

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

4,800

Open access books available

122,000

International authors and editors

135M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.  
For more information visit [www.intechopen.com](http://www.intechopen.com)



---

# Improving 'Improvement' by Refocusing Learning: Experiences from an –Initially-Unsuccessful Six Sigma Project in Healthcare

---

Svante Lifvergren and Bo Bergman

Additional information is available at the end of the chapter

<http://dx.doi.org/10.5772/46083>

---

## 1. Introduction

The Skaraborg Hospital Group (SkaS) is the first hospital group in the Nordic Countries that has added Six Sigma on a large scale to its quality programme to improve care processes (Lifvergren et al. 2010). Unlike many change efforts in the healthcare sector that are neither successful nor sustainable (Chakravorty 2009; Øvretveit 2009, 1997; Thor et al. 2007; Zimmermann and Weiss 2005), the success rate of improvement projects in the programme in this period was 75%, in some respects due to lessons learned from this particular project.

Still, the high success rate of the programme might be surprising, given the fact that the presumed success of planned or programmatic change has been seriously questioned in a number of articles and books (Alvesson and Svenningsson 2007; Beer et al. 2000; Beer et al. 1990; Dawson 2003; Duck 1993; Kotter 1995; Schaffer et al. 1992; Strebel 1996). It is argued that organizations are not rational entities where people do as they are told and follow the latest strategic 'n-step model' –on the contrary, organizational change is to a high degree seen as contextual and processual, unpredictable and beyond the realms of detailed plans (Alvesson and Svenningsson 2007; Dawson 2003; Stacey 2007). The culture and history of the actual organization define what strategies for change are possible. What may work in one organization might be impossible to carry out in another. In other words, improvement strategies seem to be notoriously difficult to transfer between organizations.

Change and improvement is about learning and apparently, organizations seem to have difficulties to learn. Furthermore, daily problem solving activities may inhibit organizational learning (Tucker et al. 2002). It is difficult for organizations to recognize and capitalize on the learning opportunities posed by operational failures (Tucker 2004) and the how-aspect of learning is vital in this respect (Tucker et al. 2007). Creating arenas for learning in a non-

punitive climate is thus critical and the role of the managers is essential in this respect (Tucker et al. 2007; 2003). Consequently, we see learning as a crucial perspective in change and improvement programmes. A better understanding on how learning can be facilitated in organizations is thus essential.

In this chapter, we describe how an enhanced focus on learning through 'learning mechanisms' (Docherty and Shani 2008; Shani and Docherty 2008, 2003) has contributed to the high project success rate of 75% in the Six Sigma programme at SkaS. We present the analysis of a traditional Six Sigma project that failed initially, but eventually led to an enhanced approach emphasizing learning. This entailed a refocusing on actively planning for learning within and between projects – 'learning by design' – involving the integration of cognitive, structural and procedural learning mechanisms (Docherty and Shani 2008; Shani and Docherty 2008, 2003). The ensuring success from utilizing learning mechanisms inspired us a) to redesign the Six Sigma roadmap –DMAIC, incorporating an 'L' for 'learning mechanisms' – DMAICL, b) to establish permanent arenas for learning between organizational units and, c) to institutionalize parallel learning networks consisting of specially educated improvement managers that support and facilitate local improvement projects. We suggest that learning mechanisms can provide a useful framework to the how-aspects of learning (Tucker et al. 2007) when designing organizational change initiatives that leave room for the cultural and historical contexts inherent in every organization.

We will first, however, give a brief overview of Six Sigma before moving on to the theoretical underpinnings of this chapter – cognitive, structural and procedural learning mechanisms. The concept of learning mechanisms is explored in some detail, connecting theories of organizational learning to learning mechanisms, thus elucidating the application of the mechanisms as a way to enhance organizational learning. These theories are then positioned in relation to theories of individual learning and of improvement cycles in quality improvement.

The context of the project is then described in some detail; SkaS, the Six Sigma quality programme, and the actual emergency ward (EW). We then describe the actual improvement project and its initially failed results before moving on to the project analysis using an action research approach. We then present how lessons learned from the analyses were used to integrate learning mechanisms in the Six Sigma programme, thus contributing to its high project success rate. In particular, we present how the analysis contributed to a successful re-take on the project. We conclude with some proposals that might be valuable to other healthcare organizations facing the difficulties of larger change initiatives and, finally, provide some suggestions for further research.

## **2. Theory and background**

### **2.1. Six Sigma**

There are many definitions of Six Sigma in the literature. Antony et al. (2007) defines Six Sigma as "a process-focused data driven methodology aimed at near elimination of

defects in all processes which are critical to customers” (p. 242). According to Harry and Schroeder (2000) “Six Sigma is a disciplined method of using extremely rigorous data-gathering and statistical analysis to pinpoint sources of errors and ways of eliminating them” (p. 23). Recent research also points to the parallel organizational structure that supports improvements within Six Sigma (Schroeder et al. 2008; Zu et al. 2008). Based on case study data and literature, Schroeder et al. (2008) more specifically define Six Sigma as “an organized, parallel-meso structure to reduce variation in organizational processes by using improvement specialists, a structured method, and performance metrics with the aim of achieving strategic objectives” (p. 540). This definition also captures some of the elements that distinguish Six Sigma from TQM –the role structure and the structured improvement procedure (Zu et al. 2008). The role structure is often referred to as the ‘belt system’ and could be seen as a way to standardize the improvement competences in an organization. The black belt role signifies a co-worker with advanced improvement knowledge, working fulltime as an improvement expert. The structured improvement procedure – DMAIC (Define-Measure-Analyze-Improve-Control) –is used to solve quality problems of greater complexity and with unknown root causes (Schroeder et al. 2008). The Define phase identifies the process or product that needs improvement, while the Measure phase identifies and measures the characteristics of the process/product that are critical to customer satisfaction. The Analyze phase evaluates the current operation of the process to determine the potential sources of variation for critical performance parameters. Improved process/product characteristics are designed and implemented and cost/benefit analyses are carried out in the Improvement phase and, finally, the solutions are documented and monitored via statistical process control methods in the Control phase (Dahlgaard and Dahlgaard-Park 2006; Schroeder et al. 2008). Iterations of the procedure are sometimes necessary but also desirable for successful project completion. Significant for this and other descriptions of the DMAIC roadmap is the instrumental approach oriented towards tools and procedures (see e.g. Antony et al. 2007; Dahlgaard and Dahlgaard-Park 2006; Schroeder et al. 2008; Zu et al. 2008). However, the how-aspects of learning in the improvement cycles are seldom explored or described (Antony et al. 2007; Dahlgaard and Dahlgaard-Park 2006; Schroeder et al. 2008).

## **2.2. Using learning mechanisms to enhance organizational learning**

Unquestionably, organizational learning has been described, defined and studied in many ways and from different theoretical angles (e.g. Argyris 1999; Argyris and Schön 1978; Crossan et al. 1999; Dixon 1999; Friedman et al. 2001; Garvin 2000; Hedberg 1981; Senge 1990; Weick 1995). Many psychologists maintain that only people can learn, though organizational theorists refer to ‘organizational learning’ by attributing the term to observable changes in the structures, procedures and formal frameworks of the organization, expressed in such documents as policies, strategies and value statements,

when these changes can be clearly related to preceding events and developments in the organization.

Many studies have shown that learning at work, like learning in formal educational settings, is a matter of design and not evolution (Docherty and Shani 2008; Ellström 2006, 2001; Fenwick 2003; Shani and Docherty 2008, 2003). That is, it is a matter of organizing the workplace, not only for production, but also for supporting learning at work. Most studies of learning at work focus on individual workers. Crossan et al. (1999) provide a '4 I' framework that links individual learning (Insight), through networks of collective or group learning (Interpretation and Integration) until it meets a senior management group whose decisions make important changes in the organization (Institutionalization), that is termed 'organizational learning'. Shani and Docherty (2008, 2003) use the term 'learning mechanisms' for the preconditions that are designed to promote and facilitate individual, collective and organizational learning. They use three main categories; cognitive, structural and procedural. *Cognitive mechanisms* are concepts, values and frameworks expressed in the values, strategy and policies of the organization and, ideally, underpin the practice-based learning processes at different organizational levels. *Structural mechanisms* are organizational infrastructures that encourage practice-based learning. An example would be lateral structures that enable learning of new practices across various organizational units. Finally, *procedural mechanisms* concern the routines, methods, and tools that support and promote learning, e.g. the introduction and, eventually, the institutionalization of a new problem-solving method. Learning mechanisms in practice may include more than one of these components, e.g. both structural and procedural (see e.g. Lifvergren et al. 2009 for an application of learning mechanisms in healthcare). In other words, learning mechanisms aim to encourage individual and collective learning eventually leading to organizational learning.

Thus, *individual* learning is a prerequisite for organizational learning. Without doubt, individuals can learn and learning takes place in iterative action/reflection cycles (or loops). Moreover, researchers who maintain that organizations can learn relate this directly to human learning, i.e. the learning of organizational members (Argyris and Schön 1978; Huzzard and Wenglén 2007; Kolb 1984; Shani and Docherty 2003).

Argyris and Schön (1978) take their departure from the concept of 'single – and double loop learning', where the former refers to our adaption of activities without questioning the 'a priori' – our taken-for-granted assumptions. Consequently, the latter signifies the alteration of our preconceptions in order to act or behave in new ways (ibid. 1978; but also Argyris 2001; Huzzard and Wenglén 2007).

Kolb (1984) pictures learning in an iterating four-phase cycle (or, rather, spiral), where learning is depicted as the interplay between theoretical knowledge that leads to activities (experiments), generating new experiences. These experiences further inform reflection, leading to new knowledge.

## 2.3. Learning cycles in continual improvement

Beyond doubt, there is a close connection between theories of learning and the improvement cycles of quality improvement. At the core of every quality programme, including Six Sigma, lies the concept of Continual Improvement, CI, in which learning cycles (or loops) should be used in every problem solving process (Bergman and Klefsjö 2010; Bergman and Mauleon 2007).

Already in the 1930s, Walter Shewhart proposed that mass production could be seen as constituting “a continuing and self-corrective method for making the most efficient use of raw and fabricated materials” (Shewhart 1939, p. 45). By repeating the steps of specification –production – inspection in a continuous spiral, a circular path representing ‘the idealized state’ could be reached. Deming (1986), inspired by Shewhart, proclaimed that the management should construct “an organization to guide continual improvement of quality”, in which a four-step cycle, the ‘Shewhart-cycle’, should be utilized (p. 88). In other writings by Deming, this cycle is referred to as the PDSA-cycle (Plan, Do, Study, Act), see e.g. Deming 1994, where ‘Act’ also signifies reflection and learning. Similarly, Joseph Juran highlighted the importance of quality improvement, meaning “the organized creation of beneficial change” (1989, p. 28). All improvement should take place “project by project”, where a project is defined as a “problem scheduled for solution...” (ibid., p. 35), and in which recurrent learning cycles should be applied. In Japan, the concept of CI, partly inspired by Juran and Deming (see e.g. Bergman and Klefsjö 2010), has been deeply ingrained in quality initiatives since the 1960s. Imai elucidated ‘kaizen,’ signifying “ongoing improvement involving everyone, including both managers and workers” (1986, p. 3) using the continuation of the Deming wheel: “Japanese executives thus recast the Deming wheel and called it the PDCA wheel (Plan, Do, Check, Act), to be applied in all phases and situations” (ibid., p. 60). According to Imai, the concept of Kaizen has been the most important and distinguishing feature of the Japanese quality movement. The DMAIC roadmap of Six Sigma shares the same origin from Shewhart and can be seen as an extension of the PDSA cycle and an enhanced version thereof, often used in the Japanese improvement descriptions, the QC-story (Bergman and Klefsjö 2010, Smith 1990). Evidently, Shewhart as well as Deming brought forward the importance of learning in the iterating PDSA cycles of today’s CI, emphasizing the importance of action as well as reflection on the action (Bergman and Mauleon 2009, 2007).

## 3. Method

### 3.1. Action research

In this project, an action research approach has been used. Action research could be described as an orientation to inquiry where the intention to improve the studied system is achieved by designing iterative action-reflection loops involving both the researchers and the practitioners in the workplaces involved in the projects. The research question usually stems from problems that need to be solved in the studied organization. In action research

projects, researchers and co-workers share a participative community, in which all the members are equally important in generating actionable knowledge. Co-workers are thus considered to be co-researchers in the inquiry process. The purpose of action research projects is mainly twofold; to generate actionable knowledge that help to solve the local problem, but also to contribute to the body of generalized knowledge (Bradbury and Reason 2008). Two project workshops were used in this research, see section 5, where a co-generative model inspired by Greenwood and Levin (2007, p. 93) and Lewin (1948, p. 143-152) was used.

Emanating from the action research framework already described, a co-generative dialogue starts out from a distinct problem definition where outsiders, in this case the project mentor, the development director and an insider through mutual reflection and learning try to solve the problem. The solutions are formulated and tested using iterative reflection-action loops to further enhance the creation of opportunities for learning and reflection.

## **4. The context: The Skaraborg Hospital Group and the Six Sigma quality programme**

### **4.1. SkaS**

The Skaraborg Hospital Group, (SkaS), is situated in the Western Region of Sweden and serves a population of 260 000 citizens. The group consists of the hospitals in four towns, Lidköping, Skövde, Mariestad and Falköping. The services offered by SkaS include acute and planned care in a large number of specialties. In total there are more than 700 beds and around 4500 employees at SkaS. There are two emergency wards (EW) in two separate hospitals at SkaS. Each ward is responsible for all aspects of acute care in its constituency.

SkaS have a long tradition of quality development using different types of quality improvement approaches, such as TQM, organizational audits, small scale improvement cycles, the Collaborative Breakthrough Series (IHI 2003). Still, in 2005 it was unclear if the many improvement efforts contributed to the realization of the overall quality strategy. In many cases, poor formulation of project goals made it difficult to assess whether the improvement initiatives had failed or succeeded. Furthermore, the economic outcomes from different improvement efforts were not measured. Drawing on these experiences and inspired by a pilot Six Sigma project in 2005 (Lifvergren et al. 2010) the senior management team decided to add Six Sigma to the SkaS quality methods tool box. Six Sigma would contribute to the quality strategy by systematically searching for and reducing unwanted variation in critical healthcare processes, and by sustaining an even flow in the processes. More than 50 black belts have been trained at SkaS in the period from 2005 to 2010. Half of them now work as fulltime internal consultants leading various improvement efforts at SkaS.

SkaS also initiated an action research collaboration with Chalmers University of Technology in 2006 to explore how Six Sigma can be embedded in a healthcare setting and to improve the DMAIC-roadmap to better correspond to healthcare process improvement.

## 4.2. The initial project at the emergency ward

From a patient's perspective, long patient waiting times at emergency wards (EW) are unacceptable. Studies have shown that the mean patient Length of Stay (LoS) at an EW correlates to increased morbidity and mortality (Sibbritt and Isbister 2006). At one of the EWs at SkaS, the LoS was increasing during 2005. An analysis revealed that about 16 000 patients were treated that year. The average LoS at the EW during the first six months was 2.7 hours. Furthermore, the variation in LoS was also significant. Nearly 10% of patients had a LoS of five hours or more, and almost 20% had a LoS of more than four hours.

To address the problem the owner of the emergency process at the EW - the manager of the surgical clinic - decided to start an improvement project in the spring of 2006, aiming to decrease the mean LoS by 20 minutes, thereby increasing patient satisfaction and safety, improving working environment and improving resource utilization. A reason for this initiative was that LoS at EWs was a topic that appeared frequently in the national patient safety discourse. The project group consisted of interested co-workers at the EW and was led by two internal black belts. A steering committee consisting of the medical and surgical clinical managers was established. The first line managers responsible for the different clinics in the emergency department followed the project.

The daily operations of the EW are admittedly complex. About 16 000 cases pass through the department each year, and each patient is unique. Some patients must receive immediate treatment in the EW, while others' treatment is less pressing. The inflow of patients varies from week to week, depending on such factors as the weather (e.g. slipperiness in the streets), epidemics (e.g. influenza) in the population and healthcare articles in newspapers. The EW is also heavily dependent on a well-functioning collaboration with other units –primarily the x-ray department and the laboratory unit –to achieve an even flow through the department. The complex operations sometimes lead to increased LoS, which is worrying, tiresome and potentially dangerous to the patients. A high inflow of patients also contributes to a stressful working environment. In addition, increased LoS put a higher demand on the resources at hand. When there is an accumulation of patients due to different bottlenecks, the tail of the patient flow has to be handled late at nights at a higher cost.

The EW is organized under the surgical clinic; nurses and assistant nurses are employed at the EW whereas the doctors responsible for the EW come from the medical and the surgical departments following a scheme for emergency duty. There are two on-duty lines; the primary doctor on duty (usually a resident) works together with front line staff at the EW, whereas the secondary doctor (a senior physician) is on standby duty, always reachable by phone and obliged to appear within 20 minutes at the ward if called for.

The DMAIC roadmap of Six Sigma was used to assess the emergency process in order to detect root causes explaining the long waiting times. Several tools and methods were used; process analysis of the patient flow, e.g. how the inpatient clinics responded to a request to admit a patient; analyses of different lead times in the process, e.g. patient in need of x-ray.



Interviewing members of the project group, the information flow in the departments was also analyzed. The most important reasons for prolonged LoS were:

- a. Patients that should be admitted had to wait too long for the doctor's examination;
- b. the waiting times for patients in need of x-ray were too long;
- c. patients with fractures had to wait too long for pain-relieving treatment;
- d. the communication between doctors and other co-workers at the EW was poor;
- e. new residents were not introduced to the procedures used at the EW and;
- f. there were no clear rules for when the secondary doctor on-call should be contacted.

With these root causes in mind, several improvements were suggested and implemented, e.g. nurses should be allowed to remit the patient for x-ray in case of suspected hip fractures and they should also be permitted to give pain-relieving treatment to these patients without consulting a doctor. A common routine for the improved communication between different categories of staff was created. In addition, a mandatory introduction program for intern doctors was developed in which important routines at the emergency ward were taught. The proposed solutions were shared with co-workers including the physicians at regular work place meetings. The results of the proposed solutions were monitored using control charts, continuously assessing the overall LoS. Random inspections were also used to make sure that the proposed solutions were implemented.

## 5. Results and analysis of the project

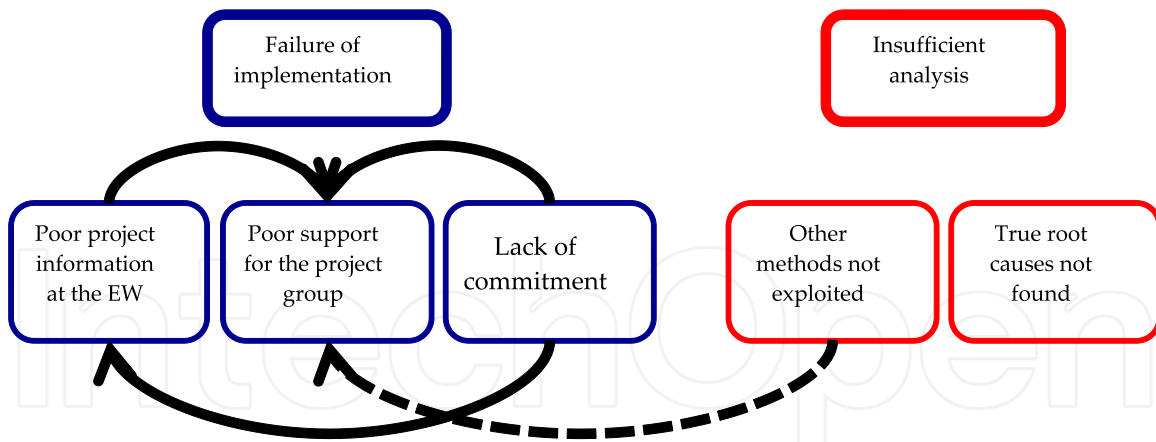
### 5.1. Initial results show no improvement

Surprisingly, the LoS at the EW were not affected at all but appeared to increase during the first three months after implementation of the suggested solutions by the initial Six Sigma project. It was the only one of eight on-going projects during 2006 that did not produce any positive results (Lifvergren et al. 2010). In order to learn from the initial failure, a deeper analysis of the project was carried out to reveal the causes of the failure and to improve the conditions for future projects. The development director (Svante Lifvergren) initiated the analysis. Two workshop dialogues, inspired by the co-generative model, were carried out. The purpose of the dialogues was to reveal the reasons to why the project had not succeeded so far. In the first workshop the development director, the supervisor of the Six Sigma program and one of the project managers participated. The second workshop also included the clinical manager and the assistant clinical manager at the surgical department, the other project manager and the manager at the EW. The results of the dialogues were also discussed with the outsider researchers, in this case Bo Bergman. Several plausible reasons explaining the failure of the project could be agreed upon (see figure 1).

The causes could be categorized into two groups; 'failure of implementation' and 'insufficient analysis'. These groups were then subdivided according to the figure and the relations between the different subgroups were visualized using arrows, thus showing the believed cause and effect relations between the subgroups. Each subgroup was further investigated using '5-why' in repetitive root cause analyses, depicted below (Table 1).

Subgroup(s)	Root cause analysis	Probable root causes
Poor project information at the EW and Lack of commitment	Lack of commitment among the ward manager, the physicians and the co workers »» (due to) poor knowledge of the usefulness of the project »» poor information about the project »» the information about the project from management was insufficient »» the management did not realize that the information had not reached all co workers »» poor management knowledge of the importance of project communication and how this should be accomplished /visual engagement from management in project was lacking	1. Management knowledge of the importance of project communication and how this should be accomplished was lacking 2. Poor management knowledge of the importance of physically being involved and showing engagement in the project
Poor support for the local project group	The project group lacked authority »» strong informal leaders didn't commit to/support the project (co-workers at the EW as well as physicians) »» management was not able to convince key personnel about the importance of the project »» management did not realize the importance of recruiting key personnel to the project group or to communicate to informal leaders about the project »» the project managers also lacked this knowledge »» not enough focus on project stakeholder issues early on in the Six Sigma education at SkaS	3. Not enough focus on critical project stakeholder issues early on in the Six Sigma education
Other methods not exploited	Project managers lacked knowledge of and experience from other methods and concepts, e.g. lean, discrete simulation, Design for Six Sigma etc. »» to learn the DMAIC-roadmap was time consuming »» project managers lacked time to study other methods »» the education was too compressed and did not contain other methods	4. The Six Sigma education was too compressed and did not contain other methods as well
True root causes not found	Data and risk analyses insufficient »» no actual root cause analysis from data »» insufficient amount of data »» project scope too large »» not enough time to gather data »» the project mentor did not give enough support to the project managers in helping them delimiting the scope of the project but also in suggesting alternative methods »» poor communication between mentor and project managers and inexperienced mentor	5. The project mentor did not give enough support to the project managers in helping them delimiting the scope of the project but also in suggesting alternative methods 6. Poor communication between mentor and project managers 7. Inexperienced project mentor and project managers

**Table 1.** Root cause analyses in the different subgroups



**Figure 1.** An affinity diagram from the workshops displaying probable causes of the, initially, failed project

## 6. Integrating learning mechanisms into the SkaS quality programme

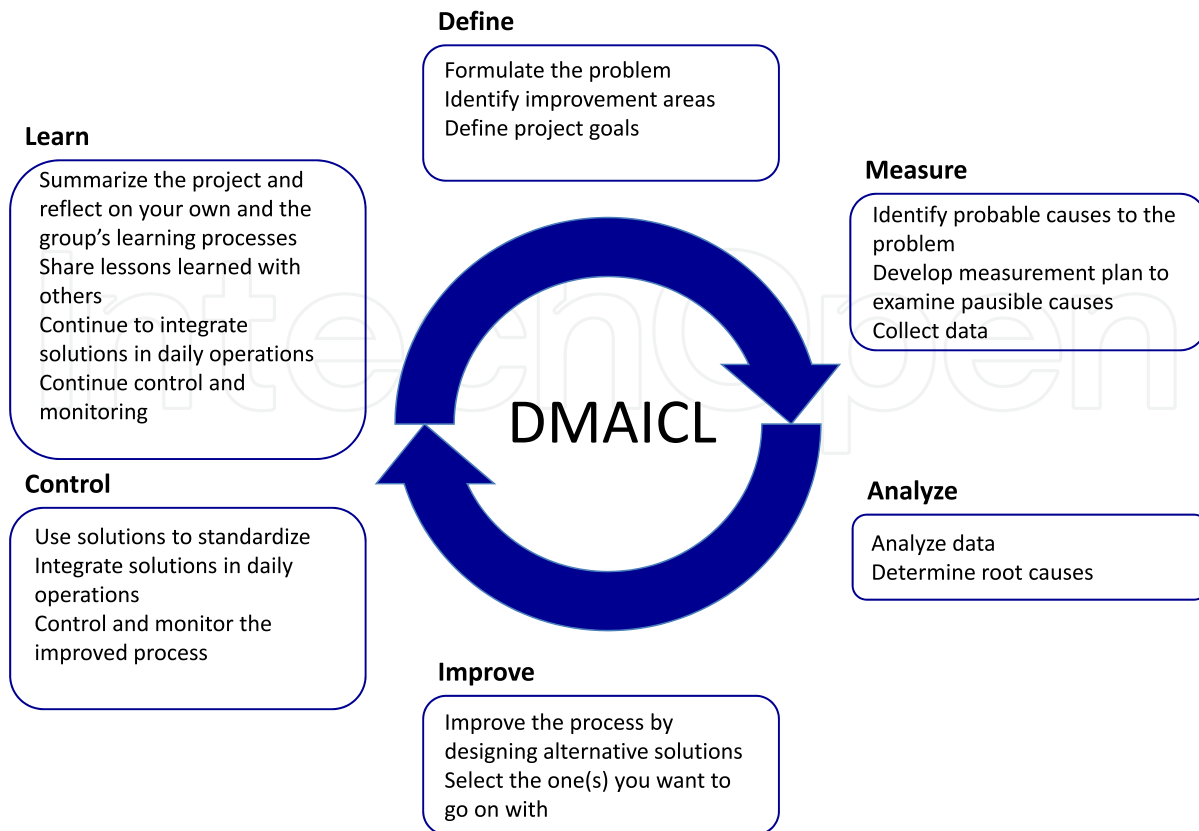
Although only this project initially failed in its impact on the operational units concerned during 2006, we believe that it was the most successful through its impact on the hospitals' development strategy and procedures, especially regarding the design and integration of learning mechanisms – cognitive, structural and procedural – into the ongoing quality program at SkaS. The lessons learned were used to redesign the Six Sigma solving process – cognitive and procedural mechanisms. Moreover, the causes to the failure so far have been shared in parallel networks – a structural mechanism. Finally, templates to be used in future projects also have been designed to prevent the mistakes to reappear in the SkaS quality programme (Table 2). This also led to a second, successful project in the EW.

### 6.1. Cognitive learning mechanisms

Cognitive mechanisms provide language, concepts, models, values and theories for thinking, reasoning and understanding learning issues. Some examples would be models and approaches for improvement, company value statements but also strategy documents (Shani & Docherty 2008, 2003; Docherty & Shani, 2008). In this case, the analysis of the failed project revealed both the absence of reflection during the project, and also the negative impact of no reflective feedback being shared with and among co-workers at the actual workplace – the how-aspect of learning (Tucker et al. 2007). The lessons learned inspired us to redesign a) the SkaS quality system elucidating the importance of management commitment, and b) a revised Six Sigma roadmap –DMAIC, incorporating an 'L' for learning and reflection –DMAICL (see figure 2). In the Learning phase, the project manager and the members of the project group conjointly reflect on the project process in order to 'improve the improvement processes'. Moreover, the sixth phase adds important time to the delivery of the solutions in the daily operations of management; this was indicated by earlier Six Sigma project experiences. The DMAICL roadmap has been used in every black belt and green belt project at SkaS since 2006 and could thus be seen as an institutionalization of a learning mechanism throughout the organization (Crossan et al. 1999). The importance of iterations of the DMAICL- cycle has also been highlighted at SkaS.

<b>Root causes of the failed project</b>	<b>Solutions integrated into the SkaS quality programme</b>	<b>Type of learning mechanism</b>
1 Management knowledge of the importance of project communication and how this should be accomplished was lacking	a) Feedback to top management and a revision of the SkaS quality system highlighting the importance of management involvement b) Revised templates for the problem solving procedure	Cognitive, structural and procedural
2 Poor management knowledge of the importance of physically being involved and showing engagement in the project	Same as above	Cognitive, structural and procedural
3 Not enough focus on critical project stakeholder issues early on in the Six Sigma education	a) A stakeholder template was incorporated into the 'DMAICL' roadmap b) The importance of stakeholder involvement was elucidated in the Six Sigma education	Cognitive and procedural
4 The Six Sigma education was too compressed and did not contain other methods as well	Revision of the education; Lean and Design for Six Sigma were added to the Six Sigma education and the education was prolonged	Cognitive
5 The project mentor did not give enough support to the project managers in helping them delimiting the scope of the project but also in suggesting alternative methods	a) A revised problem solving procedure –DMAICL – was established b) Revised templates for delimiting projects	Cognitive and procedural
6 Poor communication between mentor and project managers	a) Accelerating learning through the establishment of parallel learning structures at SkaS b) Revised templates for project communication	Structural and procedural
7 Inexperienced project mentor and project managers	Same as above	Structural and procedural

**Table 2.** The integration of lessons learned from the failed project into the SkaS quality programme



**Figure 2.** The improved DMAICL-cycle currently used at SkaS

## 6.2. Structural learning mechanisms

Structural mechanisms concern organizational, technical and physical infrastructures that enhance learning, e.g. different feedback and communication channels, arenas/forums and networks for dialogue, but also specific learning structures such as parallel learning structures.

As a result from the analysis of the actual project but also drawing from other parallel project experiences at SkaS (Lifvergren et al. 2010, 2008), horizontal permanent arenas for learning have been established. In these forums, project managers and quality coordinators from different organizational units meet every month to learn from improvement 'successes' and 'failures'. Improvement efforts are monitored and analyzed in order to learn how to improve the 'project process' itself. From these network activities, important learning is spread throughout the hospital; e.g. project groups and project mentors can learn from each other. Also, sharing the 'L' from every project inspires reflection and second loop learning between projects. Moreover, an intranet project database displaying concluded as well as ongoing and future improvement projects has been established.

A parallel learning structure has been instituted –integrating the selection and training of operational personnel to conduct the Six Sigma projects in operational units. Many return to their units, while others after further training, become internal consultants (cf. Bushe and Shani 1991).

### 6.3. Procedural learning mechanisms

Procedural mechanisms pertain to the rules, routines, procedures and methods that can be institutionalized in the organization to promote and support learning, e.g. assessment methods and standards (Docherty and Shani 2008; Shani and Docherty 2008). In this particular case, the cognitive and procedural mechanisms overlap, where roadmap templates to be used in every larger improvement project support the new cognitive model DMAICL (figure 2).

### 6.4. A second and successful retake on the project using learning mechanisms

The problem with long LoS persisted, so a new improvement project was initiated in 2008. Learning from the root cause analyses of the failed project, the clinical manager was deeply involved in the project, supporting it and requesting regular feedback on its progress; the project was subdivided in to several subprojects. Even more emphasis was put on continual and regular project communication to involve all co-workers at the EW. All these efforts are examples of *procedural* learning mechanisms. This resulted in several improvement suggestions from the front line staff. Moreover, expert knowledge on flow theory in daily operations was brought to the project – a *cognitive* learning mechanism. Much effort was also invested in involving and motivating the physicians. Finally, an improved DMAICL roadmap –signifying cognitive and procedural mechanisms –was followed (see figure 2). As a result of all these efforts, the project managed to reduce mean LoS at the EW by 20 minutes during 2008, an improvement that has been sustainable during 2009 and 2010.

## 7. Conclusions

In this chapter, we have described how a deeper analysis of a project that initially failed its client has led to emphasizing learning and integrating learning mechanisms into the SkaS Sigma programme, thus contributing to the present project success rate of 75% (Lifvergren et al. 2010).

In every improvement programme, the concept of Continual Improvement (CI) plays a vital role. At the core of CI, we find the learning cycles – PDSA, PDCA, DMAIC – critical to joint sensemaking (Weick 1995) and learning that creates actionable knowledge (Bradbury and Reason 2001, 2008). This particular project has disclosed how the importance of learning has been played down in the DMAIC roadmap in favor of more instrumentally emphasized problem solving techniques, e.g. templates, project charters and statistical analyses (Anthony et al. 2007; Schroeder et al. 2008). The experiences presented here have led to the addition of an 'L' in the roadmap, DMAICL, thus highlighting the original intentions of the learning cycles that somehow got lost on the way (Deming 1986; Shewhart 1939). We further propose that the 'L' might signify cognitive and procedural learning mechanisms, the intention of which is to invoke second loop learning within and between project groups and operational units.

Moreover, through the use of learning mechanisms, a design approach to institutionalization can be adopted (Crossan et al. 1999; Shani and Docherty 2003), including the contextual, historical and cultural factors present in every organization, while reducing the unpredictability of organizational change.

To openly show and analyze your failures adds knowledge and enhances a reflexive approach and a non-punitive culture in the organization. In that respect, the initially unsuccessful project could actually be considered to be the most successful project in SkaS Six Sigma programme, contributing to the how-aspects of learning (Tucker et al. 2007).

## 8. Further research

The challenges facing healthcare calls for sustainable changes, necessitating long term approaches. The integration of learning mechanisms in the change efforts taking place at SkaS but also in other healthcare organizations of the Western Region in Sweden will be followed continuously. How learning mechanisms are interpreted and adopted in other healthcare systems given their unique culture and history is also a question that deserves further investigation. Moreover, can learning mechanism be adopted to alleviate the conflicts that often emerge between vertical, hierarchical management structures *and* improvement projects that seek to solve problems pertaining to the value creating horizontal patient processes (Hellstrom et al. 2010)?

## Author details

Svante Lifvergren

*CHI, Centre for Healthcare Improvement, Chalmers University of Technology, Division of Quality Sciences, Gothenburg, Sweden*

*Skaraborg Hospital Group, Skövde, Sweden*

Bo Bergman

*Skaraborg Hospital Group, Skövde, Sweden*

## 9. References

- Argyris C (2001) *On organizational learning*. 2<sup>nd</sup> edition, Blackwell Publishing, MA
- Argyris C, Schön D (1978) *Organizational learning– a theory of action perspective*. 2<sup>nd</sup> edition. Addison Wesley Publishing, MA
- Alvesson M, Sveningsson S (2007) *Changing organizational culture: cultural change work in progress*. Routledge, New York, NY
- Alvesson M, Sköldberg K (2000) *Reflexive methodology - new vistas for qualitative research*. Sage, London
- Beer M, Nohria N (2000) Cracking the code of change. *Harv Bus Rev* May-June: 133-139
- Beer M, Eisenstat RA, Spector B (1990) Why change programs don't produce change. *Harv Bus Rev* Nov-Dec: 158-166

- Bergman B, Klefsjö B (2010) *Quality from customer needs to customer satisfaction*. 3<sup>rd</sup> edition, Studentlitteratur, Lund
- Bergman B, Mauleon C (2009) Exploring the epistemological origins of Shewhart's and Deming's theory of quality. Influences from Lewis conceptualistic pragmatism. *Int J Qual Serv Sci* 2:160-171
- Bergman B, Mauleon C (2007) Ständiga förbättringar och dess rötter i pragmatismen ('Continuous improvements and its roots in pragmatism'). In: Elg M, Gauthtereau Witell L (eds) *Att lyckas med förbättringsarbete* ('To succeed with improvements'). Studentlitteratur, Lund
- Boaden R, Harvey G, Moxham C, Proudlove N (2008) *Quality improvement: theory and practice in healthcare*. NHS Institute for Innovation and Improvement, Coventry
- Bradbury H, Reason P (2008) *The Sage handbook of action research*. 2<sup>nd</sup> edition, Sage, London
- Bushe GR, Shani AB (1991) *Parallel learning structures: increasing innovation in bureaucracies*. Addison-Wesley Publishing, Reading, MA
- Cederquist J, Hjortendal Hellman E (2005) *Iakttagelser om landsting* ('Observations on counties'). Finansdepartementet, Stockholm
- Chakravorty SS (2009) Six sigma failures: an escalation model. *Oper Manag Res* 2:44-55. doi:10.1007/s12063-009-0020-8
- Crossan MM, Lane HW, White RE (1999) An organizational learning framework: from intuition to institution. *Acad Manag Rev* 24: 522–537
- Dahlgaard JJ, Dahlgaard-Park SM (2006) Lean production, six sigma quality, TQM and company culture. *TQM Mag* 18:263–281
- Dawson P (2003) *Understanding organizational change– the contemporary experience of people at work*. Sage, London
- Deming WE (1994) *The new economics*. 2<sup>nd</sup> edition. MIT Press, Cambridge, MA
- Deming WE (1986) *Out of the crisis*. MIT Press, Cambridge, MA
- Dixon N (1999) *The organizational learning cycle: how we can learn collectively*. 2<sup>nd</sup> edition. McGraw-Hill, London
- Docherty P, Shani AB (2008) Learning mechanisms as means and ends in collaborative management research. In: Shani AB, Mohrman SA, Pasmore WA, Stymne B, Adler N (eds) *Handbook of Collaborative Management Research*. Sage, Thousand Oaks, CA
- Duck JD (1993) Managing change: the art of balancing. *Harv Bus Rev*, Nov-Dec: 109-118.
- Ellström PE (2006) The meaning and role of reflection in informal learning at work. In: Boud D, Cressey P, Docherty P (eds) *Productive reflection at work: learning for changing organizations*. Routledge, London
- Ellström PE (2001) Integrating learning and work: conceptual issues and critical conditions. *Hum Resour Dev Q* 12: 4



- Eriksson N (2005) *Friska vindar i sjukvården* ('Fresh breezes in healthcare'). Dissertation. Förvaltningshögskolan, Gothenburg University, Gothenburg
- Fenwick TJ (2003) Professional growth plans: possibilities and limitations of an organization-wide employee development strategy. *Hum Resour Dev Q* 14: 59–77.
- Friedman VJ, Lipshitz R, Overmeer W (2001) Creating conditions for organizational learning. In: Dierkes M, Berthoin Antal A, Child J, Nonaka I (eds) *Handbook of organizational learning and knowledge*. Oxford University Press, Oxford
- Garvin DA (2000) *Learning in action: a guide for putting the learning organization to work*. Harvard Business School Press, Boston, MA
- Greenwood DJ, Levin M (2007) *Introduction to action research*. Sage, London
- Harry M, Schroeder R (2000) *Six sigma— the breakthrough management strategy*. Doubleday, New York
- Hedberg BLT (1981) How organizations learn and unlearn. In: Nystrom PC, Starbuck WH (eds) *Handbook of organizational design, vol. 1. Adapting organizations to their environments*. Oxford University Press, Oxford
- Hyer NL, Wemmerlöv U, Morris J, Shtub A (2003) Cellular manufacturing in health care: the case of a trauma unit. In: Spina J et al. (eds) *One world? One view of OM? The Challenges of integrating research & practice*. EurOMA–POMS Conference, Como, Italy, 16–18 June, Vol I: 913–917
- Imai M (1986) *Kaizen –the key to Japan's competitive success*. Random House Business Division, New York
- Institute for Healthcare Improvement (2003) *The Collaborative Breakthrough Series*. IHI, Boston: IHI.
- Juran J (1989) *On leadership for quality –an executive handbook*. The Free Press, New York
- Kolb D (1984) *Experiential learning: Experience as the source of learning and development*. Prentice-Hall, New York
- Kotter J (1995) Leading change: why transformation efforts fail. *Harv Bus Rev*, Mar-Apr: 59–67
- Lewin K (1948) *Resolving social conflicts & field theory in social science*. American Psychological Association, Washington DC
- Lifvergren S, Gremyr I, Hellström A, Bergman B (2010) Lessons from Sweden's first large-scale implementation of six sigma in healthcare. *Oper Manag Res*, DOI 10.1007/s12063-010-0038-y
- Lifvergren S, Huzzard T, Docherty P (2009) A development coalition for sustainability in healthcare. In: Docherty P, Kira M, Shani AB (eds) *Creating sustainable work systems: developing social sustainability*. 2<sup>nd</sup> edition. Routledge, London

- Lifvergren S, Chakhunashvili A, Bergman B, Docherty P (2008) Online statistical monitoring of critical patient data increases patient safety. PICMET-conference, Proceedings, Capetown
- Lindgard Larsen M, Gertsen F, Johansen J (2003) Applying lean thinking in hospitals exploring implementation difficulties. Paper presented at the 3rd International conference on the management of healthcare and medical technology, Warwick
- OECD. (2007). OECD Health data: Statistics and indicators for 30 Countries. OECD, Paris
- Olsson J, Kammerlind P, Thor J, and Elgh M (2003): 'Surveying improvement activities in health care on a national level –the Swedish internal collaborative strategy and its challenges', *Qual Manag Healthc* 12: 202-216
- Øvretveit J (2009) Does improving quality save money? A review of evidence of which improvements to quality reduce costs to health service providers. The Health Foundation, London
- Øvretveit J (1997) A comparison of hospital quality programmes: lessons for other services. *Int J Serv Ind Manag* 3:220–235
- Schroeder RG, Linderman K, Liedtke C, Choo AS (2008) Six sigma: definition and underlying theory. *J Oper Manag* 26: 536–554
- Schaffer R, Thomson H (1992) Successful change programs begin with results. *Harv Bus Rev*, Jan-Feb: 80-89.
- Senge P (1990) *The fifth discipline: the art and practice of the learning organization*. Broadway Business, London
- Shani AB, Docherty P (2008) Learning by design. Key mechanisms in organization development. In: Cummings TG (ed) *Handbook of organization development*. Sage, Thousand Oaks, CA
- Shani AB, Docherty P (2003) *Learning by design: building sustainable organizations*. Blackwell, Oxford
- Shewhart W (1939) *Statistical method from the viewpoint of quality control*. Dover Publications, New York
- Sibbritt D, Isbister G (2006). Emergency department performance indicators that encompass the patient journey. *Qual Manag Healthc* 15: 27-38
- Smith B (1990) The Motorola story. Lecture by Bill Smith, Senior Quality Manager at Motorola at World Class Quality Event, Västerås, Sweden
- Spear S (2005) Fixing healthcare from the inside, today. *Harv Bus Rev*, Sept: 1-20
- Stacey RD (2007) *Strategic management and organizational dynamics. The challenge of complexity*. 5<sup>th</sup> edition. Prentice Hall, Harlow, England
- Strebel P (1996) Why do employees resist change? *Harv Bus Rev*, May-June: 86-92
- Thor J, Herrlin B, Wittlöv K, Øvretveit J, Brommels M (2007) Evolution and outcomes of a quality improvement program. Appended paper in Thor J (2007) *Getting going on*

- getting better. Dissertation. Department of Learning, Informatics, Management and Ethics, Karolinska Institutet, Stockholm
- Tucker AL, Nembhard I, Edmondson AC (2007) Implementing new practices: An empirical study of organizational learning in hospital intensive care units. *Manag Sci* 6, June: 894-907
- Tucker AL (2004) The impact of operational failures on hospital nurses and their patients. *J Oper Manag* 22: April
- Tucker AL, Edmondson AC (2003) Why hospitals don't learn from failures: organizational and psychological dynamics that inhibit system change. *Calif Manag Rev* 45, no 2 (winter)
- Tucker AL, Edmondson AC, Spear S (2002) When problem solving prevents organizational learning. *J Org Change Manag* 15: 2
- Weick KE (1995) *Sensemaking in organizations*. Sage, London
- Zimmerman JP, Weiss J (2005) Six Sigma's seven deadly sins. *Quality*, January: 62-67. <http://www.qualitymag.com/>
- Zu X, Fredendall L D, Douglas T J (2008) The evolving theory of quality management: the role of six sigma. *J Oper Manag* 26: 630-650