IMPROVEMENTS IN VAIN - THE 9th WASTE

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Abstract: Eliminating waste in processes through problem solving and continous improvements is one of the main ambitions in Lean. However, as the paper will elaborate on, improvement attempts itself are in many cases waste. In worst case they can create continuous waste in processes as a result. The purpose of this paper is to exemplify, discuss, and elaborate on the concept of improvements in vain. The paper is built on reasoning from industrial experience.

Keywords: Lean Production, Waste, Improvement, Effectiveness, Efficiency.

1. INTRODUCTION

Over the last decades, Lean production has spread to industries around the world. Even though Lean as a system is notoriously difficult to define (Modig and Åhlström, 2012, Netland, 2012), the practical aspects have been applied in a multitude of processes. In many cases there has only been limited success although others show better results. Regardless of the result, the companies have gathered experience and matured.

A main ambition in the application of Lean is the elimination of waste through the principles of problem solving and continuous improvements. Waste is normally defined as any activity that cost resources but does not contribute to the end customer value. Traditionally Taiichi Ohno defined seven major sources of waste (Ohno, 1988), later; another waste (waste of human potential) has been added, turning the seven wastes into 7+1 wastes (Sörqvist, 2013).

In the ambition to solve problems and reduce waste, many companies have introduced wide spread improvement programs involving most, if not all, of its employees. This broad approach has introduced other problems. Much of the effort and resources spent on improvements give very little result in terms of overall improvements. Resources are spent and no real improvement is achieved.

We define this as the 9th waste: "Wasted improvements" or "Improvements in vain".

The concept of the 9th waste is not new. Bicheno, *et al.* (2011) briefly mentions this waste as "waste in not following through" (p.31) and exemplify by stating "…if you reduce steps but do not make something of the time you have saved, you really have not saved anything" (p.31). Indeed, even Taiichi Ohno is said to refer to this waste as "Kaizen by inspiration" or "Popcorn Kaizen" (Miller, 2009)[1]. In industry there is a general sense of frustration when much effort is spent on improving the processes and few sustainable results are achieved. Even though there is some awareness of the problem of the 9th waste, it remains curiously unexplored in literature.

[1] Miller is here referring to a book that has not been translated from Japanese to English.
Toyota tsuyosa no genten – Ohno Taiichi no kaizen damashii, P. 132
ISBN 4-526-05560-3 Publisher: Nikkan Kogyo Shimbunsha, 2005

One possible explanation is that the definition of the 9th waste is somewhat different than the traditional 7+1 as it is only indirectly connected to end customer value and more connected to unrealized potential in the internal processes. This could be the reason why the 9th waste has not been problematized or discussed to a large extent. The fact that the 9th waste is a true waste is undisputable, as improvements in vain consume resources and effort within the organization, but does not contribute proportionally to a totally improved process.

Therefore, exposing the 9th waste requires a slightly different definition of the term "value" than what is traditional. In asking *why* one needs the definitions of waste and value in a lean process, the answer is normally along the lines of "It is to see where we have problems and potential". Therefore, to see problems and potential connected to the 9th waste, a more internal definition of value is used. The terms "need" and "internal value" is thus introduced to reveal internal process ineffectiveness and inefficiency.

The purpose of this paper is to exemplify, discuss, and elaborate on the concept of the 9th waste. The paper is built on reasoning from industrial experience. The paper will illustrate industrial examples of waste created through improvement work with no real "need" or no real "internal value". Also, the paper will present simple models to use to avoid ending up with the 9th waste, models, which is built on the mapping of behavioral "triggers" in the organizations that causes the 9th waste.

2. PROBLEM

One way of understanding the goals of a Lean business strategy lies in the dual purpose of increasing effectiveness without sacrificing and preferably improving resource efficiency. Effectiveness can be explained as: "doing correct things" while efficiency can be explained as: "doing things correctly". As so, effectiveness focuses on the results (for customer, internal or end customer, i.e., effect) while efficiency focuses on the activities and how efficiently these are performed.

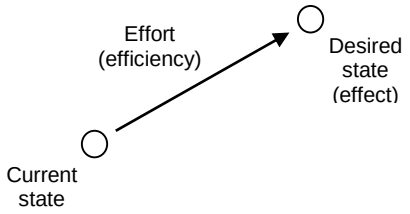

Fig. 1. Improvement process, inspired by Toyota Kata (Rother, 2010).

An improvement process is here defined as the journey from a current state to a desired state through expenditure of effort or resources. In this context a problem solving process and improvement process are used synonymously meaning the journey from an undesired (current) state to a desired (future) state.

The 9th waste has two roots. It springs from ineffective application of problem solving processes where resources are spent aiming at the wrong desired state or starting from an incomplete understanding of the current state, see Fig 1. It can also spring from an inefficient improvement process where you expend effort and resources without achieving the desired state due to incomplete understanding of Lean, wrong choices and wrong priorities or if you overspend effort and resources to reach the desired state.

2.1. Resources spent without clear understanding of current or desired state, ineffectiveness

Starting with ineffective improvement process, companies spend resources but the starting place is wrong or the desired state is not understood, see Fig 2. Either case causes the effort to fail, thus resulting in the 9th waste. Defining the current, undesired, state and the future, desired, state in an internal process requires a different approach to the term value.

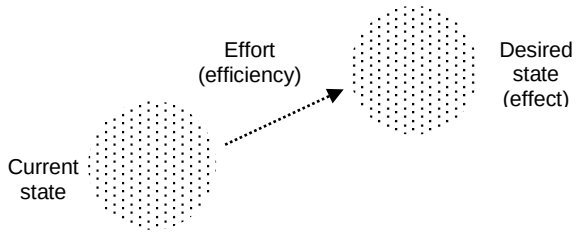

Fig. 2. Ineffective improvements. Undefined current state and/or desired state. Efforts will not achieve effect.

The traditional definition of value, and corresponding definition of waste, is based on what the end customer desires. This definition is a linchpin in any lean effort. The problem with this definition of value is that it hides some problems and potentials. Internal process problems and potential cannot always be defined in terms of end customer value.

Therefore we introduce the internal term "need" to help clarify the desired state of the improvement effort. *Is there a "need" for this improvement?* A proper understanding of the internal term "need" helps to clarify both the current and the desired state avoiding the blind spots given by the traditional definition of value.

Industrial example. From an end customer perspective, for a manufacturing company, nothing that is done by an internal logistics department can be seen as "value adding", every activity is waste. This also means that whatever effort that is spent on improving the logistics process, the remaining process is still 100% waste. Thus the traditional definition gives no guidance in finding potentials, prioritizing problems, and identifying a proper desired state within the process. It hides the problems by defining everything as a problem.

If the term "need" is substituted instead, the logistics department supplies the right parts in the right place in the right time. This is "need" of the internal customer. Using this definition, the waste of logistics can be defined and prioritized so that the resources spent, achieving that "need", can be minimized and the right problems solved.

2.2. Resources spent without a clear improvement process, inefficiency

Continuing with inefficient improvement processes, if the current and desired state is defined through internal customer need it is also of great importance that the improvement is performed and implemented in an efficient way. Spending more resources than can be given back by an improvement is the second part of the 9th waste.

Therefore we also introduce the term "internal value" in addition to the internal term "need" to help clarify the efficiency of an improvement process. *Is there a "need" for this improvement? If so, what is the cost for the improvement and what is the future internal value of the improvement?* A proper understanding of the internal terms "need" and "internal value" helps clarify current and desired state as well as the shortest journey to go from current to desired.

Industrial example. Carrying on with the logistics example: logistics developer can always improve logistics processes. However, some improvements might imply too great investments in, for instance, infrastructure. It is necessary to balance the "need" of the internal customer with the potential future "internal value". A positive benefit/cost ratio of the internal value and the cost for the improvement process must be obvious in order for an improvement to have total effectiveness.

3. TRIGGERS OF INEFFIECENCY

Even though either inefficiency or ineffectiveness can be the reason behind the 9th waste, they are not equal. Ineffectiveness can be remedied by a deeper understanding and the use of an internal definition of "value" namely "need". Inefficiency is more insidious and can have many different causes. Several organizational behaviors that trigger inefficient improvements are exemplified below.

3.1. Incomplete understanding of lean

A typical trigger of the 9th waste can be found in the connection between MUDA (Waste), MURA (Unevenness) and MURI (Overburdening). Much of the Lean literature has been focused on the MUDA of a process. This

probably goes back to the publishing of Lean thinking (Womack and Jones, 1996) where the term was popularized and made available for the general public. Later publications such as the Toyota Way (Liker, 2004) introduced MURA and MURI as well but the connection between them is not commonly understood. For instance, an effort to solve a problem with excessive waste (MUDA) might be misdirected if not simultaneously solving the problem of excessive unevenness (MURA), see Fig 3. Natural variation in the process might cause two problems. The effort of solving a problem of MUDA that fails but is done during a natural upturn in demand, thus giving a false positive. The organization believes that the effort was successful. The other problem is the opposite. An effort to solve a problem of MUDA, succeeds but is done during a natural downturn variation in the process, thus giving a false negative. The organization believes that the effort failed and draws the wrong conclusions. Therefore an incomplete understanding of how the principles of lean are connected can cause the 9th waste.

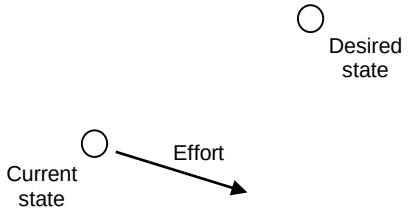

Fig. 3. Inclomplete understanding. Aiming efforts in the wrong direction.

Industrial exampel. An example of incomplete understanding of the connection between for instance MUDA and MURA can be a maintenance organization not taking into consideration current and projected production volumes in its goal setting for machine availablity. In case of a change from booming or stable market, to a downturn, it may seem that availability levels are increasing and that the current maintenance strategy is correct while a sudden increase in volumes can cripple the organization as availability levels might plunge if the maintenance strategy has been to serve machine utilization at a lower production volume (see Ahlmann, 1984).

3.2. Unfocused improvments

Another trigger of the 9th waste can also be unfocused improvements. This happens in organizations where effort has been spent on initiating improvement groups. Delegating the capacity to solve problems and improve the process down to the lowest possible level to engage the entire organization is a good and proven way to approach a Lean initiative. Everyone is engaged and the buy in of the organization in the Lean initiative is high. People are motivated and enthusiastic. The trigger of the 9th waste lies in the guidance of the management. Guiding improvement work so that everyone in the organization is improving in the same direction and making sure there is an internal need of an improvement is one of the priorities of a leader. If the leadership is inexperienced in Lean at the same time the organization is working with improvements, there is a clear risk that the total sum of the improvement work will be considerably less than the effort and resources spent, see Fig 4. Lots of thing change but few things truly improve.

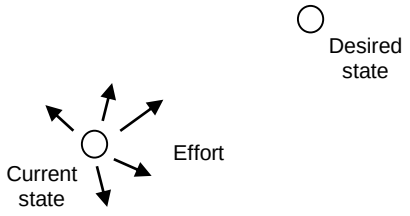

Fig. 4. Unfocused improvements. Much effort is spent achieving very little totally.

Industrial exampel. If, for instance, the overall target for an organization is to increase productivity; a repairman might start to work on increasing the availability of a machine, an assembly worker might work on reducing steps, an operator might work on rebalancing work content, a production engineer might work with reduction of cycle times etc. All might be valid improvements to pursue, but with a lack of coordination between all improvement initiatives the sum of all work might lead to no real improvement if, as Bicheno *et al.* (2011) express, it is not followed through. A lot of local improvements has been carried out but no use has been realized of the results, therefore, the resources that has been spent on performing the improvements are waste.

3.3. Superficial solutions

Superficial solutions to problems can be triggered when managment demand that a certain problem solving tool or method is used in every instance there is a problem. If the organization is untrained or there is a lack of resources to execute problem solving in combination with a demand for a formal procedure, the resources in the organization are spent on filling in forms and following methods blindly without thought. The analysis is shallow or nonexistent and the organization is measured on the number of forms filled out and not the actual problems solved, see Fig 5. The 9th waste is triggered when the demands of management does not match the capacity of the organization.

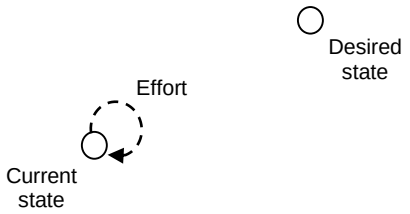

Fig. 5. Superficial solutions. Minimal effort is spent by an owerwhelmed organization achieving only shallow or non-existent actual improvements.

Industrial exampel. Maintenance management ask for the utilization of a root cause failure analysis form to be filled out at every machine breakdown. However, the administrative overload of taking care of all forms render in that the the root cause analysis exercise drowns in paper work. Soon, management asks for the forms and not what the forms are supposed to be delivering, the root causes and the proper actions to take in order to make the same problem not occuring again etc. It does not take long before employees do not take the forms seriously and the root causes are seldom or ever found through the forms as was thought in the beginning.

3.4. Lack of syncronization

Lack of syncronization between departments that is indirectly connected can also be a cause of the 9th waste. This is particularly incidius as all managment follow up systems might indicate that the individual changes are sucessful since they are in line with the organizational targets, but the total overall result might be less than satisfactory, see Fig 6. If an individual department makes a change that is in line with the overall target but it affects another department with another set of priorities the effort to change might be wasted.

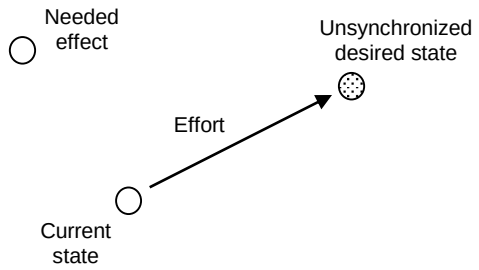

Fig. 6. Unsynchronized improvements. Efforts achieve target but the targets is wrong, effort is thus wasted.

Industrial exampel. If for instance the overall target of an organization is to increase productivity a production engineering department might interpret the target as a need to raise the OPE of the production equipment through the reduction of cycle time. Increase in speed and cutting depth might though increase the strain of the machine elements as well as increasing the risk of machine crashes that the gain in speed might be lost in machine availability as a maintenance department needs to perform much more preventive maintenance as well as corrective maintenance.

3.5. Blind improvment course

Long lists of improvements have their own problem. Even though the analysis, when a list was created and prioritized, might have been correct, it was based on what was known at the time the list was created. Simply

continuing to solve the problems in the order that they have been listed might actually cause the wrong problems to be solved if the list is not reevaluated frequently in accordance to what is learned during the last problem solving. Even though the list was correct when it first was created, things change and new knowledge is attained, see Fig 7.

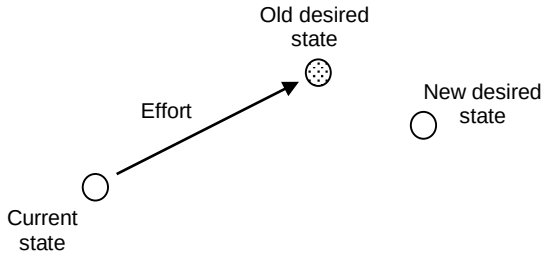

Fig. 7. Blind improvement course. Having not reevaluated long list of improvement ideas after start of improvements, course is instead followed blindly.

Industrial exampel. Not reevaluating a list of improvements after improvements are implemented of course implies that there is a risk in that both the current state as well as the old desired state has changed. Also, if not synchronizing (see 3.4 above) with other departments or employees one might miss that others have implemented other improvements, making the list obsolete. If, for instance, a maintenance department makes a list of machines in prioritizing machine availability improvements more or less all triggers, as explained above, will have impact on the list within not too long.

4. IMPROVEMENT PROCESS MODEL

All of the triggers and examples mentioned above might be interpreted as parts of an improvement process model, see Fig 8. The horizontal axel is connected to effectiveness. A proper understanding of the current situation and the desired situation based on the internal value "need" is necessary to properly orient and coordinate all improvement efforts. It creates an improvement map which is used to increase the improvement effectiveness.

The efficiency of the improvement process is judged by effort and direction. The resources used for improvement can be seen as the engine of the improvement process. This effort is directed by the leadership of the process that decides on direction, the steering wheel of the improvement process. Leadership is also primarily responsible for interpreting the improvement map and aligning it to reality, this can be seen as the improvement compass. It is also of importance that the leaders learn how to separate strategic, tactical and operational goals in order to be able to find the internal customer, the needs of the internal customer as well as the potential internal value of an improvement. Petersson *et al.* (2009), for instance, state that leadership in continuous improvement needs to be adapted case by case, supportive, and present. They continue by stating that in a more mature organization the supportive part becomes more of helping a group communicate with other departments (such as internal customers and suppliers) as well as upwards in the organization, in, for example, issues regarding investment requests. The efficiency and effectiveness of an improvement meets in the improvement method, which can be seen as the transforming mechanism where effort and guidance is connected to the improvement map.

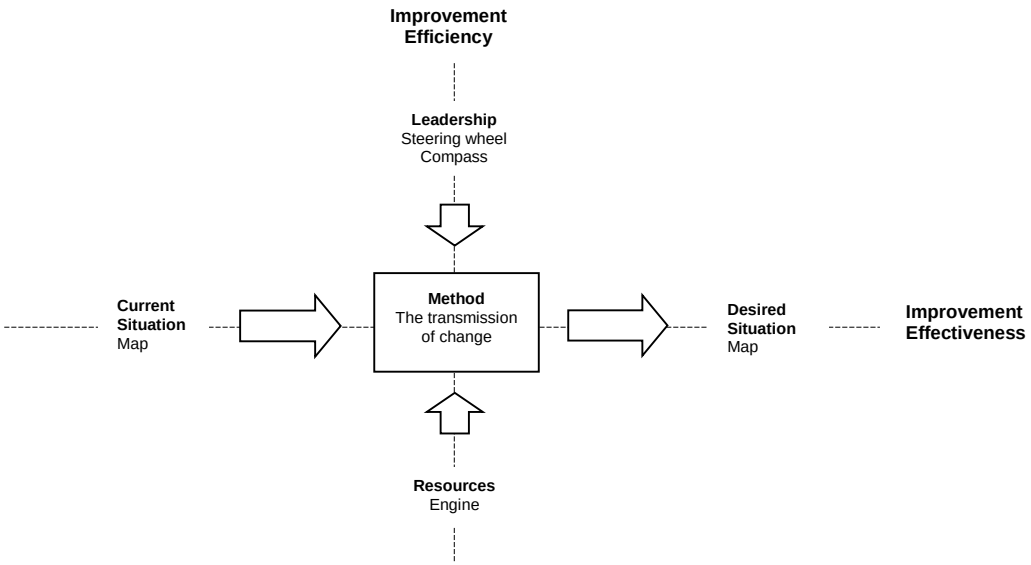

Fig. 8. Improvement process model. Mapping out the current location, making sure we are travelling towards the desired goal at a safe speed, without stalling or overspeeding the engine.

5. CONCLUSIONS

Two aspects seems to become clear in working with total effectiveness when it comes to improvement work and problem solving: maturity in lean and minimizing the effort.

5.1. Maturity in Lean

The 9th waste is a problem that becomes more obvious as improvement efforts gain momentum in a Lean process. For a process that is initializing Lean, or only has a few years' experience, the effort of getting any organized improvement work going at all, might be more important than both effectiveness and efficiency. The reason is simply that, based on experience, it is far easier to steer an organization that is changing (moving) in some direction (even if it is wrong) than aiming an organization that is not changing (moving) at all.

However, as soon as the Lean initiative gains momentum and reaches a point of maturity, some measures of both efficiency and effectiveness is required. Lean is generally about sustainably getting more output with less input. The same goes for improvement work. Since the number of possible changes in a process is basically infinite and resources are not, choosing only needed improvements and executing them efficiently becomes increasingly important as the process gains maturity, see Fig 9.

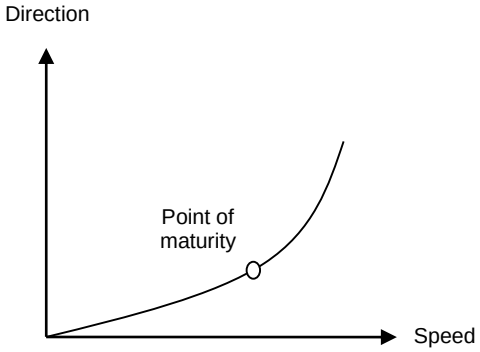

Fig. 9. Direction and speed of improvement. First gain change momentum before putting great effort in directing change.

5.2. Minimize the effort to get the needed improvement

When the current state meets the needed state at an economical cost the change becomes an improvement. In all other cases it remains just a change (and in some cases a very expensive change). In order to achieve this, any improvement system should be analyzed in terms of efficiency and effectiveness. Do we reach our needed state with a reasonable expenditure of resources and effort? Some of the pitfalls a manufacturing company needs to be aware of are explained above, in Section 3, as triggers of inefficiency. This list is by all means neither set in stone nor finished. As argued for, in Section 3.5, things change and new knowledge is attained.

The internal definition of value, "need", to find internal potential and problems that are otherwise hidden should not replace the traditional definition of value. Rather it should be seen as a supplement. The traditional definition of value could and should be the primary tool of finding waste in the main process. However, for the supporting and indirect processes that regulates the preconditions given to the main process the term "need" will link their efforts to what is needed by the main process and enable a controlled reduction of waste avoiding sub optimization and the 9th waste.

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