

Uses, Advantages and Opportunities of Kanban methods in Mechanical Engineering and Product Manufacturing

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Abstract- Whenever we talk about any product development or manufacturing process then it becomes very important that the process be perfect and premature, every process needs to be flexible. In today's era, agile is one of the ways. "Kanban" is a similar method that not only makes the production process flexible but also gives the best results through continuous monitoring. Although both Agile and kanban processes are used in the software industry, kanban is being used extensively in the field of mechanics. Kanban is not an entirely new way, but it is a means to further improve an already running process incrementally. In this article, the authors have mentioned about the history, experiments, and benefits of kanban.

Index Terms- Agile; Kanban; Software; Mechanical; Production

I. INTRODUCTION

Today's need for any business environment is headed by speed and agility. The main pressure that today's company face is to deliver the products fast and enhance the quality of the products. The flexible and rapid nature of development through agile has increased its importance and use in various industries. Not only in IT Industries for software development but also the product manufacturing in mechanical engineering is started through the agile development process. Kanban is used as an effective approach in the software development cycle as well as in production and inventory control. [1]

It is a framework whose idea behind the development came from a grocery store. The Toyota industrial engineer Taiichi Ohno was once passing by a supermarket he saw the workers refilling the shelves as the customer picks up the item to keep up demand. Similarly, he thought inventory in production could also be maintained.

Kanban is based on a lean concept whose main aim is to increase the efficiency of production and optimizes it. Continuous delivery of the products is done through the kanban method. The meaning of this term is signal or card. It works as a mediator between stages of the production and signals the demand of various components required during the manufacturing of the product.

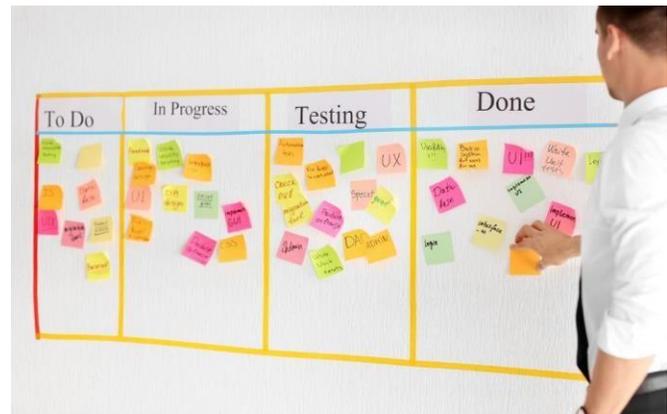


Fig 1: Kanban board

A. Preparation of a Kanban Board

The kanban board provides full transparency about the distribution of work and any kind of bottlenecks in the system. It is made by drawing a table on a whiteboard and dividing it into four columns. Each card on the board represents a specific task. [2]

- Mark the first column as To Do it will capture all the new items that are to be done.
- The second column is marked as In Progress it contains the list of all those items upon whom the work is going on.
- Items after the development are sent for testing. This column maintains the record of all those.
- Finally, the last one shows the list of all those work which are finished.

B. Working using kanban

The new work is added to the "To Do" column in the form of cards or written through markers. Once we are ready to work the item is dragged from the "To Do" column to "InProgress". After its completion, the card is dragged to the testing phase and finally, it is moved to "Done" after its completion.

C. Review your board

The tasks are dragged from one column to another based on priority. It keeps an eye on the tasks that are to be done, those that take much time and those that are at a halt.

II. LITERATURE REVIEW

The authors in reference [1] have conducted a detailed literature survey of various kanban frameworks that are proposed by many authors. Kanban framework worries about the utilization of signals. Deciding the actual signal number is an important factor in the case of Kanban based manufacturing system. The authors have described the various optimization techniques used while designing the kanban system.

Kanban technology plays an important role in production units. In reference, [13] the authors have reviewed the implementation of kanban methodology on swing liver assembly of Bajaj Steels. Their main objective was to reduce the ideal time of resources and maximize productivity. The authors concluded that the proper use of the kanban system helps in improving the flexibility of production.

The authors in reference [12] address the impact of Kanban in industry and how it helps in producing cost-effective products. They discussed the multi-stage kanban and the role of kanban size in planning and manufacturing. Their main focus is on the use of digital and e-Kanban. They also described a case study where the kanban system helps in minimizing logistics and operational issues.

Ahmad Naufal and Ahmed Jaffar in [9] discussed the development of the kanban system at the local manufacturing company of Malaysia. They deployed the kanban system at the company by following the major three steps. First is to gather the relevant parameter, after that calculations related to kanban are done and finally pull mechanism and rule is established.

In the paper [11], the authors have described the implementation of lean manufacturing in the leading autocomponent manufacturing industry of south India. Value stream mapping is the tool that authors have described. This tool is used to find the

sources of waste and ways to reduce the amount of waste. They used three types of kanban-move kanban, production kanban, and supplier kanban.

III. KANBAN FOUNDATION PRINCIPLES

Kanban technology is based on few major pillars:

1) Visualize the flow of work

The first step while implementing the kanban is to visualize the steps that are currently being used to deliver the services and work to the customer. [5] According to the complexity of the process and number of products being produced the board changes from simple to elaborate.

2) Reduce work in progress

It aims to make the mindset of the team to complete the work in hand before new ones are started. The work in progress must be finished and should be moved to the done column. This enhances the amount of production in the system.

3) Manage flow

In spite of various bottlenecks that arise at various stages of the process at one point of time to another, this ensures that work is done as fast as possible.

4) Make Policies Explicit

Along with visualizing the workflow the rules and guidelines that are followed must also be clearly stated. So that all the participants clearly understand how to do any type of work.

5) Implement feedback loops

Kanban board provides a feature of feedback loops and reviews at various stages which provides continuous feedback and gives an idea about the wrong track of any work. It ensures that the right product is delivered to the customer in the shortest possible time.

6) Improve Collaboratively

The kanban method of agile helps to evaluate the process constantly and improve continuously gradually at a pace.

Fig2: Kanban board following various principles



IV. USE IN INDUSTRIES

Kanban was originated on an industry floor to enhance the management of the supply of products. Kanban inventory management system is cost-effective, so it is widely used in many diverse industries. Management of inventory via the Kanban system results in many benefits. Manufacturing through kanban is advantageous as it applies an upper limit to the flow of work, prevents overproduction, and provides a progress report. Refilling of the inventory is done only after the depletion. This helps the company decide which products are more in demand than others. The feedback loops and reviewing feature improves lead time and prevents overcapacity. Cost in buying the surplus item gets reduced and space for storing large inventory also reduces. It provides continuous improvement in the business. Some of the industries are as follows:

1) RFID Kanban systems market analysis of medicines

The RFID kanban system is derived from the increasing demand for asset tracking, drug stock-outs in medication supply. The development of new products and an increased number of stockout cases, over inventory, has boosted up the use of the RFID kanban system. In this, the colored cards are replaced by RFID tags. The [6] software is attached to it which directly sends messages to purchase inventory in case of storage of any medicine. This reduces the risk of non-availability of the drugs at the hospital. Fig 3 shows the growing demand for RFID tags in the world by 2020.

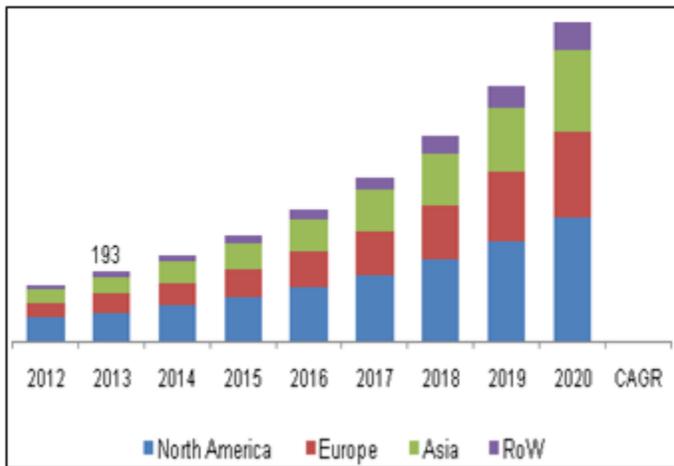


Fig 3: Global RFID kanban systems market, by region, 2012 - 2020 (USD Million)

2) Electronics company to satisfy orders

Milwaukee Electronics, a manufacturing company producing parts of medical, industrial and aerospace clients.

[7] The company started small volume production of screaming circuits which are internet-based. They utilize the kanban system in their industry to meet customer demands. The company maintained the inventory of two weeks and gave a lead time of two weeks to the supplier so that they will run out of parts in any case.

3) Toyota production system

The Toyota Company has two major features “Pull System” and “Just in Time Production”. [8] In the pull system, the production takes place according to the demand of the customer. Inline production takes place each process produces each component and passes to the other finally the product obtained is delivered to the customer. The business becomes linear by this concept. Just in time production maintains the stock level of raw material, components, and finished goods. Modern manufacturing companies use this kanban method to plan production in each production of the time. Toyota gives essential rules for kanban implementation:

- Shortening of setup time
- Minimize the production of defective items
- Defective items are not sent down the process
- Process standards are monitored regularly

4) DYNISCO SENSOR MANUFACTURERS

They are the leaders of the plastic extrusion processing and manufacturing. They were having issues with lead time and

quality. To resolve the issues they incorporated the Kanban inventory system and SyncKanban for automation. Switching to this method the company reduces its inventory cost of about 40%.

5) ORAL-B TOOTHBRUSH COMPANY

Oral-B company the largest producer of toothbrushes in the world. The main problem that they were facing is of packaging because they produce a large number of brushes as well as they are in different colors and styles. [12] That’s why they have to follow a different packaging line for each product. They divided the number of workers into three teams. First controls the movement of logistics, second the movement of materials from production to finished goods and third is for providing the data for these two. Finally, they concluded that implementing the e-Kanban brings more flexibility in their company towards meeting the changing demands of customers and also in the optimization of the process.

6) Bajaj Steels Pvt. Ltd

The Total time a swing liver takes in full completion is 22.11 minutes as per company records. [13] The need of kanban in the industry arises due to the inappropriate locations of various assembly and production areas. Drilling is done in some corners while assembling the parts is in another corner. Each time the product has to be carried manually this takes a lot of time and sometimes oversupply of products. The implementation of the kanban card system eliminates the oversupply of products and the use of a conveyor belt helps in quick transferring of parts.

7) BLM Cylinder head cover manufacturers

This company produces cylinder head covers for the proton model. They use inline production and produces three product variants at a time. Once the product is completed it is moved towards the storage area. The forecasting of the demand is not done due to which the store occupies a large part of the floor. The company started facing difficulties in meeting the changing demand requirements and arranging the space for storage.

CONCLUSION

The kanban production system is very effective in terms of waste reduction. It also helps in the effective utilization of resources in the industry extensions.

REFERENCES

- [1] Shobha N S, Dr. Subhramanya K N “A Review of Kanban-based Manufacturing Systems” International Journal of Research and Scientific Innovation (IJRSI) | Volume V, Issue IV, April 2018 | ISSN 2321–2705s
- [2] <https://www.forbes.com/sites/bryancollinseurope/2018/07/19/how-to-use-kanban-to-become-insanely-productive-a-short-guide/2/#1abbb6902a96s>
- [3] <https://www.iconnsystems.com/blog/what-is-kanban-manufacturing>
- [4] <https://businessanalyticlearnings.com/agilematters/2018/11/3/5-principles-of-kanban>
- [5] <https://www.digite.com/kanban/what-is-kanban/>
- [6] RFID Kanban Systems Market Analysis By Region and Segment Forecasts To 2020
- [7] <https://www.grandviewresearch.com/industry-analysis/rfid-kanban-systems-market>

- [8] <https://www.smartsheet.com/understanding-kanban-inventory-management-and-its-uses-across-multiple-industries>
- [9] https://elsmar.com/pdf_files/Toyota%20Kanban%20System.pdf
- [10] Naufal, Ahmad A., Ahmed Jaffer, Noriah Yusoff & Nurul Hayati (2012). Development of kanban system at local manufacturing company in Malaysia – case study. *Procedia Engineering*, Vol. 41, 1721–1726. Elsevier Ltd
- [11] <https://medium.com/@digite/implementing-a-successful-kanban-system-for-manufacturing-and-inventory-management-be6d27147986>
- [12] [11] B.Vijaya Ramnath, C. Elanchezian, R. Kesavan,” application of kanban system for implementing lean manufacturing”*Journal of Engineering Research and Studies*, Article 15 Jers Vol I Issue I July-Sept.2010
- [13] [12] M.Raju Naik, E.Vijaya Kumar, B.Upender Goud,” Electronic Kanban System”, *International Journal of Scientific and Research Publications*, Volume 3, Issue 3, March 2013 | ISSN 2250-3153
- [14] Rajat B. Wakode, Laukik P. Raut, Pravin Talmale,” Overview on Kanban Methodology and its Implementation”,*IJSRD - International Journal for Scientific Research & Development*| Vol. 3, Issue 02, 2015 | ISSN (online): 2321-0613
- [15] Vikram Abrol, ketan Shah,”Assessing Kanban fitment in the fluid and fast-paced world of software development”,*Infosys* 2018.

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