

SIX SIGMA EDUCATION FOR SMALL AND MEDIUM SIZED ENTERPRISES

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Abstract:

Six Sigma improvement projects are increasingly conducted in Brandenburg's SMEs. A brief overview is given on completed projects. Brandenburg's SMEs demand for education in this field. The conceptual structure of Six Sigma training concepts in Germany poses a problem for SMEs, due to the lack of flexibility. SME employees have to allow up to 25 days for this training, which often take place far away. The concept presented herein designs individual on-site training for the needs of regional SMEs. The complex educational content is offered in a modular form, based on the individual level of knowledge. That way a gradual completion of the training is possible without the need to schedule long absences in SMEs. The modular system takes out the "time pressure". This is also an improvement for young professionals with families. After successful completion of a one week intensive training that can be carried out in two blocks, improvement projects are carried out on-site by the new Six Sigma specialists and are instructed by Six Sigma experts. Simultaneously, the corporate network of the Department of Quality Management, BTU Cottbus, is further developed. Network partners are those enterprises, where students conducted improvement projects over the last four years. The student teams are integrated into the training concept. In the future, they will be instructed by the SMEs Six Sigma specialists. This way, students are able to develop business contacts with regional SMEs at an early stage of their studies, contacts that are continuously expanded and reinforced with the help of the corporate network. Should, due to this practice further training needs arise, they can be met in a modularized way through so-called micro-modules. These might comprise, for example, only a few hours. The training concept can be designed individually and aims to enhance the competitiveness of regional SMEs, by means of a university knowledge transfer.

Keywords: Six Sigma, Education, Small and Medium sized Enterprises

1. INTRODUCTION

To achieve competitive advantage in already partially saturated markets, companies must continuously strive to improve the processes within the framework of DIN EN ISO 9001. This presents great challenges especially for small and medium-sized enterprises (SMEs). The skills required by employees to improve these processes are usually not available or are only rudimentarily available. Concepts for the

improvement of processes are literally based on experience and insufficiently known. One conserved practical and accepted approach is provided by the Six Sigma improvement concept. Through the use of statistical methods, it is possible to analyze processes and assess them on the basis of a predictable Sigma Level.

The presented training concept in this paper is committed to the goal of exposing SMEs, especially in the state of Brandenburg, to the methodology of Six Sigma. In this case, knowledge is transferred from diverse improvement projects, which have been carried out within a framework of university events as well as new approaches from research on the concept of training in SMEs. Thus, these SMEs profit directly from research results and findings from other projects.

2. BACKGROUND

Six Sigma is a well-established approach, which tries to design products and services in the most possible faultless manner. Additionally, requirements for processes from the customer's point of view are formulated. Subsequently, statistical analyses are applied in order scrutinize these requirements and to initiate appropriate measures. Thus, Six Sigma follows the objective of continuous process improvement to ultimately achieve error-free processes. Therefore, statistical Six Sigma Level is defined, virtually ensuring a 0-error at the highest level. Additionally, processes for services can be assessed in the same manner [1].

Since the late 1990s, German companies such as Porsche and Siemens are also involved in Six Sigma. Meanwhile, it can be noted that SMEs are increasingly gaining interest in Six Sigma. Thus, it could be observed within a study carried out by BTU Cottbus and TU Berlin, on the state of quality management in Berlin-Brandenburg that SMEs in particular show potential for increasing the performance of the company in the field of process optimization [2].

Basically, Six Sigma can be applied regardless of company size and industry. However, SMEs exhibit special framework conditions with an influence on the implementation of Six Sigma [3]. Thus, the initial investments include direct training cost and a temporary exemption for the training. These exemptions of employees can amount up to 25 days for particular levels in Six Sigma. The training location is not always in the immediate vicinity of the corporate site. Subsequently, employees will have to be partly or fully

exempted from additional duties in order to participate in Six Sigma projects based on their roles in the company [1].

In order to use the tools and methods, selected employees must acquire the necessary qualifications. Within the framework of Six Sigma training programs, the following levels can be distinguished:

- White belt,
- Yellow belt,
- Green belt,
- Black belt [1].

In order to promote the application of Six Sigma methodology in SMEs, it is imperative to define the specific requirements as to develop a customized concept that is suitable for the SMEs.

3. PROBLEMS AND POTENTIALS OF EXISTING PROFESSIONAL TRAINING CONCEPTS

Within the scope of professional training on Six Sigma concepts, there exists a wide range of training possibilities for SMEs. There are a huge number of providers, who partially offer certified trainings in the area of Six Sigma, Figure 1.



Fig. 1: Training facilities for Six Sigma in Germany

It can be seen that, apart from Berlin, the Eastern section of the Country has significant drawbacks regarding coverage of professional training opportunities. An increased concentration of facilities is observed in the West and South of Germany. Due to the growing interest on high quality education and training of employees, especially for SMEs in Brandenburg, there exist chances and opportunities to serve these non-covered areas with professional trainings. The developed concept primarily serves companies within the Berlin-Brandenburg region.

The contents of training models are based on the phases of the Six Sigma DMAIC approach. Here, there is an over-

lap of all the training concepts of the facilities. Differences are only in the degree of detail or specializations.

Table 1: Average cost and duration of training

Established training facilities for obtaining the Six Sigma Green / Black Belt		
Green Belt		
Institution	Duration in Days	Costs
Integrata AG	10	4.950 €
Grundig Akademie	10	5.000 €
Innovensys	10	4.850 €
EAQC Akademie für Qualitätskultur	10	4.300 €
Unisono Training+Consulting GmbH	8	4.050 €
MBtech Group GmbH & Co. KGaA	10	4.980 €
TQU Akademie	5	2.550 €
Universität Augsburg	10	4.400 €
Deutsches Institut für Betriebswirtschaft GmbH	5	2.950 €
TQM Training & Consulting GmbH	10	4.250 €
Incas Training und Projekte GmbH & Co. KG	7	3.900 €
Six Sigma Deutschland	8	4.400 €
Vorest Ag	11	4.990 €
TÜV Süd	7	4.320 €
Average	8,6	4.278 €
Black Belt		
Institution	Duration in Days	Costs
EAQC Akademie für Qualitätskultur	20	8.600 €
Grundig Akademie	20	11.000 €
Integrata AG	20	9.900 €
Alphadi Deutschland	20	6.000 €
TEQ Training & Consulting GmbH	on request	9.000 €
Innovensys	20	9.500 €
MBtech Group GmbH & Co. KGaA	20	9.980 €
Vorest Ag	21	9.990 €
TÜV Süd	20	11.570 €
Average	20,1	9.504,44 €

As shown in Table 1 average green belt training takes 8-9 days for a total of 4.300€. A black belt training lasts about 4 weeks and costs approx. 9.500€.

An advantage of the presented concept is the modularization. The training concept should be divided into modules. This harbors, especially due to local conditions, a not be underestimated incentive for SMEs in the region. For existing training concepts, companies are obliged to exempt their employees for 4 weeks from work. These employees will thus be absent from the daily business processes. Through modularization, there is a possibility to adapt the work plan and workload of the employees to the training modules and to split as well as partly reduce the cost.

4. PRESENTATION OF THE TRAINING CONCEPT

The presented training concept aims at targeted and flexible training offers, on the one hand to promote education and training of employees and on the other hand to improve processes through acquired knowledge, in order to contribute to the competitiveness of regional SMEs. To achieve this goal, the objectives of the concept can be summarized as follows:

- Execution of a requirements analysis and integration of the results into the training concept,
- Optimization and modularization of Six Sigma educational programs to meet the needs of SMEs, in order to increase flexibility and reduce costs,
- Offer different training levels: White Belt, Yellow Belt, Green Belt, Black Belt,
- Support in research and application for funding opportunities of training,
- Integration of research results and new methodologies by a junior research group,
- Parallel development and maintenance of a corporate network.

Overall, the training program will constitute four levels: White Belt, Yellow Belt, Green Belt, and Black Belt. It is imperative to determine what is important in each phase. This requirement analysis takes place under consideration of already existing training concepts of other institutions as well as the results of the requirements analysis.

White Belt

The White Belt training provides information of the employees of a company that has opted to coordinate the Six Sigma improvement programs. The event has an approximate duration of 1.5 hours and is aimed above all at other employees, who are not directly involved in the improvement project so as to deliver an insight to the process and goal of a Six Sigma improvement project.

Yellow Belt

The Yellow Belt training is used to obtain an initial overview of the basic tools and methods of quality management and to apply them in simple examples. This training lasts about two days and is based on the phases of the DMAIC. Additionally, Q7 and M7 are trained in selected case studies. The Yellow Belt training could be carried out within the first two days of the Green Belt training.

Green Belt

A Six Sigma Green Belt training course spans a training period of approximately five days. In the process, the DMAIC phase scheme is covered and individual statistical methods are communicated. Because small companies do not often have special statistical software, training in statistical analyses is performed by using standard software such as Microsoft Excel and R. In order to achieve the Green Belt, SME employees must carry out a process improvement project in their own company after successfully completing a theoretical training. Acquired knowledge can thus be practically applied. The process improvements in SMEs will be conducted by the junior research group of the chair of quality management through coaching. Here, participants have the possibility to pose questions related to their own process improvement projects. These questions will be discussed together with the junior research group and the other participants of the training, thus creating a mutual learning effect.

These projects must be presented after successful completion of the process improvement. Furthermore, a project report is to be submitted and an oral examination must be passed. After fulfilling all the requirements, a Six Sigma Green Belt is awarded to participants.

Black Belt

The Black Belt Six Sigma training will be based on a modular format built upon the Green Belt. Multivariate statistics such as experimental methodology, presentation training and leadership training will be the artifact of the training. Digressions, such as in evolutionary algorithms, will be offered. In this training level, improved statistics software such as Mini Tab® or SPSS® will be used to deal with the complex mathematical methods applied. Through these software trainings, knowledge will be propagated, which can later be applied in the SME in order to easily and quickly generate expertise in process and risk analyses.

The target of the Black Belt training is on the one hand, to communicate in-depth knowledge of the methods within the Six Sigma framework, and on the other hand to impart expertise which can aid employees to generate and guide self-developed projects. For this purpose, leadership competences are required, which will be mediated through the Black Belt training. Within the course quality management, student projects on process optimization in SMEs will be carried out once a year. The participating companies will thus have the opportunity to develop solutions to optimize existing processes together with the students and to get an overview of approaches and methods used in optimization.

At this point the Six Sigma Black Belt training will commence. The employee of the SME participating in the training will be designated a group of students, that he is suppose guide within the framework of the improvement project. Thus, students can acquire advanced knowledge through practical examples of the Six Sigma methodology. Additionally, the participant of the training will be assigned a project team that would support him in editing the improvement project. Through the guidance of others in an improvement project, leadership skills will increasingly be developed and promoted. For this purpose, leadership workshops will be held during the training period, which will specifically highlight leadership requirements within projects. This training level is completed by a written and an oral examination from the contents of the Black Belt as well as a presentation of the improvement project. After validating all the requirements, the Six Sigma Black Belt is awarded.

Modularization

Not all the tools and methods of quality management are equally important for all the training levels. Thus, a modularization is implemented at this point. Based on the needs and special requests, the individual modules will be designed by the junior research group. However, the basic framework remains the same.

Nevertheless, it is possible that SMEs request only single modules. These modules can also be flexibly offered outside the Six Sigma training program. If SMEs complete different modules over a large period of time, there is the possibility to transfer these credits to the total modules. The advantage at this point is that SMEs are not obliged to exempt employee over a long period of time. Thus, this temporal aspect of the training supports the requirements for a family friendly education and training at the university level. Moreover, a region which greatly lacks training programs in the field of Six Sigma will be covered by the BTU training site.

The presented training concept has an upgrade feature, which means, people who are already in possession of Green Belt will only have to complete specific upgrade modules in a Black Belt training program. This leads to a reduction of time and cost with the same quality of training.

Conclusion

Through contact with the SMEs during the training phase, especially in the management of the process improvement projects through coaching, further development of existing network is carried out in order to facilitate a wide cooperation between research and industry. The existing network which includes Chamber of Commerce, HWK, VDI, VWI, QIBB and others will be expanded.

The network already includes a comprehensive number of regional companies interested in professional training programs within the framework of Six Sigma. Furthermore, the network is intended to establish and maintain contact between SMEs and students of BTU Cottbus. This offers students the opportunity to constantly receive information on the developments of SMEs or schedules of informational events as well as trade fairs. Information about job vacancies is also incorporated into the network.

Within the scope of the Black Belt training, improvement projects are to be guided by aspiring Black Belts. Additionally, student groups, from the course quality management, will be assigned to the SMEs. This initial contact between students and SMEs is promoted and deepened through the network. The advantage of this approach is that, students and SMEs already get acquainted with each other, thus obtaining a concrete picture of the nature of the activities, the business environment as well as the range of services that exist. SMEs also benefit from this networking, because they can precisely contact and invite highly dedicated students. In this case, prevailing skills shortage can be counteracted and timely bonding of graduates to regional SMEs can accordingly be promoted.

REFERENCES

- [1] Jochem, R.; Gundlach, C.: Six Sigma – Fehler vermeiden, Prozesse verbessern, Kosten senken. 1. Auflage. Düsseldorf: Symposion Publishing GmbH, 2008
- [2] Herrmann, J.; Woll, R.; Gropp, M.; Burkhard, C. (2005): Anwendung moderner Managementmethoden in Berlin und Brandenburg, IHK-Studie, Frankfurt (Oder).
- [3] Gemeinsame Fachkräftestudie Berlin-Brandenburg: Studie im Auftrag des Ministeriums für Arbeit, Soziales, Frauen und Familie und der Senatsverwaltung für Integration, Arbeit und Soziales, 2010. abgerufen am 31.01.2013 unter: http://www.esf.brandenburg.de/media_fast/667/BB-B_Fachkraeftestudie-lang_2010.pdf.