Agile project management in lean environment

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Abstract. The article discusses the possibility of integrating the traditionally opposed approaches of Agile and Kanban in the management of large manufacturing enterprises. The aim of the study is to develop a new algorithm for the implementation of lean production via formation of small work groups that operate based on Scrum methodology. Authors have classified famous approaches to lean manufacturing implementation, identified general patterns, and proposed a new integrated approach. The developed algorithm helps to launch lean production at a large enterprise in a most efficient way, quickly involve personnel in the change process, and identify change leaders. Agile frameworks in lean management support to get a specific result in a short time and make quick adjustments to scheduled plans.

1 Introduction

Lean manufacturing appeared as a formed philosophy and methodology for managing industrial enterprises in the middle of the 20th century and began its active expansion in Western enterprises with the opening of the NUMMI plant in California, a joint venture of Toyota and General Motors. The automotive industry quickly started to use this effective methodology. Since the beginning of the XXI century, Russian automakers also began to implement lean manufacturing into their practice. The low-cost, easy-to-understand, and alluring high efficiency methodology is actively used at present in all sectors, despite the ideological correspondence to serial conveyor production [1]. In general, organizational innovations related to the organization of production processes, structuring of supply and marketing channels for finished products have been widely used in the Russian economy [2,3].

Lean manufacturing methodology (customer focus and waste reduction) and variety of tools [4] are theoretically understandable. The methodology is based on a process approach with the Kanban system, which makes it possible to organize production in such a way that the stages work “just-on-time”, or, more simply, without any downtime, the product goes from hand to hand without any warehouses. Production losses are minimized with this method of organizing work. However, it is necessary to balance the production so that the duration of the stages can be the same (tact time).

The difficulty is in the practical implementation of Kanban: how to balance production? What to begin with? The introduction of lean production at a large enterprise (a vast majori-

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ty of machine-building manufacturers are large enterprises) is an “elephant” - a great problem, big frightening task as it is not clear what to start with. According to the time management methodology, the “elephant” must be divided into “steaks”, i.e. it is necessary to divide the large-scale task into elements and start with small ones [5]. But what size should “steaks” be if the company employs several thousand people? Does everyone need to work with one “steak” or simultaneously with several, distributing tasks to different departments? How to combine them together as the process approach requires a constant flow? Every manager who wants to run a lean production at his plant asks these questions.

2 Methods

Obviously, it requires some kind of algorithmization of actions. Since lean production is widely used abroad, the experience of successful implementations can be adopted by Russian manufacturers. There are 7 widely known implementation algorithms developed by American and Japanese practitioners: algorithms of James Womack, Lonnie Wilson [6], Ann Deiterich [7], Michael Wader [8], Jeffrey Liker [4], Shigeo Shinga [9] and Dennis Hobbs [10].

Having analyzed algorithms described in literature and applied in practice, the authors tried to single out the commonality in the orientation of launching lean production. The Colon classification developed by Ranganathan assumes approximately the same significance and independence of classification features, as well as the possibility of their addition. This method fully meets requirements of this research. At the same time, the advantage of the faceted method is its flexibility in complementing and expanding the number of objects under study. Therefore, when new algorithms appear, they can be included in the developed classification. Since facets are relatively independent, each of them can be divided into smaller ones, deepening the classification hierarchy due to additional features.

An analysis of common features, in turn, makes it possible to single out classification features and group similar approaches to reduce their number and identify the general idea of the initial launch. We have taken the initial action as a classification attribute since the main issue of the research is the nominal issue of starting actions when implementing lean production.

3 Results

Our attempts to classify algorithms led to their grouping according to the initial actions (Table 1). We can say that some researchers suggest starting with the staff (team building, training of participants), while the other part suggests starting with prioritizing processes. The algorithm of Dennis Hobbs makes an attempt to combine both groups, first to select processes and then train participants in these processes.

However, regardless of the proposed sequence of actions, each of these approaches involves systematic work according to the Kanban method as it minimizes wastes. Kanban has many advantages, but the main problem with introducing this method is its applicability only for stable repetitive processes. When continuous improvement is supposed in the enterprise's activity, the Kaizen regime forces to change the processes to a greater or lesser extent in each new iteration, so they never stabilize completely. In fact, it turns out that Kaizen interferes with Kanban, although both of these methods are fundamental to the concept of lean production.

Table 1. Classification of algorithms of lean production implementation.

Classification attribute (initial action)		
Formation of a team of like-minded individuals, leaders of change	Training of all staff of the enterprise	Process analysis, prioritization
Ann Deiterich: Get like-minded people → choose any process → training of the team → think of improvement for the selected process → implementation	Lonnie Wilson: Training → mapping → determination of the target state → task list to achieve the target state → Kaizen	Michael Wader: Choose the most inefficient process → 5S in the selected process → mapping → target state → again the most inefficient process
Shigeo Shingo: Safety of working conditions for employees → employee training → process stability and standardization → flow → stretching → quality system → elimination of losses → leveling → continuous measurement of customer value		Jeffrey Liker: The company's goal → mapping of the entire company → elimination of major losses → flow → leveling → improving product quality
James Womack: Choose a “conductor of changes” → organize training → identify problems → spontaneously and precisely eliminate losses where they are found → mapping → flow → Kaizen		
Dennis Hobbs: Project goals and targets for future production → team building and training of participants → gathering information about processes and products → action plan → designing a lean line		

4 Discussion

The main problem of the interaction between Kanban and Kaizen is the slowness of the first and the need for constant changes of the second method. Traditional Kanban works in cascading type: the project (product release) is carried out step by step in accordance with a predetermined sequence of actions. Change in the cascade type is possible only after the end of the cycle, which significantly slows down Kaizen in large enterprises with long production cycles.

If to divide the production cycle into meso-sections, then it is possible to apply the Scrum approach. An important point in the integration of this Agile flexible framework is the iteration of the work [11]. Thus, it is possible to make changes to individual parts of the processes without waiting for the end of the production cycle. The system of short-term iterations (“sprints”) with the obligatory result at the end allows to quickly achieve precisely defined indicators than with the traditional cascade model. The obligatory retrospective of the sprint serves as a kind of “quality circle” when the past period and its results are analyzed and work is planned for the next sprint.

Thus, it turns out that the Kanban chain may consist of Agile elements. According to the Scrum methodology, the main producers are the development team managed by the Scrum Master. Combining Scrum and Kanban, it is advisable to implement the collective (team) responsibility of the developers, since the main condition is the achievement of a specific result by the team at the end of each sprint. The collective goal also contributes to a softer transition to lean production [12] and decreases personnel resistance in the process of changes.

Another problem is the relative isolation of teams of developers, though they are at the same time parts of a single production chain. As it is known, in the process, local changes do not produce an effect due to the flow. Therefore, it is extremely important to correctly

implement links between scrum plots. A possible solution to the link may be the joint holding of retrospectives between adjacent sections. Thus, each subsequent plot is actually a stakeholder of the previous one, and the result of the scrum plot (different from the previous result) is an input condition for subsequent work. At the same time, the sprint result (“product”) is not included in the product backlog of the next plot, but it is the source material, an axiom that the subsequent plot cannot change. Otherwise, all previous work is meaningless.

Thus, the operation algorithm is as follows (Fig. 1).

Fig. 1. Agile project management in lean production

A special feature of Scrum is the small size of the development team, usually not more than 5-7 people, in rare cases up to 9 people. However, industrial enterprises have much larger production sites. At the same time, one of the conceptual foundations of lean production is the involvement of all employees in the continuous improvement. Here there is a clear contradiction, as to divide production sites into dozens of development teams is impractical. It is logical to create one team on one site, and the functionality of other employees is to fill in the backlog with Kaizen ideas. At the same time, backlog management, prioritization of ideas (tasks, work items), indexation of their significance are the responsibility of the Product Owner - the leader who controls the process and is responsible for the result.

5 Conclusion

Thus, the introduction of Scrum-framework elements allows to have more flexible changes in the implementation of lean production. The practical significance of the developed model is to facilitate the process of Kanban implementation at large enterprises, as well as the simplicity and effectiveness of links between meso processes due to the scrum retrospective procedure. Team building in the proposed scheme of work deserves a more detailed study, since developers and a scrum master should in fact be not only ideological leaders of change, but also specialists of development. Regarding the rest employees, the main problem is usually the resistance [12] of the staff, which can be reduced through training.

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