Implementation of Lean Tools on Lean Classroom: AET 0.212

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Abstract

This project is about implementing lean tools in a system to make it work for everyone and to make it better and leaner as a future perspective. Keeping all the tools in mind, a system has been selected and a brief analysis is done on how to improve the system to work better and what were the faults that led to this inefficiency in system which is to be corrected for next time.

1. Introduction

Everyone needs lean and lean is for everyone. To me being lean means making the world faster and a better place to live. And how do we reach there, is by learning from others. Toyota Production System has taught us very interesting and innovative ways of handling and maintaining a work space environment with use of different lean tools and techniques. Now I have tried to implement these tools in my most accessed system. The most visited/accessed place for me is our university, particularly classrooms. And what better system could I get than improving our own classrooms. I have taken our lean classroom for a system, and I am going to discuss a few non lean things which I observed in it and I am going to try and help make it leaner and a better place for teaching and learning.

2. Literature Review

Find the source and eliminate the waste, this is the key concept behind lean. Every waste elimination process is done either to make a system cost effective or time efficient or both preferably. There is no fixed count for lean tools to follow, as every firm has its own requirement and its own way of improvement. Below are some of the lean tools briefly discussed that I used to improve a system of selection, in my case its our lean classroom.

Lean Tool	What Is It? (Introducing the lean tool)	How Does It Help? (Benefits)
5S	Organize the work area: safe, visible and efficient. • Sort (grouping of items that are not needed) • Set In Order (a place for everything and everything at its place) • Shine (clean the work area) • Standardize (write standards for improvement) • Sustain (regularly apply the standards for success)	Eliminates waste/muda due to poorly organized workspace and ensures success. Serves as a foundation for other lean tools.

Visual Factory	Visual indicators and displays used throughout the system to improve communication of information.	Makes the concept very clear and visual to everyone. Creates a friendly environment.
Cellular layout	Work set-up where workers can move easily from one place to another. This set-up links operator and machines in an efficient way. In my case its Instructor and students.	Makes the Value Stream flow with a proper design layout.
Quick Changeover (SMED)	Reduce setup (changeover) time to less than 10 minutes. • Converting internal process to external. • Simplifying internal process • Eliminating non-essential operations by implementing Standardize work in adjunct with the changeover process.	Divide and rule policy. Reduces and divides the NVA time into smaller lots. Increases availability of classrooms and increases VA time.
Heijunka box	Stabilize operations while serving dynamic demands.	Meets customer demands and most cost effective and time efficient strategy.

3. Lean Implementation

3.1 Errors and it's remedies

The most significant error/flaw that I noticed is in the construction of our classroom. It has two big broad pillars in the middle of the room which makes it difficult to have a proper arrangement of chairs and tables around the classroom and a lot of space is left unutilized.

- By looking at the layout of ground floor of our AET building (see Figure 1), what conclusion I drew out of it was; that the space was meant for parking as it has the stairs exit (see Figure 1) portion perfectly suited for vehicles to roll down and basements always have lot of pillars which could help dividing the parking lot. But the management team might have decided to use the space for classrooms and the basement pillars made it difficult for the construction engineers to split rooms. Hence this was the best they could draw out of it. Now I have no evidence to support my claim, but this could have been a possible scenario or any such similar case plausibly.
- Being a lean engineer the most basic remedy that I would suggest is following PDCA problem solving technique in every step form beginning of construction plan till the end of final result. This would require a lot of kaizen events and other Lean and Six Sigma problem solving techniques.
- A job well planned is half work done. A lack of planning at the beginning led to this undesired mistake.
- Now the flaw cannot be corrected, as it would require a lot of reconstruction work, man power, investment etc. It comes under the category of Brownfield and I am going to suggest a few aspects which can be improved and better workspace utilization can be achieved.

3.2 Lean tools to help create a better environment

The errors are not just limited to construction, and I am going to expand the other problems with the specific lean tools that would help in rectifying those errors.

- The first and most basic of all lean tools "5S" is recommended. Helps where there is improper utilization of workspace and poorly organized work area.
    - Sorting (red tagging) - eliminating that which is not needed (ex: White boards). White boards are not frequently used and also the positioning is improper. Involves motion of instructor and students gathering around makes it messy. Suggestion: using movable white boards with caster or roller wheels

which can be moved around freely and can be kept in the non-utilized space behind pillars (see Figure 3).
    - Set in order – Organizing remaining items
        - Tables and chairs are not properly positioned, affects teacher-student interaction. For a proposed improvement plan (see Figure 3).
        - Some projectors work at times and some don't. By proper arrangement of classroom, no. of projectors can be reduced from 8 to 6 (see Figure 3).
    - Shine – Clean and inspect work area
        - Floor has some unwanted markings (line strips), used by students of different class to actuate autonomous path follower robots (see Figure 2). Can be suggested to use cardboards/wooden ply sheets to stick those strips.
        - Wires coming out of computers looks shaggy can be rolled into larger diameter insulated pipes.
    - Standardize- Write standards for above. As the classrooms are used by different faculties and group of students for a different class. A list of do's and don'ts should be formed and notice boards can be used to communicate the standardized plan. Like turning off the projectors and computers after use. Treating the amenities properly and arranging the chairs after use. Not to draw the marking on the floor etc.
    - Sustain- Regular apply of standards
        - Maintaining regular audits and periodic check of all the facilities.
        - Advertising the improvement plan and ask others to help sustain it by providing proper motivation.
- Visual Factory: Visual indicators, displays and controls can be used throughout classroom to improve communication of information. Makes the thoughts and ideas easily accessible and very clear to everyone.
    - Use of notice boards (visual display) inside the class room, where students and instructor can put up some new day today things going on related to the subject. That would help grasp a deeper knowledge of concepts and keep the interest for learning new things.
    - This would encourage students to get involved and bring up some new ideas.
    - Four exit signs for four doors, but no signs for entry as we know not all the doors are allowed for getting in to the class (visual display).
    - In case of fire, we have fire alarms which would indicate signals and alarm in emergency. We have fire extinguisher to put down small fires. Many sign boards saying to use stairs etc. (see Figure 1). But in case of a natural calamity like earthquake, classrooms down there do not have a direct access to open ground. In such situations people have to travel longer distances to evacuate the premises. And the only visual aid is the exit sign. I would propose incorporating direction signs (visual indicators) for such events too and changing/building doors to have direct access to open space as safety is our first concern.
- Cellular layout – the proposed model has enough space for movement, and promotes continuous flow.
    - This layout would help during passing of papers around the class, rather than one person distributing to all. A way to link instructor and students to minimize downtime/non-value added time for the instructor (see Figure 3).
    - This would help instructor even during exams to distribute question papers and to govern the whole class by standing at one position.
- Quick Changeover: reduce the time to switch between classes, increase uptime by reducing redistribution of work (say VSM charts).
        - As we know each room is assigned for different subject classes at different timings. And it sometimes happens that we need some extra time to wrap up and move out and the students of next class are already in.
        - So the changeover can be accelerated by using rolling white boards, notice boards and lockers. If we had our own notice boards and lockers we can leave all our work as such in those boards and lock them up at the end of class. That would help reduce wrap up time, benefit students to start their work right where they left, reduce work for instructor, saves redistribution time at the beginning of class and also makes the room available for the next class.
        - Standardized work can be incorporated in adjunct to changeover process; eliminating repeatable tasks to a minimum. Like if the projector screen buttons were near to instructor's workspace, then it would save time and reduce effort for the instructor to walk around and switching on every button. Remedy: Use of remotes to controlled projector screen (Jidoka).

- Heijunka box: If all the lean tools work out perfectly then we can incorporate leveling into our scenario.
  - Use of heijunka box to distribute/arrange all homework papers, assignments, exam papers near the entrance of the class room. So that it would be easier for the instructor to put right things at right place and also for the students to collect their work and sheets at the entrance itself as per their arrival.

4. Figures and Tables

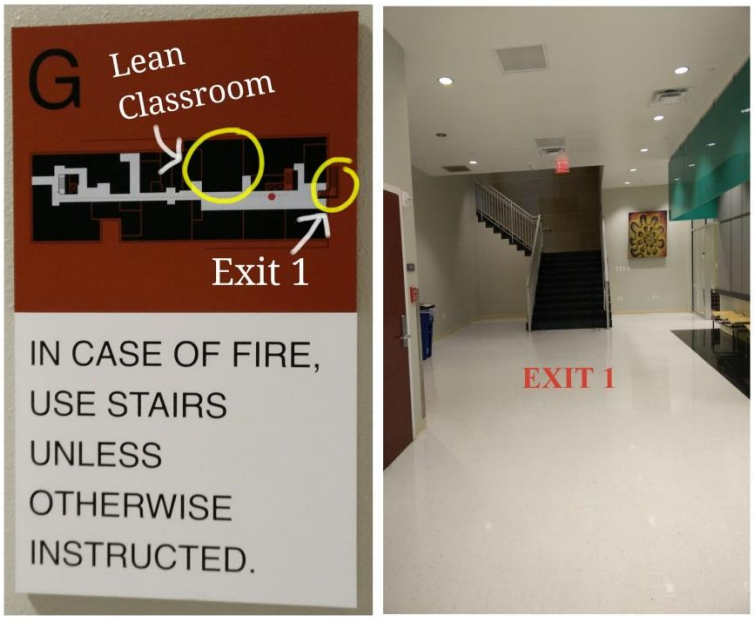

Figure 1: (a) Ground floor layout (b) main stairs exit (exit1)

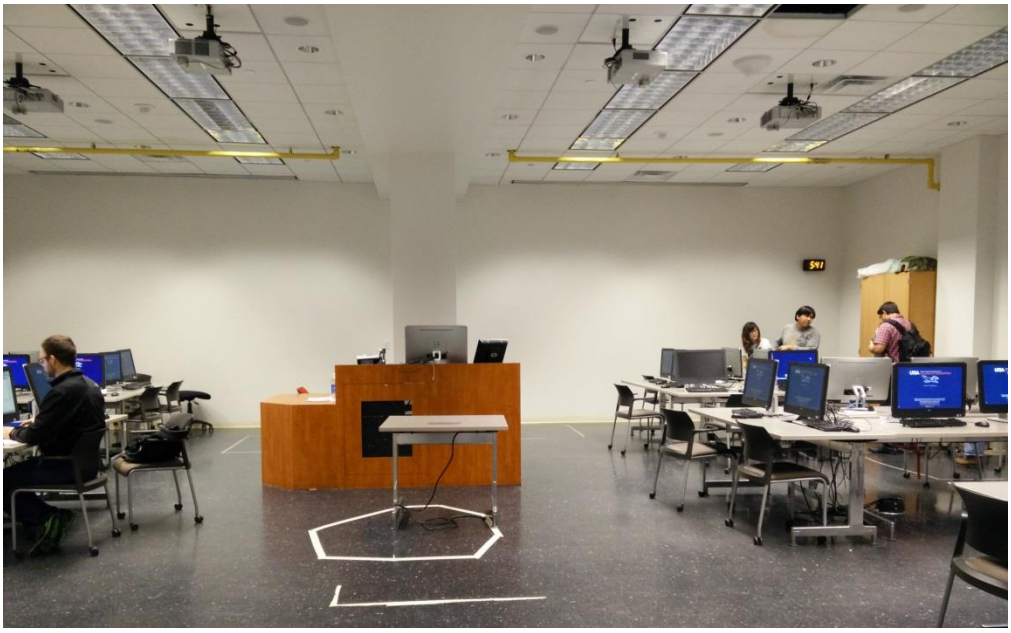

Figure 2: Unwanted markings on the floor

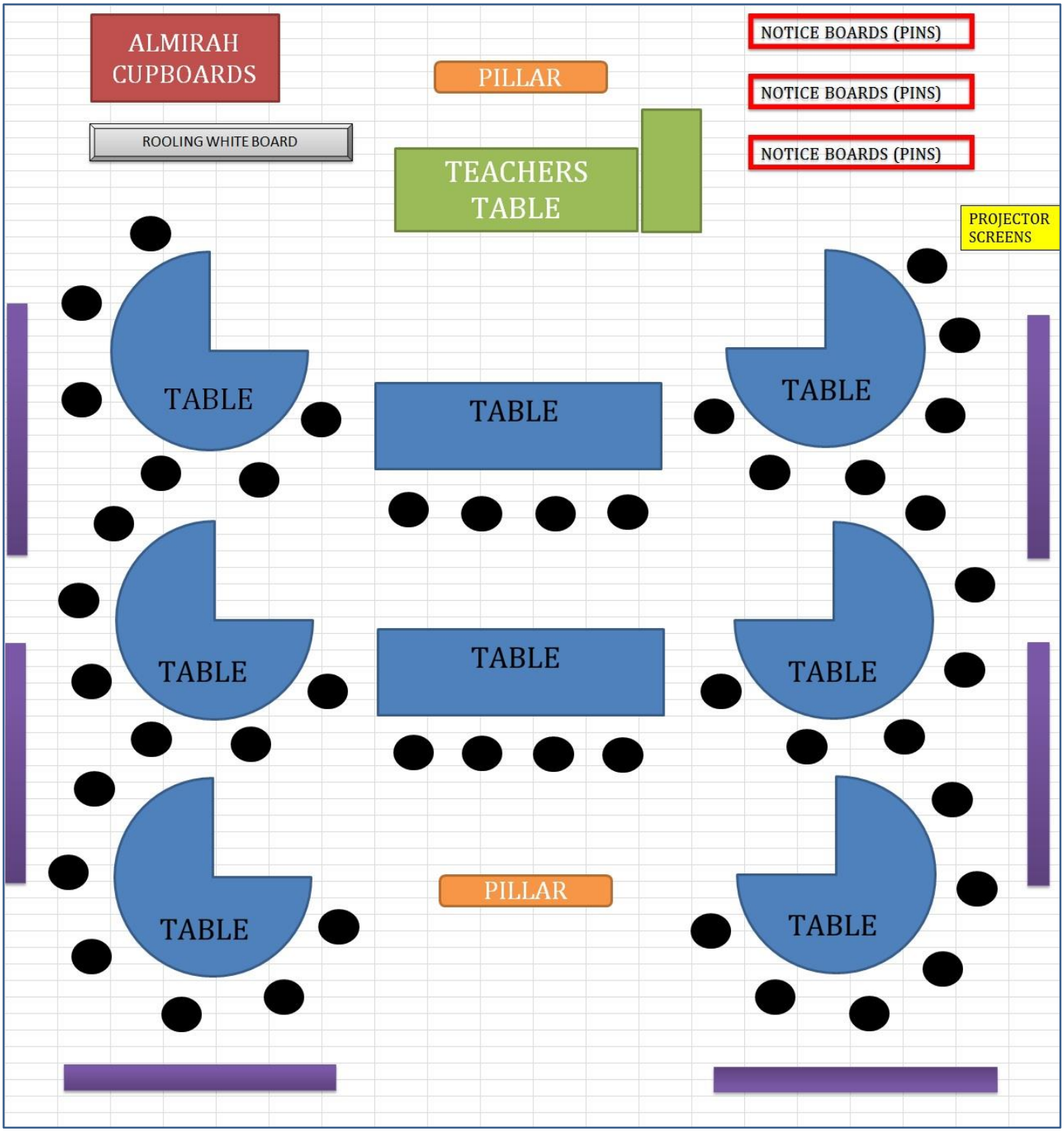

Figure 3: Proposed improvement classroom plan

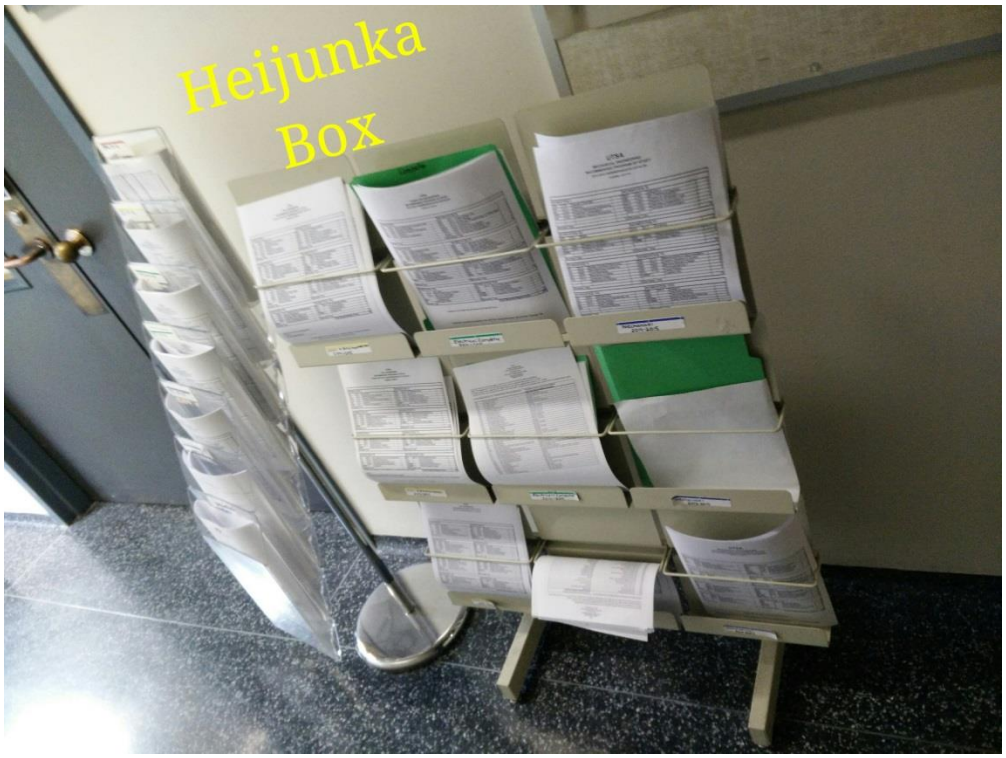

Figure 4: Arrangement of worksheets using Heijunka box

Table 1: General requirement for the proposed lean classroom

		Conservative
TABLES	Pie shaped	6
	Rectangular (for Students)	2
	Rectangular (for Faculty)	2
CHAIRS	Round	44
BOARDS	White Marker board (rolling wheels)	1
	Notice boards (One that can be pinned)	5-6
	Heijunka box	1

5. Conclusion

Hence to summarize, I implemented a few lean tools to improve our lean classroom by making use of the unutilized space and making a few additional changes in the system which would help build a better and leaner environment. Smart work is always better than hard work. Even a lean system can be made leaner by putting in new thoughts and applying new ideas. A very interesting quote which I try to follow "Sky is the limit for improvement" – Anonymous, and this is recommended for every system out there.

References

"Online Resources for Lean-Based Information and Tools," [http://www.leanproduction.com/top-25-lean-tools.html].

Class notes by Dr.Wan.