



**Making
New
BELTS**

Topic Lean Six Sigma

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How a university medical center used LSS to improve quality and cut costs

The University Medical Center Groningen (UMCG) is the second largest hospital in the Netherlands and the largest employer in Northern Netherlands. It is the only level-one trauma center in this region and is licensed to perform all categories of transplants. UMCG's 12,000 employees provide patient care and medical education, and perform cutting-edge scientific research focused on healthy and active aging.

In 2007, UMCG recognized that if it wanted to continue providing high-quality service to its patients and be recognized as a leader in medical education and research, it must improve and change its working processes. UMCG was facing a growing demand from an aging population, with a diminishing number of nurses, rises in medical materials and vast financial cuts from the Dutch government. It needed a solution to resolve its challenges while maintaining and improving its service delivery to patients, academia and research.

"Cost and quality of healthcare are two critical issues within our university medical center," said UMCG CEO, Jos Aartsen. "Finding ways to improve quality and reduce costs are therefore the most important issues facing the medical profession as well as the public in general."

Laura de Jong, HR director, with years of commercial knowledge of process improvement, and the CFO, Henk Snapper, compiled a case to address the hospital's challenges. After some time, the UMCG board of directors was convinced of the benefits of starting a new process improvement program using lean Six Sigma (LSS). The scientific research base of LSS was determined to conform well with UMCG, even though historically LSS was an industry-specific method.

The Institute for Business and Industrial Statistics of the University of Amsterdam (IBIS UvA) was invited to meet the UMCG board in June 2007. UMCG hoped that IBIS UvA's knowledge of and experience implementing LSS in industry, services and healthcare through a learning and development approach would add value to UMCG and positively affect the challenges it was facing. Furthermore, the academic profile of IBIS UvA was considered an added advantage, complementing UMCG's profile.

Implementing LSS

UMCG used LSS as described in *Solutions to the Healthcare Quality Crisis: Cases and Examples of Lean Six Sigma in Healthcare*.¹ Soon after the board meeting, UMCG senior management participated in an executive LSS training, and the journey started. One of the first commitments from the UMCG board was to appoint an LSS program director. De Jong was selected because of her previous experience with LSS.

IBIS UvA was committed to training and implementing LSS for two years. Black Belts (BB) committed about three days per week to a project, and Green Belts (GB) 1.5 days per week. Financial targets were identified for the first phase of BB and GB training. It was estimated that BB projects would result in about \$107,000 in savings per project, and GB projects would result in about \$53,000 in savings per project.

Senior management's aim was to embed LSS into all departments through daily operational practices and initiatives. For this reason, management selected high-potential candidates who



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had grassroots knowledge of the challenging areas. In LSS terminology, they are called Champions and are representatives from senior management who play the roles of project owners and project supervisors.

The Master Black Belt (MBB) is responsible for training, support and guidance throughout the training and development process. The MBB also is responsible for daily administration and coaching of BBs and GBs. This role initially was held by an IBIS UvA consultant (the first author of this article), and after two years the role was internal by UMCG (the other authors).

All training was delivered in-house at UMCG. The program director was responsible for evaluating and, together with the Champions, selecting new BBs, GBs and projects, and supervising daily management of the LSS program throughout the hospital. The BB projects were large and spanned departments. GBs were selected from physicians, nurses and managers. Their projects had a more localized scope, including their own teams' processes.

In 2014, UMCG also started training Yellow Belts (YB) and Orange Belts (OB). These Belts were recruited from all areas of the hospital, including administrative and facilities employees, and nutrition assistants. YBs supported the BB and GB projects, and OBs focused on how they could improve their own work and processes. This typically resulted in a financial savings of about \$8,000 per project. The YBs and OBs received a two-day training that covered the foundation and basics of the define, measure, analyze, improve and control method. OBs received an additional one-day training on lean techniques.

The first half of the journey: 2007-2014

The effect of LSS in the first half of UMCG's journey across all departments was phenomenal, combining problem solving and process enhancement with solutions and changes in mindset. A huge impact was the 27% reduction in beds (from 1,300 to 950) from 2007-2014

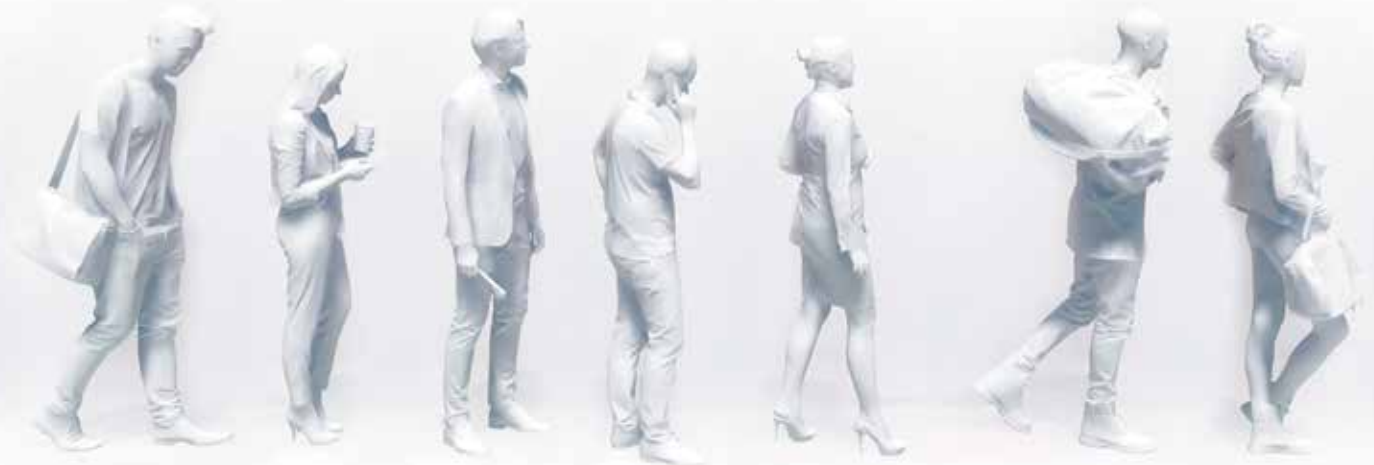


Figure 1 OVERVIEW OF THE NUMBER OF BELTS TRAINED AT UMCG: 2001-2021



In 15 years, UMCG made a gross financial saving of tens of millions of dollars, trained thousands of employees, implemented hundreds of projects, and made significant improvements.

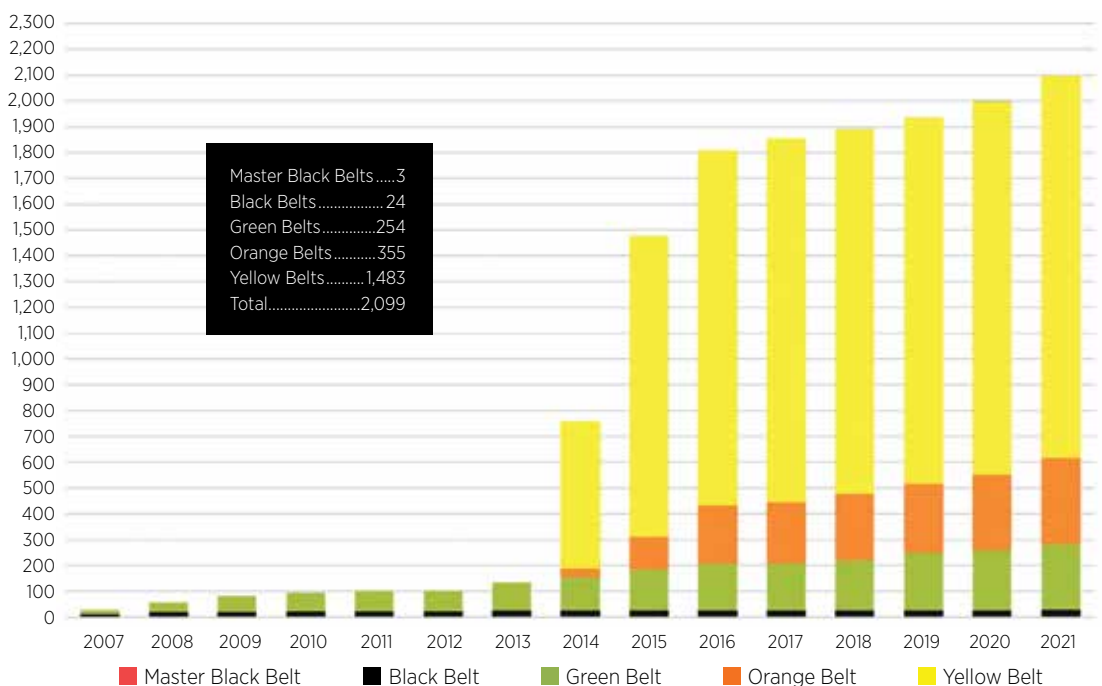
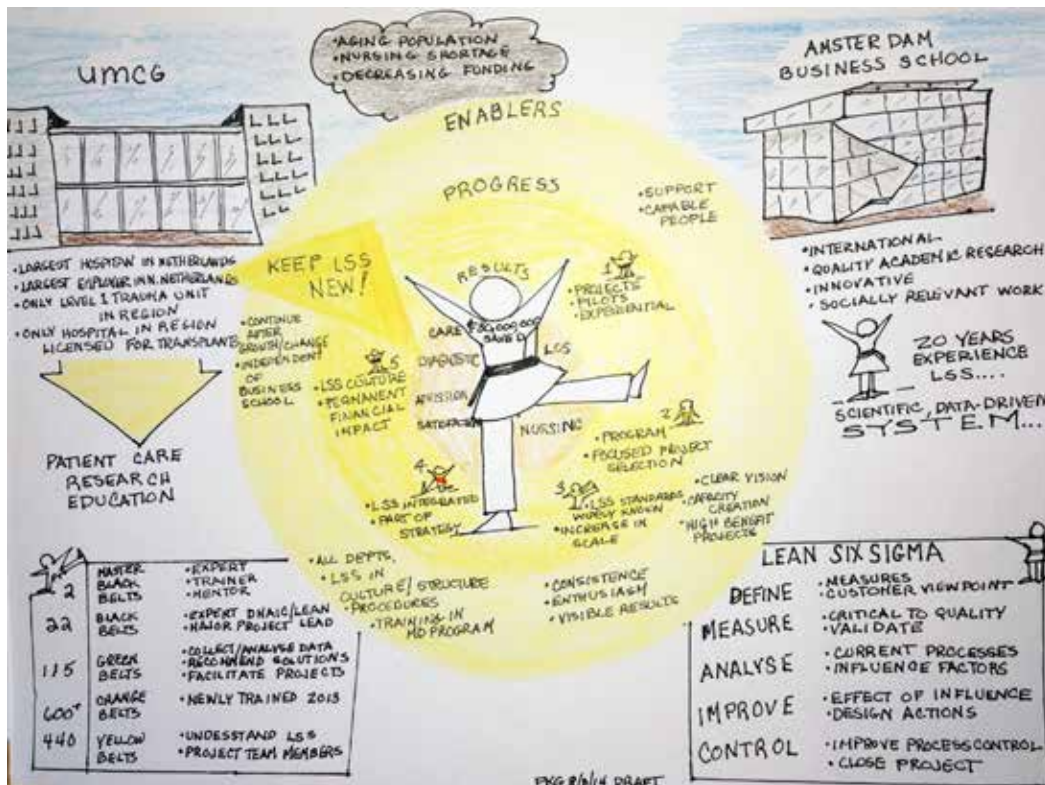


Figure 2 ART IMPRESSION OF THE PRESENTATION OF THE UMCG-IBIS UvA CASE



UMCG-IBIS UvA = University Medical Center Groningen-Institute for Business and Industrial Statistics of the University of Amsterdam

despite an increase in the number of services offered. Examples of the effect in financial, quality and efficiency terms include:

- **DIAGNOSTIC COSTS.** From 2007–2010, overall costs decreased despite 10% more treatments. In the trauma clinic, for example, the average cost of diagnostics per treatment was reduced from about \$34.48 to \$30.30, resulting in an annual cost savings of about \$55,652.²
- **NURSING EFFICIENCY.** LSS was deployed in a potentially threatening situation involving many delicate human elements for patients and nurses. The BB—with careful consideration of human aspects, potential fear of change and many political traps—used LSS to collect objective measurements about employee activities, basing the analysis on facts and data, not just opinions, while involving everyone in the process.

Rather than eliminating jobs, the BB eliminated redundant and wasteful activities that did not provide value to patients, which, of course, is easier to accept. It resulted in revised and improved personnel planning, which meant nonskilled activities were transferred to nurse assistants. All 32 of UMCG’s nursing departments have implemented this project, with an estimated annual cost savings of more than \$106,000 per department.³

- **LENGTH OF HOSPITALIZATION.** This is a financial indicator of cost and a process, service or clinical indicator of quality of care.

LSS was used to identify the variables of a prolonged length of stay (LOS) for hip fractures in elderly patients, and to measure the effect of the process improvements with the aim of improving care efficiency and reducing LOS.

The project identified several variables influencing LOS, and interventions were designed to improve the process of care. Significant results were achieved by reducing the average LOS by 4.2 days (31%) and the average surgery duration by 57 minutes (36%). The average LOS of patients discharged to a nursing home was reduced by 4.4 days. Reducing LOS amounted to an annual cost savings of about \$128,000.⁴

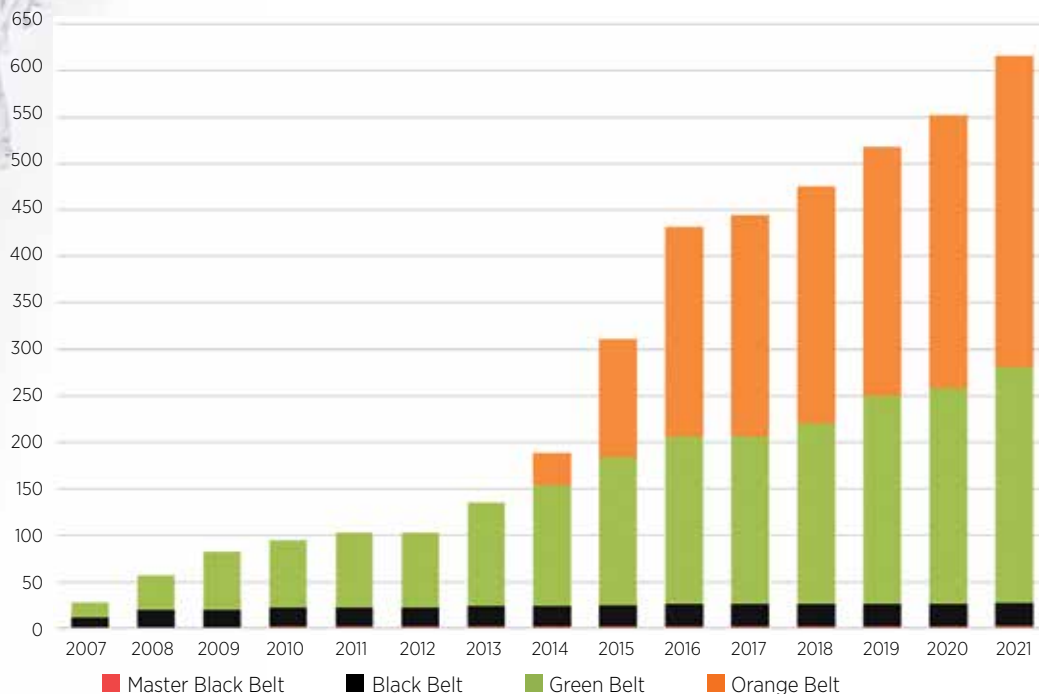
According to financial records, the total financial impact of LSS during the first seven years was about \$32 million. According to Snapper, “Without the LSS program, we would have been in serious financial trouble. [Since implementing LSS,] we have had real bottom-line results based on the outcomes of this program.”

Figure 1 shows that about 750 Belts were trained from 2007–2014. In the first two years, 19 BBs and 63 GBs were trained, and in 2008, an IBIS UvA consultant was employed by UMCG as an MBB. In 2010 and 2013, two more UMCG employees were promoted to MBB. The 22 OBs and 440 YBs trained in 2014 shows a significant increase in employee engagement.

In 2014, UMCG and IBIS UvA received the Excellence in Practice Gold Award from the European Foundation for Management



Figure 3 NUMBER OF PROJECTS RUN BY BLACK, GREEN AND ORANGE BELTS



Development. An impression of the presentation of the UMCG-IBIS UvA case study during the ceremony is illustrated in Figure 2 (p. 13).

About 200 projects were implemented between 2007 and 2014 (see Figure 3). The continuous implementation of projects, including the start of OB projects in 2014, shows the integration of LSS into daily operations. It became a way of working.

The second half of the journey: 2015–2021

Ideally, the result of deploying an LSS initiative will lead organizational development into a mature state. In addition, the level of organizational maturity should be identifiable to execute appropriate management actions that drive further maturity.

There are five levels of organizational maturity.⁵ Each phase is characterized by specific topics that are subject to the phase of maturity. In terms of deploying LSS, the phases are:

1. Pre-LSS interest in the concept by a sense of urgency with implementing improvements on an ad hoc basis.
2. Structured LSS by formal commitment to a system that will further develop LSS throughout the organization.
3. Goal-oriented LSS with commitment to linking LSS behavior to the organization’s wider strategic concerns.
4. Proactive LSS with autonomy and empowerment of individuals to manage and direct their own processes.
5. Full LSS capability whereby a learning organization is established (operational excellence).

Extensive research on LSS implementation revealed that most operational LSS implementation models are programmatic and prescriptive. Therefore, the operational and programmatic LSS implementation models’ advice had to be placed into the

organizational learning process advocated for by continuous improvement (CI) theory.

Based on an extensive analysis and reconciliation of the CI implementation model, a holistic CI implementation metamodel is presented in the article, “Continuous Improvement Deployment Models: A Reconciliation and Holistic Metamodel.”⁶

The readiness factors for each of the five phases outline activities for the next phase as well as sustainability factors that are prerequisites for the next phase. It resulted in a matrix with the five phases on one axis and the organizational focal areas—based on the 7S model⁷—on the other axis. The matrix cells are readiness factors, activities and sustainability factors.

UMCG has made significant improvements to its processes, procedures, employees and patients, which can be seen in the financial results. If UMCG is to achieve operational excellence, it must continue developing and training employees with the momentum it has achieved. Another consideration is to ensure sufficient Belts are trained at all levels of the hospital to maintain sustainability when employees leave.

“When we started this initiative, my original idea was that in the future, when we have a real problem, there would always a Belt in the neighborhood who may solve this issue using LSS,” said de Jong. “It should be the way of working.”

The challenge is continuous financial growth with ongoing health-care cuts. In the second part of the journey, UMCG continued to train Belts and run projects, even during COVID-19 (see Figures 1 and 3).

Although UMCG has not followed the metamodel for LSS deployment exactly, it can be concluded in retrospect that the LSS deployment in UMCG is mature as it enters the fifth phase of deployment.

The journey continues

In 15 years, UMCG made a gross financial saving of tens of millions of dollars, trained thousands of employees, implemented hundreds of projects, made significant improvements in nursing efficiency, diagnostics testing and LOS, enhanced patient care and experience, and

contributed to the learning and development of its employees.

The past years have been a great learning opportunity for everyone involved. The journey continues with greater cost savings, improved patient care, innovative processes and procedures, and positively transforming UMCG's processes, procedures and culture. &



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