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To cite this article: Amarria Dila Sari *et al* 2017 *IOP Conf. Ser.: Mater. Sci. Eng.* **215** 012032

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# Implementation of 5S Method for Ergonomic Laboratory

**Amarria Dila Sari<sup>1)</sup>, Fety Ilma Rahmillah<sup>2)</sup>, Bagus Prabowo Aji<sup>3)</sup>**

<sup>1,2,3)</sup> Department of Industrial Engineering, Faculty of Industrial Technology,  
Islamic University of Indonesia, Jl. Kaliurang Km 14.5 Yogyakarta, Indonesia

amarria@uii.ac.id<sup>1)</sup>, fety.rahmillah@uii.ac.id<sup>2)</sup>, ajikgoez@gmail.com<sup>3)</sup>

**Abstract.** This article discusses 5S implementation in Work System Design and Ergonomic Laboratory, Department of Industrial Engineering, Islamic University of Indonesia. There are some problems related to equipment settings for activity involving students such as files which is accumulated over the previous year practicum, as well as the movement of waste in the form of time due to the placement of goods that do not fit. Therefore, this study aims to apply the 5S method in DSK & E laboratory to facilitate the work processes and reduce waste. The project is performed by laboratory management using 5S methods in response to continuous improvement (*Kaizen*). Moreover, some strategy and suggestions are promoted to impose 5S system within the laboratory. As a result, the tidiness and cleanliness can be achieved that lead to the great performance of laboratory users. Score assessment before implementing 5S DSKE laboratory is at 64 (2.56) while the score after implementation is 32 (1.28) and shows an improvement of 50%. This has implications for better use in the laboratory area, save time when looking for tools and materials due to its location and good visual control, as well as improving the culture and spirit of '5S' on staff regarding better working environment

*Keywords:* 5S, laboratory, management, waste

## 1. Introduction

5S system is commonly used by several laboratories in the global scope [1][2]. Implementation of 5S is part of a continuous improvement (*Kaizen*), aims to improve quality and work systems within an organization. Scholars [3] state that 5S is a management method of the work area as a consequence of the application of *kaizen* culture. Implementation of 5S method has been applied to the various work areas such as in manufacturing companies [4], metal SMEs [5], hotel service industry [6], and education especially in university laboratories. Some researches related to the implementation of 5S in the laboratory Coast University [2], laboratory Quality Assurance [7], Pharmaceutical laboratories [1], laboratory of Graphic Communications Management at the University of Wisconsin-Stout [8] and NDE laboratory in India [9].

A neat and clean workplace can be a modal of the good work culture. It gives a reflection of service quality and provides image of excellent to the institution. Laboratory as one of the component supporting university services should have a neat and clean workplace. DSK & E is one of six laboratories in Department of Industrial Engineering, Islamic University of Indonesia. The activities include teaching and learning/tutorials, research and administrative activities. Tutorial activities



performed for subjects Physiology and work measurement and work system engineering and ergonomics. Tutorial activities carried out more use of practical tools such as antropometer, lux meter, stopwatch, sound level meters and other lab tools such as toys, plug, and resistor. Besides the practical activities, the business processes in the laboratory are administrative activities such as lending tools, attendance and research activities.

There are some problems related to equipment settings for activity involving students such as filing which is accumulated over the previous year practicum, as well as the movement of waste in the form of time due to the placement of goods that do not fit, inappropriate storage space for bin, broken printer, old computer and lab tools such as toys and resistors. In addition, wasting time in searching files, documents, books and lab tools due to workplace management and unnecessary material as well as lack of visual control for SOP (Standard Operational Procedures). However, the major issue in the laboratory management is the shortage of system which can determine recent arrangement and disproportionate participation of all staff in workplace management. Therefore, this research aims to apply the 5S method in DSK & E laboratory in order to respond continuous improvement in several aspects such as equipment setting, work processes, and reduce waste.

## 2. Literature review

5S is commonly known as a simple housekeeping method which can be used to arrange equipment or household, but actually the main concept of 5S is on the details and continuous working [2]. This method is also implemented by Japanese companies at the administration field which infiltrate in the ideology and technique management [10]. Furthermore, 5S methodology is believed can reduce the waste, improve safety and work process.

Basically, 5S method consists of 5 stages representing the meaning of five Japanese words and all of the levels are integrated in a whole working process [11]:

1. **Seiri/sort**, it means removing the waste and unused items from the working area. By sorting the unnecessary tools employee will be able to prioritize the equipment whether it is needed or not to be placed in their workplace.
2. **Seiton/set in order**, it means arranging tools in specific place and keeping it into the right position. Therefore, the items can be found easily by the workers when it is needed.
3. **Seiso/shine**, it means cleaning all working space and necessary tools. Therefore, the workers will have convenient place to work, and the equipment will always be ready to be used for other employee.
4. **Seiketsu/standardize**, it means ensuring all setup and equipment which has been arranged and cleaned in the right condition by promoting visible and modest rules.
5. **Shitsuke/sustain**, it means obeying the rules and procedures which has been issued as a respond of the first four phases.

In practice 5S methodology is used to build and keep the quality of environment within an organization [12]. Toyota Production System (TPS) is one of the obvious model of 5S implemented at the firm [13]. In addition, 5S methodology had been implemented in various manufacturing company such ceramics [14], sheet metal [15], and luggage bag [16]. Scholar [17] point out that 5S implementation creates domino effects which influence personal or company performance as depicted in Fig.1. 5S environment as a result of the 5S implementation will affect working behaviour of a person or culture in a company. Then, it will boost the personal skills and knowledge as well as company's operational excellence. Further, the skills will build the mindset which affect positive thinking of person and care optimism in a firm. Next, the mindset will lead the person and company to build identity in

order to create personal excellence and top brand. Finally, the goal can be achieved in the term of company growth or a better personal life.



Fig.1 5S domino effect

### 3. Methods

This study was conducted in Work System Design and Ergonomic Laboratory. In this project, there are four strategy practiced by Industrial Engineering Department. First, 5S training is given to the laboratory personnels in order to raise awareness about the importance of 5S implementation and to provide the 5S basic knowledge. The next step is building the 5S team organization structure, including designating the referees, operation area and team leader. Furthermore, project scheduling and sharing responsibility are also performed during this session. Third, 5S action is performed with prior preparation namely, providing 5S check list, identification form, as well as identifying the laboratory arrangement problem (laboratory tools and furniture). Then 5S method is implemented sequentially by 5S team in accordance with roles and duties. Moreover, 5S board indicator and poster are provided in order to foster and to assert 5S method in the laboratory. Finally, periodical inspection are performed by selected judge to keep the laboratory arrangement in 5S condition. In addition, the management also give further 5S training for its personnel, and conduct 5S contest among the laboratories. This process is briefly described in Table. 1

**Table. 1** 5S Implementation Strategy and Suggestion

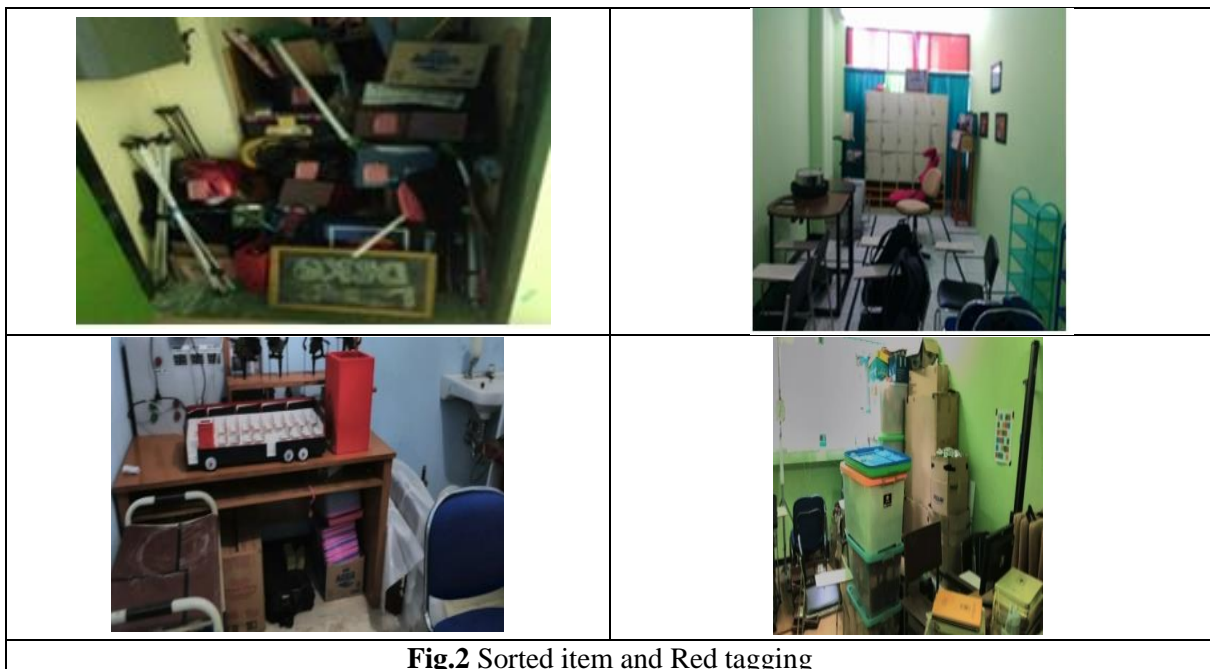
Strategy	Suggestion
- 5S Training	<ul style="list-style-type: none"> <li>• Evoking 5S consciousness to the laboratory management.</li> <li>• Equipping the laboratory organization with 5S knowledge.</li> <li>• Assigning the 5S implementation leader.</li> </ul>
- Creating 5S team and dividing the tasks	<ul style="list-style-type: none"> <li>• Creating 5S organization structure and defining personnel responsibility</li> <li>• Pointing 5S judges in order to review 5S implementation at the laboratory</li> <li>• Providing 5S check list and identification form for each laboratory</li> </ul>
- 5S action	<ul style="list-style-type: none"> <li>• Identifying the problem of laboratory arrangements</li> </ul>

Strategy	Suggestion
- Continuous Improvement	<ul style="list-style-type: none"> <li>• Performing 5S method : <i>Seiri, Seiton, Seiso, Seiketsu, Shitsuke</i></li> <li>• Presenting 5S board indicator and poster inside the laboratories for educating and enforcing 5S method.</li> <li>• Conducting periodical inspection</li> <li>• Establishing further 5S training</li> <li>• Conducting 5S Competition</li> </ul>

## 4. Results and Discussion

### 4.1 *Seiri/Sort*

In this phase, sorting necessary or unnecessary items is practiced. All non-essential items located inside the laboratory are given red tag. This step is useful to identify whether unimportant papers and books from previous practicum, lab tools (i.e resistors, toys), equipment (i.e chairs, boxes, sticks) will be discarded or stored at the shed (Fig.2).



**Fig.2** Sorted item and Red tagging

### 4.2 *Seiton/Set in Order*

This step is important to put essential equipments and furnitures remain in its proper place. Moreover, lab items are labelled, and colored tapes are stucked for defining the boundary (Fig.3).





#### 4.3 Seiso/Shine

It is done by arranging the goods to be easy to use, easy to find and easy to revert as always done in cleaning work area and any objects that have been used must be returned to the same place to reduce the risk of missing items and hard to find.

In maintaining the cleanliness, neatness and comfort of Work System Design and Ergonomic laboratory and sustainability of 5S which has been implemented, therefore each teaching assistant has been required after the projector is turned off again, trimmed projector cables, and AC is turned off. And also, before leaving the lab assistants are required to clean up first in the area, especially at room assistants such as washing cutlery and drinks that have been used, reposition the seat into place,

smoothing the goods there on the table, and taking out the trash if there is rubbish in assistant room area. In addition, before going home assistant is required to ensure that no return bins in every room and turn off all electricity devices which still alive such as air conditioning, projector or computer and turn off all the lights. Whereas, for the cleanliness of the general's own lab DSK & E coordinate with the cleaning service to assist in cleaning up any room assistants in lab DSK & E such as sweeping, mopping, etc.

In this stage, 5S organizational structure is created. It contains team members duties within their operation area. Although all academics community must be responsible in the use of laboratory, there should be person in charge to ensure 5S method is practiced in the lab (Fig.4).

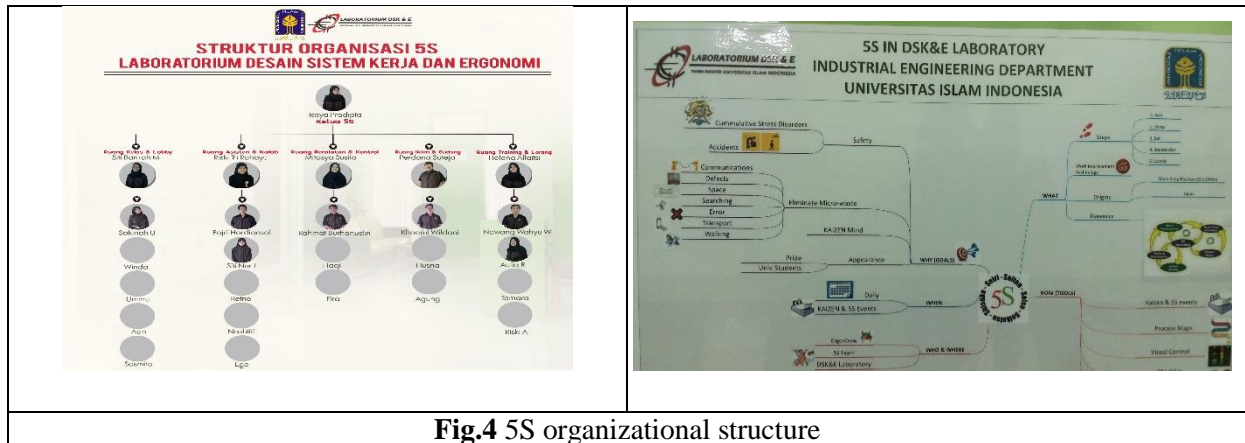





Fig.4 5S organizational structure

4.4 *Seiketsu/Standardize*

This stage aims to standardize 5S setting by providing visual control attached in the 5S board indicator. Therefore, every irregularity happening in the laboratory can be quickly identified and adjusted (Fig.5).

Standart Condition	Picture
<p>Books should be in a good arrangement The book shelf should be in clean condition</p>	
<p>Table and chair should be inside the boundary (colored tape) Room must be in spotless condition</p>	

Standart Condition	Picture
<p>Table and chair should be arranged neatly                      Table surface should be free of paper, pen, etc.</p>	
<p><b>Fig. 5</b> Visual control of 5S</p>	

4.5 *Shitsuke/Sustain*

In this stage, the management urges all lab users to maintain 5S condition and to obey the laboratory standard which has been organized by installing 5S poster as depicted in Fig.6



**Fig. 6** Poster of 5S

Visual Board of 5S is one way to make the staffs and all stakeholders understand the concept of 5S. It is created with the concept of 5W + 1H, What filled with what the 5S concept, and second W is filled with the list of waste that can be reduced in the current of 5S, the third W is When, it is the execution time of 5S periodically, the fourth W is Where, it is the work area of 5S, the fifth W is Who, who was responsible for 5S, and H is How to measure 5S DSKE lab. The detailed explanation is available on the picture (Fig.7).



**Fig. 7** Visual Board of 5S



#### 4.6 '5S' Radar Chart

The radar map system is a result of the implementation of 5S performance indicators that have been run. Radar chart based on the results of the audit of the rating table 5S checklist consisting of five check items / questions on each of the 'S', so that the total check items are 25 check items which include signage and standards, general work area, information areas and documentation, visual controls, and habitual behavior. By using a 0-4 rating, with the conditions of observation 0 = very bad (above 7 problems), 3 = Bad (5-6 problems), 2 = ok (3-4 problems), 1 = good (1-2 problems), 0 = very good (perfect conditions). Results score check items before the implementation of 5S (audit in May) is 64 obtained from the sum score for sort/*seiri* (16), store/*seiton* (12), shine/*seiso* (11), standardize/*seiketsu* (12), and sustain/*shitsuke* (13) with an average of 25 items is 2.56 means the application of 5S in DSK&E Laboratory is good enough (3-4 problems). Fig. 8 is a radar chart before the implementation of 5S. While the score of the check items after the implementation of 5S (audit in September) was 32 obtained from the sum score for sort/*seiri* (6), store/*seiton* (8), shine/*seiso* (6), standardize/*seiketsu* (8), and sustain/*shitsuke* (4) with an average of 25 items is 1.28 means good (1-2 problems). Fig.9 shows a radar chart after the implementation of 5S. As a result, there is an improvement of 50% from 2.56 became 1.28. This has implications for better use in the laboratory area, save time when looking for tools and materials due to its location and good visual control, as well as improving the culture and spirit of '5S' on staff regarding better working environment.

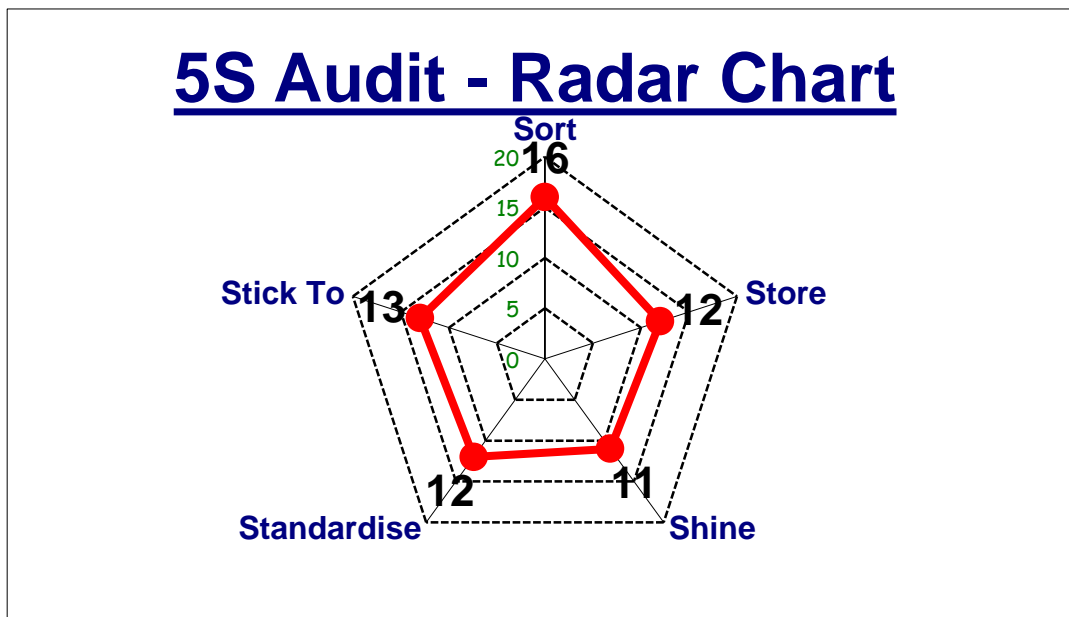
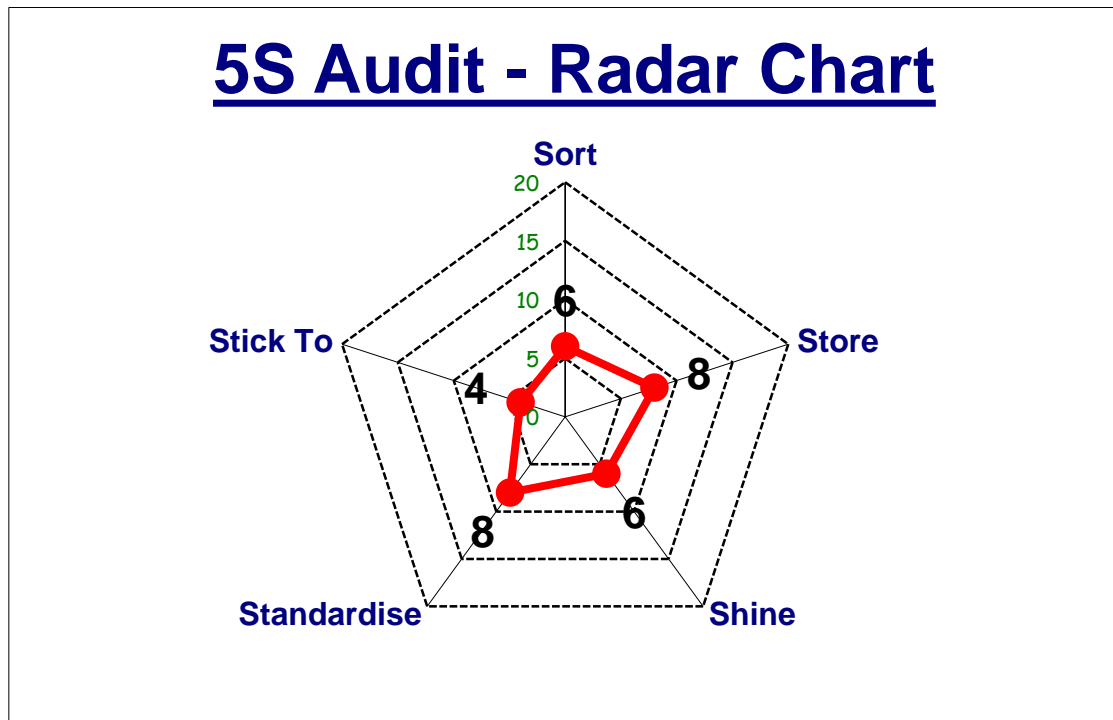


Fig 8. Radar Chart 5S on May



**Fig. 9** Radar Chart 5S on September

## 5. Conclusions and Recommendations

Score assessment before implementing 5S DSKE laboratory is at 64 (2.56) while the score after implementation is 32 (1.28) and shows an improvement of 50%. This has implications for better use in the laboratory area, save time when looking for tools and materials due to its location and good visual control, as well as improving the culture and spirit of '5S' on staff due to better working environment

As a recommendation, it is necessary to have continuous improvement, provide more visualization regarding the number of minimum / maximum objects arranged in a box, as well as the consistent '5S' audit / regular self assessment. Further research studies can be done by calculating the time before and after the implementation process, and research into the 6S (Seiri, Seiton, Seiso, Seiketsu, Shitsuke and Safety). This research also can be implemented in other laboratory.

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