

# Implementing Lean in Swedish Municipalities and Hospitals

## *Initial effects on the work system*

Mikael Brännmark<sup>1,2</sup>, Agneta Halvarsson<sup>2,3</sup>, Pernilla Lindskog<sup>1,2</sup>

<sup>1)</sup> Royal Institute of Technology, Division of Ergonomics, Stockholm, Sweden

<sup>2)</sup> Linköping University, HELIX Vinn Excellence Centre, Linköping, Sweden

<sup>3)</sup> APeL FoU, Örebro, Sweden

**Abstract:** This paper is the first preliminary product of a three year interactive research project, studying the effects of Lean when introduced in Swedish municipalities and hospitals. Focus of the paper is the implementation process (more specifically, employee participation and facilitated learning) and changes in the work system (focusing on work content, organization and work environment). The empirical data has been collected through interviews and group interviews in three municipalities and one hospital. These results, together with the discussion and analysis, shows firstly that the implementation processes of the studied units are characterized by a medium or high level of opportunities for employee participation and learning, although this is produced in different ways. Second, the changes in the work systems mostly affect the organization of the work, through reorganization and redistribution of the work tasks, rather than changes in how the work tasks are performed. This has led to more orderly and structured work processes. Lastly, the employees' reactions to these changes have been mostly positive, although not exclusively so. However, it is important to stress that the employee reactions are most likely as much a result of the implementation process, as of the changes in the work systems. Longitudinal studies are therefore needed to study the long term changes in the work system and the effects on employee health, which will be the next step of this research project.

**Keywords:** Lean, municipalities, hospitals, working conditions, participation, learning

**Kontaktuppgifter:**

Mikael Brännmark ([mikael.branmark@sth.kth.se](mailto:mikael.branmark@sth.kth.se))

Agneta Halvarsson ([agneta.halvarsson@apel-fou.se](mailto:agneta.halvarsson@apel-fou.se))

Pernilla Lindskog ([pernilla.lindskog@sth.kth.se](mailto:pernilla.lindskog@sth.kth.se))

## Introduction

The management concept *Lean Production* is a dominating approach for rationalization work in the Swedish manufacturing industry (Börnfelt, 2006, Eklund and Berglund, 2007, Johansson and Abrahamsson, 2009). The concept also spreads fast to other sectors of society, such as municipalities and hospitals. There are several Swedish national programs focused on aiding and spreading Lean both in the manufacturing sector and in the public sector (Brännmark, 2010a). Several researchers have, through literature reviews, studied Lean in other contexts than the manufacturing industry, for instance, when introduced in healthcare (Holden, 2011, Mazzocato et al., 2010), administration (Brännmark, 2011) or service (Holm and Åhlström, 2010). One example of the fast spread of Lean in Sweden, outside of the manufacturing industry, is the Swedish program *Verksamhetslyftet* (freely translated “the Public Sector Boost”). The program is focused on supporting municipalities and hospitals in their work to introduce Lean, through an educational program.

Due to the fast spread of Lean, it is important to study the concepts impact on working conditions and employee health. This, firstly, because there are few studies regarding employee effects from Lean in other contexts other than the manufacturing industry. Secondly, the studies of employee effects of Lean in the manufacturing sector often show negative or mixed results (Landsbergis et al., 1999, Westgaard and Winkel, 2011, Hasle et al., unpublished). Thirdly, the employee effects of Lean Healthcare are of particular interest, since the care sector context offers many challenges; both the physical and psychosocial working conditions can be quite demanding (Westgaard and Winkel, 2011). Also, the few existing studies of employee effects of Lean in healthcare show mixed or inconclusive results, often leading to increased work content but also more stress (Landsbergis et al., 1999). However, rationalization work generally seems to have negative employee effects in the healthcare sector (Westgaard and Winkel, 2011).

A forth reason why it is important to study the employee effects of Lean in the Swedish context, is that many researchers have argued for the importance of context, when studying both the concept itself, and also the effects from Lean on working conditions (Hasle et al., unpublished, Hampson, 1999, Eklund and Berglund, 2007, Pettersen, 2009, Seppälä and Klemola, 2004). When combining this with the (historically) strong socio-technical influence in Scandinavia, a strong union and extensive legislation regarding working conditions (Johansson and Abrahamsson, 2009, Björkman, 1996), a likely assumption is that Lean takes on special forms when introduced in Sweden, i.e. likely a “mixture” of Lean and socio-technical practices, or to use Börnfelt’s (2006) term, a “hybrid organization”. The implication this will have, regarding the employee effects of Lean, is difficult to predict, based on the previous studies of Lean. For instance, one often used argument is that many of the previous studies are based in the American automotive industry; are the results from that context applicable when Lean is introduced in Swedish municipalities? How strong are the socio-technical and union influences *today*, and what degree of mediating factors does these factors produce? Furthermore, while the socio-technical influence has been strong in the Swedish automotive industry, can the same be said about municipalities or hospitals, in Sweden? There are plausible theoretical and conceptual arguments for both sides of this dispute; thus, in the end, this is a question that can only be answered through more empirical data.

## *Implementing Lean in Swedish Municipalities and Hospitals*

In this paper, some preliminary results and analysis from a Swedish research project will be presented. This is based on case studies made in three municipalities and one hospital, which have implemented Lean in several workplaces. The aim of this paper is carried by questions concerning two areas:

- 1) The *implementation process* used at the workplace, focusing on two factors, namely *employee participation* and *facilitated learning processes*, due to their importance for creating sustainable work systems.
- 2) The effects on the *work systems*, focusing on *work environment*, *the organization* and *the work content*.

A sustainable work system is here defined as a work system that regenerates the human, social and economical resources it uses, e.g. regenerative work systems (Docherty et al., 2009, Svensson et al., 2007, Kira and Forslin, 2008).

### **Method**

These results are based on qualitative case studies in eight work units, who all have initiated one or more Lean implementation projects. The empirical data was collected during the autumn of 2010 and spring of 2011. This was done as part of a three year research project with an interactive approach (Aagaard Nielsen and Svensson, 2006). The research project is financed by AFA-försäkring and made in cooperation with the national program Verksamhetslyftet ([www.verksamhetslyftet](http://www.verksamhetslyftet.se); 2011-05-11).

Semi-structured employee interviews and group interviews (Kvale, 1997) were used by the authors of this paper to collect the qualitative data. Three interview guides were used; the first focused on the implementation structure and program; the second focused on the impact of Lean on the work systems and the employees' perceptions of these changes; the third focused on the employees' perception of the work with improvement groups. Interview guide one was used with managers, while interview guides two and three were used with employees. Extensive notes were taken by the interviewers during the interviews; these notes have been the main source of the qualitative data. It was stressed to the interview persons that the interviews were voluntary and that the material would be treated with confidentiality; also, when permitted, the interviews were recorded. The data collection method is summarized in table 1 (below).

Two analysis seminars have been held with municipality one and two. In municipality one, the participants were researchers and Lean coordinators; in municipality two, researchers, managers and employees participated. The participants discussed and analyzed the empirical data in the analysis seminars; this, as part of the interactive research process, which has also been used in a previous project. For more information about these methods, see Brännmark (2010a, 2009, 2010b), Halvarsson & Öhman (2009), and Brännmark and Halvarsson (2011).

## *Implementing Lean in Swedish Municipalities and Hospitals*

**Table 1: Work units and number of interviews**

Hospital/ municipality	Municipality 1 (Mun1)		Municipality 2 (Mun2)		Municipality 3 (Mun3)		Hospital 1 Hos1	
	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8
<b>Individual interviews</b>	4	3	10	9	3	3	8	6
<b>Employee group interviews</b>	1 (8 participants)	1 (5 participants)					1 (4 participants)	
<b>Interviews with work place manager</b>	1	1	1	1	1	1	1	1
<b>Interviews with Lean support persons</b>	3		2		4		1	
<b>Analysis seminars</b>	1		1		0		0	
<b>Lean initiated</b>	2008	2009	2007	2009	2010	2010	2008	2008
<b>Function</b>	Inspection	Work shop	Elderly care	Restaurant	Care for disabled	Social care	Cancer care	Child Care

To analyze the data, a method similar to Yin's (1981) "narrative writing" has been used. The answers, from the interview persons, have been sorted into categories based on the interview guides. To evaluate the implementation process, employee participation and facilitated learning processes have been analyzed, due to their importance for creating sustainable work systems (Docherty et al., 2009, Svensson et al., 2007, Norrgren et al., 1996). To evaluate the changes in the work system, three aspects has been analyzed; the work content, the organization of the work system (which here include work processes) and the work environment (in the form of the employees perception of these changes), i.e. three aspects of Carayon's (1989, 2000, 2006) work system balance model. Only empirical material from work units that has actively initiated Lean implementation programs will be included for the sake of this analysis.

### **Results**

The implementation processes of the municipalities and hospital, together with perceived changes on work content, organization and work environment are described below.

#### **Municipality 1**

Municipality one (Mun1) has an extensive Lean program, where both central and local Lean coordinators, within the workplace, are used. Lean is mandatory and all work units must initiate Lean projects; Unit 1 (inspection work) and 2 (work shop) has initiated their Lean implementations. There is a one-day Lean training program, which most employees participate in; this includes a game meant to simulate a "Lean system" versus a "mass production system", sometimes referred to as "the Lego Game". At the work place level, local "Lean experts" are appointed, which receive a five-day training event in Lean. The central

## *Implementing Lean in Swedish Municipalities and Hospitals*

Lean coordinators presently manage most of the training, but initially they took in external consultants. The two work places took part in training early on in Mun1.

The implementation process of Mun1 revolves around the Lean tool *value stream mapping*, consisting of several steps; 1) mapping the current process, 2) describing a future “ideal” state of the process, where different forms of obstacles, problems and unnecessary activities have been removed (i.e. “waste”, or “muda”, using the Lean terminology; see for instance Womack and Jones, 2003); 3) creating an action plan to implement the ideal state; 4) a follow-up phase after the ideal state has been implemented. A selection of employees from each workplace participates in the value stream mapping events, which takes place during three consecutive days. While the participants in this process are free to design their ideal states, these are always characterized by standardization. The standardizations are for instance, documented routines, checklists, etc., increased orderliness and means for the employees to participate in the work with continuous improvements such as weekly meetings and an improvement boards. The improvement boards contain space for suggested improvements, improvements projects currently active, weekly measurements of the work environment and statistics concerning the performance of the work group etc. Most employees participate in continuous improvement work, although to a varying degree; some employees are more active than others. Time is not scheduled for this work; instead, it is done when other work load permits.

Most of the introduced changes, through the Lean implementation, have affected the organization of the work. Examples of these are changes in who does what, i.e. the distribution of work, or how the work processes are designed, for instance, in which order task are performed. When asked how, or if, the work tasks had been affected, very few examples were produced by the interviewees. However, some new work task has been introduced, such as the work with continuous improvements projects, though these projects account for a small portion of the total work time.

The employee’s reactions to the implementation of Lean have been varied; in unit 1, the response is mixed. The results point toward increased group efficiency and productivity, which together with the work with continuous improvement projects are considered positive by the interview persons. These results are consistent for both unit 1 and 2. In unit 2, there are also positive responses to the increased orderliness of the workplace and increased structure in the work processes. Negative responses, from unit 1, are a more fragmented and standardized work process, leading to reduced autonomy. In unit 2, the increased measurement and statistics have also been perceived negatively.

### **Municipality 2**

Municipality 2 (Mun2) has an extensive Lean program, with central Lean coordinators. Lean is not mandatory, and only initiated at the request of the managers at the local worksite (although work with Lean is promoted from top management). Both unit 3 and 4 has initiated the implementation of Lean. No educational or training program is used. No local Lean coordinators are appointed, although in unit 3, an employee who considers herself a Lean enthusiast has taken on a coordinating role; this has not happened in unit 4.

As in Mun1, the implementation process of Mun2 revolves around the Lean tool *value stream mapping*, consisting of several steps; 1) mapping the current process, 2) describing a future “ideal” state of the process, where different forms of “waste” has been removed; 3) creating an action plan to implement the ideal state; 4) follow-up phases 30, 60 and 90 days after the ideal process has been implemented. All employees from a workplace participate in these

## *Implementing Lean in Swedish Municipalities and Hospitals*

value stream mapping events, which take place during three coherent days. The Lean coordinators participate in these events, and provide coaching and support. These events also contains educational elements about the Lean concepts, and the Lean Lego Game (see Mun1, above) is played. The participants in the value stream mapping process are free to choose which process they want to transform. In unit 3, an improvement board and weekly meetings has been introduced, which are used to coordinate the work with continuous improvements. A large portion of the employees participate in this work, although to a varying degree; some employees are clearly more active than others. Time is not scheduled for this work; instead, as in Mun1, it is done when other work load permits.

The work with Lean has, in both unit 3 and 4, lead to several changes in the organization of the work, including the distribution of work task, the design of the work processes and who does what. In unit 3, this has also lead to some documentation regarding routines, and an increased amount of structure in the work. These changes have increased efficiency, and the time freed up has been used, according to the interview persons, to increase time spent with the elderly. Very few changes in the actual work content have been described by the interview persons, although they do exist. In unit 3, the work with continuous improvements has also been a new task, though as in Mun1, it consists of a small portion of the total work time.

Reactions from the employees to the introduced changes have been mostly positive, although unit 3 is clearly more positive than the other workplaces, which show either positive or neutral reactions to the changes. In fact, there are very few examples of negative reactions to the work with Lean, from the interview persons. Both the increased structure, work with continuous improvements and increased time with the elderly are considered positive outcomes.

### **Municipality 3**

Municipality 3 (Mun3) has an extensive Lean program in its social council, working in elderly care, care of the disabled and with general social work. The council has a management support centre with Lean coordinators and other forms of management support. Two of the Lean coordinators are strategically focused, and six more are operationally focused in giving support directly to work place managers. Lean is mandatory, but only initiated at the request of a work place manager.

Like Mun1 and Mun2, the implementation process of Mun3 revolves around the *value stream mapping* approach. This process, in Mun3, begins with a “brain storm” which includes all employees at the work place. It is during the brain storm that the process which is to be value stream mapped is chosen. The process chosen is usually the one that the majority of employees find most challenging or time consuming. The value stream mapping itself consists of several steps; 1) mapping the current process, 2) describing a future “ideal” state of the process, where different forms of “waste” has been removed; 3) creating an action plan to implement the ideal state; 4) an educational phase, where those employees who has not been involved in the value stream mapping processes are taught the new process; 5) a follow-up phase, 180 days after the ideal state has been implemented. A selection of the employees, from a workplace, participates in the value stream mapping events, i.e. not all employees participate in the process. One operative Lean coordinator is present at these events. Her focus is to coach and support the workplace manager. The value stream mapping process does not take place during a few consecutive days as in Mun2 and Mun1; instead it is spread out over a longer time period.

## *Implementing Lean in Swedish Municipalities and Hospitals*

The Lean implementation has, in both unit 5 and 6, lead to changes in work organization. These changes affect the distribution of work task, the design of the work processes and who does what. This has also lead to increased or better documentation, such as a process map, describing which activities that are included in the process and in what order they occur. Very few changes in the actual work content have been described by the interviewees. In unit 5 new areas of responsibility for the staff came out as a result of the value stream mapping. This means that some employees no longer deal with food purchases or the preparation of the main meal during the day. The first value stream map has been followed by another in unit 5. It was aimed at improving the laundry. The two mapping processes have also resulted in two 5S-projects. In unit 6, the ideal state has been implemented quite recently, meaning that there are few cases of it being put into use, so far.

Reactions from the employees to the introduced changes have been mostly positive. In unit 5 the interviewees were overall positive, with descriptions of perceived significantly lower stress levels for employees and clients both. The work climate and was perceived as better than before whereas the handling of food purchases had been an area of conflict before the value stream mapping. In unit 6, the changes from the value stream map process are relatively new, but the interviewees' perception is that the process map gives the work structure and makes the communication with the clients easier, since it can be used to show the steps in the process.

### **Hospital 1**

Hospital 1 (Hos1) has an extensive Lean program, with central Lean coordinators. Lean is mandatory, but as in Mun2 and Mun3, at present only initiated at the request of the work place managers, although there are plans on making daily steering mandatory in all hospital wards. Unit 7 and 8 has both initiated the implementation of lean. No local Lean coordinators are appointed. There is, however, support from a Lean-group or from higher executives in value stream mapping processes.

The work with Lean revolves around the Lean tool *daily steering*, rather than value stream mapping (although they too are used, though in a different manner than in the municipalities; see below). The daily steering takes the form of daily morning meetings, where the ward manager and all employees participate. The meetings concern improvement and planning boards. Issues discussed and handled are the work lined up during the day, scheduling and staffing for the day, a follow up from the earlier shift, etc. The work with continuous improvements takes on two forms; smaller improvements, which can be handled through the daily meetings, and larger changes, which are usually handled through an approach similar to the value stream mapping process, described above. These are handled in smaller groups, which are assigned to the improvement projects. However, the staff is informed on progresses made in the value stream mapping and they are able to discuss the results and make new suggestions throughout the mapping. The work with these projects is not coherent in time, but spread out over a larger time period. Time can be scheduled for these improvement projects in unit 7, but not in unit 8; here, the work is performed when the other workload allow for this.

The Lean implementation has in unit 7 and 8 lead to several changes in the organization of the work. These affect the distribution of work tasks, the design of the work processes and who does what. An increase in documentation has also occurred, for instance, in the form of documented routines. Also, the work with continuous improvements has meant new task for the employees. Few changes in the actual work content have been described by the interview persons. In unit 7, two new work roles has also been created (these were created using a

## *Implementing Lean in Swedish Municipalities and Hospitals*

process similar to the value stream mapping process); one to administrate and coordinate the work at the unit, and one to handle a specific process. Several work tasks has been distributed to these new work roles, which has meant that the employees, in their ordinary work role, to a much lower degree perform these tasks.

Reactions from the employees to the introduced changes have been almost exclusively positive. The increased structure in the work, the changes in the work processes and the work with continuous improvements have all been met with positive responses from the interviewed employees. Few examples of negative responses or changes are expressed in the interviews, although they do exist. Some examples of these are a concern for an increased work load, in connection to the introduction of the daily steering, or that some employees have expressed dismay with the work with Lean. Also, some employees express a certain level of suspicion of what management's actual intent is, with the work with Lean, although they do favor the introduced Lean practices.

### **Discussion**

We will now, based on the presented results, analyze the implementation processes and changes in the work systems. We will also classify them, relative to each other; these classifications are described in table 2 (below).

Lean is mandatory in two of the three studied municipalities and in the hospital; also, the implementation processes differ. In Mun2, Hos1 and Mun3, it is initiated at the request of the local managers, while in Mun1, it is initiated by the top management. Consequently, for Mun2 and Mun3 and Hos1, it will be labeled "pull-based", while for Mun1, it will be labeled "push-based". Operationally, there are also differences between the work unit's Lean implementations. In the municipalities, the process revolves around, or focuses, the Lean tool value stream mapping; in the hospital, it instead revolves around the tool daily steering. Also, they differ concerning if work with continuous improvements are mandatory; in Mun1 and Hos1, it is, while in Mun2 and Mun3, it is not.

Concerning employee participation and learning opportunities, there are several important differences. In Mun1 and Mun3, a selection of the employees participates in the value stream mapping process; in Mun2, all employees participate. The implementation processes is also more steered, in Mun1, from central guidelines, meaning that there is much less room for the employees to design the new ideal state of the work system, when compared to Mun2 and Mun3. This is not the case for Mun3, where the employees are free to choose which process to change, and how to change it. However, in Mun1, a Lean training program providing information about Lean concepts is used. Most employees participate in the training program, whether involved in the mapping process or not. Consequently, for Mun1 and Mun3, employee participation and learning will be classified as "medium"; in Mun2, it will be classified as "high", since all of the employees participate in the implementation process and here they have, comparably, the greatest freedom to design their new ideal state. In Hos1, all of the employees participate in the used Lean implementation process. While the work revolves around daily steering, and contains certain common elements, i.e. daily meetings to manage the work, the employees appear to be free to design their activities included in these meetings. For instance, in unit 7, they have included means for continuous improvements, while in unit 8, they have worked much with planning. Consequently, both the employee participation and learning processes facilitated are classified as "high".

## *Implementing Lean in Swedish Municipalities and Hospitals*

Changes in the work system are in all units mostly focused on the organization of the work, rather than the actual work content. The distribution of the work content, work load and work responsibilities change mostly through redistribution among the employees; new work tasks exist, although they are much less common than changes in the organization of the work. The most common form of new work task is the continuous improvements work, which has been implemented in six of the eight units. Another common change in the work systems in the studied units, although not necessarily a change in work content or work tasks (even if it can provide new work tasks and duties), is an increased level of documentation, in the form of documented routines and standards. The sum of these changes in the work system has meant an increased level of structure and orderliness in the work system.

The employee's perception of the changes varies; in Mun1, the changes in the work system has created both positive and negative reactions, based on the changes, while in Mun2 and Mun3 they are mostly positive, or neutral. In Hos1, they are mostly positive. Based on the created changes, the work with continuous improvements is always positively met, although in all studied units, they only correspond to a small amount of the total working time. The increased orderliness and structure of the work processes are met with more varying responses; in Mun1 the increased orderliness and the higher degree of structured work have created varied responses, both negative and positive; in Mun2, Mun3 and Hos1, they are mostly perceived positively by the interviewees. Worth noting is that in Mun1, this standardization process has gone the farthest, while in Mun2 and Mun3, the Lean implementation appears to have changed the work from a very unstructured process, to a more structured process. In one unit respectively, for Mun2 and Mun3, we also see that the work with Lean has created fewer changes than in the others. In the units with fewer changes, the reactions are close to neutral or only slightly positive. Based on this, the employee's reactions to the changes will be classified as "positive and negative" in Mun1, "positive or neutral" in Mun2, "positive" in Hos1 and "positive or somewhat positive" for Mun3.

Table 2 (below) categorizes the changes in work system seen in our studies.

It is difficult to compare these results with other studies of Lean outside of the manufacturing sector since there are few publications which describe employee effects (Brännmark, 2011). However, there are a few publications which provide anecdotic results regarding this. For instance, Radnor's (2010, Radnor and Walley, 2008) studies suggest positive effects on factors such as productivity and efficiency, although the employee effects are more varied, when mentioned in these studies. For instance, increased standardization is in one study met with negative employee reactions, based on reports from the unions (Radnor, 2010). The value stream mapping is the unifying operational factor for Mun1, Mun2 and Mun3; this approach also seem common in other municipalities' approach to Lean (Brännmark, 2011). While the approach provides many means to employee participation, it can also provide of sense of "change fatigue" (Radnor and Walley, 2008), i.e. the sense that the work with Lean is "done". This could, therefore, create problems in sustaining the continuous development work, especially when combined with the observation that during periods of high work load, Lean activities can be difficult to sustain (see for instance Berglund, 2010).

One advantage of this study is that it allows us, at least to some degree, to study the employee effects of both the implementation phase and the created changes in the work systems. The difference between changes made in an implementation phase and changes made in the actual work system are distinction which many studies fail to consider (Hasle et al., unpublished). For instance, Landsbergis et al. (1999) describes how an implementation process

## *Implementing Lean in Swedish Municipalities and Hospitals*

characterized by a high level of employee participation is first met favorably. However, after the new work system was implemented, this high level was not upheld, which resulted in a sense of disappointment from the employees. This again shows the importance of distinguishing between an implementation phase and effects (more or less permanent changes) on the work systems.

Another aspect of this distinction is Schouteten and Benders's (2004) argumentation, in which they note that the work with continuous improvements and increased levels of standardization, while initially providing positive employee effects, can provide negative long term effects. This, since continuous improvements during the implementation phase provide the employees new work tasks and means of participation in the work with Lean, although in the long run, the improvements make the work more routinized and controlled, thereby decreasing work autonomy for the employees. Combining this with Landsbergis et al.'s observation, i.e. that high levels of employee participation can be difficult to sustain, suggests a risk that the positive effects of the Lean implementation will decrease, leaving only the negative effects. However, which will be the case in our studied municipalities and hospital, is difficult to tell at the moment. This, since the distinction between implementation and work system effects means that longitudinal studies are needed, to study the latter. Consequently, in this research project, a longitudinal questionnaire survey will be conducted, which will study psychosocial, environmental and health changes for the employees, in the included municipalities and hospitals. This will be initiated during the fall of 2011.

**Table 2: Categorization of changes in work system**

	<b>Mun1</b>	<b>Mun2</b>	<b>Hos1</b>	<b>Mun3</b>
<b>Lean mandatory:</b>	Yes	No	Yes	Yes
<b>Lean initiation:</b>	Push-based	Pull-based	Pull-based	Pull-based
<b>Participation:</b>	Medium	High	High	Medium
<b>Learning:</b>	Medium	High	High	Medium
<b>Lean tool mostly used:</b>	Value stream mapping	Value stream mapping	Daily steering	Value stream mapping
<b>Continuous improvements mandatory:</b>	Yes (time cannot be scheduled)	No	Yes (time can be scheduled in unit 7)	No
<b>Changes in organization:</b>	Several	Several	Several	Several
<b>Changes in work content:</b>	Few	Few	Few	Few
<b>Employee reactions:</b>	Positive and negative	Positive or somewhat positive	Positive	Positive or neutral

### **Conclusions**

The results presented here, together with the analysis and discussion, merits several conclusions of at least tentative nature. Focus has been on the Lean implementation process and employees' experienced changes in the work system.

Concerning the implementation processes, the first conclusion is that they are characterized by a medium or high level of both opportunities for employee participation and number of learning opportunities, although the processes themselves, and how this is achieved, vary between the studied municipalities and hospital. Second, the changes in the work systems,

## *Implementing Lean in Swedish Municipalities and Hospitals*

from the work with Lean, can be characterized as mostly affecting the organization of work, rather than the work content. This has led to a more orderly and structured work system. Thirdly, the employees' reactions to these changes have been mostly positive, although not exclusively so. Influencing factors are the level of standardization, if continuous improvements are used, employee participation, etc.

However, since the presented results in this paper is most likely a product of the implementation processes, as much as the changes in the work systems, longitudinal studies are needed in order to study the employee effects (such as employee health), from the work with Lean and the implemented new work systems. This will be provided by this research project, using a longitudinal questionnaire survey. The results from this study will be presented in future publications.

### References

- AAGAARD NIELSEN, K. & SVENSSON, L. 2006. *Action and interactive research : beyond practice and theory*, Maastricht, Shaker Publishing.
- BERGLUND, R. 2010. *Engagemang efterfrågas: Hur tre tillverkande företag söker medverkan från sina medarbetare när de inför Lean*. University of Gothenburg.
- BJÖRKMAN, T. 1996. The rationalisation movement in perspective and some ergonomic implications. *Applied Ergonomics*, 27, 111-117.
- BRÄNNMARK, M. 2009. Ökad delaktighet i programutvärdering – en metodik för ökad resultatspridning? *Konferensen Högskola och samhälle i samverkan (HSS2009): Vi bygger morgondagens samhälle*. Luleå, Sweden: HSS: Högskola och samhälle i samverkan.
- BRÄNNMARK, M. 2010a. Implementering av Lean i medelstora företag - En lärande utvärdering om hållbar utveckling. *HELIX Working Paper*. Linköping: Linköping University.
- BRÄNNMARK, M. 2010b. Interaktiv forskning - Gemensamt kunskapande för allas nytta. *Forum för arbetslivsforskning konferens (FALF2010): Arbetsliv i förändring* Malmö, Sweden: FALF: Forum för arbetslivsforskning.
- BRÄNNMARK, M. 2011. Lean administration - En litteraturgenomgång av lean när konceptet implementeras i kommuner. *Forum för arbetslivsforskning konferens (FALF2010): Det nya arbetslivet*. Luleå, Sweden: FALF: Forum för arbetslivsforskning.
- BRÄNNMARK, M. & HALVARSSON, A. 2011. Analysseminarier som samverkansform. Följeforskning för hållbart utvecklingsarbete? *Konferensen Högskola och samhälle i samverkan (HSS2011): Vi bygger tillsammans*. Karlstad, Sweden: HSS: Högskola och samhälle i samverkan.
- BÖRNFELT, P.-O. 2006. *Förändringskompetens på industrigolvet: kontinuerligt förändringsarbete i gränlandet mellan lean production och socioteknisk arbetsorganisation*. University of Gothenburg.
- CARAYON, P. 2006. Human factors of complex sociotechnical systems. *Applied Ergonomics*, 37, 525-535.
- CARAYON, P. & SMITH, M. J. 2000. Work organization and ergonomics. *Applied Ergonomics*, 31, 649-662.
- DOCHERTY, P., KIRA, M. & SHANI, A. B. R. (eds.) 2009. *Creating sustainable work systems*, London: Routledge.
- EKLUND, J. & BERGLUND, P. 2007. Reactions from employees on the implementation of lean production. *Presented at the Nordic Ergonomics Society conference (NES2007): Ergonomics for a future*. Lysekil, Sweden: Nordic Ergonomics Society.

## *Implementing Lean in Swedish Municipalities and Hospitals*

- HALVARSSON, A. & ÖHMAN, A. 2009. How theory can contribute to learning – interactive research in national development programmes. In: SVENSSON, L., BRULIN, G., JANSSON, S. & SJÖBERG, K. (eds.) *Learning Through Ongoing Evaluation*. Lund: Studentlitteratur AB.
- HAMPSON, I. 1999. Lean Production and the Toyota Production System Or, the Case of the Forgotten Production Concepts. *Economic and Industrial Democracy*, 20, 369-391.
- HASLE, P., BOJESEN, A., JENSEN, P. L. & BRAMMING, P. unpublished. Lean and the working environment – a review of the literature. *International Journal of Operations and Production Management*.
- HOLDEN, R. J. 2011. Lean Thinking in Emergency Departments: A Critical Review. *Annals of Emergency Medicine*, 57, 265-278.
- HOLM, M. & ÅHLSTRÖM, P. 2010. Lean Service – a literature review. *Center for Innovation and Operations Management*, 1-10.
- JOHANSSON, J. & ABRAHAMSSON, L. 2009. The good work - A Swedish trade union vision in the shadow of lean production. *Applied Ergonomics*, 40, 775-780.
- KIRA, M. & FORSLIN, J. 2008. Seeking regenerative work in the post-bureaucratic transition. *Journal of Organizational Change Management*, 21, 76-91.
- KVALE, S. 1997. *Den kvalitativa forskningsintervjun*, Lund, Studentlitteratur.
- LANDSBERGIS, P. A., CAHILL, J. & SCHNALL, P. 1999. The impact of lean production and related new systems of work organization on worker health. *Journal of Occupational Health Psychology*, 4, 108-130.
- MAZZOCATO, P., SAVAGE, C., BROMMELS, M., ARONSSON, H. & THOR, J. 2010. Lean thinking in healthcare: a realist review of the literature. *Qual Saf Health Care*, 376-382.
- NORRGREN, F., HART, H. & SCHALLER, J. 1996. *Förändringsstrategiers Effektivitet. CORE*. Göteborg: Chalmers University of Technology.
- PETTERSEN, J. 2009. *Translating lean production : from managerial discourse to organizational practice*. Department of Management and Engineering Linköping University.
- RADNOR, Z. 2010. Transferring Lean into government. *Journal of Manufacturing Technology Management*, 21, 411-428.
- RADNOR, Z. & WALLEY, P. 2008. Learning to Walk Before We Try to Run: Adapting Lean for the Public Sector. *Public Money & Management*, 28, 13 - 20.
- SCHOUTETEN, R. & BENDERS, J. 2004. Lean Production Assessed by Karasek's Job Demand–Job Control Model. *Economic and Industrial Democracy*, 25, 347-373.
- SEPPÄLÄ, P. & KLEMOLA, S. 2004. How do employees perceive their organization and job when companies adopt principles of lean production? *Human Factors and Ergonomics in Manufacturing & Service Industries*, 14, 157-180.
- SMITH, M. J. & SAINFORT, P. C. 1989. A balance theory of job design for stress reduction. *International Journal of Industrial Ergonomics*, 4, 67-79.
- SVENSSON, L., ARONSSON, G., RANDLE, H. & EKLUND, J. 2007. *Hållbart arbetsliv: projekt som gästspel eller strategi i hållbar utveckling*, Malmö, Gleerups Utbildning.
- WESTGAARD, R. H. & WINKEL, J. 2011. Occupational musculoskeletal and mental health: Significance of rationalization and opportunities to create sustainable production systems - A systematic review. *Applied Ergonomics*, 42, 261-296.
- WOMACK, J. & JONES, D. 2003. *Lean thinking : banish waste and create wealth in your corporation*, London, Free Press Business.
- YIN, R., K 1981. The Case Study Crisis: Some Answers. *Administrative Science Quarterly*, 26, 58-65.