5S Implementation of SME Readiness in Meeting Environmental Management System Standards based on ISO 14001:2015 (Study Case: PT. ABC)

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Abstract. The application of 5S can be used in assisting environmental management system standards. 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) is a simple concept in managing workplaces for efficiency and waste reduction as well as optimizing quality and productivity through an organized environment. An environmental management system is part of a management system which used to manage environmental aspects, compliance obligations, and opportunity risks. ISO 14001: 2015 as an international standard of the environmental management system which refers to the PDCA (Plan-Do-Check-Action) cycle. The environmental management system at SMEs faces greater limitations compared to large companies. 5S can be used as a tool to improve environmental performances by reducing waste, pollution, and energy which will be easier to identify and control. In this study, it’s explained how the influence of 5S in fulfilling ISO 14001: 2015 standards in electrical Batik stove SME in which the application of 5S is not optimal and resulting in compliance with environmental management systems that less than the ISO 14001: 2015 standards. Factors affecting the application of both 5S and EMS are leadership and commitment, knowledge and training, communication, employee participation and motivation, and external factors such as law and regulation.

1. Introduction
Sustainable indicators such as economic, environmental and social are important factors for large, medium and small scale industries [1]. Small and Medium Enterprises (SMEs) have an important role in Indonesia's economic growth [2]. This can be seen from the Ministry of Finance data wherein 2018 SMEs contributed 60.34% to GDP (Gross Domestic Product) [3]. An increase in the number of SMEs in Indonesia which continues to increase from 36.81 million units in 1998 to 61.7 million units in 2017 (Figure 1). However, the number of SMEs that is increasing every year is not in line with the growth rate of SMEs. The level of SME's contribution to Indonesia's GDP can’t reflect the SME's good performance in domestic and international market competition [4].
One of the significant problems that impede the SME’s sustainability is the issue of environmental management systems [5]. Along with the increase in the number of SMEs each year, there’s also an increase in greenhouse gas emissions from industrial waste (Figure 2.). SMEs contribute to pollution by 70% of the industrial sector and require changes in policy [6]. The companies must balance out with sustainability factors such as economic, social and environment to achieve greater sustainability performance [7]. The application of an environmental management system is one way to reduce the environmental impact [8]. ISO 14001 is an international standard for implementing an environmental management system [9]. However SMEs have difficulties in implementing environmental management systems due to various factors, namely government regulations, environmental communities, managerial, awareness of environmental issues, and non-governmental organizations [10].

5S which is part of lean can also help companies to implement environmental management systems because their policies drive changes towards cultural and operational improvement [11]. Environmental management in the context of business and industry is based on a philosophy that is highly related to 5S, the application of environmental management system and 5S is highly dependent on the commitment of top management which in managing 5S and environmental management systems, both large and small
companies need leadership and strong commitment through an example not just from words [12]. 5S is a tool to improve environmental performance that reduces waste, pollution, and energy, with the use of 5S these three things can be identified easily which has driving factors such as management commitment, responsibility of the project committee, employee participation, and training for all employees ranging from operational to top management, although there are many advantages in implementing 5S and environmental management systems, usually SMEs have greater difficulties in their applications due to limited resources [13]. The success of 5S depends on the people who run the 5S program [14]. Furthermore, the success of 5S lies in crucial factors, such as role and support of management, empowerment and employee training [15].

2. Literature Review

5S is an approach for organizing, standardizing, and continuously improving work area [16]. 5S increases workplace productivity in systematically organized conditions [17]. 5S must be maintained whose application will improve organizational performance [18]. Especially for small scale companies, knowledge about 5S is needed so that the benefits of 5S can be achieved optimally [19]. ISO 14001 is intended to be used by organizations to manage environmental responsibility in a systematic way that contributes to the environmental pillar of sustainable development [20]. ISO 14001 has the aim to standardize the management of environmental aspects in the operational and administrative processes of a company, where its implementation can be applied by various types and sizes of companies and the level of application of environmental development in their businesses [21]. ISO 14001 is a popular management system to be adopted by developing countries [22].

The environmental impacts of production waste (for example, raw materials, energy use, and emissions associated with overproduction) can be avoided by the application of 5S so that the productivity and efficiency of the company will increase [23]. With 5S the company gets the comfort of the environment both from the side of the workplace and from the environment itself because with the 5S which is part of continuous improvement, workers have been routinely trained to always improve the quality of the company [24].

The role of leadership and commitment from the company leader or top management determine the success of the quality improvement program such as 5S and EMS as an example for his subordinates [25] [26]. Not only needed the role from top management, organizations in implementing management systems such as 5S and SML, require employee participation and motivation so that the program can continue to run [27] [28]. One of the commitments from organizations start in training, the training will provide knowledge in application and assist in increasing employee initiative when problems occur during the implementation process [29] [30]. The application of 5S can be adopted as an organizational culture as a way to increase employee the participation [31]. Communication and knowledge transfer systems by management to employees will be useful to follow up and track the extent to which the program has been run in accordance with company planning [32]. External factors also influence the application of 5S and environmental management systems. Although the application of the environmental management system has a positive impact on the company in its fulfillment an understanding and compliance with local laws is required, the main difficulty usually faced by companies in implementing ISO 14001 is the fulfillment of legal requirements [33]. In fact, before implementing an environmental management system a company is required to be aware of applicable laws [34]. Regulation and law make pressure to run an environmental management system [35].

From the previous researches, it is known that the application of 5S affects the environmental management system in reducing waste, energy, and pollution produced by companies. In implementing 5S and the environmental management system, several factors are influenced by leadership and commitment, employee participation and motivation, knowledge and training, organizational culture, communication, and external factors such as law and regulation, as well as stakeholder requests. In this study (Figure 3.), researchers will analyze the effect of 5S and fulfillment of an environmental
management system under ISO 14001: 2015 standards on SME Batik stoves, where the influencing factors will be seen from the ISO 14001: 2015 clauses and 5S implementation on the SME.

![Figure 3. Conceptual Model of The Study](image)

3. Methodology
The object in this issue is the electrical Batik stove division at PT. ABC, Kasihan, Bantul, Yogyakarta. This research will identify the effect of 5S on the fulfillment of environmental management system standards and what factors influence the implementations.

3.1. Subject
The subjects in this study are the workers who are directly involved in the division which is divided into four departments, namely production, administration, research and development (RND), as well as the owner of the company itself which consisting of 5 respondents.

3.2. Data Collection
Data of 5S and EMS based on ISO 14001:2015 are collected from the respondents using questionnaire (5S and ISO 14001:2015) and interviews. Data collected is used by purposive sampling method. The collected data is then processed manually using Microsoft Excel 2016 software and to measure the effect and relation between 5S and EMS implementation with regression and correlation, data is processed with SPSS.

3.3. Data Analysis
3.3.1. 5S
Calculation of 5S uses the average value, i.e. total score divided by the total number of questions, then categorized as belonging to the appropriate level.

3.3.2. EMS
The values obtained for each of the elements of ISO 14001 can be used as an illustration of how much the company is able to meet the standard requirements of ISO 14001 in implementing SML [36]. In this analysis, each requirement element score obtained through a questionnaire will be entered into the calculation formula as follows:

\[ X_i = \frac{\sum P_i}{\sum Q_i}, \quad i = 1, 2, 3 \ldots \]  

3.3.3. Regression
Regression test is a statistical analysis method used to determine the causal relationship between 5S activities and compliance with environmental management system standards. The following are the hypotheses used in this study

Ho = there is no influence between 5S activities and compliance with environmental management system standards
Ha = there is an influence between 5S activities and compliance with environmental management system standards
3.3.4. Correlation

Correlation test is used to determine the closeness of the relationship between two variables, namely 5S activity and compliance with environmental management system standards, and to determine the direction of the relationship that occurs. The hypothesis in this study are

Ho = there is no relationship between 5S activities on compliance with environmental management system standards
Ha = there is a relationship between 5S activities and compliance with environmental management system standards.

4. Results

In the calculation of 5S activities (Table 1), there are differences of opinion among the respondents. Respondent at the top management level (SME’s owner) with a value of 1.86 thinks that the 5S activities that the company does are still in the poor category or are under-performed. Whereas 2 respondents at the intermediate level, Head of Administration and the Head of RND rate that 5S activities are good or the activities are carried out sufficiently (applied and clear in most areas) with a value of 2.77 and 3. Head of Production with a score of 3.59 assumes that 5S activities have been categorized as excellent which activities are carried out well (fully clear and applied to all areas). One respondent at the operator level, Production Operators, rated that 5S activities are the world-class category or that the activities were carried out very well and there was supporting evidence with a value of 4.73.

| No | Respondent       | Score | Category         | (%)  |
|----|------------------|-------|------------------|------|
| 1  | Head of Admistration | 2.77  | GOOD             | 55.45|
| 2  | Head of Production | 3.59  | EXCELLENT        | 71.82|
| 3  | Operator         | 4.73  | WORLD CLASS      | 94.55|
| 4  | Owner            | 1.86  | POOR             | 37.27|
| 5  | Head of RND      | 3.00  | GOOD             | 60   |

The difference between each respondent at each level of management shows that the goals of top management have not been well communicated. Differences in the assessment of 5S activities are also due to differences in the standards of each respondent related to 5S activities based on interviews with workers and the owner. The objectives of management are not carried out because the instructions or instructions given to their employees are unclear and inaccurate [37]. Effective communication is needed so that the goals to be achieved by the central leadership can be understood and implemented by employees, effective communication must also be established in both directions between employees and leaders, with proper communication employees will feel more valued and connected to their workplaces so that they continue to provide contribution in improving company performance [38].

Based on the results of interviews with employees at PT. Putra Multi Cipta Teknikindo showed that there was no 5S training given by the company and there was no evaluation from top management in the form of direct reprimands or self-assessment of 5S activities. 5S training is the responsibility of management to provide the resources needed for employees to understand 5S activities [39]. The development, implementation, and continuous monitoring of 5S implementation is the responsibility of management which to implement 5S, the initial step begins by providing workers with appropriate training on the various elements and benefits of 5S [40]. Training and evaluation are needed as one of the activities of the 5S elements namely shitsuke which supports the sustainability of the 5S program [41]. Evaluation can help management to identify improvements in the 5S performance that has been carried out [42]. Management needs to monitor the entire 5S process and explain the importance of 5S to workers [43].
Even though the company has obtained ISO 9001: 2008 certification, in its procedure the company does not set 5S as part of the standard operating procedure. The owner considers that the preparation of ISO 9001: 2008 requirements documents have followed the guidance of the BSN (National Certification Agency). According to the BSN, even though 5S is not an ISO requirement, 5S is the basis for implementing ISO management systems and companies that want to run ISO management systems must first run 5S well. The influence of BSN has a role in organizational behavior in developing and implementing activities for the objectives to be achieved [44]. BSN as part of a government agency influences the actions taken by companies. Government policies and actions affect the business environment, one of which is the design and implementation of the workplace [45]. Governments have diverse important roles in determining corporate investment decisions [46].

Comparable to 5S assessments, the assessment of compliance with ISO 14001: 2015 standards also varies from each respondent (Figure 4). The Head of Administration, Head of Production, Director and Head of R&D assess that the fulfillment of the ISO 14001: 2015 standard is still below the standard value of 21 while the production operator assesses that the fulfillment of the ISO 14001: 2015 standard is above the standard with a value of 25.71. This assessment difference is caused by the absence of understanding by top management related to the environmental management system. The standard value of 21 is obtained from a total of 7 clauses multiplied by the default value of the questionnaire that is 3.

![ISO 14001:2015 Fulfilment](image.png)

**Figure 4. ISO 14001:2015 Fulfilment**

The assessment of ISO 14001: 2015 standard fulfillment is used to measure the extent of compliance with ISO 14001 that the company has implemented and to measure how deep the company's understanding of existing environmental issues. With ISO 14001, companies can improve environmental performance, improve compliance with environmental standards, reduce or overcome risks arising from company activities, and can reduce production costs and increase profits [47].

Based on the results of interviews with SME’s owner, the owner plans to add ISO 14001: 2015 certification to support his business along with plans to open a separate division to sell Batik made by the company within the next five years. However, SME’s owners do not yet know what laws must be fulfilled as compliance obligations which are the most important part of ISO 14001: 2015 and environmental issues related to the business being run. Understanding of environmental issues is important to understand by top management because the success or failure of top management systems is strongly influenced by factors of leadership, commitment, and responsibility of top management. Top management becomes the driving force in running the environmental management system, top management is responsible for setting ISO 14001 implementation plans and is responsible for ensuring that everyone in the company has the right enthusiasm and knowledge about the environmental management system [48]. The commitment of top management in carrying out ISO 14001 has an
important role [49]. The leadership factor is influential in promoting the environmental management system and motivating employees in their role to carry out ISO 14001. That way, top management, namely the owner of SME, must have the right knowledge and commitment on issues and legislation to run the environmental management system.

There is no allocation of resources to finance the implementation of ISO certification. According to SME owner, because the company is guided by BSN, SME owner are better off waiting for directions from BSN related to the application and completion of ISO certification documents. These resources are better allocated for production needs. As is the case with 5S, the leadership and commitment factors of top management are one of the important driving factors for building a successful EMS program [50]. One form of company commitment in implementing ISO 14001 is by preparing human and financial resources to attend ISO 14001 training or other environmental standards in Indonesia [51]. According to Larsson preparing resources is part of fulfilling the ISO 14001 clauses [52]. In preparing for the fulfillment of ISO 14001 standards, human resources, finance, infrastructure, and technology become important points that must be considered by company leaders.

Based on a regression test using SPSS, it is known that there is an influence between 5S activities and compliance with environmental management system standards because the significance value produced is 0.031 less than 0.050. While the correlation test shows that there is a relationship between 5S activities and compliance with environmental management system standards. The relationship between 5S activities and compliance with environmental management system standards has a very strong relationship with a close level of 0.912. Based on this test, 5S activities that have not been optimal can cause a lack of compliance with environmental management system standards. 5S provides seven types of waste prevention (unnecessary motion, defects, overproduction, waiting, transport, inventory, inappropriate processing) that can affect the environmental performance of a company [53]. The application of ISO 14001 has a positive effect on improving environmental performance and reducing environmental impacts that can harm the company [54].

Based on Table 2 it is known that leadership has the smallest value in meeting ISO 14001: 2015 standards. The interviews also found that the owner of SME does not yet have the capacity of knowledge and commitment in running the environmental management system. This is evidenced by the lack of infrastructure that supports environmental management systems such as waste disposal sites at each production station, the absence of trash bins in several places, the absence of training for employees on environmental issues or ISO 14001 standards, the lack of funds allocated to run the system environmental management and the lack of top management skills in Indonesian laws and regulations on the environment. As previously stated, leadership is the most important factor in ensuring ISO 14001 fulfillment. Leadership is an important component for implementing an environmental management system project [55].

| Table 2. Ranking of Factors Affection ISO 14001:2015 |
|---------------------------------|----------------|
| Factors Affecting ISO 14001:2015 | Score (%) |
| Leadership                      | 10.94       |
| Evaluation                      | 14.22       |
| Planning                        | 14.46       |
| Operation                       | 14.50       |
| Organization Context            | 14.76       |
| Support                         | 15.23       |
| Improvement                     | 15.89       |
Based on observations and interviews, instructions given by top management are unclear so that top management desires in implementing 5S are not carried out, besides the absence of providing training to employees about the elements and importance of 5S to be applied in the company, top management also does not provide an evaluation of implementation of 5S that has been done and the absence of appeals or reprimands from top management for the inappropriate implementation of 5S in the company. The lack of commitment from top management to 5S activities in the company is evidenced by the absence of elements or 5S elements in work procedures or instructions, lack of infrastructure to support 5S activities such as trash bins, dividing lines, cleaning tools, and unclear hygiene mechanisms that are applied and there is no standard for how 5S should be applied in a company.

The lack of commitment from top management is the dominant obstacle in successfully implementing a quality management system such as 5S, commitment and appropriate leadership attitudes provide a clear view of the goals and values of implementing the 5S program. Lack of commitment and leadership attitudes can be caused by various factors such as lack of experience, lack of training, refusal to change, and doubt to initiate improvement programs [56]. Significant obstacles in implementing 5S are the lack of communication between top management and operators, the distance between top management and operators, the lack of training and awareness have given from management to employees [57]. Decision making by management can be caused by one of the macro external environments namely law and regulation, where government policies determine the limits of the company's strategy and opportunities [58]. Laws and regulations in Indonesia do not support the application of 5S. There is no government regulation on how 5S should be implemented in Indonesia, especially for SMEs.

5. Conclusion
The implementation of 5S and compliance with environmental management system standards ISO 14001: 2015 in the company are not optimal. The company should allocate resources for the application of 5S and fulfillment of ISO 14001: 2015 environmental management system standards. Discipline 5S to all employees so that 5S continues to run well and provide preliminary information about the environmental management system to meet ISO 14001: 2015 standards.

References
[1] J. Shields and J. M. Shelleman, INTEGRATING SUSTAINABILITY INTO SME STRATEGY, Journal of Small Business Strategy, Vol. 2, no. 59-76, p. 25, 2015.
[2] P. P. Hapsari, A. Hakim and A. Hakim, Pengaruh Pertumbuhan Usaha Kecil Menengah (UKM) terhadap Pertumbuhan Ekonomi Daerah (Studi di Pemerintah Kota Batu), Wacana, Vol. 2, no. 88-96, p. 17, 2014.
[3] D. A. Putra, "Liputan 6," 19 April 2019. [Online]. Available: https://www.liputan6.com/bisnis/read/3581067/umkm-sumbang-60-persen-ke-pertumbuhan-ekonomi-nasional?utm_expid=.9Z4i5ypGQeGiS7w9arwTvQ.0&utm_referrer=https%3A%2F%2Fwww.google.com%2F.
[4] Y. Wardi, P. Susanto and N. L. Abdullah, Orientasi Kewirausahaan pada Kinerja Usaha Kecil dan Menengah (UKM) Sumatera Barat: Analisis Peran Moderasi dari Intensitas Persaingan, Turbulensi Pasar dan Teknologi, Jurnal Manajemen Teknologi, Vol. 1, no. 46-61, p. 16, 2017.
[5] Bank Indonesia, KAJIAN KESIAPAN UMKM RAMAH LINGKUNGAN DALAM MENDAPATKAN AKSES PEMBIAYAAN, Jakarta, 2012.
[6] M. Singh, M. Brueckner and P. K. Padhy, Environmental management system ISO 14001: effective waste minimisation in small and medium enterprises in India, Journal of Cleaner Production, Vol. 102, pp. 285-301, 2015.
[7] J. El Baz and I. Laguir, Third-party logistics providers (TPLs) and environmental sustainability

practices in developing countries: the case of Morocco, *International Journal of Operations & Production Management*, Vol. 37, no. 10, pp. 1451-1474, 2017.

[8] M. D. Guerrero-Baena, J. A. Gómez-Limón and J. V. Fruct, A multicriteria method for environmental management system selection: An intellectual capital approach, *Journal of Cleaner Production*, Vol. 105, pp. 428-437, 2015.

[9] L. M. C. Martins Da Fonseca, ISO 14001:2015: An Improved Tool for Sustainability, *Journal of Industrial Engineering and Management*, Vol. 8, no. 1, pp. 37-50, 2015.

[10] G. S. Natarajan and D. A. Wyrick, Framework for Implementing Sustainable Practices in SMEs in the United States, *Proceedings of the World Congress on Engineering*, Vol. 1, 2011.

[11] P. Puvanasvaran, R. K. S. Tian, V. Suresh and M. R. Muhamad, Lean principles adoption in environmental management system (EMS): A survey on ISO 14001 certified companies in Malaysia, *Journal of Industrial Engineering and Management*, Vol. 5, no. 2, pp. 406-430, Journal of Industrial Engineering and Management.

[12] M. O'hEocha, Case studies A study of the influence of company culture, communications and employee attitudes on the use of 5Ss for environmental management at Cooke Brothers Ltd, *The TQM Magazine*, Vol. 12, no. 5, pp. 321-330, 2006.

[13] R. Jamian, M. N. A. Rahman, B. M. Dero and N. Z. N. Ismail, A Conceptual Model Towards Sustainable Management System Based Upon 5S Practice For Manufacturing SMEs, *Asia Pacific Journal of Operations Management*, Vol. 1, no. 1, pp. 19-31, 2012.

[14] A. Q. Malik, Implementation plan of 5s methodology in the basic surgical instruments manufacturing industry of Sialkot, *International Journal of Scientific and Technology Research*, Vol. 3, no. 9, pp. 176-182, 2014.

[15] W. A. A. Wan Asri and C. M. Azman, The effectiveness of implementation of 5S on employee motivation, *Business and Social Sciences Review*, Vol. 1, no. 1, pp. 41-52, 2011.

[16] R. S. Agrahari, P. A. Dangle and K. V. Chandratre, Implementation of 5S Methodology in the Small Scale Industry: a Case Study, *International Research Journal of Engineering and Technology(IRJET)*, Vol. 3, no. 1, pp. 180-187, 2015.

[17] S. P. Deshpande, V. V. Damle, M. L. Patel and A. B. K., Implementation of ‘5S’ Technique in a Manufacturing Organization: a Case Study, *International Journal of Research in Engineering and Technology*, Vol. 4, no. 1, pp. 136-148, 2015.

[18] C. Veres, L. Marian, S. Moica and K. Al-Akel, Case study concerning 5S method impact in an automotive company, *Procedia Manufacturing*, Vol. 22, pp. 900-905, 2015.

[19] P. M. Sánchez, C. M. Rodriguez, U. Maruyama and F. Salazar, Impact of 5S on quality, productivity and organizational climate - Two Analysis Cases, *Proceeding of the 2015 International Conference on Operations Excellence and Service Engineering Orlando, Florida, USA*, pp. 748-755, 2015.

[20] SNI, SNI ISO 14001:2015, 2015.

[21] J. W. S. Oliveira, O BLOG DE NOTÍCIAS: DO HIPERGÊNERO AO HIPERLEITOR 124, *Santa Cruz*, Vol. 38, no. 7, p. 124–145, 2013.

[22] W. To and P. Lee, Diffusion of ISO 14001 environmental management system: Global, regional and country-level analyses, *Journal of Cleaner Production*, Vol. 66, pp. 489-498, 2014.

[23] J. Tice, L. Ahouse and T. Larson, Lean production and EMSs: Aligning environmental management with business priorities, *Environmental Quality Management*, Vol. 15, no. 2, pp. 1-12, 2005.

[24] C. Jaca, M. Ormazarbal, E. Viles and J. Santos, Environmental comfort based (ECB) methodology as a tool for preparing Kaizen application in a catering service company, *TQM Journal*, Vol. 30, no. 4, pp. 281-295, 2018.

[25] R. Attri, B. Singh and S. Mehra, Analysis of interaction among the barriers to 5S implementation using interpretive structural modeling approach, *Benchmarking: An International Journal*, Vol. 104, pp. 1-20, 2017.

[26] D. Prajogo, A. K. Tang and K.-H. Lai, The diffusion of environmental management system and
its effect on environmental management practices, *International Journal of Operations & Production Management*, Vol. 34, no. 5, pp. 565-585, 2014.

[27] S. C. Houa, M. Haslinda, S. Muliati, A. M. Miri and A. F. Rahim, Implementation of 5S in Manufacturing Industry: A Case of Foreign Workers in Melaka, *MATEC Web of Conferences*, Vol. 150, no. 05034, 2018.

[28] N. A. Pratama, V. Kumar, A. Kumari, J. A. Garza- Reyes and S. P. Nadeem, Investigating the benefits and challenges of the implementation of ISO 9001 and ISO 14001 in the aerospace industry, in *Proceedings of the International Conference on Industrial Engineering and Operations Management, Bandung, Indonesia, March 6-8, 2018*, Bandung, 2018.

[29] D. Kiran, Total Quality Management: Key Concepts and Case Studies, Elsevier Inc., 2017.

[30] N. S. Khairani, E. S. Kasim, I. D. Rajamanoharan and F. N. Misman, Green supply chain management in the Malaysian automotive industry: A systems thinking perspective, *International Journal of Supply Chain Management*, Vol. 6, no. 2, pp. 38-48, 2017.

[31] B. Purwanggono, R. Ruminta and S. Irawat, Analisis Faktor-Faktor yang Memengaruhi Motivasi Karyawan dalam Menerapkan Budaya Kerja 5S (Studi Kasus pada Karyawan PT.PLN (Persero) P3JB APP Semarang), in *Posiding SNAFTIF*, Kudus, 2014.

[32] N. Khamis, M. N. A. Rahman, K. Jamaludin, A. Ismail, J. Ghani and R. Zulkifli, Development of 5S Practice Checklist for Manufacturing Industry, in *Proceedings of the World Congress on Engineering 2009 Vol I*, London, 2009.

[33] A. Mazzi, S. Tonolo, M. Mason, F. Aguiari and A. Scipioni, What are the benefits and difficulties in adopting an environmental management system? The opinion of Italian organizations, *Journal of Cleaner Production*, Vol. 139, no. September, pp. 873-885, 2016.

[34] C. Nengu and A. Neagu, The Stages of Implementing an Environment Management System in, *Revista Română de Statistică*, no. 10, pp. 93-99, 2015.

[35] Y. Yang, A. K. Lau, P. K. Lee, A. C. Yeung and T. E. Cheng, Efficacy of China’s strategic environmental management in its institutional environment, *International Journal of Operations and Production Management*, Vol. 39, no. 1, pp. 138-163, 2019.

[36] B. Hardiwiardjo, *ISO 14001: Panduan Penerapan Sistem Manajemen Lingkungan*, Jakarta: Gramedia Pustaka Utama, 1997.

[37] T. Osada, *Sikap Kerja 5S*, Jakarta: CV. Teruna Grafica, 2000.

[38] J. Gieber, "ISIXSIGMA," 22 February 2013. [Online]. Available: https://www.isixsigma.com/community/blogs/5s-of-communication/.

[39] J. S. RANDHAWA and I. S. A. Article, 5S implementation methodologies: literature review and directions, *International Journal of Productivity and Quality Management*, Vol. 34, no. 3, pp. 1-45, 2016.

[40] F. C. Filip and V. Marascu-Klein, The 5S lean method as a tool of industrial management performances, *IOP Conference Series: Materials Science and Engineering*, Vol. 95, no. 1, pp. 1-6, 2015.

[41] R. Gapp, R. Fisher and K. Kobayashi, Implementing 5S within a Japanese context: An integrated management system, *Management Decision*, Vol. 46, no. 4, pp. 565-579, 2008.

[42] J. Sing, V. Rastogi and R. Sharma, Implementation of 5S practices: A review, *Uncertain Supply Chain Management*, Vol. 2, no. 3, pp. 155-162, 2014.

[43] S. R. B. Ashraf, M. M. Rashid and D. A. R. M. H. Rashid, Implementation of 5S Methodology in a Food & Beverage Industry: A Case Study, *International Research Journal of Engineering and Technology*, Vol. 4, no. 3, pp. 1791-1796, 2017.

[44] A. S. Burlea and I. Popa, Legitimacy Theory, *Encyclopedia of Corporate Social Responsibility*, Vol. 28, no. 6, pp. 1579-1584, 2014.

[45] C. Johnson, *Introduction: The Idea of Industrial Policy*, San Fransisco: ICS Press, 1984.

[46] The National Academics of Engineering, *Time Horizons and Technology Investments*, Washington DC: The National Academic Press, 1992.

[47] R. Tanaya and T. W. Panjaitan, Persiapan Implementasi ISO 14001 pada CV. ABC, *Jurnal Titra*, 

10
Vol. 3, no. 2, pp. 143-150, 2015.

[48] A. S. Morris, *ISO 14000 Environmental Management Standards*, West Sussex: John Wiley & Sons Inc, 2004.

[49] Y. Mauliddina and A. Susanty, Evaluasi Faktor Sukses Implementasi Iso 14001 Dengan Metode Analytical Hierarchy Process (AHP) Di PT. Apac Inti Corpora Semarang, *Industrial Engineering Online Journal*, Vol. 4, no. 4, pp. 1-8, 2018.

[50] A. P. Iswara and R. Boedisantoso, Penyederhanaan ISO 14001:2015 Sebagai Inovasi dalam Monitoring Lingkungan dan K3 di Industri Kecil Menengah, in *The 2nd Conference on Innovation and Industrial Applications (CINIA 2016)*, Surabaya, 2016.

[51] A. D. Ananta, H. Suryono and S. Mamik, Persiapan Penerapan ISO 14001:2015 di PT. Semen Bosowa Banyuwangi, *GEMA Lingkungan Kesehatan*, Vol. 17, no. 1, pp. 9-13, 2019.

[52] S. Larsson, "NMC," 2 December 2015. [Online]. Available: nmc.a.se/wp-content/uploads/2017/06/2015-12-02-Stefan-Larsson.pdf. [Accessed 19 April 2019].

[53] R. Jamian, M. N. A. Rahman, B. M. Deros, M. S. Mohamed and N. Z. N. Ismail, A conceptual approach of 5S to improving quality and environmental performance of Malaysian oil palm dealers, *Journal Teknologi (Sciences and Engineering)*, Vol. 70, no. 1, pp. 65-73, 2014.

[54] T. H. Arimura, N. Darnall, R. Ganguli and H. Katayama, The effect of ISO 14001 on environmental performance: Resolving equivocal findings, *Journal of Environmental Management*, Vol. 166, pp. 556-566, 2016.

[55] A. Kasim, Environmental management system (EMS): Postulating the value of its adoption to organizational learning in hotels, *International Journal of Contemporary Hospitality Management*, Vol. 27, no. 6, pp. 1233-1253, 2015.

[56] F. R. Z. a. Q. M. Talib, Analysis of interaction among the barriers to total quality management implementation using interpretive structural modeling approach, *Benchmarking: An International Journal*, pp. 563-587, 2011.

[57] R. Sharma and J. Singh, Impact of implementing japanese 5S practices on total productive maintenance, *International Journal of Current Engineering and Technology*, Vol. 55, no. 22, pp. 2277-4106, 2015.

[58] T. S. Bateman and S. A. Snell, Manajemen: Kepemimpinan dan Kerja Sama dalam Dunia yang Kompetitif, Jakarta: Salemba Empat, 2014.