9-16-2019

Utilization of Statistics for Provision of Business Information: Implementation of α-Sutte Indicator on Provision of Stock Movement Prediction Information

Nuning Kurniasih
Universitas Padjadjaran, nuning.kurniasih@unpad.ac.id

Ansari Saleh Ahmar
Univeritas Negeri Makassar, ansarisaleh@unm.ac.id

Nanik Kurniawati
The National Archive of The Republic of Indonesia (ANRI), nanik.kurniawati.anri@gmail.com

Utilization of Statistics for Provision of Business Information: Implementation of α-Sutte Indicator on Provision of Stock Movement Prediction Information

Nuning Kurniasih[1], Ansari Saleh Ahmar[2], Nanik Kurniawati[3]
[1]Faculty of Communication Sciences, Library and Information Science Program, Universitas Padjadjaran, Bandung, Indonesia
[2]Department of Statistics, Faculty of Mathematics and Natural Science, Universitas Negeri Makassar, Makassar, Indonesia
[3]The National Archive of The Republic of Indonesia (ANRI), Jakarta, Indonesia

Corresponding Author Email: nuning.kurniasih@unpad.ac.id

Abstract
The Current information services are dealing with big data that is freely accessible. Companies providing information services and products need to develop creativity and innovation to maintain their existence. In this paper, we offer that information specialist can add value to information. The added value is given through an analysis of information that is relevant to user needs. The Research and Development Method can be used to develop a framework for service information products and services, and bridge the gap between the theories studied in higher education and the needs of the industry. α-Sutte Indicator can be used to predict stock movements. The results of the stock movement forecast can be used by potential investors in reducing uncertainty in stock prices. The Library and Information Science Program in Higher Education needs to develop a curriculum to be able to respond to industry needs, including developing statistical materials in processing information.

Keywords: business information, forecasting, statistics for business, information science, competency of information experts

1. Introduction

The development of information and communication technology (ICT) has an impact on increasing productivity and efficiency of various activities, such as information activities. ICT has opened the world's information window and become the fastest media for information dissemination. Millions of information is available, not only for entertainment or knowledge, but also as a medium for millions of business transactions, including information business (Kurniasih, 2005). Information service companies are now facing an explosion of information, where information can be obtained freely by the world community. Freedom of access and distribution of information becomes both a challenge and an opportunity for information service provider companies. The application of an effective marketing strategy can guarantee the efficiency of business activities in the midst of increasingly intense competition (Kurniasih, 2005).

The marketing concept will bring information service provider companies to better understand the business environment such as the market, competition, customers, government and trends. The issues such as information products/ services needed by the market, how companies can enter and survive in the business, how influential internal and external environments in business processes, how to introduce and persuade the target market to buy products/ services offered, how the

products/ services can reach customers at the right time, how to manage business processes so that businesses can run effectively and efficiently, how to create a corporate image in the minds of customers which are issues that can be studied with marketing principles.

In the Theory of Social Exchange, a mutually beneficial relationship is the key to the continuity of a relationship. Each individual will voluntarily enter and live in a relationship only if the relationship is felt to provide greater benefits than the costs incurred (Cropanzano & Mitchell, 2005). Likewise with service provider companies such as information services. Mutually beneficial relationships between companies and consumers need to be built, because customers will remain loyal to use the services of the company if they get benefits that are greater than the costs that must be incurred to obtain company services.

Information is data that has meaning. Information is a representation of knowledge and becomes part of the communication process and the source of communication (Madden, 2000). Information has different characteristics from goods products, both as public goods and private goods. Information as public goods is usually duplicated so that consumption of such information will not reduce the availability of such information for others. Consumption of information as public goods can build pseudo-exclusivity but still be public. This means that when the information is known to the public, it will be difficult to hide from others. However, like other public goods, people usually do not have the desire to pay for the information so that information producers will lose the opportunity to get royalties. Another characteristic is that the public information market is usually less transparent (Case & Fair, 2002). With these characteristics, public goods will be difficult to become private goods.

In private goods, information is produced and distributed based on market mechanisms. Consumption of information products or services will reduce the opportunity for others to consume them and usually people are willing to pay for the information they get (Case & Fair, 2002). One business strategy that must be prepared by information services companies is by preparing a product or information service strategy, especially the strategy for information products/ services that fall into the category of private goods. With the right strategy, an information service company will increase productivity, profits, market standing and service (Kurniasih, 2005).

One of the private goods in information service marketing is stock prediction information. Stock prediction information is needed by investors in making decisions. Investors will invest their capital in stocks that are expected to benefit. Mathematical and statistical calculations allow the information companies to calculate and predict the profit, loss and return of investment (Whitelaw, 2000). This paper discusses the use of statistics for providing business forecast information in the Information Center by implementing the α-Sutte Indicator in forecasting stock movements. The application of statistical methods in the provision of business forecast information, especially forecasts of stock fluctuations in information service companies, can contribute to fulfilling measurable information needs.

2. Literature Review

Currently we are dealing with the era of big data. The big data era provides opportunities for both the public sector and the private sector. If it is utilized properly, big data will contribute positively to macroeconomic and microeconomic. The big data era is characterized by high volume, speed

and variety of information (Hammer, Kostroch, Quirós, & Group, 2017). This very large amount of data needs to be processed so that producing specific information can be utilized in a field, including the field of stock investment. Data management can be done by utilizing technology and technical analysis. One of the tools that can be used to analyze and interpret the data is Statistics.

Statistics is a methodology for collecting, presenting, analyzing, interpreting and drawing conclusions from collected data. Statistics can also be used as a method of decision making when we are dealing with uncertainty by using numerical data (Chou, 1969). In business information, Statistics plays an important role. Information businesses will be faced with a variety of consumer information needs, with complex entities. Statistics can process data into quantitative information with its interpretation. The use of statistics for providing information on future business opportunity forecasts is very relevant in meeting the information needs of investors.

Statistical methods that can be used to predict stock movements can be done using technical analysis such as Moving Average, Stochastic, Parabolic SAR, MACD (Moving Average Convergence Divergence), Bollinger Band, RSI (Relative Strength Index), Sutte Indicator and others. In addition, we can also predict stock movements using time series analysis methods including ARIMA, Neural Network (Fuzzy), and α-Sutte Indicator. These methods require the ability to process data in the form of statistical analysis capabilities. Because of this need, Statistics and Data Science cannot be separated from Information Science (Yoo, 2004; Marchionini, 2016; Diggle, 2015).

Information is the glue that unites all business structures (Porter, 1998). The access that is not limited to information, makes the information a public good that has no selling value. To make an information a commodity, there needs to be restrictions through copyright, patents and maintained confidentiality (David, 1993). Christopher Yoo in his book proposes an approach to copyright law based on product differentiation (Yoo, 2004). Product differentiation and accuracy in targeting market segmentation are alternative marketing strategies that can be done in marketing information products or services (Smith, 1995). A study shows that product differentiation can provide a competitive advantage for a paper printing company if it is supported by the knowledge, skills and capabilities of the company (Haarla, 2003). West and Phillips provide advice in preparing Business Information Services (BIS) through the following steps: first, ensure all processes are documented; second, the research team built a map of information sources; third, make a number of scenarios in exploiting the pattern of inquiry and making a matrix of skills that can support research; fourth, the use of technology to monitor feedback from end-user services in order to provide added value and product/ service differentiation; fifth, proactively provides input for all parties including stakeholders (West & Phillips, 2018).

3. Research Methods

The changes in the structure of society are characterized by changes in the fields of industry, technology, etc. Yoshikawa described industrial changes (including changes in the economy) as a continuous process, where every change in various sectors, such as in the economic and industrial sectors, needs to be supported by human resource readiness (Yoshikawa, 2012).

Current information services are dealing with big data that is freely accessible. Companies providing information services and products need to develop creativity and innovation to maintain

their existence. Likewise with the organizers of education in the field of Information and Library Sciences, they need to develop a curriculum that can accommodate market and industrial needs. The Research and Development (RnD) method can be used to develop a framework for service products and information services and bridge the gap between the theories studied in higher education and the needs of the industry. Based on these considerations, this study uses the RnD method.

The RnD method is a creative and systematic work to increase knowledge and design an application of knowledge. There are at least 5 criteria for identifying the RnD method, which is aimed at finding novelty, originality, uncertainty in the end of result, systematic, and can be reproduced (Frascati Manual , 2015). The steps in RnD include preliminary investigation, theoretical embedding, empirical testing and documentation, analysis and reflection on process and outcomes (Akker, 1999).

Preliminary investigation in this study was carried out through observation of the curriculum in the Library and Information Science Study Program at Universitas Padjadjaran and discussion in the National Convention on Indonesian National Work Competency Standards (SKKNI) in December 2018 in Jakarta. Theoretical review is done through literature. Empirical testing is done using one of the forecasting formulas, namely α-Sutte Indicator. Furthermore, the results of empirical testing are analyzed and recommendations are made for curriculum development in the Information and Library Science Program. In brief, the steps in this study can be seen in Figure 1.

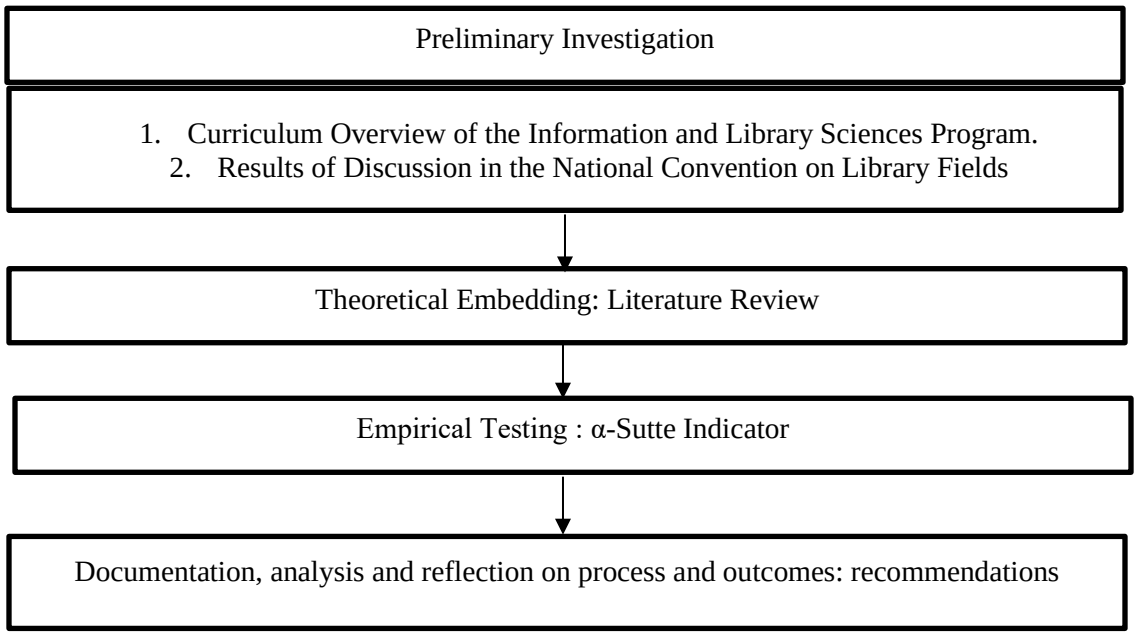

Figure 1. Research Steps, adaptation from Akker (Akker, 1999)

To produce forecast information on stock fluctuations, we used α-Sutte Indicator with the help of the R Package, namely sutteForecastR and RcmdrPlugin.sutteForecastR. α-Sutte is adopted from the moving average method by using Simple Moving Average-2 (SMA2) to see the trend of data and the previous four data which are predicted to influence the prediction of the next data (Ahmar, 2018). The sample used to test the forecasting method is the stock data of PT Astra Agro Lestari

Tbk (AALI.JK) obtained from Yahoo Finance Website (Yahoo Finance, 2018). Data in the study were 254 daily stock closing price data and divided into 2 parts, namely train data (January 2, 2017 - December 20, 2017) and testing data (December 21, 2017 - December 29, 2017). To see the reliability of the α-Sutte Indicator method, this method will be compared with other forecasting methods, namely Robust Exponential Smoothing Time Series (ROBEST). The important thing to be prepared in ROBEST is robust forecasting equation, robust starting values, robust information criterion and robust smoothing parameter estimation (Crevits Ruben, 2017).

The results of this stock movement forecast can be used by the Library and Information Science Program to develop curricula and for information centers and information service providers companies can be used to develop information products that can be sold so they can generate profits for the institution, while getting target markets from investors or businessmen.

4. Result and Discussion

4.1. The Review of the Curriculum in Information and Library Science Program at Universitas Padjadjaran on the Themes of Marketing and Statistics

In marketing information products and services, currently the Library and Information Science Program at Universitas Padjadjaran is given an Information Marketing Course. Previously subjects related to marketing consisted of Information Marketing, Market Research, Marketing Program Design, Information Economy and Information Entrepreneurship. Through Information Marketing Courses, students are given knowledge and skills that cover the basics of marketing, the concept of marketing services, marketing strategies for information products/ services, starting from business planning processes, market analysis, product/ service life cycles, positioning, promotion strategies, pricing strategies, strategies for selecting human resources, processes, physical evidence, etc. This course is the basis for graduates of the Library and Information Science Program to develop marketing information products/ services. Product and service information packaging is added to the Documentation and Information Course. In the course, students are given the task of making information packages. Meanwhile Statistics material is more focused on processing quantitative research data. Statistics have not been used as a tool in processing information as an information product or service.

4.2. The Review of the Indonesian National Work Competency Standards (SKKNI) in the Library Sector, Particularly in Librarian Competence Development

On December 17-18, 2018, National Library of Indonesia was held a convention which discussed SKKNI. In the convention discussed how libraries (information centers) can meet the needs of education, research, preservation of information and recreation of library users. Through the results of long discussions, convention participants agreed to pay special attention to multidisciplinary fields. In the convention, we provide input that the library must respond and adapt to change, especially related to the industrial revolution 4.0. Libraries and information centers must also be able to predict changes that will occur next in the information field. The convention participants in information technology then agreed to be able to accommodate capabilities related to big data, social media analysis, data mining, forecasting, artificial intelligence, internet of things, system thinking, etc. in the upcoming SKKNI.

4.3. Information on Forecast of Movement of Stock by Using the α-Sutte Indicator and ROBETS

Libraries and other information centers, usually package the information from the information that is already available. For example, librarians or information experts collect articles about stock fluctuations at the Jakarta Stock Exchange of Indonesia, then pack them in a Stock Information Package, a collection of articles on Indonesian natural beauty packed in Indonesian Tourism Packages, a collection of articles about shopping centers packed in Shopping Tourism Information Packages , etc. In this paper, we offer that information managers can add value to information. The added value is given through an analysis of information that is relevant to user needs. For example, in this paper we display stock data for a company. With this data, it will become an information for forecasting stock movements for the company. Information about stock movement predictions is intended for potential investors to get an overview of stock predictions in a company.

To provide forecast information on stock movements in this study, a sample was used to test the forecasting method. The data used in this study is data on shares of PT Astra Agro Lestari Tbk (AALI.JK) obtained from Yahoo Finance Website (Yahoo Finance, 2018). Data plotting is done at the beginning of data processing to predict and predict stock movements. Data plotting from the sample can be seen in Figure 2.

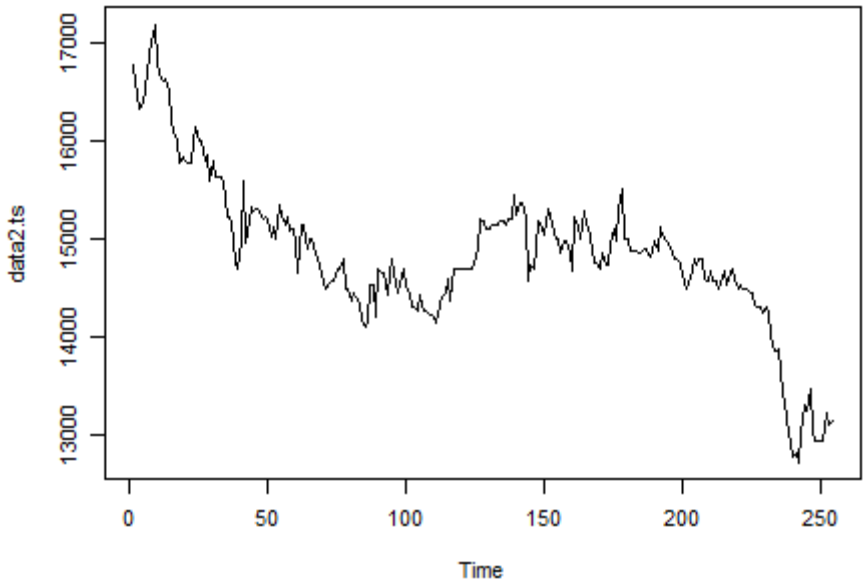

Figure 2 Stock Data Ploting

In Figure 2, it can be seen that the stock closing price is inconsistent over time (volatile). This is if it will be difficult for investors to decide whether to sell or buy shares.

The next step is to use the SutteForecastR which is the R Package of the α-Sutte Indicator in making predictions and forecasting data. The forecasting results of α-Sutte Indicator can be seen in Figure 3. The output results are as follows.

$Tes_Data
[1] 12950 12950 12950 12950 13225 13100 13150

$Forecast_AlphaSutte
[1] 12969.60 12853.03 12777.40 12916.79 12950.00 13317.63 13151.16

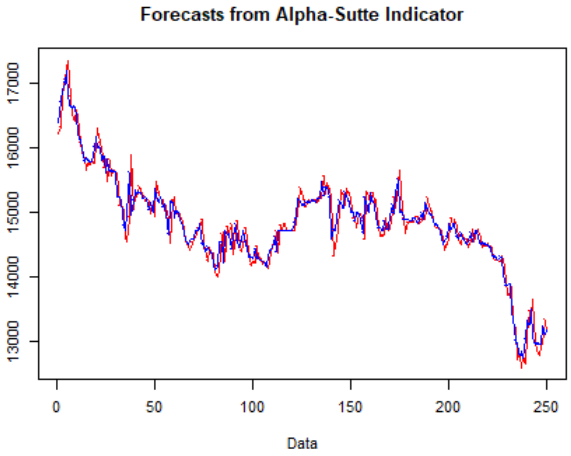

Figure 3 Forecasting Results of α-Sutte Indicator

$Robust_exponential_smoothing
ROBETS(M,N,N)

Call:
robets(y = al_mi_10)

Smoothing parameters:
alpha = 0.9999

Initial states:
sigma = 0.0177
l = 16737.5

sigma: 0.0117
robAIC robAICc robBIC
3780.927 3780.943 3784.436

The forecasting result from PT. Astra Agro Lestari Tbk (AALI.JK) can be seen in Table 1.

Table 1. $Forecast_Robust_exponential_smoothing

	Point Forecast	Lo 80	Hi 80	Lo 95	Hi 95
248	13050.04	12826.50	13273.59	12708.16	13391.93
249	13050.04	12733.90	13366.18	12566.55	13533.54
250	13050.04	12662.84	13437.25	12457.87	13642.22
251	13050.04	12602.92	13497.16	12366.23	13733.85
252	13050.04	12550.13	13549.96	12285.49	13814.60
253	13050.04	12502.39	13597.69	12212.48	13887.60
254	13050.04	12458.49	13641.60	12145.33	13954.75

Table 1 shows the forecasting results from PT. Astra Agro Lestari Tbk (AALI.JK) data for the next 7 periods. The forecasting data is in the range of 80% and 95% confidence intervals. The next step is to compare the forecasting results using ROBERT as can be seen in Figure 4.

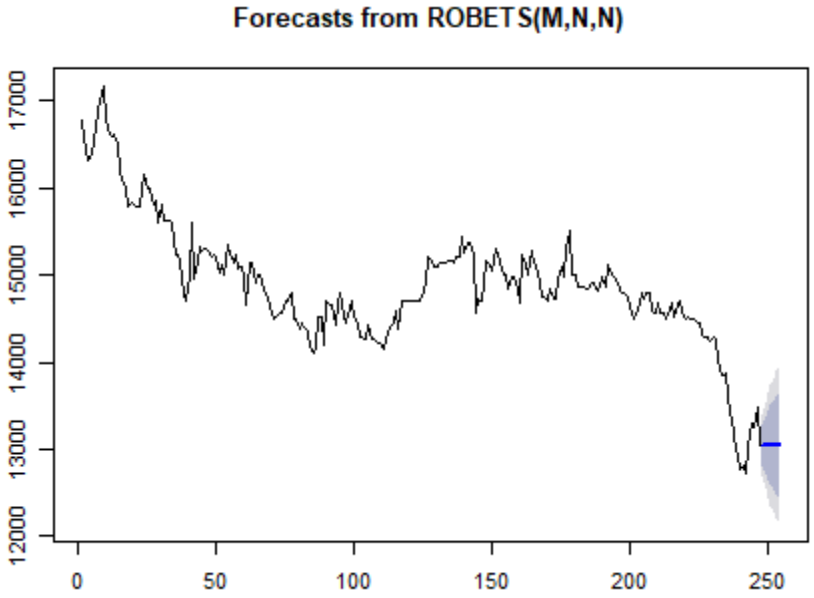

Figure 4 ROBETS Forecasting Results

The output in Figure 3 shows that α-Sutte Indicator is more precise than the ROBETS forecast results in Figure 4. This can also be seen in the comparison of the MSE values of each method (Figure 2).

Based on the analysis of the data, it can be concluded that the α-Sutte Indicator and the ROBERT method can be used to predict stock movements, where α-Sutte Indicator is more suitable to predict the movement of shares of AALI.JK compared to the ROBETS method. α-Sutte Indicator predicts the movement of upcoming stocks will tend to be stable (stagnant) with the value of the predicted closing price of the stock is 13217,859 or (13218).

The application of statistical methods in the provision of business forecast information, especially the forecast of stock movements can be used by information service companies or other information centers in meeting the needs of investors or researchers related to information on predicting business opportunities in the future. There are several things that need to be prepared to be able to use Statistics in managing information, namely, data, capabilities in statistics, analytical skills and the ability to package information from statistical calculations into narratives that can be easily understood by the public.

Conclusions

Facing the industrial revolution era 4.0, libraries and information centers must be able to respond, adapt and predict the changes that will occur in the information field. Information business is dealing with big data that is freely accessible. The companies providing information services and products need to develop creativity and innovation to maintain their existence. One of the things

that can be done is to provide the added value to an information or package of information offered to consumers. Statistics can contribute to the provision of stock movement forecast information as discussed in this paper. The results of the stock movement forecast can provide information needed by investors to reduce uncertainty in stock prices. The Library and Information Science Program in Higher Education needs to develop a curriculum to be able to respond to industry needs, including developing statistical materials in processing information. Statistics and Data Science cannot be separated in Information Science.

References

Ahmar, A. S. (2018). Sutte indicator: an approach to predict the direction of stock market movements. *Songklanakarin J. Sci. Technol 40 (5)*, 1228-1231.

Akker, J. v. (1999). Principles and methods of development research. In B. R. van den Akker J., *Design approaches and tools in education and training* (pp. 1-14). Dordrecht: Springer.

Case, C., & Fair, R. (2002). *Principles of Economics.* Canada: Pearson Education Canada.

Chou, Y.-L. (1969). *Statistical analysis with business and economic applications.* New York, NY: Holt, Rinehart and Winston.

Crevits Ruben, C. C. (2017). *Forecasting using robust exponential smoothing with damped trend and seasonal components.* Leuven Belgium: KU Leuven - Faculty of Economics and Business .

Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: an interdisciplinary review. *Journal of Management, Vol. 31 No. 6*, 874-900.

David, P. A. (1993). Intellectual property institutions and the Panda's Thumb: patents, copyrights, and trade secrets in economic theory and history. In N. R. Council, *Global dimensions of intellectual property rights in science and technology* (pp. 19-62). The National Academies Press.

Diggle, P. J. (2015). Statistics: a data science for the 21st century. *Journal of the Royal Statistical Society: Statistics in Society Series A*, 793–813.

Frascati Manual . (2015). *Guidelines for collecting and reporting data on research and experimental development.* Paris: OECD Publishing.

Haarla, A. (2003). *Product differentiation: does it provide competitive advantage for a printing paper.* Helsinki: Helsinki University of Technology, Laboratory of Paper Technology.

Hammer, C. L., Kostroch, D. C., Quirós, G., & Group, S. I. (2017). *Big data: potential, challenges, and statistical implications.* Statistics Department (STA) International Monetary Fund.

Kurniasih, N. (2005). *Strategi pemasaran jasa informasi (studi kasus di PT. Data Consult, Inc. dan PT. Agranet Multicitra Siberkom).* Jakarta: Universitas Indonesia.

Madden, A. D. (2000). A definition of information. *Aslib Proceedings Vol 52, No.9* (pp. 343-349). MCB UP Ltd, https://doi.org/10.1108/EUM0000000007027.

Marchionini, G. (2016). Information science roles in the emerging field of data science. *Journal of Data and Information Science Vol. 1 No. 2*, 1-6.

Porter, M. E. (1998). *The competitive advantage: creating and sustaining superior performance.* NY: Free Press.

Smith, W. R. (1995). Product differentiation and market segmentation as alternative marketing strategies. *Marketing Management Vol. 4 No. 3*, 63-65.

West, M., & Phillips, D. (2018). Exploring the future of Business Information Services in the financial sector. *Business Information Review 2018, Vol. 35(1)*, 12-16.

Whitelaw, R. F. (2000). Stock market risk and return: an equilibrium approach. *The review of financial studies Vol. 13 No. 3*, 521-547.

Yahoo Finance. (2018, June). *Yahoo Finance* . Retrieved from PT Astra Agro Lestari Tbk (AALI.JK): https://finance.yahoo.com/quote/AALI.JK?p=AALI.JK

Yan, X.-S. (2011). Information science: its past, present and future. *Information*, 510-527.

Yoo, C. S. (2004). *Copyright and product.* Pennsylvania : University of Pennsylvania Law School.

Yoshikawa, H. (2012). *Design methodology for research and development strategy: realising a sustainable society.* Japan: Center for Research and Development Strategy, Japan Science and Technology Agency.