Sustainable Organizational Change - Can you make the change happen with Large Teams alone?

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Abstract: *The article presents some insights from ongoing research on sustainable organizational change. It focuses on a concept of improvements actions conducted by teams within manufacturing organization. There are considered two types of approaches, namely bottom-up – example of which are empowered, small, cross-functional teams; and top-down – large teams following rigorous problem solving methodologies. In order to investigate impact of small teams and large teams on the organizational system structure a System Dynamics model was developed. The model investigates the effectiveness of both kinds of approaches from the perspective of sustainable organizational change effort. The analysis of the model and simulation results is supported by example of successful organizational change in Lima Refinery. In the conclusion section the implications for sustainable organizational change efforts are presented.*

Key words: organizational change, action, team, ownership, model, simulation

1. Introduction

This paper is a report on ongoing search for the means to ensure sustainable organizational change emerges. Despite a significant amount of literature and various approaches proposing a list of components required (Collins 2001; HBS 2005), there are few examples of successful and lasting change efforts. The question the authors try to answer is what are the components and how should they be linked together in order to improve safety and reliability of operations not only in a short-term but to deliver enduring results.

By 'enduring results' the authors mean outcomes similar to a well quoted example of Lima refinery (Sterman 2000; Repenning and Sterman 2001; Linder 2008). The overview of the results is presented in Figure 1. For four years prior to the improvement effort, % Planned Work, represented by the red bars, hovered around 60% and the total

number of work orders was around 24,000 per year, represented by the red line. The improvement effort began in late 1994 where the yellow shaded area begins and officially continued through mid-1998. The % Planned Work increased from approximately 60% to 90+% by the end of the effort and has been sustained through to the present time. This was accomplished not by increasing planning, but by decreasing the amount of work which is represented by the drop in the red line. At the end of the effort, the number of work orders per year had dropped from around 24,000 to approximately 15,000 representing a 37.5% decrease. As the effort continued unofficially after mid-1998, the reduction in work also continued with annual work orders dropping to about 7,000 per year.

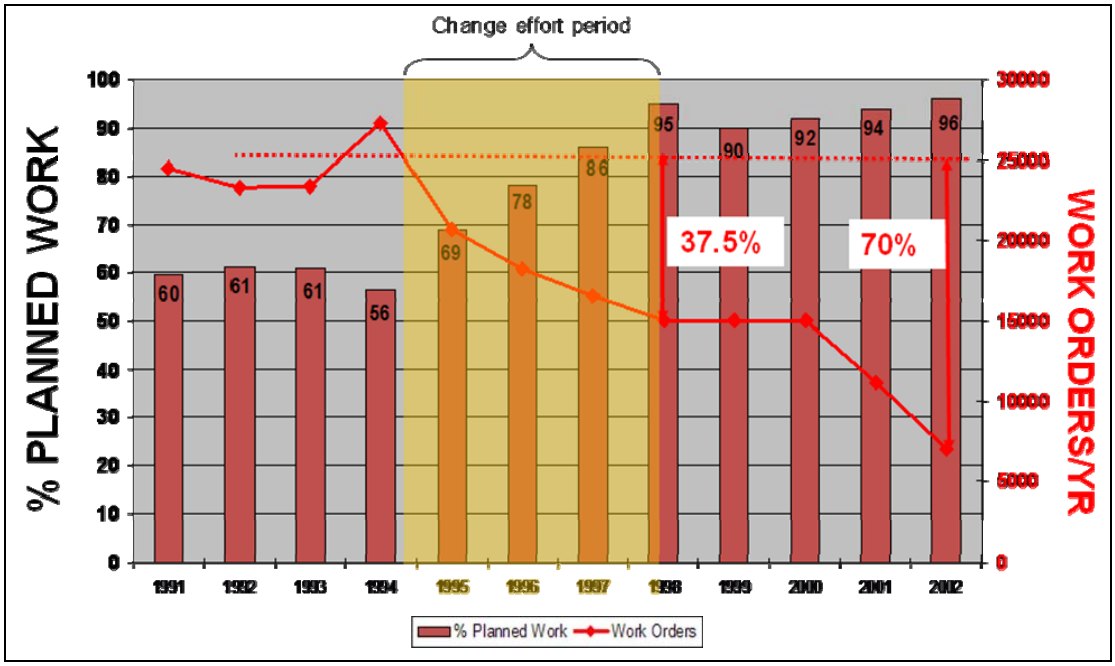

Figure 1 Overview of enduring results following change effort in Lima Refinery

The most notable points from the Lima Refinery change effort data include:

- dramatic reduction in the work required to run the refinery (70% less)
- ability to change, despite starting in a 'capability trap'
- dramatic increases in operating and financial performance, that were sustained
- improved safety and reduced environmental impact
- sustained high degree of planned work, with accompanying efficiencies

In this paper the main focus is given to a concept of 'actions' conducted by 'teams'. *Action* is a starting and a fundamental element of change. *Action* is taken by *teams* in order to pursue new values in organization. It seems to be a straight forward concept yet various improvement methodologies suggest various kinds of actions to be taken.

Total Productive Maintenance (TPM) advices Equipment Improvement Teams – a very bottom-up approach suggesting many small, cross-functional action teams made up of hourly operators and maintenance personnel to pick their own defects to pursue.

More ‘engineering mind’ driven approach like Reliability Centered Maintenance (RCM) and Six Sigma represents top-down approach ensuring that the teams are focused on the most important defects, have a very rigorous process and are heavily facilitated by managers and engineers.

Thinking about organizational change one can compare it to chaos, abandoning well known ‘status quo’ and leaving to a new, unknown ground. Being in such a chaotic state there seems to be a natural tendency to look for order, discipline, and rigor. John Kotter (1990) distinguishes management and leadership in his statement – ‘good management controls complexity; effective leadership produces useful change’ – managers try to control the process of change. This might be a reason for favoring structured and planned actions like those proposed by RCM or Six Sigma. Another advantage of such actions, and thus desire to apply it, might be the perceived success rate. The process of selecting an appropriate problem to be addressed and also applied analytical tools insure that most of the actions taken following RCM and Six Sigma approach are successful. Quite often this is not the case with TPM like action teams which sometimes have to try two or more times to approach a problem before they solve it.

Nevertheless, there is no question that an action taken following both TPM and RCM or Six Sigma approaches has a potential to deliver value. However, there is a question of *what kind of actions will pioneer and lead to sustainable organizational change*.

This seems to be a strategic question having a significant impact on success or failure of the entire change effort. This sort of question had to be answered also by Jack Welch in another well known successful organizational change example. Below is an excerpt from a book by Dave Ulrich, Steve Kerr, and Ron Ashkenas (2002) reflecting on what stimulated the change in GE:

> *“In the 1980’s, a number of the GE business leaders, particularly in the Aircraft Engine business, lobbied vigorously for a Six Sigma approach instead of Work-Out. At the time, Motorola was trumpeting its success with Six Sigma, and the Total Quality movement was just gaining momentum. Jack Welch, however felt strongly that a highly analytical approach such as Six Sigma would have reinforced GE’s already exaggerated tendency to* ***analyze and audit rather than act****. And it would not have changed the underlying culture of hierarchy and constrained dialogue.*
> *In retrospect, it’s clear that Welch was correct. GE became a more flexible and change-oriented culture through the first half of the 1990’s and was thus much more capable of implementing Six Sigma in the second half of the decade. (…) In contrast, Motorola, which pioneered Six Sigma in the 1980’s, did not develop a sufficiently fast and flexible culture to underpin its focus on quality.”*

In order to investigate more thoroughly the question of two different approaches for taking actions by teams and tap into the experience of a successful organizational change there we created a System Dynamics model of a manufacturing plant. In the next section of the paper the model structure is described. Section three presents and discusses the results of the model simulation scenarios. The final section makes some closing remarks.

2. Model Structure

Usually the desire to change comes from recognition of a gap between actual and desired performance. The basic cause of poor performance in any industry that produces a tangible product is defects in the system. The defects are represented as a stock variable. Calibrating the model to the Lima Refinery data, and assuming 3 defects per work order the initial value of the defects stock will be 72,000.

The number of defects increases every day due to ABC process – *A* stands for Aging, *B* stands for Basic Wear And Tear of the equipment when it is operated, and *C* stands for Care-less Work Habits (by care-less we mean, "not providing the proper care" that the equipment needs to run perfectly) (Ledet 2008). The ABC process is modeled as an inflow to a stock of *Defects* and is named *Defects Introduction Rate*. Defects can also be removed from the system, which is modeled as an outflow from the stock of *Defects* and is named *Defects Removal Rate*. The basic model structure representing change and accumulation of defects in the production system is presented in Figure 2

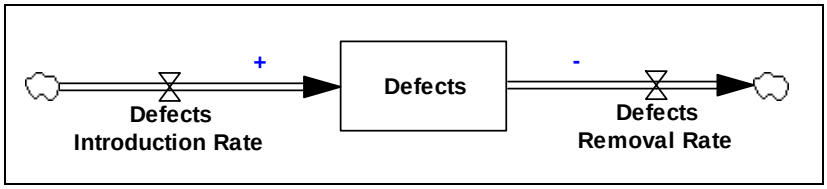

Figure 2 Model structure overview – Defects

Improvement actions taken by teams, following both bottom up and top down approach, have a positive impact on defects removal from the system – they increase *Defects Removal Rate*, but also such actions try to find root causes and eliminate sources of defects – they decrease the *Defects Introduction Rate*. Still, bottom-up and top-down types of action have different characteristics, which will be described now.

Small and Large Teams Characteristics

Thinking about bottom-up, TPM like actions, we will talk about 'small teams'. The reason for that is that an optimal size of the team is five people. In an asset with 1000 employees there might be 200 action teams. Each team targets a small defect that can be eliminated within 90 days. In the model there is an assumption that each person can participate in two action teams per year (in the organization with 1000 employees there might be 400 action teams per year). Based on our significant experience in that area, small team success rate is about 55% in removing defects from the system, whereas 40% of these teams are also successful in defect source elimination.

The success rate of top-down approach, RCM and Six Sigma like, is much higher. The model assumes a 90% success rate for these top-down teams (10% failure might be due to lack of management support or poor idea generation). Furthermore, such actions also have a greater impact as they bring tools and skills to solve serious problems and tend to systematically go after significant defects. Results from Six Sigma approach suggest savings of $250,000 per year per team compared to average savings of $25,000 per year per small team.

Thus, in the model the impact of successful top-down approach is 10 times more effective, in terms of defects removal and also defects source elimination, than in case of small teams. However, there are also shortcomings of the top-down approach. The RCM analyses are costly and time consuming. The Six Sigma requires Black Belts to sponsor and facilitate projects. The literature suggests one facilitator for every 100 employees each working on average on 4 projects per year. In the organization with 1000 employees that would mean about 40 projects in a year. Thus, in the model talking about top-down approach we will use a term 'large teams'.

Assembling Small and Large Teams

The small and large teams are modeled as stocks. The model structure is exactly the same for both kinds of teams – the one used for small teams is presented in Figure 3. When a new team is assembled the *Small (Large) Team Increase Rate* is adding to the stock. When the team is disbanded the *Small (Large) Team Decrease Rate* is removing the team from the stock.

Since the large teams are usually strongly supported by management the time to establish large team is shorter than to establish small team. On the other hand, in case of small teams, every team member is strongly personally involved in the improvement process action taking. Due to its nature, the large teams' participants are less involved in the action taking than the small teams. Still, almost every large team is successful and makes a significant contribution.

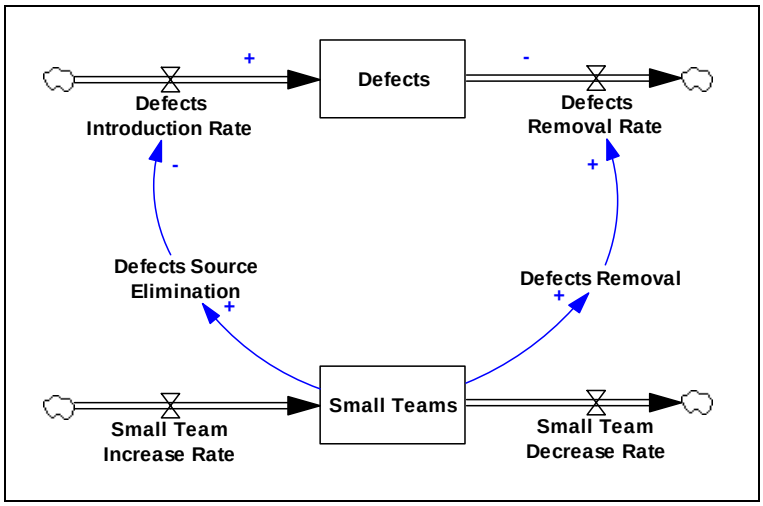

Figure 3 Model structure overview – Small Teams (the same structure applicable to Large Teams)

Ownership

The different involvement ratio in case of small and large teams has however a significant impact on 'ownership'. Following the practical experience in that area the ownership is measured on a 0 to 5 scale, with a 0 indicating that most people will actively resist improvement efforts and a 5 meaning that most people will initiate improvements without management prompting (Ledet 2003). The ownership is in turn responsible for willingness to get involved and act to eliminate defects. Thus

Willingness for Improvement in the model impacts the *Small* and *Large Teams Increase Rate*. The new teams are assembled and work on improvements.

However, one has to remember that over time, working in a dynamic environment where every day a new problem arises there is a process of *Ownership Erosion*. Due to day-to-day emergencies people switch their attention from improvements to 'fighting fires'. As the consequence of the *Ownership Erosion* the *Willingness for Improvement* might decline and less new improvement actions will be taken.

Ownership is important – without it no sustainable culture change will occur. To mobilize the entire organization in continuous improvement activity requires at least some expanded ownership, beyond sitting managers. In the Lima Refinery story it is clear that workers and engineers took ownership to a much higher degree; it is our hypothesis that the model dynamics discussed above drove this expanded ownership, and was involved in the sustained high performance results.

Ownership enables workers to work independently on what is needed to pursue the vision, driven by the urgency behind the need for the organizational change. Kotter says that this ability for 'independent action' is vital. This is what enabled the large number of action teams at Lima Refinery – workers managed themselves. Managers could not have controlled and directed the actions of the large number of teams at work. A large amount of simultaneous action without 'loss of control' cannot occur without this 'self regulation' and was key to making the large number of improvement actions while actually driving greatly improved safety and environmental results.

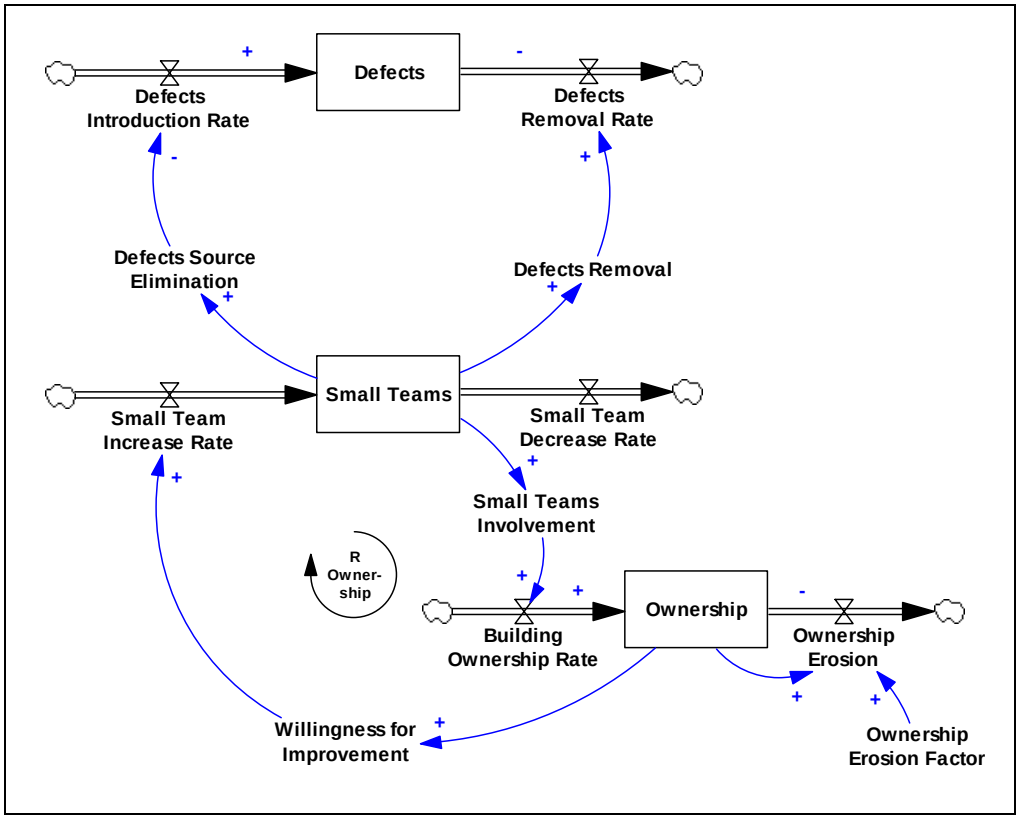

Figure 4 Model structure overview – Ownership

Experiencing Results of Improvements

Along with completed improvement actions there is a positive experience of improvements – a pride of the achievements and satisfaction. In case of the small teams, due to the fact that the actions are usually oriented on the day-to-day problems that 'irritate' the team members, this experience can be identified with a relief that the particular problem will not happen again or at least will not appear again for a significant period of time.

On the other hand the improvements delivered by large teams are usually of significant value which is very welcomed by the organization. Thus, the model does not introduce different improvements impacts on experience for small or large teams. The greater the improvement the more positive experience is gained.

However, similarly to the idea of Ownership the experience of improvements results naturally or due to the working environment characteristics decays over time. If not 'fed' by the outcomes of improvement actions this experience can be all but gone. The model structure illustrating the concept of experience is presented in Figure 5.

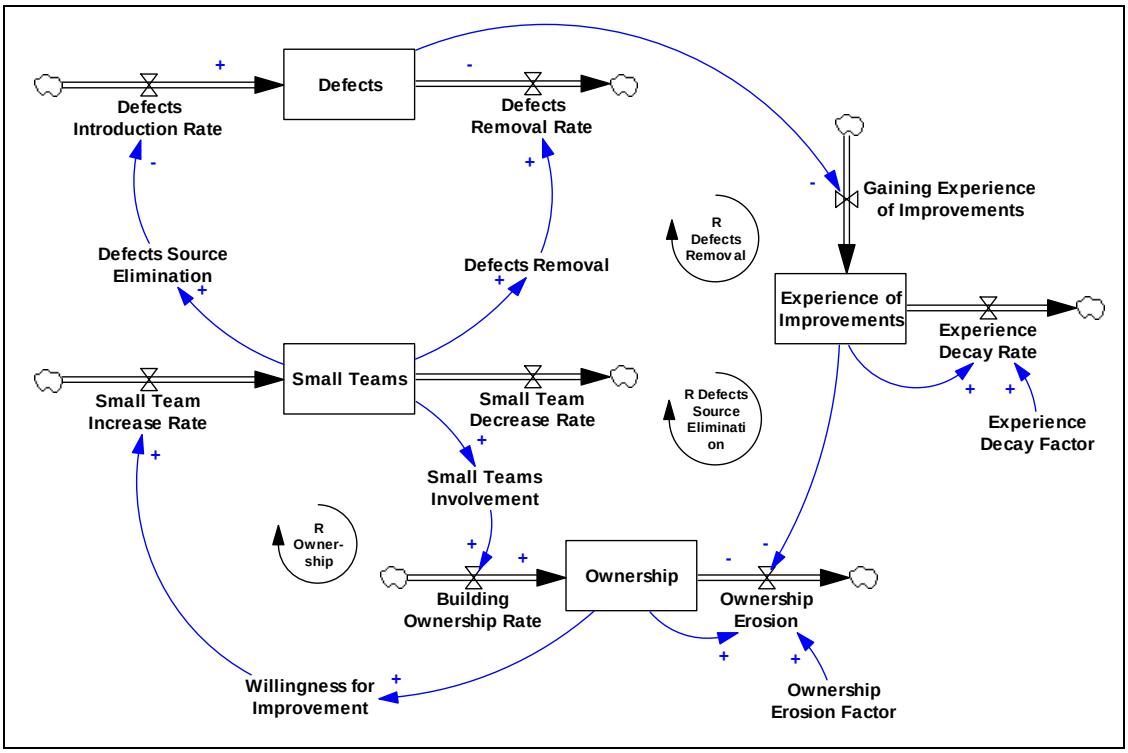

Figure 5 Model structure overview – Experience

A feature of the *Experience* resulting from completed improvement is that it locks the *Ownership* – in the mode the greater experience is reducing the *Ownership Decrease Rate*. The greater experience means that employees will maintain the ownership for a longer period of time. Locking the ownership leads to its greater accumulation and stimulates the willingness to take the new improvement action. Another way to say this is that if I see myself as an owner of the Refinery, I am more willing and able to take independent actions to sustain the future I see for it. I take a longer range view, am more

willing to give of myself, notice deviations and correct them sooner, and participate with colleagues to help them on their improvement actions. Without ownership locked in, I may behave in such a way that I just "mark my time" and leave all the improving and performance delivery to 'managers.' Because managers are far away from the equipment much of the time, this works against improvement – defect accumulation rates increase and performance will decline. Whoever is close to the work sees the defects and can take improvement actions earlier and more effectively, if they are empowered to do and see it as their accountability. Locking in the ownership occurs when large numbers of workers start to behave in a new way – when they behave like "I am the owner of this place".

Low hanging fruit

Into the model structure there is also build an idea of 'quick wins' or 'low hanging fruits'. While starting the organizational change effort there is a significant amount of defects in the systems. Thus it is relatively easy to come up with a good problem idea, find a root cause of the problem and eliminate defects behind it.

Over time, when the number of defects in the system is reduced due to improvement actions taken by small or large teams working on defects removal and defects source elimination, it becomes more difficult to find a defect and eliminate it. This concept is covered in the model by two balancing loops, as presented in Figure 6, reducing the effectiveness of small and large teams in both defects removal and defects source elimination.

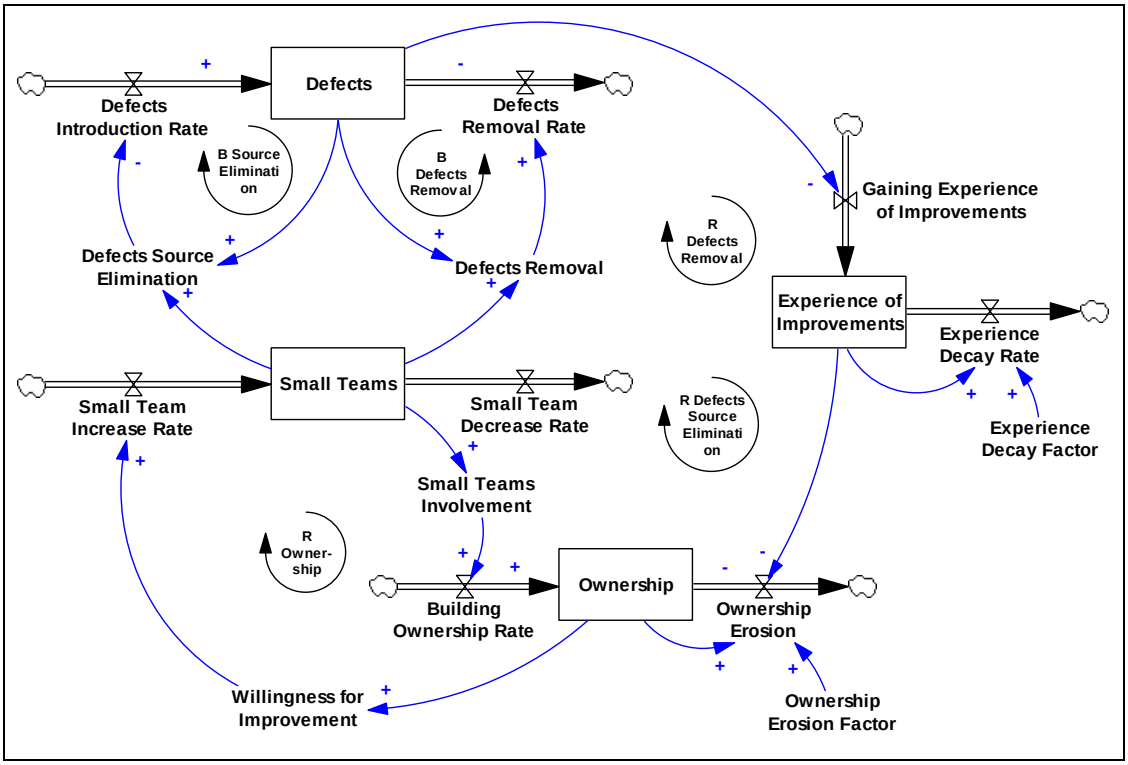

Figure 6 Model structure overview – 'Low hanging fruits'

The System Dynamics model structure is exactly the same for small teams (as presented in figures above) and for large teams. The model elements that are modeled separately is Assembling Small and Large Teams sector and characteristics of the actions taken by both kinds of teams (number of teams members, success rate, involvement in action team). The model incorporates a switch allowing for enabling small team or large team sectors to interact with the common for both types of teams model structure. This allows us to compare and discuss some simulation scenarios.

3. Simulation Scenarios

In the first simulation scenario there will be investigated what would happen if the organization, regardless of, some might say, 'unstructured' or 'chaotic' nature, decides to mobilize small teams in order to make the change happen.

The outcomes of the simulation scenario are presented in Figure 7. The first action teams start to work on eliminating defects which results in a slight progress in defects elimination. Gained Experience from the completed improvements locks Ownership, which leads to more small action teams taking the improvement actions. As the ownership reinforcing loop gains momentum suddenly a significant amount of small teams are initiated. A faster decrease of defects in the system can be observed. The pace of defects elimination slows down again as the 'low hanging fruits' were addressed and it becomes more difficult to find a good idea and eliminate problems.

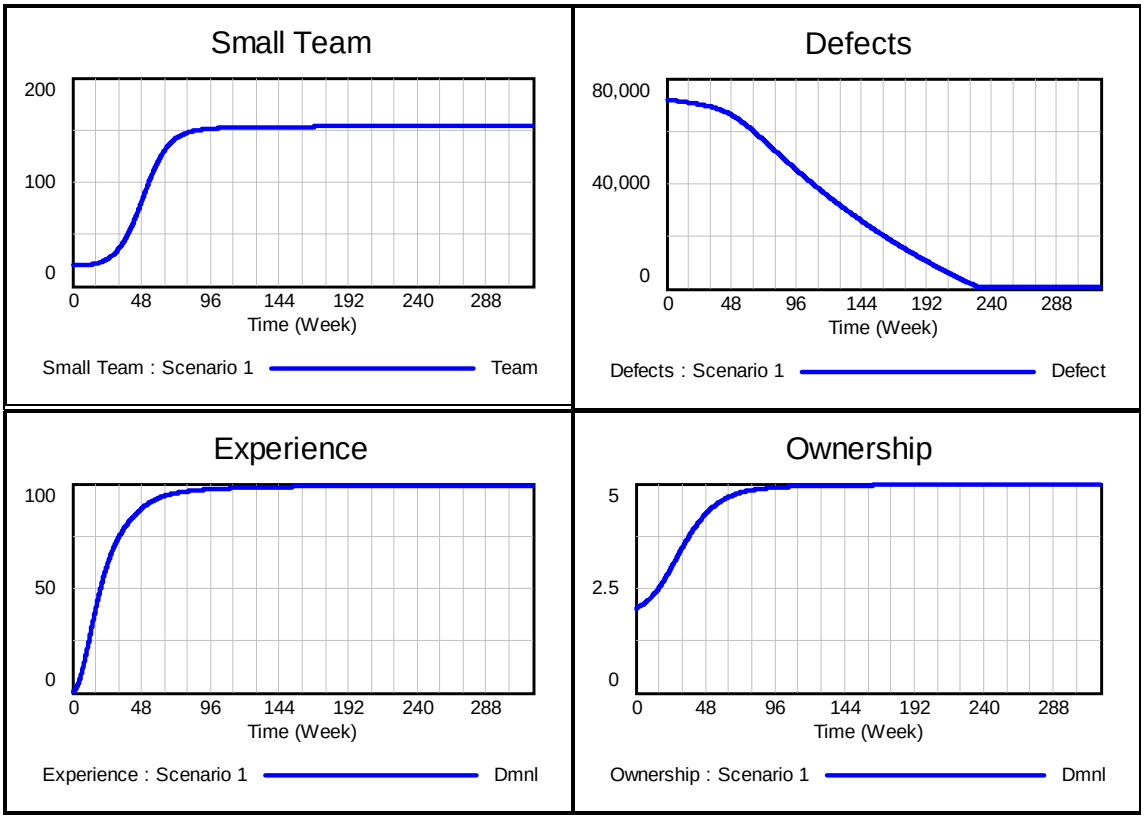

Figure 7 The first simulation scenario – small teams to make the change happen

The second scenario considers a situation when management decided to sponsor large teams only. Knowing about much greater success rate of the large teams it would be expected to see yet greater results than in the case of the small teams. The results of the second scenario compared to the first one are presented in Figure 8.

Even though there is a small number of large teams initially the defects are eliminated faster than in case of small teams. Furthermore, since the completed projects bring significant improvements the positive experience grows faster than in the first scenario. However, due to low involvement of all team members even a great experience does not lock the ownership. Instead it decreases causing less people being interested in initiating new improvements actions. The number of teams significantly decreases leading to much slower pace of defect elimination than in the case of small teams.

This scenario illustrates how important the Ownership loop is. Making people involved and allowing them to become 'owners' of improvements creates the new Continuous Improvement culture. As the actions taken by small teams lock them in the ownership loop they stop resisting the improvements. Instead they take more and more initiative and start to ***act*** even without management prompting. The improvement actions becomes something very natural, they are part of the job.

On the other hand the large teams though experiencing successes lack that element. ***Analyzing and auditing*** – the elements Jack Welch was so concerned about – do not deliver the spirit needed to engage the entire organization into a change effort. Since the ownership is not built the change in work culture does not occur. Employees do not undertake the improvement action unless delegated by managers.

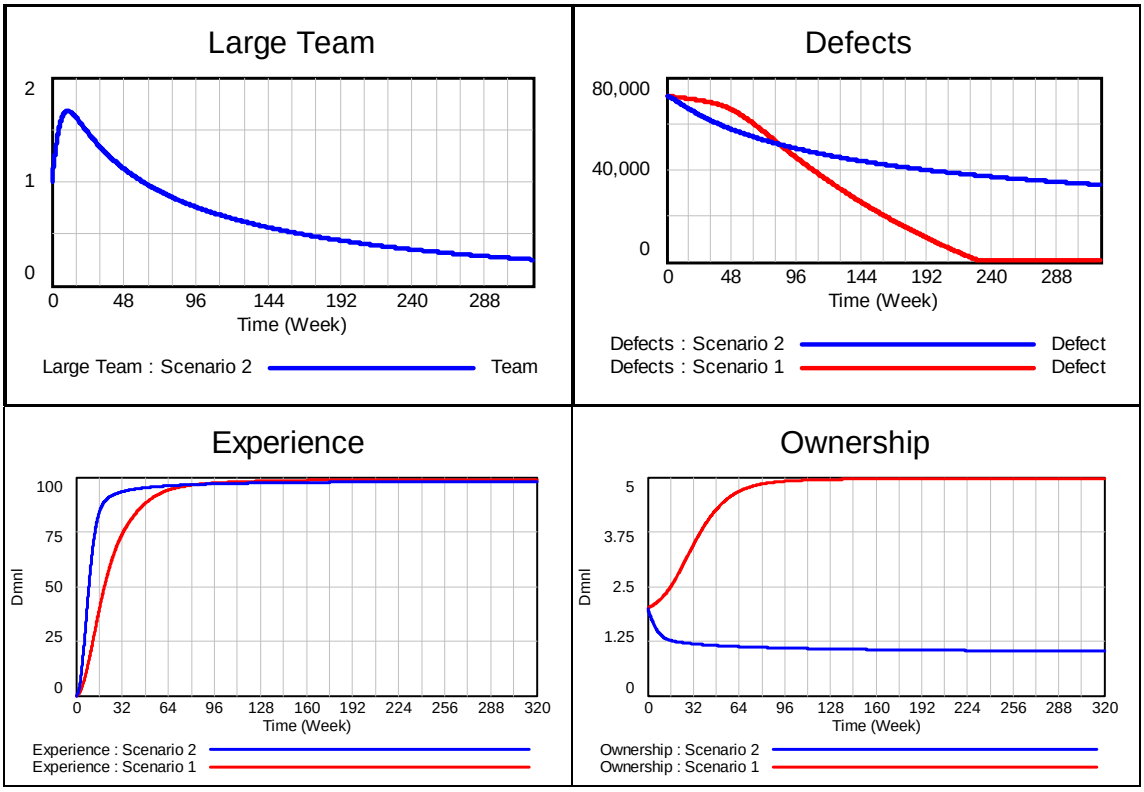

Figure 8 The second simulation scenario – large teams to make the change happen

The last scenarios to be run will try to tap into GE's experience quoted in the introduction. Let's assume that the organizational change will be initiated with small teams, quickly addressing problems that solution to which matters for the team members. In week 80 of the simulation scenario the organization will decide to switch to large teams. The results of the third simulation scenario are presented in Figure 9.

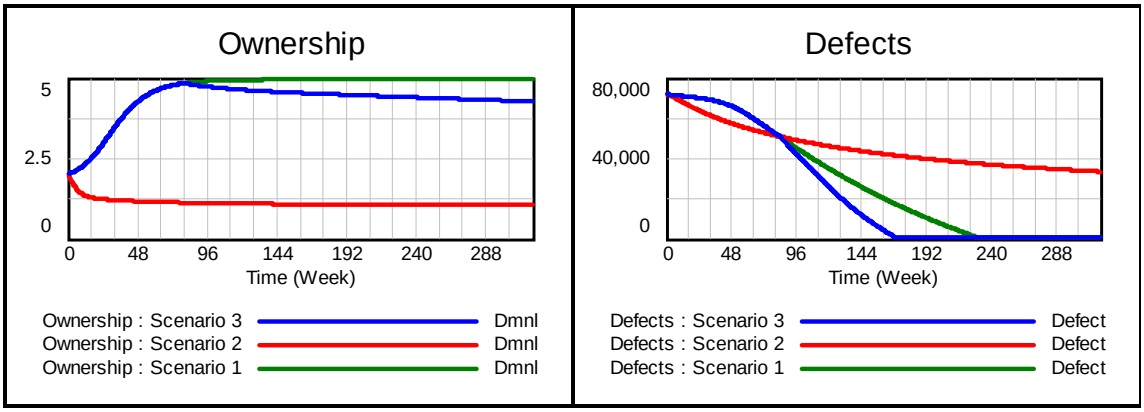

Figure 9 The third simulation scenario – small teams initiate the change and are followed by large teams

The ownership built through actions taken by small teams fuel the defect elimination once the organization switches to large teams.

The defects are eliminated significantly faster than in the first scenario. There might be some concerns however about the sustainability of the organizational change following such decision. Once switched to large teams approach the ownership starts to decay. Over the period considered in the simulation the level of the ownership is on such a high enough level to stimulate enough actions to significantly decrease the amount of defects in the system. However, over time the ownership decay might become so significant that no new improvement actions will be taken and the defects will start accumulate in the system. This situation can however be avoided by allowing both kinds of teams continue to work on defect elimination.

4. Conclusion

Large scale organizational change requires changes in structure. Performance is created by behavior which is in turn determined by the system structure. Only by changing the system structure can real and sustainable change happen. Important aspects involved in changing the organization thus can be examined by testing how the system structure elements create observed behaviors, both prior to and after the organization is changed.

Peter Senge (1990) gives the explanation on what the 'structure' is, by saying:

> *'Structure in Human Systems means the basic interrelationships that control behavior. (It) includes how people make decisions, the "operating policies" whereby we translate perceptions, goals, rules, and norms into actions.'*

Further research suggests that key structures are created by relations between people. Creation of relations is through **action,** taken by people in the organization, to pursue new values. The structure of relations between people is what exports disorder, and defect elimination is a method to do it.

Establishing a strategy for making large scale change happen in an organization requires more than just assessing and focusing on the activities that seem to be are highly successful in terms of one-time performance results. It is clear that we must also pay attention to a set of reinforcing and balancing loops. Like cogwheels the factors in these loops need to fit and work together to make the system run. The interactions between these factors seem to be as important as the factors themselves, and this is why a 'package' of elements orchestrated skillfully appears to be required to achieve step changes in performance results, especially when performance has degraded and the organization is captured by a capability trap.

In the Lima Refinery example it was not enough to assemble teams and ask them to remove defects from the system. In order to gain enduring results the Ownership loop had to be initiated and running. For this to occur, large numbers of small teams seem to have been required, to lock in the ownership.

The organizational change at the Lima Refinery was accomplished by creating small, cross-functional teams, which took actions that could be completed within 90 days. Employees were empowered to act independently on behalf of improving the Refinery, and a 'defect elimination culture' resulted. Notice that the graph illustrating the number of action teams launched over time in Lima Refinery, presented in Figure 10, is very similar to the outcome of the described above results of the first simulation scenario.

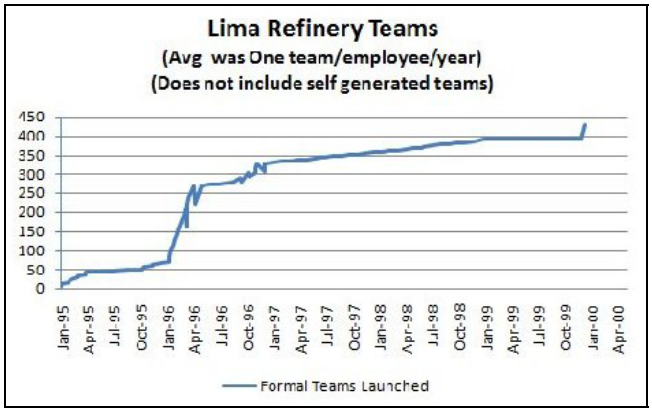

Figure 10 Number of formally launched small teams in Lima Refinery

Figure 11 presents the organizational change from the perspective of relations development.

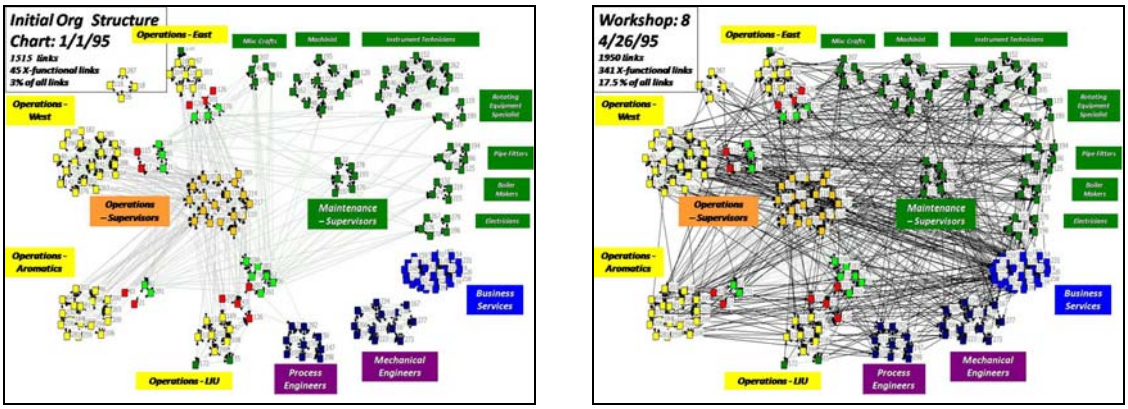

Figure 11 Cross-functional connections before (left) and after three months (right) of the organizational change effort in Lima Refinery

Only over the first three months from the start of organizational change effort the number of cross-functional relations increased from 3% of all connections up to 17.5% creating a system structure that drove continuous improvement oriented behaviors, which in turn drove mass scale performance improvement results, which have been sustained for more than 10 years. The cross-functional connections of the small teams enabled improvement actions between the organizational 'silos' similar to the GE example quoted above. This is the organizational structure that creates the behavior which in turn creates the superior performance. Therefore, our conclusion is that an improvement program must create the proper relationships among people in the organization in order to be sustained over time.

Our conviction is that Lima Refinery was able to escape the 'capability trap' by enacting a large number of improvements over a short time, combining a set of interventions as a 'package' that enabled the organization to change and sustain the performance gains achieved. Many continuous improvement initiatives fail to combine factors 'all at once'; it is our assertion from review of what occurred in the change at Lima Refinery that the type and integration of factors are both important to success. Initiating a large quantity of actions, far more than typically are initiated in most CI programs, was a key to success. The 'package elements' used seemed to combine to allow for this large number of actions to go on simultaneously, while also increasing the quality of thinking and effect, and led to sustained capability growth. Further, we assert that the quantity of actions required CANNOT be produced strictly by a top down 'Six Sigma' like approach. The required ownership and 'spread' of involvement in improvement actions occurs via a less structured approach to continuous improvement. We assert that culture change and the ability to escape the capability trap flows from ownership and involvement that can only be produced via "small teams" – with a fundamentally 'bottom up' flavor. The rub for most managers seeking to widen and expand continuous improvement, especially if their organization is captured by the gravity of a capability trap is that their very instincts towards tools, capability building, and CI experts may be detrimental to what is needed.

Six sigma tools, scientific method, rigorous problem solving definitely have a place in the 'package' of CI initiatives for any company, but they must be introduced in such a

way so as to not destroy local initiative and ownership for performance improvement. Management attention is scarce – it is focused on 'large team' approaches, the ability to start and followup large numbers of 'small teams' may be impaired.

To answer the question in our title – we believe that large scale organizational change cannot occur by large teams alone. Large numbers of small teams seem to be required to build up the needed capability and ownership, to enable mass scale independent actions to occur simultaneously.

Questions for future inquiry:

1. Is there any other way to achieve 'ownership behaviors' in a majority of employees, other than via small improvement teams?

2. If large numbers of bottom up driven 'small teams' are required to build up needed ownership, but sitting managers either fail to see this need or worse actively resist allowing this many teams, what is the intervention?

3. Can CI experts be allowed to practice Six Sigma methods prior to 'locking in the ownership' – how to avoid having frontline employees defer to them as the ones accountable for improvement actions?

4. What is the 'signal' for starting 'large team' efforts? (Is it when the ownership locks?)

5. What should the governance process be, for managing the ramp up of ownership, during organizational change? (Who should 'manage' and 'lead' the orchestration of package elements involved in altering the system structure?)

6. What effects does delay have on effectiveness of interventions? (i.e. Does going too slowly in the 'build-up' of ownership cause loss of the change program? How fast must the ownership 'build-up' occur?)

7. What effect does various 'agents' have as the change program unfolds?

   (i.e. Senior Management – demands regarding performance or allowing flexibility in allowing managing through the worse before better period, changes in key change leaders during the unfolding of package elements, capability and understanding of operational leaders, actions of regulatory bodies, perception and understanding of externals like stock analysts, news media if reputational incidents have occurred prior to initiating the change.

   All of these can have the effect of reducing local ownership of performance improvement results.)

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