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Published Date: 11/30/2019

Page.837-849

Vol 7 No 11 2019

DOI: <https://doi.org/10.31686/ijer.Vol7.Iss11.1940>

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Abstract

The 5S Program is a quality tool that aims to restructure and improve the processes of teamwork production, system rationalization, desperation changes and especially the change of attitude of employees using a new work culture. In this situation, the article demonstrates the importance of implementing the 5S Quality Program in a monument to the city of Manaus - I am, with the purpose of improving the service provided to clients. The method used for the development of the work was a case study, based on the following steps: data collection, PDCA action plan, using Ishikawa, Flowchart and Gut Matrix tools. The results obtained consisted of the following occurrences in the environment were evident, such as: more organized environments, reduction of waste, availability of spaces in the monument to the work, easy access to equipment, as well as commitment of employees to the principles of 5S and research in relation to the execution of the program, to realize how much the changes provided by this instrument improve the area and way of working.

Keywords: 5S Program; PDCA; Construction site;

1. Introduction

The 5s program aims to provide knowledge by recommending to all participants to improve quality and productivity in the workplace in order to reduce costs and increase efficiency. Nowadays companies in the construction industry have been adopting the philosophy to improve the quality of the services rendered,

and achieve the greatest reduction of financial impact.

For this reason, we need to invest in improving the quality systems in these industries to provide customers with improved and efficient service. For [1], even with the constant evolution of quality concepts, some tools created several years ago are still valid and widely used by companies that work with quality system. From traditional management concepts to Total Quality Management, many management philosophies, techniques, tools, and forms have been created, refined, or redefined to create the right conditions in organizations for the best results [2].

Among the tools used in the total quality planning processes is the Japanese 5S Program, which seeks to clean and order the environments, as well as the elimination of losses through educational actions and training of people, resulting in better quality. working life and better productivity in organizations [3].

Thus, the present work aims to implement the 5s program in a building renovation site in the central region of Manaus, with the purpose of improving the service offered to clients, developing a sense of organization and cleanliness of the site. It also promotes respect and self-discipline on the part of employees.

2. Theoretical Foundation

For the effective realization of the research project and case study, it was sought to base the implementation of the 5S Program in the context of process and continuous quality improvement within the Construction and building reforms segment.

2.1 5 S Methodology

5S is a set of concepts and practices whose main objectives are the organization and rationalization of the work environment. Broadcasting in English as Housekeeping, 5S emerged in Japan in the 1950s as a Japanese Total Quality Control program. The program name refers to 5 Japanese words starting with letter S in western alphabet: Seiri; Seiton; Seiso; Seiketsu; and Shitsuke [4].

With the emergence of the 5S's, they made Brazilian companies in the productive sector of construction adhere to the ideology to reduce waste and improve the internal culture of employees, thus awakening a conscious mind and concerned about the quality of the tasks performed. The meanings of these words are presented in table 01.

Table 01 - Meaning of 5s words.

| | Japanese | English | |
|------|-----------------------|----------|-----------------|
| 1º S | Seiri Tidiness | Sense of | Use |
| | | | Storage |
| | | | Organization |
| | | | Selection |
| 2º S | Seiton Orderliness | Sense of | Ordering |
| | | | Systematization |
| | | | Classification |
| 3º S | Seiso | Sense of | Cleaning |

| | | | |
|------------------|-----------------------------|----------|-------------|
| | Cleanliness | | Zeal |
| 4 ^o S | Seiketsu Standardization | Sense of | Cleanliness |
| | | | Hygiene |
| | | | Health |
| | | | Integrity |
| 5 ^o S | Shitsuke Discipline | Sense of | Discipline |
| | | | Education |
| | | | Commitment |

Source: Adapted from CARPINETT (2012)

2.1.1 The Sense of Use (Seiri)

It means leaving only what is actually used on the desktop, unnecessary tasks should also be eliminated, the frequency at which equipment will be used should be analyzed, they should be kept in sight. Putting “in order what is messy,” when everyone should select items that are unnecessary to perform their tasks and give them a proper destination, is knowing how to use without wasting, [5].

2.1.2 The Sense of Ordination (Seiton)

This Sense can be summed up as the set of actions that allow the necessary objects, documents and data to be located quickly, correctly and securely. It is also responsible for improving visual communication through drawings, warnings and phrases. Generating benefits such as improving the physical environment of the company, saving time and energy by reducing unnecessary movement, speed, security and ease of searching for materials, documents and data, among others. It is knowing how to order to facilitate access and replacement, [6].

2.1.3 The Sense of Cleanliness (Seiso)

The sense of cleanliness comes to eliminate dirt, more important than clean and not dirty. This sense also comes preemptively seeking improvements and awareness, focusing that the clean environment is the least dirty. Cleaning should have its daily maintenance performed by each person living in the environment and using the machines or equipment. One must know how to use without fouling, attacking the sources of dirt, [7].

2.1.4 The Sense of Hygiene - Health (Seiketsu)

This Sense is also known as Health, Hygiene or Cleanliness. It is the result of the implementation of previous Senses, is directly linked to the physical and mental health of people and especially the physical and behavioral changes that occurred in the company. Several factors contribute to making people feel good inside the work environment and therefore can perform their tasks with joy and creativity, which is positive for quality and productivity. It is necessary to strive to standardize and maintain the first three S on a daily basis, as well as to take care of the health of body and mind, [8]

2.1.5 The Sense of Self-Discipline (Shitsuke)

The sense of self-discipline comes to systematize the new values and standards that the three senses Seiri, Seiton, Seiso. Seiketsu calls for everyone's awareness and commitment leading to standardization. It is to strictly comply with what is established.

Discipline comes when people start to do the things that have to be done and the way they should be done, even when no one sees and no one controls or demands, [9].

2.2 Quality Management

Quality is a fundamental factor for the growth and consolidation of companies or any other type of organization, as companies that have an efficient quality system become differentiated in the market. In order to ensure that quality is considered in daily management processes, various organizations choose to implement quality management systems (QMS) to demonstrate their full commitment and involvement in offering products or services that meet the needs of their customers. customers [10].

According to [11], QMS seek to contribute to the achievement of three main objectives: "to provide a systematic approach to all activities that may affect quality [...]; focus on prevention activities rather than relying solely on inspection; provide objective evidence that quality has been achieved. "

Total Quality Control (TQC), which [12] says is "an improved administrative system in Japan developed from American ideas inserted after World War II, known as Total Quality Control - TQC." The author points out that total quality deals with the dimension's quality, cost, delivery, morale and safety, which affect the satisfaction of people's needs and, in particular, the survival of the company.

2.3 PDCA

The PDCA (Plan, Do, Check, Action) cycle is a methodology for problem solving based on continuous improvement, making it possible for the guidelines outlined by the strategic planning to be made feasible in the company. the method [13].

This cycle is uninterrupted and is intended for continuous improvement, because using what has been learned in one application of the PDCA cycle, another cycle can be started in a more complex attempt, and so on. With that, the last point on the PDCA cycle becomes the most important one, where the cycle will take on a new beginning [13].



Figure 1 - PDCA Cycle

Source: Adapted by own author (2019)

The PDCA Cycle (Plan, Do, Check and Act), known by some scholars also as MASP (Methodology of Analysis and Problem Solving), is a methodology of continuous improvement focused on the processes of the organizations. [14]

The PDCA involves four steps:

2.3.1 PLAN- Plan what is to be achieved by defining the objectives, the methodology and the schedule.

2.3.2 DO - Execute the planning. Includes training the professionals involved.

2.3.3 CHECK - Verify that results are being achieved as planned. It is at this stage that possible failures and errors are detected.

2.3.4 ACT - The remedial measures identified in the previous step apply. Action plans are defined to improve quality. The results are disseminated and the improvement is reflected.

According to [15] the PDCA cycle quality tool can be defined as an analysis and mediation of particular process (s) in an organization. It consists of four steps: Plan, Do, Verify, and Act. The initial letter of its steps gives rise to the term PDCA.

PDCA is used to guide the actions to be taken, which are broken down into the phases of problem identification, observation, root cause analysis, action plan, action to eliminate the root problem, verification of action effectiveness, standardization and conclusion.

2.4 Ishikawa

The Ishikawa methodology or cause and effect diagram, or fishbone diagram, consists of exploring and indicating all possible causes of a specific condition or problem. This method was developed to delimit the relationship between effect x cause and cause x effect in the development of production processes and quality.

The problem specification is placed on the fishbone head. The causes are identified on some levels. When the possible causes at various levels are exhausted, the most repeated causes should be analyzed by summing up all the levels. Those that appear most frequently should be analyzed to identify which is the root cause of the effect [16].

Tool developed by Kaoru Ishikawa also known as cause and effect diagram or fishbone, provides a practical view of the variables that affect the outcome, [17].

This Diagram is a way of organizing what has happened inside the company and everything that can be reshaped and corrected based on the negative experiences that have happened [18].

2.5 Flow Chart

The flowchart is an attempt to holistically visualize a given activity and, by definition, is the graphical representation of the various tasks. This tool should bring as much information as possible to its user, however, to be an accurate instrument and not overly overloaded, it is sometimes merged with other methods. The presentation facilitates the identification of critical points of operation and can clearly define the desired limits.

[19] presents the Standard Flowchart. The author describes it as a deepening of the Block Diagram, in

which "each task of the process under study can be detailed to the extent that the standard flowchart can be used as part of a new employee training manual." This form, however, is best used in situations where the process reaches an international standard quality level.

The flowchart begins with an issue / problem / mission / project that needs treatment or care within a team or organization [20].

In other definitions flowcharts are simple diagrams for documenting algorithms or processes in a formal, graphical manner.

Graphically, flowcharts are the heart of business process mapping [21]. A flowchart where roles are assigned indicates a process map consisting of shapes representing different elements of a workflow. For example, rectangles represent actions, diamonds represent decision points, and rectangles with wavy bases represent documents.

2.6 GUT Matrix

The GUT matrix is developed by analyzing the following criteria: Severity, Urgency and Trend of each of the existing problems, in order to identify which, one has the highest priority and which will therefore be analyzed and solved first [22].

This tool assumes that a large list of problems has been found and that the resources to solve these problems are limited. Therefore, it is necessary to focus on the most relevant problem at the moment [23].

In this view, [22] defines the three points of analysis:

Table 02 - Analysis Points

| ANALYSIS POINTS | |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GRAVITY | Refers to the impact of the problem on situations, outcomes, things people or organization |
| URGENCY | Is the relationship with the time available for the problem to be solved; |
| TREND | Is the proportion that the problem can reach in the future. In the GUT array, the problems are listed in rows in the same column and next to a column for each of the three parameters |

Source: Adapted by own author (2019)

[24], clarifying how to use this method can serve to prioritize problems and address them. To do so, consider the Gravity, Urgency, and Trend factors, and each gives a score on a scale of 1 (one) to 5 (five), where Gravity is about not solving problems, and indicates the impact, especially on results, and processes that will emerge in the longer term.

Urgency is a specialized variable with time available to resolve the specific situation. Trend analyzes the trend or pattern of the evolution, reduction or change of the problem.

3. Tools and Methods

How tools applied to compose how cannon site improvement actions were planned for Excel control, Power

point employee presentations, periodic meetings during deployment, 5S program finalization a team of auditors was chosen to be trained to perform compliance check and non-conformities using Ishikawa. Through the use of the flowchart, it was remarkable the evaluation of all steps, especially in the places that need to be changed in appearance. The Gut tool showed that the collected data were essential for prioritizing the problem encountered, giving relevance to the emergency. In this case, it will be presented the methods of application of the PDCA tool, such as the process management system of the 5S program, in the case of a previous renovation work, which is located in the city of Manaus Amazonas. The PDCA cycle lasted 04 months. The system was applied from July to September 2019, thus meeting or planned schedule.

4. Application of Study

4.1.1 GUT Matrix

One tool was extremely useful during practice in project control, allowing you to prioritize the issues that must be solved. The earlier they are more affected by the impact, the faster the activity gets back in control and the lesser the dissatisfaction of the reduced parts.

Table 03- Gut matrix step

| Priority items | G | U | T | G x U x T |
|---------------------------------|---|---|---|-----------|
| Dirty bedding | 3 | 3 | 5 | 45 |
| Cardboard boxes on the floor | 2 | 3 | 4 | 24 |
| Disorganized stock | 5 | 5 | 5 | 125 |
| No identification | 3 | 2 | 3 | 18 |
| Shares and mortars on the floor | 3 | 5 | 4 | 60 |

Source: Adapted by own author (2019)

4.1.2 Planning (PLAN)

In this step, I started with the designation of the 5S Team, this team was responsible for executing the program implementation planning, the user group experienced several problems in the area, such as equipment clutter, obsolete material with materials in use, lack of label. and stock control. The environment of mortar, cement and lime materials without local identification. Tools work completely off site, wasting time on a particular problem on the jobsite. With various Sector images, a presentation was presented to show employees or current status, and the weekly Action plan was set at a meeting with the entire 5S team.

Table 04- Planning Step (Action)

| ITEMS | PDCA | TASK NAME | DAY |
|-------|------|---------------------------------|-----|
| 1 | PLAN | Team Definition | 1 |
| 2 | PLAN | Industry Assessment | 2 |
| 3 | PLAN | Preparation of the Presentation | 1 |
| 4 | PLAN | Action Plan | 2 |

Source: Adapted by own author (2019)

Through the mapping made by the flowchart it was possible to survey the problems and locations that would be applied the 5 senses, proposing the facilitation to reduce downtime, process failures and cost cutting.

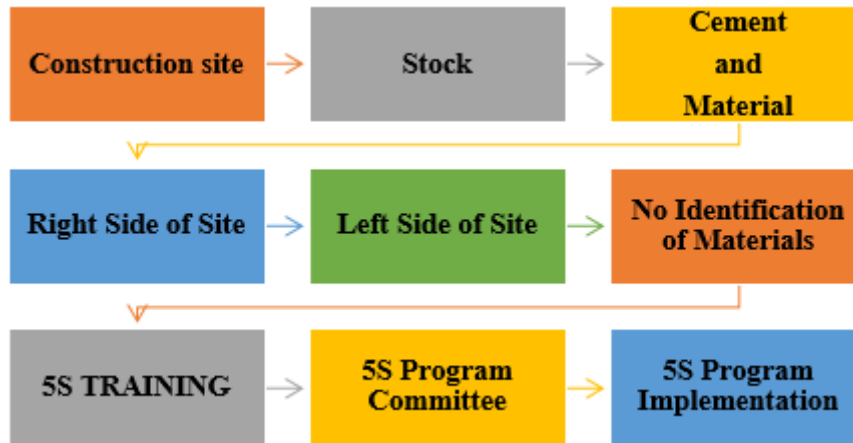


Figure 02- Flowchart Step

Source: Adapted by own author (2019)

4.1.3 Implementation (DO)

Following the preparation of the Weekly Action Plan by the 5S Team, we sent the document to be approved by the Director. The first action after approval was to set the date of the presentation for the construction site employees. This presentation addressed the 5S Program, the Current situation that was the environment through images and the weekly action plan created by the commission, the employees saw the need for change, as the construction site had only business hours, the formation of teams among the employees became necessary, there was also a material request for the beginning of the activities, after the material was released we started the implementation with the Usage Sense, in table 07 the “Do” execution, and in table 08 the fishbone diagram was used for analysis. of the production process, aiming to identify the problems and the root cause.

Table 05- Execute (Do) Step

| ITEMS | PDCA | TASK NAME | DAY |
|-------|------|------------------------------------|-----|
| 5 | DO | Meeting for Implementation | 1 |
| 6 | DO | Team building | 1 |
| 7 | DO | Request Materials | 1 |
| 8 | DO | Implementation-Start of Activities | 2 |
| 9 | DO | Implementation-(Ordinance) | 5 |
| 10 | DO | Implementation-(Cleaning) | 4 |
| 11 | DO | Implementation-(Health) | 5 |
| 12 | DO | Implementation-(Discipline) | 5 |
| 13 | DO | Disclousure of Results | 1 |

Source: Adapted by own author (2019)

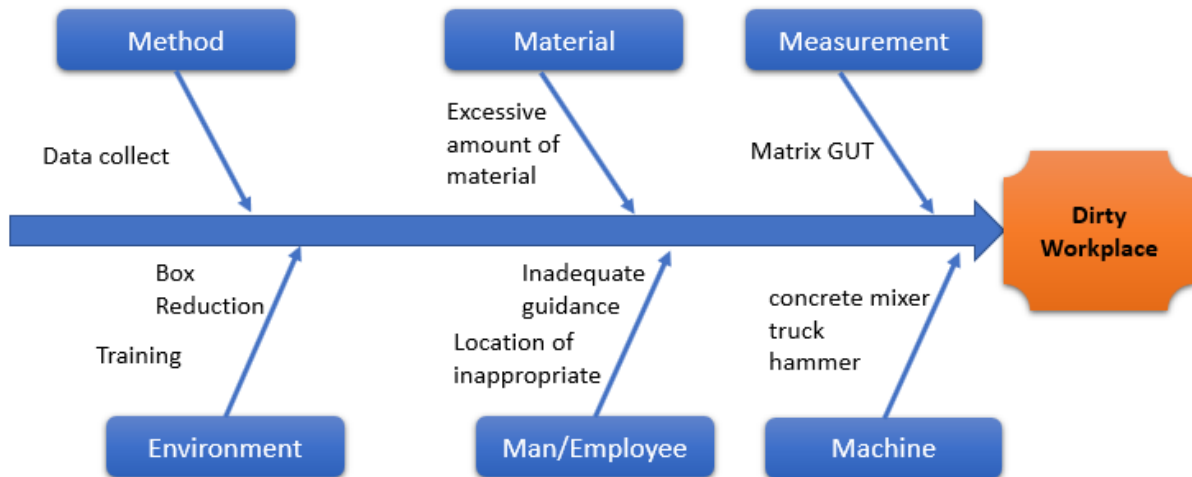


Figure 03- Herringbone Stage (Ishikawa)

Source: Adapted by own author (2019)

4.1.4 Sense of Use Week

The first week of project execution was to separate what is useful from what is not, to improve the use of what is useful, to keep only what is needed on the construction site, to combat waste and idleness. Before week of use, it was possible to find several empty boxes in the sector, leftover shards, expired mortars, many useless equipment. In figures 4 and 5. An analysis of equipment and materials was made, and many of them were sent to the sector responsible for obsolete equipment.



Figure 4 and 5: Activity performed in the first week (Organization of the flowerbed)

Source: Adapted by own author (2019)

4.1.5 Systematization Sense Week

In the second week was the turn of the Systematization Sense. The organization, in this sense, referred to the disposal of tools and equipment, mortars and cements, in an order that allowed the best flow of activity. The materials were being left where will be used later. The process is designed to eliminate unnecessary movement. Figures 6, 7, and 8.



Figure 6, 7, and 8: Activity Performed on Week Two (Inventory Organization)

Source: Adapted by own author (2019)

4.1.6 Sense of Cleansing Week

The third week, with the Sense of Cleanliness shown in figure 9 and 10, began to be streamlined, the whole sector was already visible along with the other senses there was already difference across the field. At this stage it was important not only to clean the environment but also to maintain it daily. The time has come to educate not to pollute, and always watch over all that is our responsibility.



Figure 9 and 10: Before the cables were all thrown to the floor, now they are fixed to the wall (Organization of the flowerbed)

Source: Adapted by own author (2019)

4.1.7 Health Sense Week

In the fourth week, the Health Sense was implemented, with it the challenge was to leave the most favorable environment that was already clean and organized, prioritizing physical, mental and emotional health, based on hygiene practices. A meeting was also held for suggestions and compliments, reinforcing the interpersonal relationship and respect for others while maintaining the Harmonize work environment.

4.1.8 Health Sense Week

By the fifth week, the Self-Discipline Sense was already well in force, since in the other senses these practices had already been stimulated, because the fact that every week, a group is scheduled for organization and monitoring of the work area, helped to keep everything that was already done. had been done.

Also, every Friday was collected the main changes to be made next week, on Monday is collected the results (photos), and sent to all staff.

4.1.9 CHECK

In order to maintain the 5S Program, a group and work were defined to perform the audit training with the SGI (Person responsible for the Integrated Management System), so that there was control and monitoring of the development of the implementation.

The audit took place 10 days after the deployment results release meeting, through an ISHIKAWA, shown in table 08, produced by the SGI, where all 5S items that had been implemented were reviewed. The results achieved were very rewarding, meant the evolution of the improvement in the productive environment.

Table 6: Check step performed in Project - Flowerbed organization

| ITEMS | PDCA | TASK NAME | DAY |
|-------|-------|--------------------------------|-----|
| 14 | CHECK | TRAINING FOR AUDITORS | 2 |
| 15 | CHECK | CREATION OF CHECK LIST FOR SGI | 3 |
| 16 | CHECK | APPLICATION FOR AUDIT IN AREA | 2 |

Source: Adapted by own author (2019)

4.2.1 ACTION

Subsequent to the Audit, there was a meeting with the 5S program committee, the Auditors and the SGI where the results were discussed and the timing of a new audit was decided, and it was defined at this meeting that the Audits would be held once a month for the audit. continuity of the program and adaptation of employees to the new reality of the work environment.

Verification items in which contributors scored higher would be added to the list of standardized items, verification items that scored lower would be treated as problem points, thus seeking through quality tools to eliminate the problem.

Table 7: Verification (Action) step performed in Project.

| ITEMS | PDCA | TASK NAME | DAY |
|-------|--------|--------------------------------------------------------------|-----|
| 14 | ACTION | ANALYSIS OF AUDIT RESULTS, MEETING TO DEFINE NEW ACTION PLAN | 1 |

Source: Adapted by own author (2019)

5. Results and Discussions

The results show that the continuous improvement tools in particular PDCA Cycle, Gut Matrix, Flowchart and Ishikawa are extremely important for eliminating atypical events in the production process. Therefore, the objectives achieved by the 5S Program were essential to reach the metrics defined by Total Quality. Aiming to optimize spaces, and always keep it organized and clean, forging more agile processes, and easy access to searches of operational materials, where it was also possible to identify the main cause of the disorder of the area. Working with program deployment is very dynamic. There is pressure from all sides and it requires a large organizational capacity of those working in the sector. As the environment can change overnight, you need to be aware of changes and anything that can interfere with the deployment progress. Quality measurement and control comes as a strategic action to ensure project control and establish

effective actions to put it on the expected performance baseline, whether in cost, time or project. As it was possible to realize during the search process, although there are a greater number of quality tools linked to the production and process areas, several tools can be used in a deployment, whether for indicator control, performance control, cause analysis. root or problem prioritization.

6. Final Considerations

Through the case study carried out in the field, it was possible to achieve the proposed objectives, that is, understanding how the presented quality tools can help the 5S program auditors and how they could use them proactively and analytically. enabling a better identification of the organization's problems and a more effective action in the possible solutions.

The main difficulties encountered were when the team was going to apply the shares, and using a lot of clay, leaving cardboard boxes on the production site and carrying many work tools, the return of these tools was almost always not organized. It was possible to see this, because the unions complained a lot about this failure, also when there were changes of rockers in the production area, almost always the equipment did not return to the places of origin, due to the small space of the sector, we always had to request an adjustment of the labels for identification of such equipment.

The space after 5S was organized, the sector began to breathe more clean air. Some difficulties were overcome, others really only with the analysis time, for possible adjustments. The Program demanded from each employee constant self-discipline, compliance with the rules and procedures was a great victory for Team 5S, and certainly a productivity gain and elimination of various waste that were occurring on the jobsite.

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