ISSN 1757-8981

IOP Conference Series
Materials Science and Engineering

2nd International Conference on Robotics and Mechantronics

517

VOLUME 517 – 2019

9–11 November 2018
Singapore

EDITOR
Meng Joo Er

The open access journal for conference proceedings

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IOP Publishing

Tarumanagara International Conference on the Applications of Technology and Engineering

IOP Conf. Series: Materials Science and Engineering **508** (2019) 011001 doi:10.1088/1757-899X/508/1/011001

1st Tarumanagara International Conference on the Applications of Technology and Engineering 2018

Preface

On behalf of the organising committee of 1st Tarumanagara International Conference on the Applications of Technology and Engineering (TICATE) 2018, I would like to welcome all delegates to the Campus of Universitas Tarumanagara (UNTAR) in Jakarta, Indonesia with great pleasure. Being held from November 22 to 23, 2018 the international conference is organized by UNTAR and technically sponsored by IOP Conference Series: Materials Science and Engineering (MSE).

Universities play an important role in facing the rapid development of technology and engineering in recent digital era. The rapid developments of technology and engineering impact various aspects of people's life in welcoming the era of Industry 4.0. The biggest challenge faced by universities due to these rapid developments is how the results of research and technological innovation can contribute to the people's prosperity. As a form of contribution from universities in responding this challenge, Universitas Tarumanagara hold the 1st TICATE 2018 with the theme of: "The Implementation of Research Results and Innovation for People's Prosperity".

This international conference activity is expected to be a forum of discussion, networking and exchanging ideas among researchers, academicians, and practitioners to work together to pursue research and technological innovation that can be used to contribute to people's prosperity.

Over 160 papers have been submitted to 1st TICATE 2018 from 6 different countries, those are Germany, France, Australia, Taiwan, Malaysia, and Indonesia. We categorized the papers under seven groups, namely Mechanical Engineering and Technology; Electrical Engineering; Industrial Engineering; Civil and Environmental Engineering; Food and Agriculture Technology; Informatic Engineering & Technologies; and Medical & Health Technology. All papers, regardless of their standing or initial classification, were available for general discussion at the committee's meeting.

Our special thank goes to our Rector, Prof. Dr. Agustinus Purna Irawan, who has initiated this conference, Dr. Svann Langguth as Head of Science and Technology Division from the Embassy of the Federal Republic of Germany in Jakarta, Prof. Dr. Mohd. Zulkifly bin Abdullah as Professor from Universiti Sains Malaysia, and Dr. Ir. Yono Reksoprodjo, DIC as Vice President Corporate Affairs of Sintesa Group, as our pleanary speakers and Bank DKI, Bank Mandiri, Tarzan Photo, Hyperzone Computer, as our patrons. I would like to give special thanks to all of you for the interesting keynote speech at this international conference.

We also thank all individuals and organisations such as the members of international editorial board, the conference organisers, the reviewers, and the authors, for their contribution in making TICATE 2018 as a successful international conference and a memorable gathering event. I am also grateful for the support of publication service of IOP Conference Series: Materials Science and Engineering (MSE).

We hope that the conference could present you wonderful memories to bring home in addition to new insights and friendship congregated during the event. We truly value your participation and support for the conference. We hope that you will enjoy TICATE 2018 and Betawi culture and tradition in Jakarta.

Dr. Hugeng, S.T., M.T. (SMIEEE)

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Effectiveness and efficiency of kitchen space reviewed from the kitchen triangle concept in small flats case study 'Rusunawa' Manis Jaya, Tangerang city, Banten

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Abstract. The increase in population led to the narrowness of the land mainly for housing and settlement needs. Therefore the presence of housing and settlements vertically is one of the alternative solutions in solving this problem, one of which is the apartment project targeting low income citizen (MBR). But in fact in most cases in big cities, precisely due to the narrow residential area, many cause new problems such as narrow space and also the function of space so that space becomes ineffective and inefficient. This research was conducted with the aim to examine the effectiveness and efficiency of kitchen space as one of the space facilities that support family needs in food in simple flat unit with a case study of Rusunawa Manis Jaya, Tangerang City. The method used in this research is comparing the condition of existing kitchen space in flat units in Rusunawa Manis Jaya with the parameters about the effectiveness and efficiency of the kitchen space by using the kitchen triangle concept issued by the National Kitchen and Bath Association with the aim of producing a recommendation that can be used by managers, designers and users in designing the kitchen to support users in terms of effectiveness and efficiency of kitchen activities in the kitchen itself. From the results of the research on the effectiveness and efficiency of the kitchen space based on the kitchen triangle concept, it can be concluded that the kitchen space in the Rusunawa Manis Jaya unit has met the standard from the space requirements, but has not fully met all these parameters issued by National Kitchen and Bath Association so that the effectiveness and efficiency of the kitchen space in the flat unit in Rusunawa Manis Jaya is still not compatible with the parameters.

1. Introduction

The population that continues to increase along with the development of a city is one of the problems faced by big cities in Indonesia, especially in the Jakarta area and its surroundings. Planning and construction of multi-storey houses is an alternative solution to the problem of housing and settlement needs in large cities such as Jakarta and surrounding areas**.** The government already has a flat house planning and construction program as an effort to meet the needs of public housing which will later be inhabited by the people from the slums area with a low-income (MBR). But in reality there are still many flats that have a very limited occupancy unit and are not in accordance with the minimum requirements for a simple familyWith a limited unit area, often areas in flats that are considered unimportant are sacrificed. Many residents of the flats complained about the limited space for flats in the units they occupied so that the areas that were previously important, now only became the filler aspect of the flats without optimal planning, one of which was the kitchen area[1]. According to the results of research conducted by a market research company GfK (a research institute from Germany) shows that most people in Indonesia, spend around 8.3 hours per day to do cooking activities which consist of cooking preparation process, processing of food ingredients up to washing cooking and eating equipment[2]. Whereas according to the Law of the Republic of Indonesia No. 1 of 2011 concerning Housing and Settlement Areas, said that everyone has the right to live in prosperity, birth and

inner life, to live, and to have a good and healthy living environment, which is a basic human need [3].

With the explanation of the data above, it can be said that the kitchen area is the area with the most time spent by the occupants of the house, especially the mother, apart from sleeping / resting areas in residential units in Indonesia. However, there are still many kitchen areas that are designed to be modest, especially in flats and sometimes not in accordance with its function so that it can create new problems for the occupants such as physical health problems regarding aspects that can disrupt the physical comfort of the user over time. A study conducted by the Spinalogy Clinic on the link between kitchen ergonomics and physical health problems found that simple changes in kitchen ergonomics have an adverse effect on the spine and can cause joint pain[4], hence the researchers want to do a study on the effectiveness and efficiency of the kitchen area from the concept of the kitchen triangle issued by the National Kitchen and Bath Association (NKBA) on one of the rental flats in the city of Tangerang with existing kitchen conditions in Rusunawa Manis Jaya.

2. Material and Method

2.1 *Case Study*

In this study, the researcher chose Rusunawa Manis Jaya which had been established in stages since 1998 and until now, Rusunawa Manis Jaya is still operating with the fact that all leased units have been occupied according to the results of interviews with one of the security officers in the Flat. In addition, the physical condition of Rusunawa Manis Jaya is still in good condition, although there are still some problems with the maintenance. But overall, as a rental flats which has been almost 20 years old, it can be said that Rusunawa Manis Jaya managed to maintain a relatively good regional environment compared to other flats in the Tangerang City area.

In addition Rusunawa Manis Jaya is one of three rental flats located in the City of Tangerang and each unit is always fully occupied every year due to the high interest of low-income people in the city of Tangerang to live in a rental flat [5].

Figure 1. The location of Rusunawa Manis Jaya Region is seen from the top view
(Source: https://www.google.com/maps/place/Rusunawa+Manis+Jaya)

Rusunawa Manis Jaya is located at Jalan Cikoneng Girang PLN No 60, Manis Jaya, Jatiuwung, Kota Tangerang, Banten. Manis I, II, III and IV tower were built by the National Housing Development Public Company with a total of 192 units and land used by the Regional Government of

1.5 hectares. The towers were constructed as many as two twin blocks with five floors. The National Housing Development Company also built six management room units, four panel room units and 22 business and social space units. Likewise, Manis V, VI and VII which were built by the Department of Settlement and Regional Infrastructure together with the Department of Public Works consisted of 144 units. Tangerang City Government provides land, electricity supply, clean water and PSD. Rental Flat is intended for flood victims, factory workers and formal and informal workers as well as Low-Income Citizen (MBR) [6].

Figure 2. One of the towers in the area of Rusunawa Manis Jaya (Source: Personal Documentation, 2018)

2.2 *Method*

The basic principle of the kitchen layout that must be considered in the design of the kitchen is known as the kitchen triangle that defines the 3 main activity zones in the kitchen, namely cooking zone, washing zone, and storing zone. This principle focuses on the organization of an effective kitchen layout with the prevention of the occurrence of cross-motion circulation and to maintain an effective range of motion between the three main activities in the kitchen. A simple understanding of this concept can be understood with the illustration below [7][8]:

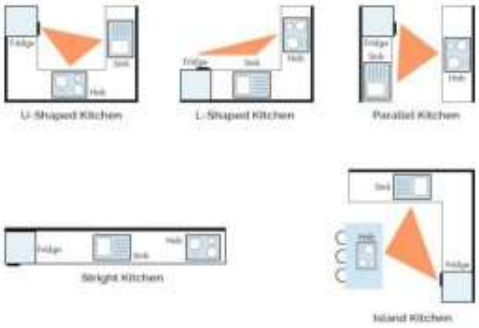

Figure 3. Layout of kitchen and kitchen triangle in general (Source: https://www.dominicavibes.dm/columns-212553/)

According to the National Kitchen and Bath Association (NKBA), there are several conditions that must be met in supporting the efficiency of the kitchen space that uses the kitchen triangle concept, including [9]:

1. The sum of the three sides of the kitchen triangle does not exceed 792 cm and each triangle leg of the kitchen triangle must have a length of between 122 and 275 cm;
2. Kitchen Triangle may not collide with an island kitchen or anything more than 365 cm;

3. If the kitchen has only one sink, the sink should be placed between or across from the cooking area, preparation area or storage area (refrigerator);
4. There is no major traffic that cuts or blocks the kitchen triangle.

Research on the effectiveness and efficiency of the kitchen space was carried out in Rusunawa Manis Jaya, Tangerang by comparing the theory and standardization (deductive) with the reality in the case of the study conducted at one of the unit in Rusunawa Manis Jaya, Tangerang. The data obtained based on the results of observations and studies of the literature, then analyzed by returning the empirical data obtained during the observation and then comparing the results with the theory and assessment indicators summarized based on the explanation of the theory.

From the results of the explanation above, the researcher describes the parameters used to further review the level of efficiency of the kitchen space in the Rusunawa Manis Jaya residential unit, Tangerang City. The parameters are as follow:

Table 1. Parameters used to review the level of effectiveness and efficiency in a residential unit in Rusunawa Manis Jaya , Kota Tangerang

	Assessment parameters according to NKBA
1	The form of a kitchen layout consisting of 3 zones, including cooking zone, preparation zone and washing zone. The three zones form a triangle which is generally known as the kitchen triangle concept.
2	The length of each kitchen triangle leg is between 122 cm and 275 cm
3	The total number of the three legs of the kitchen triangle is not more than 792 cm
4	Kitchen triangle does not collide with an island kitchen or anything more than 365 cm
5	If the kitchen only has 1 sink, the sink should be between or across from the cooking area, preparation area or wet food storage area (refrigerator)
6	Not intersecting with the major traffic which cuts or blocks the kitchen triangle

Research activities are summarized in the following flowchart of the framework:

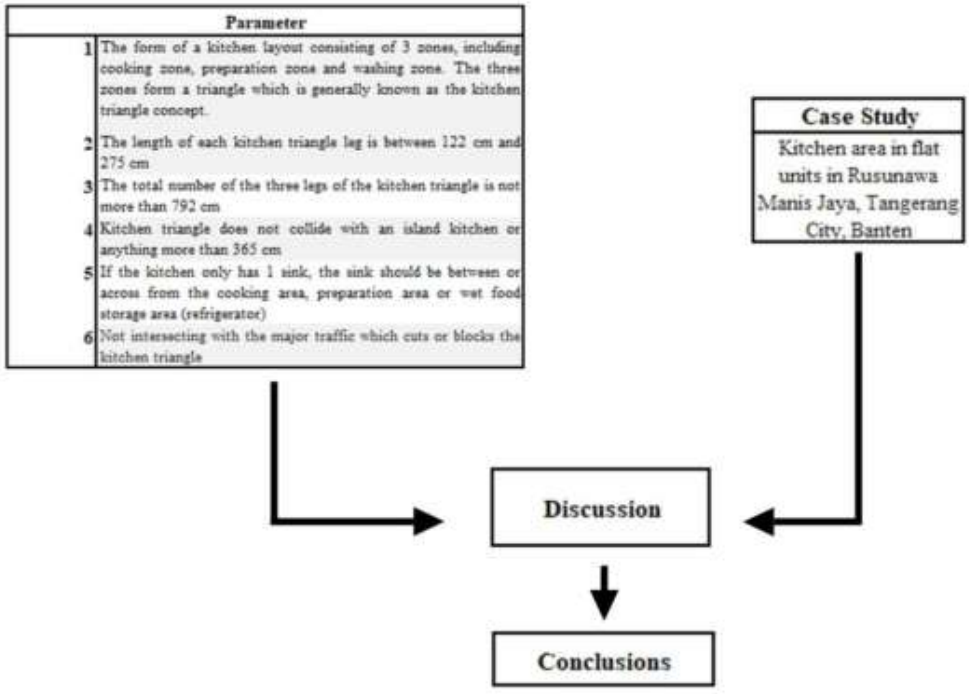

Diagram 1. Framework for observing case study (Source: Results of personal processing, 2018)

3. Discussion

From the results of data collection obtained during observation, Rusunawa Manis Jaya only has 1 type unit. Each unit in the Rusunawa Manis Jaya has the same area and space configuration and consists of a main room that is used as a family room as well as a bedroom and dining room. In addition to the main room, there is a bathroom area as well as a rear balcony area which becomes a kitchen space with an area of $3m^2$ in each residential unit, this certainly can cause various kinds of problems regarding the efficiency of the use of the kitchen space itself, such as the limited space for kitchen users and the limited storage area in the kitchen.

Figure 4. Layout and zoning of residential units in Rusunawa Manis Jaya, Tangerang (Source: Results of personal processing, 2018)

In the kitchen itself, there is an area for preparing, cooking and washing as well as an area for storing but with typical Indonesian cooking activities, the kitchen facilities provided do not seem to support occupant activities so that there are additional areas by the residents for preparation and washing areas related to activities kitchen.

Figure 5. Existing areas are provided to support cooking activities in the Rusunawa Manis Jaya residential unit (Source: Results of processing and personal documentation, 2018)

Based on observations, with limited kitchen area and kitchen area that integrates with the balcony and connecting space between the main area and the bathroom, the kitchen function in supporting the activities feels very low marked by the addition of a kitchen supporting area located in the main area of residence, such as refrigerator as a storage area for wet food and dish racks and eating equipment as a dry storage area.

Figure 6. The kitchen area which is integrated with the main area of the unit in Rusunawa Manis Jaya (Source: Results of processing and personal documentation, 2018)

Another additional area in the kitchen area in the Rusunawa Manis Jaya flats unit is just above the laundry area and the additional preparation area is blocked by a washing machine that is not related to cooking activities in the kitchen area. In addition, the storage conditions of kitchen appliances are considered very lacking because the storeroom does not have a cover so it looks very messy.

Figure 7. Preparation and washing area in the kitchen room added by residents of the Rusunawa Manis Jaya (Source: Results of processing and personal documentation, 2018)

From the results of the data above, it can be illustrated that the shape of the kitchen triangle obtained in the kitchen area in the Rusunawa Manis Jaya is using the L-Shaped Kitchen layout that is bounded by the door between the main room and the kitchen which also integrates with rear balcony. In addition to being separated between rooms, the layout of the kitchen is also disrupted by the presence of a washing machine that blocks the circulation pattern in the kitchen area.

Figure 8. Kitchen layout and kitchen triangle concept on the Rusunawa Manis Jaya unit (Source: Results of processing and personal documentation, 2018)

With the data above, the level of efficiency of the kitchen space in the Rusunawa Manis Jaya residential unit can be measured based on the references issued by the National Kitchen and Bath Association (NKBA) as follows:

Table 2. Data analysis obtained with the parameters used to review the level of efficiency of the Rusunawa Manis Jaya flat unit, Kota Tangerang

	Assessment parameters according to the National Kitchen and Bath Association (NKBA)	Flat Unit Condition in Rusunawa Manis Jaya	Compatibility with Parameters
1	The form of a kitchen layout consisting of 3 zones, including cooking zone, preparation zone and washing zone. The three zones form a triangle which is generally known as the kitchen triangle concept.	The shape of the kitchen kitchen triangle obtained from the analysis on the Rusunawa Manis Jaya residential unit is the L-Shaped Kitchen layout that is bounded by the door between the main room and the kitchen space that integrates with the back balcony.	Compatible
2	The length of each kitchen triangle leg is between 122 cm and 275 cm	The length on the line A of the kitchen triangle is 195 cm. The length of the kitchen triangle line B is 170cm while the length of the kitchen triangle line C is 262cm. (**see figure number 8**)	Compatible
3	The total number of the three legs of the kitchen triangle is not more than 792 cm	The total number of the three legs of the kitchen triangle in the Rusunawa Manis Jaya residential unit is 632cm.	Compatible
4	Kitchen triangle does not collide with an island kitchen or anything more than 365 cm	The kitchen triangle in the kitchen space of the Rusunawa Manis Jaya flat unit is separated between rooms where the cooking and washing areas are separated with storage areas, in this case are both wet storage (refrigerator) and dry storage (dish rack). In addition to space separation, the kitchen triangle is also cut with the washing machine cutting the preparation area with the sink area provided. (**see figure number 8**)	Not Compatible
5	If the kitchen only has 1 sink, the sink should be between or across from the cooking area, preparation area or wet food storage area (refrigerator)	The kitchen in the Rusunawa Manis residential unit only has 1 sink where the sink is located adjacent to the cooking area but is blocked by the layout of the washing machine that separates the sink area with the preparation area. (**see figure number 5**)	Not Compatible

6	Not intersecting with the major traffic which cuts or blocks the kitchen triangle	The kitchen area that integrates with the balcony as the only link between the main area and the bathroom clearly cuts and blocks the kitchen triangle that intersects with the main circulation (major traffic) of the occupants of the unit. (**see figure number 8**)	**Not Compatible**

(Source: Results of data processing and analysis, 2018)

4. Conclusions

Based on the above analysis, it can be concluded that the layout of the kitchen in the Rusunawa Manis Jaya residential unit in terms of the kitchen triangle zoning area is in accordance with the parameters, but the problem of limited space and the narrowness of occupancy affect the effectiveness and efficiency of the circulation of cooking activities in the dwelling. The separation of space makes the wet and dry storage area separate from the kitchen space itself. Besides that, there is a mix of activities between cooking and washing clothes, making the kitchen has two different functions. The existence of a washing machine in the layout of the kitchen room has separated the kitchen triangle in the kitchen space which affects the efficiency of the kitchen space itself. In addition, because of the narrowness of the unit, the only major access (major traffic) that connects between the main area and the bathroom is through a balcony that is used as a kitchen area.

With an area of only $3m^2$, the kitchen room has a limited number of users in order to achieve the effectiveness and efficiency of the space that supports user activities, therefore the management, residents and designers need to review further the kitchen design standards with the kitchen triangle concept as appropriate as recommendations for achieving effectiveness and efficiency in carrying out activities in the kitchen area.

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Subject Area and Category	Engineering Engineering (miscellaneous) Materials Science Materials Science (miscellaneous)
Publisher	
Publication type	Conferences and Proceedings
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Coverage	2009-ongoing
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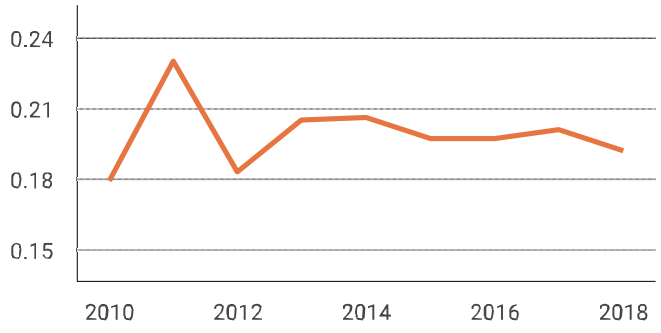

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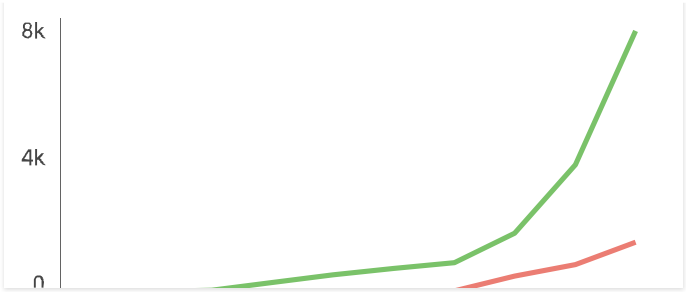

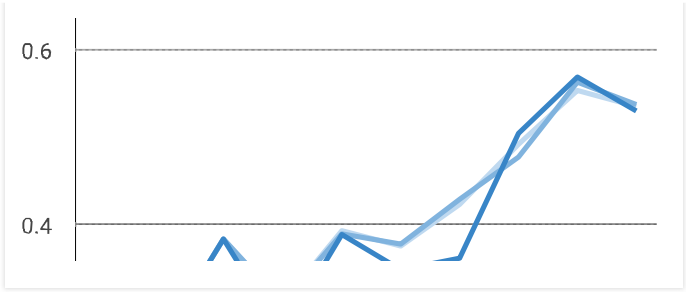

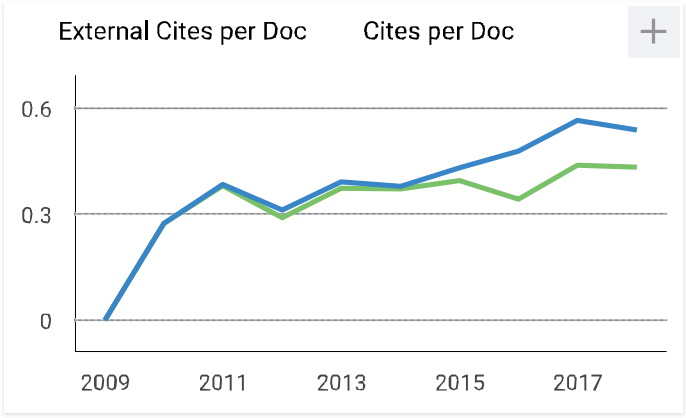

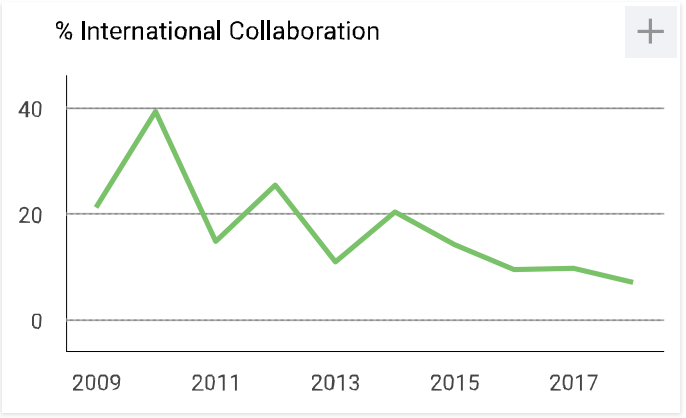

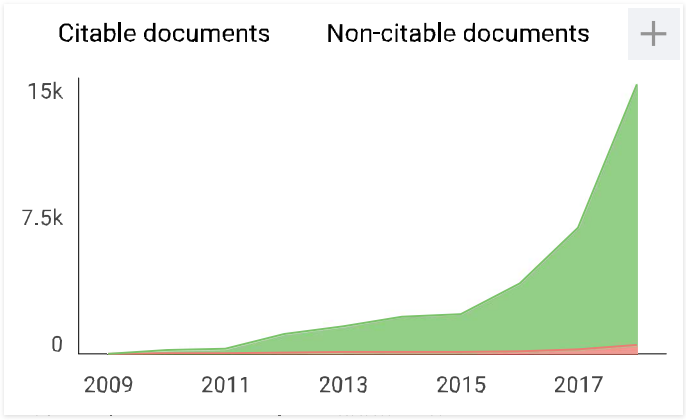

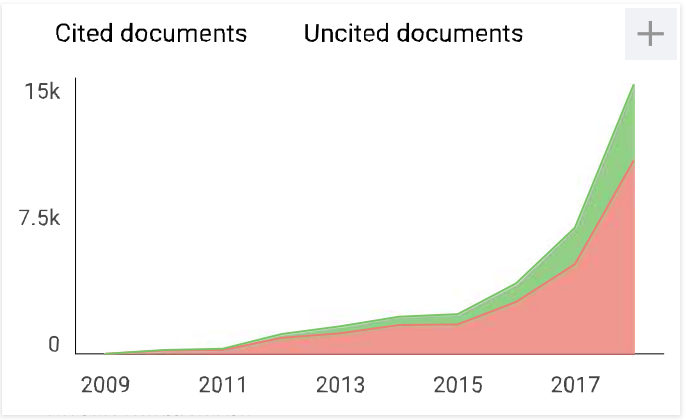

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