

Case study 1: General Electric (GE)

With over 4000 Black Belts and 10 000 Green Belts across its businesses, and Six Sigma savings of \$2 billion in 1999 alone, GE is a comprehensive Six Sigma organization. GE is the benchmark for Six Sigma programmes.

The company

General Electric has been at the top of the list of Fortune 500's most admired companies for the last five years, and without doubt their Six Sigma programme has played a key role in their continued success. In 2001 GE's turnover was over \$125.8 billion, they employed 310 000 people worldwide, and their market value was \$401 billion. With earnings growing at 10 per cent per annum, GE also has the enviable record of pleasing Wall Street and financial analysts year after year. GE's products and business categories span a wide spectrum and include automotive, construction, health-care, retail, transport, utilities, telecommunications and finance industries.

Driver for Six Sigma

The CEO of GE, Jack Welch, is reported to have become attracted to the systematic and statistical method of Six Sigma in the mid-1990s. He was ultimately convinced of the power of Six Sigma after a presentation by Allied Signal's former CEO, Larry Bossidy, to a group of GE employees. Bossidy, a former Vice Chairman of GE, had witnessed excellent returns from Allied Signal's experience with Six Sigma.

In 1995 GE retained the Six Sigma Academy, an organization started by two early pioneers of the process, both ex-Motorola, Michael Harry and Richard Schroeder. It was pointed out that the gap between three sigma and six sigma was costing GE between \$7 and \$10 billion annually in scrap, rework, transactional errors and lost productivity. With the full and energetic support of Jack Welch, senior management became fully committed to the Six Sigma programme. 'GE QUALITY 2000' became the GE mantra for the 1990s and beyond. Jack Welch declared that 'Six Sigma, GE Quality 2000 will be the biggest, the most personally rewarding and in the end the most profitable undertaking in our history!'. While financial benefits and the share price were a driving force in Six Sigma deployment, GE identified four specific reasons for implementing it:

1. Cost reduction
2. Customer satisfaction improvement
3. Wall Street recognition
4. Corporate synergies.

Improvement programme

Although Motorola pioneered the Six Sigma programme in the 1980s to improve manufacturing quality and eliminate waste in production, GE broke the mould of Motorola's original process by applying the Six Sigma standards to its service-oriented businesses – GE Capital Services and GE Medical systems. Note that GE Capital Services accounts for nearly half of GE's total sales.

The Six Sigma programme was launched in 1995 with 200 separate projects supported by a massive training effort. In the following two years a further 9000 projects were successfully undertaken, and the reported savings were \$600 million. The training investment for the first five years of the programme was close to \$1 billion. GE also instituted a personnel recruitment plan to augment the cadre of dedicated full-time Six Sigma staff. Figure 4.1 shows the structure of a typical GE Six Sigma team.

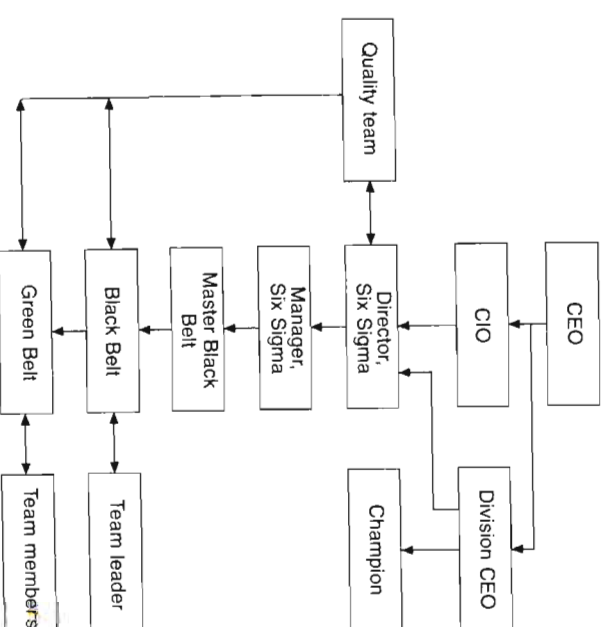


Figure 4.1 The structure of a typical GE Six Sigma team.

The GE programme revolved around the following few key concepts, all focused on the customer and internal processes:

- Critical to Quality – the determination of and development of attributes most important to the customer
- Defect – the identification of failure to meet customer wants
- Process capability – what the process can deliver
- Variation – what the customer sees and feels, as against what the customer wants

- Stable operation – ensuring consistent and predictable processes to improve what the customer sees and feels
- Design for Six Sigma – designing to meet customer needs and process capability.

Model for roll out

There does not appear to be one universal model for roll out of Six Sigma amongst the companies that have implemented a Six Sigma programme. However, the Six Sigma Academy advises that there is a general model that is effective and has been adopted/developed by GE. This general model is shown in Table 4.1.

Table 4.1 GE training model

Phase one	Business units select champions and Master Black Belts. The Six Sigma Academy recommends one Champion per business group and one Master Black Belt for every 30 Black Belts
Phase two	Champions and Master Black Belts undergo training. The overriding deployment plan is developed
Phase three	Champions and Master Black Belts, with the assistance of Black Belts, begin identifying potential projects
Phase four	Master Black Belts receive additional training, focusing on how to train other staff
Phase five	Black Belts undergo training and the first projects are officially launched
Phase six	Black Belts begin training Green Belts

Key benefits achieved

Figure 4.2 shows the direct financial benefits achieved by GE over a four-year

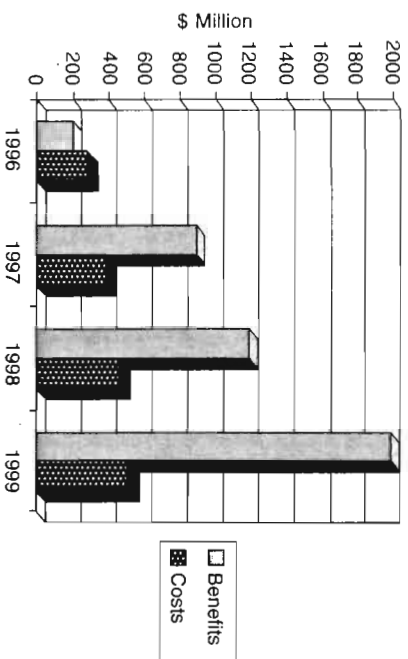


Figure 4.2 Six Sigma payoff at GE.

period. This provides evidence of the very real benefits that are achievable from a Six Sigma programme. With FIT SIGMA™, the next stage is to sustain and to grow the benefits.

At the second level of benefits, where the impact on savings is not direct, the achievements, average per year, include:

- 20 per cent margin improvement
- 12–18 per cent capacity increase
- 12 per cent reduction in headcount
- 10 per cent to 30 per cent capital expenditure reduction.

Some specific examples from business units are:

- GE Medical Systems – in the introductory year there were 200 successful projects
- GE Capital – invested \$6 million over four years to train just 5 per cent of the work force who worked full time on quality projects, and 28 000 quality projects were successfully completed
- GE Aircraft Engines – the time taken to overhaul engines reduced by an average of 65 days
- GE Plastics – in just one project, a European polycarbonate unit increased capacity by 30 per cent in eight months.

Market consultants and analysts have reacted favourably to GE's achievements with Six Sigma. Merrill Lynch is quoted as saying: 'Six Sigma balance sheet discipline plus service and global growth are helping fuel (GE's) 13 per cent earning per share gains'.

On 8 May 2002 GE announced that it will deliver record earnings in 2002 of more than \$16.5 billion, and it comfortably forecast double-digit earnings growth for 2003.

Lessons learned

At one level, to emulate GE maybe considered as being beyond the reach of many companies. It is cash rich, and its business generates over 10 billion dollars per month (\$125.8 billion sales for 2001). It makes real things like turbines and refrigerators, and people buy their products with real money. However, on closer examination there are some strong learning points from the GE Six Sigma programme that can benefit *any* company embarking on a quality programme. These include:

1. *Leadership support.* There is absolutely no doubt from published data that the chief architect of success was Jack Welch. For any organization wanting to change a culture such as is required for Six Sigma and FIT SIGMA, strong unstinting leadership from the top is essential. Likewise, all senior management must be engaged and believe in the philosophy.

2. *Definition of Six Sigma objectives.* The objective is to be world class. World-class companies such as GE recognize that quality initiatives are synonymous with profit enhancement and share price. World class means internal efficiency, best practice and a focus of customer satisfaction. The lesson is that anything less than an ambition to be world class simply won't do.
3. *Development of initial processes and tools.* At GE each problem was defined through measurement and analysis along a five-step DMAIC (Define, Measure, Analyse, Improve and Control) approach, and the use of the seven quality 'tools' of control charts, defect measurement, Pareto analysis, process mapping, root cause analysis, statistical process control, and decision tree diagram. The lesson is that a structured approach has to be followed for Six Sigma process management.
4. *Alignment of Six Sigma with career paths.* At GE, Black Belt status became essential for staff on the fast track for advancement. Black Belts were rewarded with share options (in most companies share options are reserved for senior management). The lesson from this is that recognition has to be given to motivate and retain valuable talent.
5. *Six Sigma and service industries.* The piloting of Six Sigma in GE Medical Systems and GE Capital Services incontrovertibly proved that Six Sigma is not just for manufacturing; the process is equally applicable to all operations, including services. GE has opened the gate for service operations. In western economies, 80 per cent of gross domestic product is from the service sector.

Case study 2: The Dow Chemical Company

The company

The Dow Chemical Company, at just over 100 years old, is widely recognized as a technology-based manufacturing business. With annual sales of US\$28 billion, Dow is the world leader in the production of plastics, chemicals, hydrocarbons, and herbicides and pesticides. Dow is also a leader on performance plastics (adhesives, sealants and coatings). Other products include polyethylene resins for packaging, fibres and films, as well as performance chemicals such as acrylic acid. Dow has recently bolstered its polyethylene operations with the acquisition of Union Carbide, and also produces commodity chemicals (chlorine and caustic soda) and oil-based raw materials. They have customers in more than 170 countries who have a wide range of markets, including food, transportation, health and medicine, personal and home care, and building and construction, among others. Dow has a policy of sustainable development, and uses 'triple bottom-line' results – an approach that measures success by economic prosperity, environmental stewardship and corporate social responsibility. The company has approximately 50 000 employees around