

## The strategy of enhancing article citation and H-index on SINTA to improve tertiary reputation

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### Abstract

*Development of technology as it is today, most students or lecturers in education community write documents or articles digitally. However, there are still many obstacles when searching for a legitimate source of reference and to know whether it contains plagiarism or not. Until present, there are still many students and lecturers who seek references from sources that have not been valid and not yet trusted, but it is considered a fatal mistake for writing articles and also writing thesis or dissertation from untrusted resources. Therefore, Google Scholar system helps to alleviate this problem. Google also facilitates the use of citations or references. The purpose of this research is to identify the number of citation H-Index owned by lecturers at tertiary education and score ranking achieved at tertiary education SINTA (Science and Technology Index) Ristekdikti. Citing an article from another publication is one form of scientific communication by the author or researcher. The large number of citations obtained from an article published in the publication indicates how significant the contributions of the author in improving the quality of the study field. In this study, citation analysis is used as an analysis of all citations which indicate the type of information sources used by students and lecturers in writing the journal as a result of their research. The following research use two methods of analysis: Mind Mapping methods and SWOT Analysis. After conducting research and executing the research strategy, it will result in improving the reputation by increasing the number of citation and lecturer H-Index at Google Scholar which can automatically also increase the affiliations of authors at tertiary education in Google Scholar. Lecturers who have already verified authors in SINTA (Science and Technology Index) Ristekdikti can contribute in improving the rank and number of tertiary education scores on Ristekdikti Science and Technology Index (SINTA). This research produces a comprehensive and straightforward mathematical formula that can be used in understanding SINTA index calculation which will hence improve the enthusiasm of education community in pursuing research as a team as well as individually. Hopefully, with this research, students and lecturers are able to increase their citation and H-index on articles in publications so as to contribute in improving the reputation and quality of universities in the countries.*

**Keywords:** citation, google scholar, h-index

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### 1. Introduction

According to Jayashree R. [1], it takes good language and grammar skills, as well as a mature understanding of knowledge according to the topic of scientific work in writing a scientific paper. To support the content of the argument in the paper it is desirable to add additional information and facts as one side of the power of an argument [1]. This is where one of the benefits of internet existence as an unlimited source of information. This section will discuss the benefits of supporting the Internet with the Google Scholar as a reference search engine as well as scientific articles in the writing of scientific papers [2].

Google Scholar is one of the services supported by Google and aims to compose articles, taking into account the completeness of the text on each article written, the author of the article, and display some references from published articles. Google Scholar is very useful in making scientific papers as it provides literature scientific knowledge of various good books or documents, abstracts, and also articles [3]. Once we find the article material that we required, we can use the article as a reference of scientific papers that we want to create. Citation is the way we tell the reader that certain parts of our article come from sources or articles written by other authors and have been published. Because ethically in writing

scientific articles, if we use or cite the thoughts of others we are required to include the source as a reference in the scientific articles we make. The higher the citation rate in the published article, the higher the H-Index frequency in our article so that it can give good contributions in improving the quality of the research paper [4]. The H-Index is an index that measures the productivity of an article published by a scientist or scholar, H-Index is based on the number of articles published by a scientist as well as the number of citations or citations obtained from other articles from year to year.

Because of the impact it has on the university's development level is very high, for the most part scientists are looking for useful techniques to improve citations in their scientific journals. According to Bornmann [2], in a study, the results are the most important part of the achievement and evaluation of research on the quality of the research conducted. Previously, to obtain a high research ranking the means used were frequency factors on the impact of publications and journals. Then at a later stage through the last approach to assessing the quality of research in publications relies on the number of citations per article. Because in general, line quotes indicated by the number of times an article has been quoted by another article means the articles quoted is said to have good qualities [5]. The problems that arise is in finding a variety of reliable sources of reference and finding out whether the writing that we make contains elements of plagiarism or not.

## 2. Theoretical Basis

According to D. Wahyudin [3], the foundation of theory is a theory that serves to explain the scientific work to be studied and the average is mostly used to provide temporary answers to the problem formulation presented in the hypothesis is relevant. The theory used as a source is not merely the opinion or idea of the previous author or writer, but a well-tested theory of truth and legitimacy [6].

### 2.1. Definition of Citation

According to Zhang C. T. [4], the citation is a work or portion of a work already produced by the author, or previous editor clearly and legitimately identifying a document obtained in which the reference is in writing. To produce a scientific paper (journal, thesis and dissertation) the author requires various sources of information as a support. Various sources of information used as supporting authors get from books, papers, e-books, e-journals, proceedings and so forth. In the process of writing a scientific work, the author will make a list of libraries or references used to include sources of information from previous researchers used in scientific papers written by the author [7]. According to Tee K. S, [8] a writer cites scientific papers on previous researchers on the grounds that, among other things, to reinforce his findings on scientific works made, rewarding previous authors, informing readers of scientific research already conducted by a previous scientist, explaining a concept and explaining a theory, showing another work or reference and so forth [8].

The following points indicate that a new scientific work written by the researcher will always refer to be relevant to a scientific work written by an earlier researcher concerned. A research theme for a scientific work to be devised by a new researcher will always be communication and scientific relationships with a pre-existing and almost identical theme [9]. According to Garfield E. [9], citing is one form of communication or scientific relationship. To support the writing of scientific papers produced stating the source of information that in citation means the source of such information is important for the author. The existence of a source of information that is cited or cited must be considered by the library, which can be used as consideration for the development of collections in the library. Therefore it is necessary to conduct a study on citation analysis of the utilization of existing information sources in the writing of scientific papers conducted by scientists [10].

According to Bakkalbasi N. [11], citation analysis is a part or branch of Bibliometrics. Bibliometrics explanation is to apply a method of statistics and mathematics into the form of written communication as well as other recorded communications, and has a quantitative nature. Meanwhile, according to Sulisty and Basuki, Bibliometrics study was initially divided into two major groups: the first group to examine a distribution of publications and the second to examine a citation analysis. Thus an investigation of a scientific work written using the method of citation analysis is an appropriate choice [11].

## 2.2. Definition of H-Index

According to Thakral S, generally in calculating H-index can be calculated manually by counting the number of citations from all papers that have been published by a researcher. To determine the H-index, it can be done by sorting paper or research papers based on the number of most citation. For example, if a researcher has 10 published papers, and each of the citations are 45, 23, 17, 10, 5, 2, 1 and 3 (three) publications that have been published does not have a citation, then the H-index of the researcher is 5 (five). In short the H-index can be calculated based on how many papers that have been published and quoted by other authors [12]. The H-index was first introduced by Jorge E. Hirsch, Jorge E. Hirsch said that h-index is one of the most commonly used indexes to measure productivity from a scientist or researcher. Jorge E. Hirsch also stated that the purpose of an h-index is defined as the number of papers with a citation number and serves to characterize a researcher's scientific work [13]. Also according to Jorge E. Hirsch, for most scientists who have been officially awarded, there is no doubt the impact and relevance of their research. So how can one measure the cumulative impact and relevance of their scientific research results? Such quantification is often required as an evaluation and comparative objective in a world with such limited resources now, with examples as recruitment and progress on tertiary education, grant awards, and so on. defined the proportionality constant as follows [14].

$$N_{c,tot} = ah^2 \quad (1)$$

$$N_{c,tot} = \sum_{i=A}^F Bi \frac{pcn(n+1)}{2}$$

It can be interpreted as an individual's publication record and its citation record is data that has useful information content. The information is included in the number ( $N_p$ ) number of paper citations that can be issued for  $n$  years ( $N_c$ ) for each paper ( $j$ ), most of this information will be evaluated with different criteria with different people. Here is J. E. Hirsch proposing an "H-Index" number is useful as a way to characterize a simple scientist's results. A scientist has an H-Index if each paper contains at least one and the other ( $N_p - h$ ) paper has quoted ( $\leq h$ ) the following research. With the highest  $h$  example among researches owned by E. Witten's is 110 with the meaning Witten has written 110 papers with at least 110 citations each. This gives a lower limit on the total number of Witten Journal. Of course it can be interpreted that the total number of quotes ( $N_{c,tot}$ ) will usually be much larger than  $h^2$ , because  $h^2$  ignores the number of quotes from the most  $c$  quoted and ignores the paper with the  $c$  quote. The relationship between the two  $N_{c,tot}$  and  $h$  will depend on the details of the distribution with a particular shape. The following is also defined as calculating score author at SINTA. Where the calculation component as well as score calculation formula at SINTA for lecturers or researchers. Formula for Sinta Score is as follows [15]. A more realistic model can be an exponential expansion:

$$Nc(y) = \frac{Ne}{0} - \frac{(y)^\beta}{y^0} \quad (2)$$

notice that in section  $\beta \leq 1$ ,  $Nc_n(y) > 0$  states for all  $y$ ; because  $a < 2$  is true. Scientists also say can write a distribution of subject  $h$  with the following formula

$$Nc(y) = \alpha \frac{he}{al(\beta)} \left(\frac{y}{h_a}\right)^\beta \quad (3)$$

with  $I(\beta)$  in Integral form with the following formula

$$I(\beta) = \int_0^\infty dze^{-z} \quad (4)$$

In some individuals, a scientist expects within a certain time roughly linear on  $h$  will increased. With the simplest form of the model possible, assuming that scientists successfully publish papers or  $p$  paper every year and any such published paper or paper may produce a new  $c$  quote in each subsequent year [16].

### 3. Results and Analysis

To improve the citation of the article on the scientific work we have made and to increase the number of H-Index, a series of tests is conducted. This method is designed to cover all aspects of research on citation and h-index.

#### 3.1. Literature Review

According to Rahardja, U., the literature review is in the form of a book or written material, discussing journals with topics to be researched is relevant to the previous author's topic. Because previously, many researchers have done research on citation and H-Index [17]. In a study on increasing the number of Citation and H-Index like this, literature studies has been done as one of the application of research methods and to support the research methods to be performed. The following are 10 (ten) scientific literature review that have correlated or relevant correlation and used as a source in this research, which include:

- a. The research conducted by Khanna Tiara with the reputation of having H-Index 1 and not yet registered in SINTA, Untung Rahardja with the reputation of having H-Index 10 and registered in SINTA with Ranking 5828 and Iis Ariska Rosalinda with reputation not yet have H-Index and not yet registered in SINTA with the title "Utilization of Google Scholar and Citation To Meet the Needs of Student's Thesis on tertiary education" studied in 2016. There are 3 (three) interesting thing in this research that explain the purpose of Google Scholar and Citation made very interestingly in the form of Mind Mapping method, the strengths and weaknesses of the sources in the article are made very neat and detailed in the form of SWOT analysis method, Prototype and Implementation methods are outlined in a clear and easy to understand way that makes it easy for end-level students to find valid sources of reference [18].
- b. Research conducted by JE Hirsch with the reputation of having H-index 63 with the title "An Index to Quantify An Individual's Scientific Research Output" investigated in 2005. There are 2 (two) interesting thing in this study, which is in calculating H-Index amount for the total number of citations annually made in the form of Mathematical Formulas, The existence of graphs and schematic curves on the number of citations each year simplify the H-Index calculation [19].
- c. Research conducted by Eugene Garfield with a reputation of having H-Index 62 under the title "Citation Analysis as a Tool in Journal Evaluation" this research was conducted in 1972. In this study using Basic Static Code Analysis Method. There are 3 (three) interesting things in this research that the data shows the total number of each cited each year is made very interesting in the form of frequency quotes, data in the cited journal and data on each cite, both made in the form of statistics making it easier to describe, the existence of a column that can simplify the explanation shows the number of items processed from each journal [20].
- d. The research conducted by Steve Lawrence with the reputation of having H-Index 63, C Lee Giles with the reputation of having H-Index 87, and Kurt Bollacker with the title "Digital Libraries and Autonomous Citation Indexing". This research was conducted in 1999. In this study using 5 (five) methods are Invariants First Method on the heuristic build section used to parse quotes, Four Class Methods used to identify and classify excerpts of articles: Distance Strings, Word Frequency, Knowledge of Sub Divisions, Probabilistic Models, and Tree-base Method for Partitioning Data, Method Learn Rules, Methods "Divide and Conquer". There are 3 (three) interesting things in this research that is using ACI system to improve technology by extracting and making citation context easily accessible, existence of CiteSeer using Web search engine (like AltaVista, HotBot, and Excite), CiteSeer indexes the full text of  $k$  utilities and articles, providing full Boolean search with phrase and proximity support (search for separate words with specified maximum distance) [21].

- e. Research conducted by Dietmar Harhoff with the reputation of having H-Index 49, Francis Narin with the reputation of having H-Index 49, FM Scherer and Katrin Vopel with the title "Citation Frequency and the Value of Patented Inventions". This study was conducted in 1999. This research uses 3 (three) methods: Survey Methods of Sampling Approach, Hypothesis Testing, and F-ratio Tests to show that the two groups differ significantly. There is an interesting point in this study that can be a benchmark for innovative contributions by obtaining data on the frequency and number of States protected by patent protection [22].

### 3.2. Framework Synthesis

According to Ary Budi Warsito, Framework can be defined as general outline and overview, or skeleton that link interconnected items which together supports a certain approach to a particular objectives. And can also be interpreted as a basic function or set of commands that can form a certain rules and interact or relate between one another so that in the process of forming a website application required to follow the rules that have been made on the Framework. In the case of Framework computer systems can be interpreted as a collection of scripts such as functions and classes in order to facilitate the developer or programmer when handling various problems that exist in programming [23].

Framework is a method of developing thoughts and views in all directions. Capturing different mindsets from different angles. Framework is also considered as a method of developing different ways of thinking or diverging and creative. The framework or what can also be called a concept map is a very powerful organizational thinking pattern and is the easiest way to position information into the brain and retrieve that information when we need it [24]. The framework when viewed in terms of time can be more efficient or shorten the time in studying an information. This is certainly because the framework can present a picture on a thing as a whole, in a very efficient time. Or it can also be called that framework can shorten the learning time compared with inefficient linear notes pattern into a more effective note-taking pattern and certainly can be directly understood and understood by individuals. In this framework method produces the following explanation of the flow in the strategy of increasing the citation and also the H-index ranking on Google Scholar and Scopus [25]. Mind mapping on citation and h-index framework as shown in Figure 1.

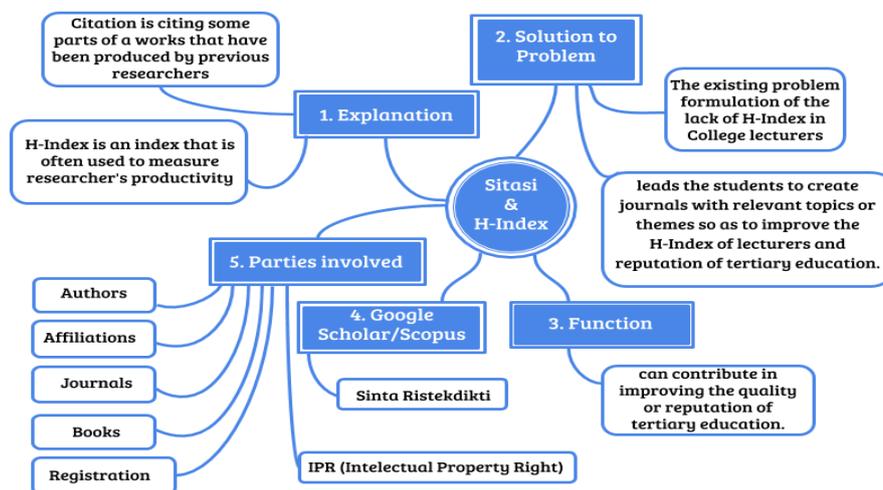


Figure 1. Mind mapping on citation and h-index framework

Figure 1 is a view of the mind mapping on citation and H-Index Framework that describes the graph on the strategy of citation and H-Index improvement, which consists of:

- a. Explanation: H-Index is an index that is often used to measure researcher's productivity and Citation is citing some parts of a works that have been produced by previous

researchers. (2) Problem solving: The existing problem formulation of the lack of H-Index in College lecturers and problem solving leads the students to create journals with relevant topics or themes so as to improve the H-Index of lecturers and reputation of tertiary education.

- b. Function: can contribute in improving the quality or reputation of tertiary education.
- c. Flow: Increase the number of citation and lecturer H-Index on Google Scholar or Scopus and then improve the reputation of tertiary education in Science and Technology Index Ristekdikti
- d. Parties involved: Lecturers, Students, Publishers, Science and Technology Index) Ristekdikti.

### 3.3. Mathematical Equation Synthesis

Synthesis can be interpreted as combining or mixing elements and parts to form a new unity. Synthesis also includes arranging parts that can not be formed as a new unity. Synthesis involves using parts that is precised and clear. Synthesis can be categorized into 3 (three) perceptions, namely: (1) create a communication that contains a unique bonding between writers and speakers to express feelings, ideas, and experience of others in the communication itself, creating a plan, which is to make an operational proposal and a work plan, (3) create a series of relationships used to clarify certain data [26]. The following formula is the synthesis of calculating author score at SINTA. Where it presents the calculation component as well as score calculation formula at SINTA for lecturers or researchers. Formula synthesis of Sinta Score (SS) is as follows:

$$\sum_{i=A}^F J_i = J_A + J_B + J_C + J_D + J_E + J_F \quad (5)$$

$$SS = \frac{J_A A + J_B B + J_C C + J_D D + J_E E + J_F F}{\sum_{i=A}^F J_i}$$

Weight Rating (not percentage)

Annotation	Description	Weight
A	Number of Documents Articles in Scopus	40
B	Number of Non-Article Documents in Scopus	15
C	Number of Cites in Google Scholar	1
D	Number of Citation in Scopus	4
E	Quality of H-Index (Google Scholar)	4
F	Quality of H-Index (Scopus)	16
J	Beban dari setiap komponen	
SS	Sinta Score	

The divisor is a numerical result of a statistical calculation that takes into account the maximum Personal Score Sinta for Lecturer or Researcher. Description: At this point in point E (Quality of H-Index Google Scholar) and point F (Quality of H-Index Scopus) are not activated so the synthesis formula is not taken into account and for the divider the fixed number is stated as 102 so as to produce the following calculation. Sinta score Tole Sutikno as shown in Figure 2.

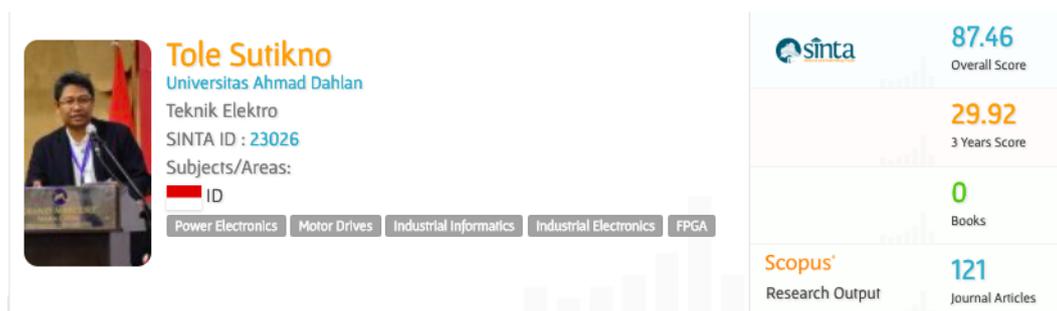


Figure 2. Sinta score Tole Sutikno

Tole Sutikno on the SINTA website has a score of 77.55 based on the calculation formula we made, the resulting score is as follows:

$$\begin{aligned} \sum_{i=A}^F J_i &= J_A + J_B + J_C + J_D + J_E + J_F & (6) \\ SS &= \frac{J_A A + J_B B + J_C C + J_D D + J_E E + J_F F}{\sum_{i=A}^F J_i} \\ &= \frac{105 \times 40 + 14 \times 15 + 1121 + 625 \times 4 + 18 \times 0 + 12 \times 0}{102} = \frac{7910}{102} = 77,55 \end{aligned}$$

remarks:

$\sum_{i=A}^F J_i = 102$ , a constant in SINTA Score calculation.

Maximum limit for scopus and google scholar citations=1000

The current SINTA calculation algorithm does not include variable E and F. Hence, the variable of E=0 and F=0

#### 4. Implementation

According to Ibnu Wibowo, reputation can be interpreted as a view or perception of some observers of an individual or group of organizations, in which such views or perceptions may arise because of the productivity or performance of the qualities of an individual and a group of such organizations. Mitcnick and Mahon, also convey the company's reputation can be long-term and relatively stable as a result of mutual assessment by outsiders on the productivity and achievement of a company. According to Deephouse, reputation can also be defined as the most important competitive advantage a company must have [27]. As a result, reputation can be synthesized as a position or rank that has been owned by an individual due to the performance quality that has been achieved by an individual itself, and can be interpreted as the productivity performance quality of individuals according to the perceptions of some observers [28].

##### 4.1 Google Scholar Profile Lecturer Ahmad Dahlan University

In this Google Scholar profile it displays information about the number of Cites and H-Index on Tole Sutikno's published paper in Google Scholar. There are 1024 citation under the heading "An Optimized Switching Strategy for Quick Dynamic Torque Control in DTC Hysteresis- Based Induction Machines" [29], studied in 2011. There are 2 (two) interesting things in this study that there are six steps achieved in the proposed method by switching only the most optimized voltage vectors that produce the largest tangential component to the circular flux locus. This paper also discusses the performance of dynamic torque controls in the basic DTC to justify on how the proposed results of the selected voltage vectors in excellent dynamic torque performance [30], with a total of 80 citations in 2010. And there are 8 H-Indexes with the boundary of paper that has H-Index that is the 18th paper with Research conducted by Tole Sutikno with reputation of having H-Index 18 and registered in SINTA with Ranking 29 and Mochammad Facta with reputation of having H-Index 8 and registered at SINTA with Ranking 867 under the title "An Efficient Strategy to Generate High Resolution Three-Phase Pulse Width Modulation Signal Based on Field Programmable Gate Array" [31].

Which was researched in 2010. There are 2 (two) interesting things in this research that is paper, this report modifies the unsync hronous unipolar sinusoidal PWM (SPWM) switching scheme based on the Altera Field Programmable Gate Array (FPGA) switching Altera Field Programmable Gate Array (FPGA), presenting various forms of the traditional three-phase SPMW block diagram of signal generation based on FPGA [32]. in 2010. Then there are 26 i10-index on Google Scholar Tole Sutikno profile as shown in Figure 3.

##### 4.2. Display Submit Journal on TELKOMNIKA

Based on Figure 4 students who have completed the journal or paper in accordance with the direction of the lecturers, for the submission process in in accordance to student's choice of journal entry. Students submit a journal or paper on TELKOMNIKA where according to Istadi, has the first sequence with a score S1 and reputed Scopus indexed. From 54 Journals admitted to Raharja tertiary education there are 4 (four) Journals that entered into

959 Journals in Sinta (Science and Technology Index), namely: TELKOMNIKA, CSRID (Computer Science Research and Its Development Journal), Journal Science Computer and Information, and Cogito Journal [33].

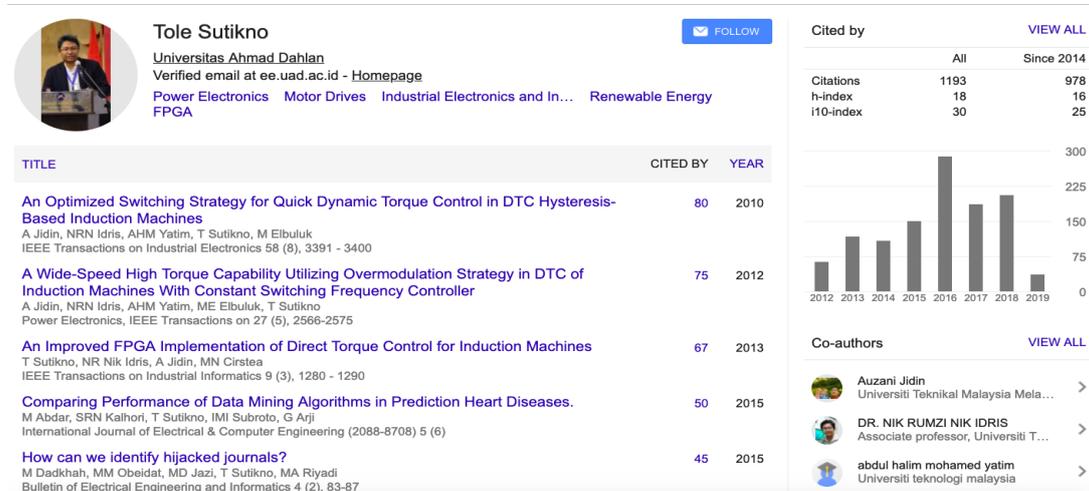


Figure 3. Google scholar Tole Sutikno profile



Figure 4. Interface submit journal on TELKOMNIKA on March 2018

**4.3. Reputation Interface on Ristekdikti SINTA**

Based on Figure 5, the information presented in the form of a bar graph and his explanation of the overall reputation of Ahmad Dahlan University in SISTA (Science and Technology Index) Ristekdikti ranked 51 with a score of 1,865 and has 405 Verified Authors, where the next strategy in increasing citation and H-Index can improve Ahmad Dahlan University's reputation with higher rankings.

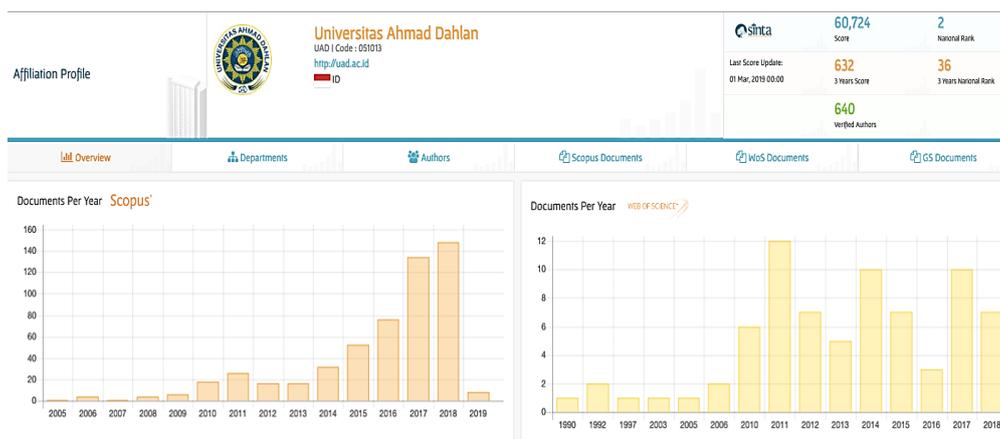


Figure 5. Interface of Ahmad Dahlan University's Reputation at SINTA Ristekdikti on March 2018

## 5. Conclusion

In the research conducted there are several research methods including the following literature review useful to identify gaps in this study, continuing what has been achieved by previous researchers by discussing journals that have a topic relevant to the previous author's topic, base on many researchers who have done research on Citation and H-Index. Addition of framework analysis is useful to display all the important points in this study and allows the material essence contained to be clear and sequence and the information more clearly visually. There is a SINTA Score calculation synthesis formula so that it can be used as a reference to increase the ranking of affiliations authors in SINTA. From the predetermined system it can be drawn 2 (two) conclusions, that with the improvement of article Citation and H-Index can contribute in the progress of reputation of tertiary education is the first to increase the number of Citation and H-Index on the profile of Google Scholar lecturers as well can increase affiliations of lecturers at universities and furthermore with increasing citation and H-Index lecturers who become verified authors at SINTA can contribute to improve the reputation of tertiary education both rank and also the number of score owned.

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