluated and expressed directly to achieve the goal. This study recommends an assessment to measure audit quality based on Goodness-of-Fit (Gof) which is an indication of the comparison between the specified model and the analysis of covariance between indicators (observed variable). This assessment is intended to test whether the proposed model has a fit with the data or not with the following measurement criteria.

*Absolute Fit Indices*

A type of goodness-of-fit that compares theoretically the fit model with the data collected. Absolute fit indices consist of:

1) *Chi-Square* ($\chi^2$)

Chi-Square is a measure of the good or bad of an overall model (overall). This assessment can be said to be fit if the assumption of data normality is met and the sample size is large (asymptotic), with a probability value (p-value) > 0.05 and suggests combining this measurement with other measurements.

2) *Goodness-of-Fit Index* (GFI)

GFI is a measure of the accuracy of the model in producing an observed covariance matrix by comparing the overall suitability of the model with actual observational data. The recommended value as a fit model size is > 0.90.

3) *Root Mean Square Error of Approximation* (RMSEA)

RMSEA is a measurement index for the deviation of parameter values of a model with its population covariance matrix. RMSEA values less than (<) 0.05 indicate close-fit or the best models, and then values ranging from 0.05 to 0.08 indicate that the model has reasonable estimates of error. However, an RMSEA value greater than 0.10 indicates that the model needs to be modified (Browne and Cudeck 1993; Latan 2013).

4) *Root Mean Square Residual* (RMR) and *Standardized* RMR

The RMR represents the average residual value obtained by matching the variance-covariance matrix of the model hypothesized with the sample data variance-covariance matrix. A model that has good good-of-fit if it has a value of RMR less than 0.05, with a standardized value of RMR ≤ 0.08.

*Incremental Fit Indices*

A type of goodness-of-fit that compares theoretically fit models, relative to alternative baseline-models (null / independence models) with data collected. Incremental fit indices consist of:

1) *Adjusted Goodness of Fit Indices* (AGFI)

AGFI is a GFI develop that is adjusted to the degree of freedom ratio in a proposed model. The recommended AGFI value as a fit model size is ≥ 0.90.

2) *Normal Fit Index* (NFI)

NFI is a measure of comparison between the proposed model and the null model. The recommended value to indicate the model fit is > 0.90 or close to score 1.

3) *Tucker-Lewis Index* (TLI) / *Non-Normed Fit Index* (NNFI)

TLI or NNFI is a measure to overcome problems that arise due to the complexity of the model by comparing the tested model against the model baseline. The expected value is ≥ 0.95, which indicates that the model is very good, and a value close to score 1 indicates a very good fit.

4) *Comparative Fit Index* (CFI)

CFI is a measure the level of comparison between hypothesized models and null models, but CFI cannot be influenced by sample size. The recommended value as a measure of model fit is ≥ 0.95 or close to score 1.

5) *Relative Fit Indices* (RFI)

RFI or known as the Relative Non-centrality Index (RNI) is a measure of comparison between the proposed model and the null model. The recommended value as a fit model size is ≥ 0.90 or close to score 1.

Based on several criteria in the Incremental Fit Indices generally ranges from zero (0) to one (1) to get a good-fit while the score of 0.80 until 0,90 stated that the model is still acceptable (marginal-fit).

*Parsimonious Fit Indices*

A type of goodness-of-fit that links the model with a number of estimated coefficients needed to achieve the model fit. This procedure is similar to the adjustment of $R^2$ in multiple regression. Parsimonious fit indices consist of:

1) *Parsimony Goodness Fit Index* (PGFI)

PGFI is a re-specification of the GFI index to measure parsimony models. PGFI values range from 0-1. The higher the PGFI value of a model, the more parsimony the model. The recommended value is > 0.50.

2) *Parsimony Normed Fit Index* (PNFI)

PNFI is a modification of NFI by looking at the degree of freedom used to achieve model compatibility. PNFI values range from 0.60 until 0.90 shows a good model.

Normed of Chi-Square (CMIN / degree-of freedom - dF) is a ratio used to measure the level of conformity obtained by looking at a value with a confidence level of 95% (α = 0.05). The recommended CMIN divided of degree-of freedom value is less than (<) 2.0, indicating that between the model and the data indicate acceptable-fit. (Hair et al. 2010:666-669).

*Choice Phases*

This phase is a critical choice and action in actual decision-making and is committed to following certain steps that are made. In addition, the decision support system can support the choice phase through "what-if" analysis and "goal-seeking" analysis (Sharda, Delen, and Turban 2013:69,76). The search for a solution that is expected as a recommendation for its feasibility is expected to be able to provide a detailed analysis of the resulting output. Finally, this decision can be implemented more easily and with direction in measuring a goal.

## Results

*Intelligence Phases*

This phase begins by outlining:

1. Identification of Problems
- The difficulty of formulating an audit quality definition
- The difficulty of formulating audit quality measurements

2. Classification of Problems
- Analysis of measurement of audit quality through several approaches
- Use of primary and secondary data

3. Alternative Troubleshooting
- Formulate into the structure of the system, the environment and its limitations in the process
- Designing audit quality measurement models.

*Design Phases*

This phase is done by designing a decision making model with a data mining perspective approach (Fig. 3).

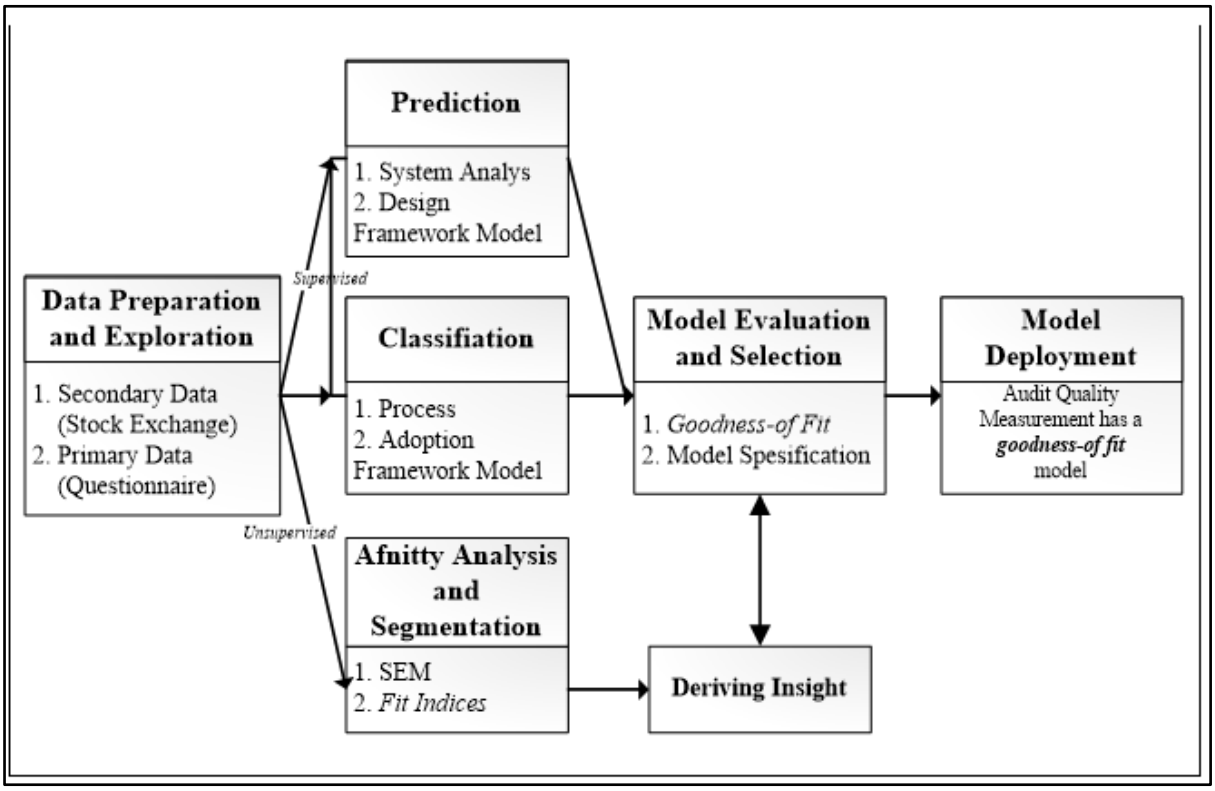


Fig. 3. *Developed by* Dana Mining a Process Perspective
(Source: Shmueli et al., 2010: 38)

Supervised learning algorithms involve prediction and classification functions, which must ensure that data is available to be assessed, based on established criteria while unsupervised learning algorithms are uses that do not function in predicting or classifying. Therefore, based on cases whose construct the results are known, then using the association rules with dimension reduction, and the grouping technique of all methods that are not monitored (Shmueli et al., 2010: 47-48). Modeling the framework is designed to configure the input, processing and output mechanism with different approaches that are still made manually, this requires analysis and search for theoretical studies creatively with the aim of being able to produce models for testing criteria based on specific audit quality measurement data usage segments. The system analysis and design framework of the audit quality measurement model in this study was designed by adopting a number of previous models using a tabulation framework, theoretical models and mapping a framework with an audit quality measurement index (DeFond and Zhang, 2014: 275-326; Brown et al., 2016: 949-980; Christensen et al., 2016: 1648-1684).

*Choice Phases*

This phase is done by entering data into the decision making model for measuring audit quality.

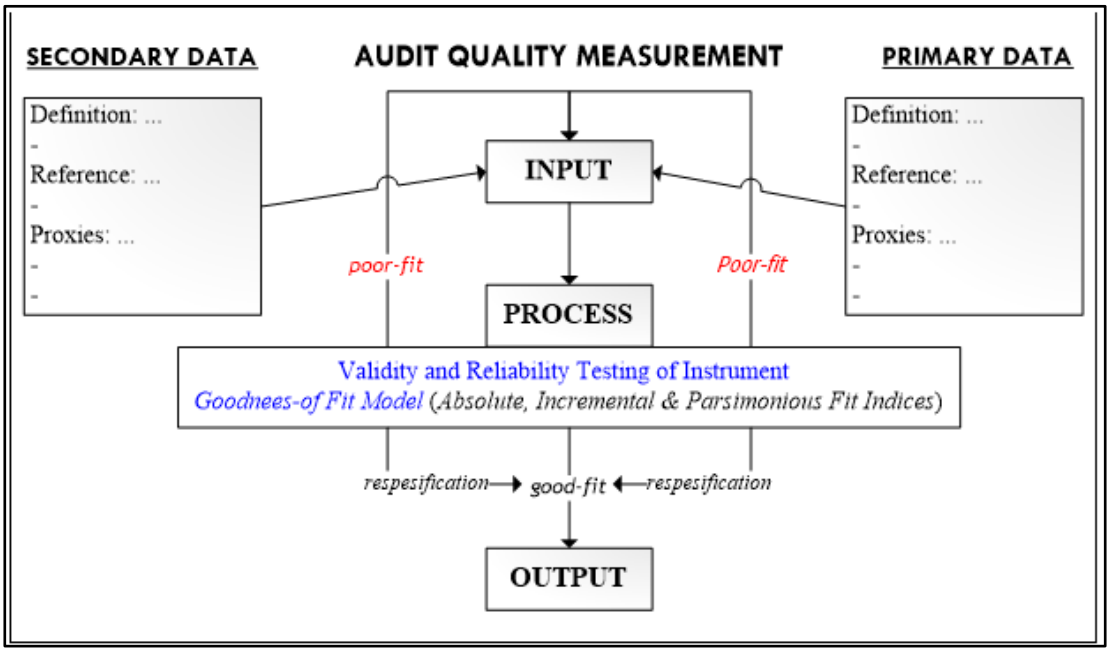


Fig. 4. Developed by Audit Quality Measurement (Christensen et al., 2016: 1648)

Audit quality measurements be input properly classified in advance based on numerical or mathematical measurements (secondary data) and perception measurements (primary data). Then, these two measurements are derived into the operational definition of the indicator (manifest) based on previous literature and measurements. Furthermore, it is processed into the model specifications using a mathematical model approach to structural equation analysis through the initial stages of validity and reliability of test. The next step is to compile the path diagram, convert the path diagram into the equation system, choose the model estimation technique, identify the model, evaluate the criteria for goodness-of fit (GoF) and finally interpret the model (is it worth testing or not), if it cannot be modified or modification. The model re-specification also requires absolute fit indices in RMSEA criteria greater than (>) 0.1 (Browne and Cudeck, 1993; Latan, 2013), this means that the model has a reasonable error estimate so that it can be decided whether the model is reassigned to produce the measurement output to be further tested or return to the input stage test.

## Conclusion

Decision support systems based on structural equation models developed into the audit quality measurement model can be used as recommendations for beginner researchers in formulating definitions, theoretical reviews and measuring audit quality using a specific approach.

The results of the goodness-of-fit test in this research can be make some recommendations based on each cut-off value criterion in the valuation model in making a fairly fast decision by looking at the output RMSEA score.

These deployment can be run on statistical software, such as IBM SPSS, AMOS, PLS-Graph, LISREL and others.

## References

Abdou, A., Radaideh, M., Lewis, J. (2010). Decision Support Systems and their Application in Construction. In: Management Association, Information Resources. Business Information Systems: Concepts, Methodologies, Tools, and Application (pp.

1027-1028). New York: Information Science Reference (an inprint of IGI Global). https://doi.org/10.4018/978-1-61520-969-9

Ali, H., Limakrisna, N. (2013). Metodologi Penelitian (Petunjuk Praktis untuk Pemecahan Masalah Bisnis, Penyusunan Skripsi, Tesis, dan Disertasi). 1st ed. Yogyakarta: Deepublish.

Brown, V.L., Jodi, L.G., Daniel, G.N. (2016). Audit Quality Indicators: Perceptions of Junior Level Auditors." Managerial Auditing Journal, 31(8/9), 949-980. https://doi.org/10.1108/MAJ-01-2016-1300

Browne, M.W., Cudeck, R. (1993). Alternative ways of assessing model fit (Testing structural equation models). Newbury Park, CA: Sage. https://doi.org/10.1177/0049124192021002005

Christensen, B.E., Glover, S.M., Omer, Th.C., Shelley, M.K.. (2016). Understanding Audit Quality: Insights from Audit Professionals and Investors. Contemporary Accounting Research, 33(4), 1648-1684. https://doi.org/10.1111/1911-3846.12212

DeAngelo, L.E. (1981). Auditor Size and Audit Quality. Journal of Accounting and Economics, 3(3), 183-199. https://doi.org/10.1016/0165-4101(81)90002-1

DeFond, M., Zhang, J. (2014). A review of archival auditing research. Journal of Accounting and Economics, 58(2-3), 275-326. https://doi.org/10.1016/j.jacceco.2014.09.002

Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2010). Multivariate Data Analysis. 7th ed. New Jersey: Prentice Hall. Available at: https://is.muni.cz/el/1423/podzim2017/PSY028/um/_Hair_-_Multivariate_data_analysis_7th_revised.pdf

Holmlund, M. (2008). A Definition, Model, and Empirical Analysis of Business-To-Business. International Journal of Service Industry and Management, 19(1), 32-62. https://doi.org/10.1108/09564230810855707

Kirkpatrik's, Ch.D., Dahlquist, J. (2011). Technical Analysis: The Complete Resource for Financial Market Technicians. 2nd ed. Upper Saddle River, New Jersey: FT Press. Available at: https://www.slideshare.net/citata34322/technical-analysis-the-complete-resource-for-financial-market-technicians-charles-d-kirkpatrick-ii

Latan, H. (2013). Model Persamaan Struktural: Teori dan Implementasi Amos 21,0. Bandung (ID): Penerbit Alfabeta.

Law, A.M., Kelton, W.D. (1991). Simulation Modeling & Analysis. 2nd ed. New York: McGraw-Hill, Inc. Available at: https://fac.ksu.edu.sa/sites/default/files/index.pdf

Sarwono, J. (2010). Pengertian Dasar Structural Equation Modeling (SEM). Jurnal Ilmiah Manajemen Bisnis, 10(3), 173-182.

Sharda, R., Delen, D., Turban, E. (2013). Business Intelligence and Analytics: Systems for Decision Support. 10th ed. New Jersey: Pearson.

Tandiontong, M. (2016). Kualitas Audit dan Pengukurannya. Bandung: Alfabeta. Available at: https://repository.maranatha.edu/22679/1/Kualitas%20Audit%20dan%20Pengukurannya.pdf