

Implementation and Continues Monitoring of 5S Principles adapted to Developing city Roads Using Android application Based solution

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Abstract: -- Cities are integrated with Transportation system which forms the major part. The roads in India are to be particularly monitored for its long time sustainability. The improvement of Road conditions in India can be done using the 5S principles (Seiri, Seiton, Seiso, Seiketsu, and Shinseki) which are most popular power tool of lean thinking and a cornerstone of any successful Implementation for long time sustainability. This paper represents the continuous monitoring of roads using an IoT (InternetofThings)based application called "Smart city Developers", the application developed is feed with the data through sensors present in the pipelines adopted to the Roads and this data analyzed is used to monitor the Road condition for its long time sustainability.

Keywords—5S, smart city developers, Internet of things, continuous monitoring.

I. INTRODUCTION

A city is an urban development vision to integrate multiple information and communication technology (ICT) and Internet of Things (IoT) solutions in a secure fashion to manage a city's assets. The goal of building a city is to improve quality of life by using technology to improve the efficiency of services and meet resident's needs.

A city is a developed urban area that creates sustainable economic development and high quality of life by excelling in multiple key areas; economy, mobility, environment, people, living, and government. Excelling in these key areas can be done so through strong human capital, social capital, and ICT infrastructure [2] Cities are usually associated with metropolitan areas and urban areas, Creating numerous business commuters travelling to urban centres for employment.

As with any technology, city technologies come with downsides. Futuristic technologies will not fix basic urban problems in existing cities such as haphazard growth patterns and poor neighbourhood design. While the technologies strive to bring sustainability, it cannot overcome issues such as sub-standard architecture (Ex: Road Construction).

City technologies rely on constant monitoring and analysis of data for smooth operations. Data that can be used

to find a parking spot can also be used for surveillance. This is an attempt to utilize the data for the continuous monitoring of the city to sustain its optimum quality.

II. 5S PRINCIPLES:

The 5S principles are narrated in the Poetic manner for the easy understanding and also for the effective presentation as given below which is taken from QCFI India:

For providing right ambience for Quality Housekeeping is an organization's vitality. The Japanese practice of 5S scheme, For training, it has become a pet theme.

In Sanskrit texts too, a similarity we can note. What those words are, following will denote. Sankalan- Segregate items into different category. Retain the useful ones and discard the unnecessary.

Suvidhan - Organize them for easy identification. Retrieving within 30 seconds is the specification Suchitva- Clean & Inspect to keep them tidy & neat. For Safety & Productivity, it will be a welcome seat

Suvyavaste standardize for consistency, conformity. Men may come, may go, systems will ensure continuity Sushikshana self-discipline and habit formation. Use Training- Education, to lay a strong foundation.

Seiri, Seiton, Seiso, Seiketsu, Shitsuke Japanese are. Both Indian and Japanese have common 5S to share. Concepts we know. In practice they score. About our weakness, don't we feel sore? (*Poem Credits: Sri B N Jagadeesh Prasadji, Hon Adviser and Mentor- QCFI Mysore Chapter. Former Vice Chairman QCFI- Bengaluru Chapter)

5S can be defined as structured method for achieving, maintaining and improving the standard setup, organization, layout and control of a work area, so as to ensure safe and efficient living area.

The concept of 5C/5S is generally regarded to have originated from the Japanese automotive industry, and is considered one of the fundamental building blocks for an organization striving to establish lean practices and a culture of continuous improvement.



Fig 2.1: 5S Principles

5S is a process designed to organize the workplace, keep it clean, and maintain effective and standard conditions. The use of this tool was started in 1972 by Henry Ford in the United States as the CANDO Programme: Cleaning up, Arranging, Neatness, Discipline and Ongoing improvement. The technique was popularized as 'Japanese 5S' in 1980 by Hiroyuki Hirano. 5S is the acronym for five Japanese words: Seiri, Seiton, Seiso, Seiketsu and Shitsuke and they represent the five steps for a systematic technique for good housekeeping as indicated in the table below

5 S Methodology			
JAPANESE	ENGLISH	MEANING	TYPICAL EXAMPLE
SEIRI	Sort	Organization	Throw away rubbish
SEITON	Set in Order	Neatness	30-second retrieval of a document
SEISO	Shine	Cleaning	Individual cleaning responsibility
SEIKETSU	Standardize	Standardization	Transparency of storage
SHITSUKE	Sustain	Discipline	Do 5-S daily

Table

2.1: 5S Principles Table

1. Seiri

Seiri is the first step in 5S. Seiri/ sort are the process of removing items from the workplace that are not essential to enable the work activity to be carried out. The emphasis of Seiri is on stratification management and being able to spot the unwanted and unnecessary before they become problematic.



Fig 2.2: Sorting of Pipes Based on Sizes & Colour

2. Seiton

The orderly organization of those items that is necessary to complete the work activity, in a way that ensures safe and efficient operations, which can be repeated with minimal waste.

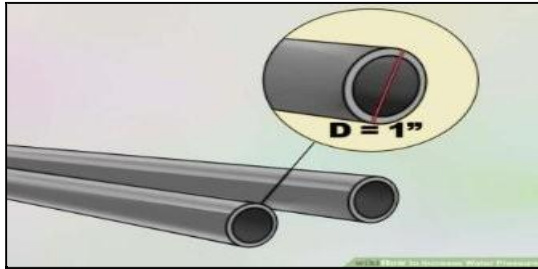


Fig 2.3: Setting of Pipe Based on Size

Seiton in essence can be defined as neatness, having things in the right places or set up so that they are readily available for use, eliminating the need to search. Once everything has a right place so that it's functionally placed for quality and safety, it can then be deemed that the workplace is neat.

3. Seiso

Clean and check (or shine), is used to ensure that items are clean and ready to be used. Seiso places emphasis on cleaning so that things are clean; in other words carrying out cleaning as a form of inspection i.e. getting rid of waste, and foreign matter.



Fig 2.4: Cleaning of the Pipes for good Sustenance

It is important to note that depending on the circumstance, with higher quality, higher precision and finer processing technologies, even the minute details may have the greatest Ramifications, hence the importance to carry out cleaning as a form of inspection.

4. Seiketsu/ Standardize:

The process of setting the 5C/5S standards and making them easy to maintain by using simple systems and processes. This aspect of the 5S focuses on standardization, making the first three S's, Seiri, Seiton, and Seiso a constant routine.



Fig 2.5: Standardization of pipes according to colours

The emphasis here is on visual management, an important aspect to attain and maintain standardized conditions to enable the individuals always act quickly.

5. Shitsuke/ Sustain:

Ensuring consistent adoption and use of 5C/5S by all personnel who are either involved directly with the workplace or who interact with the workplace. Shitsuke places emphasis on being able to forge a workplace with good habits and discipline. Demonstrating to others what needs to be done and encouraging practice amongst them. This is mainly a management responsibility.

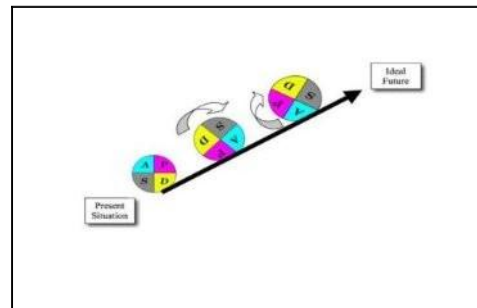


Fig 2.6: Sustainability

III. IMPLEMENTATION OF 5S FOR SMART CITY:

For better understanding of 5s implementation on smart city few cases are discussed below,

3.1. 5S implementation in Road construction:

Roads are the heart of any transportation system for a city, but most of the times due to architect development the road is being dogged very often such as for piping and drainage system. In future these damaged roads are reconstructed which leads in path holes and dungeons and henceforth increases the risk of accidents specially risk to human life. To overcome these problems the 5S tool can be implemented and can be done as follows,

- Seiri: Blue print of the road map has to be constructed is set up in which it should include allowance for other constructions and drainage system.
- Seiton: A detailed plan has to be layout for each & every area with some specific numbers or identifications which leads to the easy set up & construction.
- Seiso: The newly constructed road map should include separate department for the purpose of maintaining the interior roads which includes daily clean up, weekly supervision, monthly reworking of damaged roads & it is to be maid sire that the continued working dedicatedly towards the cleanliness towards the city.
- Seiketsu: The frame work of the standardization has to be followed strictly according to Indian accords. Apart from that it is also made sure that the passage system for the garbage has to be made & maintained.
- Shitsuke: Sustainability is not the final step instant it begins with sort out. Following the Edward Deming's PDSA.

3.2. Case Study:

This paper introduces a new type IoT based equipment and an android application for the continuous monitoring and data collection for sustaining the smartness of the city. For the better understanding about the technology, the sensor based IoT equipment is designed which is implemented to a 5S principles adopted road, to collect the data continuously and feed the data to an Android Application that shows the criticalness of the 5S condition implemented to Road and helps the Auditor or the Inspector to take action to sustain the

Smartness of the road. The details of the Android application developed and data collection is given below.

3.3. Condition of the Road before implementation of 5S Principles



Fig 3.1: Road condition before 5S Implementation

As shown in the above fig, the roads are often dug for putting pipelines for different purposes like Water lines, drain systems, Underground electrical wiring etc., after the construction of New roads in the cities and then are subjected to finishing (Patch working) which reduces the quality of the Road i.e., originality of the Road is affected very badly. Here is the solution for the above mentioned problem which uses IoT based equipment for continues monitoring.

3.4. Condition of roads after "5S Principles" Implementation for the Developing Cities and its continuous Monitoring.

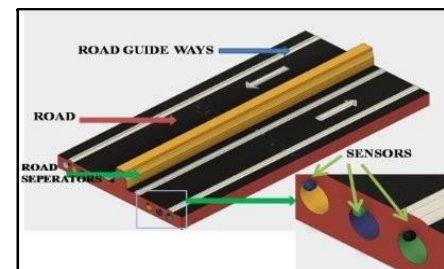


FIG 3.2: Road condition after 5S Implementation

As shown in the above fig, the IoT based equipment is developed and installed to the pipes which are placed before construction of the roads to avoid the digging of roads after construction (Adoption of 5S Principles). The sensors give the continuous data to the application and helps for continuous monitoring resulting in Smartness sustainability.

3.5. Technology for Sustainability

- We have tried to create application based solution to the above stated problem.
- We have used Android Studio to create an application which monitors the instants of inputs at different intervals of time and evaluate inputs against 5S principles.
- We have tried to give inputs manually and evaluate its impact on the output.
- We can develop a real time application for this purpose by using IoT based equipments.
- As of now we have used is application development by using App based android application

3.6. Android Application for monitoring the sustenance of 5S principles

Android App App indicating Breakage App indicating Normal data

Fig 3.3: Android Application for Data Collection and Monitoring

III. CONCLUSION

The paper is successfully representing the continuous monitoring system of the case study (Roads). An IoT based application was successfully implemented “Smart Technology Developer” which was used to continuously receive the data of the Road condition and hence it was monitored based against 5S Principles.

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REFERENCES

- [1]. Kohinoor Kar, An overview of Mobility and safety issues related to Highway Transportation in India, www.ite.org
- [2]. Sudhir and Sameera, Bangalore: Silicon city or Black city? Last accessed 4- Aug 2007.
- [3]. Dinesh Mohan: Traffic Safety and Health In Indian Cities- <http://web.iitd.ac.in/-trip/publications/paper/safety/aitd02.PDF>, last accessed on 23-July 07.