Six Sigma Diplomacy – The Impact of Six Sigma on National Patterns of Corporate Culture

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Abstract

Purpose: The purpose of this paper is to elaborate on the implications of implementing and applying Six Sigma in countries with different national cultures, especially countries with non-American cultures.

Methodology/Approach: The major part of the research for this paper was conducted during approximately a decade in accordance with the methodology of a 'collaborative action inquiry' (Westlander, 1998), and 'management action research' (Gummesson, 2000) at a global gas turbine company with development and manufacturing sites all over the world. The action research was complemented by a case study of implementing and conducting Six Sigma at major train equipment company with a facility in China. The basic ideas for the paper were described in the author's PhD. thesis (Cronemyr, 2007). The case study in China was described in a M.Sc. thesis (Eriksson and Jakolini, 2013) supervised by the author. The final conclusions of this paper have not been published before.

Findings: The paper shows how to take cultural aspects into account when implementing Six Sigma. Furthermore, it is shown how implementing Six Sigma influences the local (national) culture of the company. Finally it is argued that implementing and applying the structure of Six Sigma within global organizations, taking into account the different cultural aspects defined by the framework of National Patterns of Corporate Culture (Trompenaars and Hampden-Turner, 1997) will enhance understanding and cooperation between people from different national cultures.

Research limitations/implications: Given that the major part of this research was conducted as action research, there are limitations concerning generalizability. Given these limitations, more applications in other settings would be valuable in providing more generalizable results. Still, this paper fills a gap in management research literature between 'general success criteria for Six Sigma' and 'implementing and applying Six Sigma taking cultural context into account'.

Originality/Value of paper: Organizations implementing Six Sigma sometimes do it without adapting it to the local culture and needs which can lead to unsuccessful implementations. In two case studies we investigated how the national cultures influenced the implementation of Six Sigma and how Six Sigma influenced the cultures of the local companies. Our conclusion is that national patterns of corporate cultures should be taken into account to make international cooperation with Six Sigma possible and effective and that it also will strengthen the local companies. This paper contributes to the knowledge of how to implement Six Sigma, taking cultural aspects into account, which is seldom mentioned in lists of success criteria for implementing Six Sigma.

Keywords: Six Sigma, Implementation, National Culture, Corporate Culture

Category: Conceptual paper based on case studies

Introduction

The improvement methodology of Six Sigma is a mix of Japanese and American influences. Motorola took the improvement methods of Japanese companies and moulded them into an American 'hit-the-target' project management model (Chadwick, 2007). While several American companies had failed with 'Japanese' TQM initiatives, many of the companies that adopted the more American Six Sigma methodology were a huge success in the 1990s. Today Six Sigma has become an integral part of many organisation's management culture (Antony and Banuelas, 2002).

European companies tried to follow the success of the American Six Sigma implementations, but there was resistance from some companies and scholars, who preferred the 'Japanese' TQM methods already in use to the new 'American' Six Sigma approach. They felt that 'soft' customer relations were given lower priority than 'hard' business benefit results. Six Sigma was 'too American'. Eventually something called 'European Six Sigma' emerged, claiming to be 'softer' in its design (Magnusson, Kroslid and Bergman, 2003).

So what are we talking about here? Japanese, American and European cultures; Are these relevant to implementing such a well-structured improvement methodology as Six Sigma?

From our own experience we found that the national culture seems to influence the way Six Sigma is implemented and applied. In cooperation within global companies acting in several countries, this would probably need to be considered.

The purpose of this paper is to elaborate on the implications of implementing and applying Six Sigma in countries with different national cultures, especially countries with non-American cultures.

The research questions that we investigate in the analysis of the conducted case studies are:

- How do *national cultures influence* implementation and application of Six Sigma?
- How could *understanding of national cultures* help to implement and apply Six Sigma in international cooperation within global companies?
- How do implementation and application of Six Sigma in international cooperation within global companies *influence the national cultures*?

We would like to put forward the following somewhat frivolous question, summarizing the three research questions:

- Could 'Six Sigma diplomacy' be used to enhance understanding and cooperation between people from different national cultures?

Methodology

The research for this paper was conducted during approximately a decade in accordance with the methodology of a 'collaborative action inquiry' (Westlander, 1998), which seeks to integrate the social sciences with organizational knowledge to generate actionable scientific knowledge. It is also described by Gummesson (2000) as 'management action research'. The major part of the development work was carried out at a global gas turbine company with development and manufacturing sites all over the world, where the author was employed during thirteen years as a Business Excellence Manager, Black Belt and eventually Master Black Belt, implementing and conducting Six Sigma in several countries. The action research was complemented by a case study, by two Swedish M.Sc. students, of implementing and conducting Six Sigma at major train equipment company with a facility in China. The basic ideas for the paper were

described in the author's PhD. thesis (Cronemyr, 2007). The case study in China was described in a M.Sc. thesis (Eriksson and Jakolini, 2013) supervised by the author. The final conclusions of this paper have not been published before.

Theory and previous research

Six Sigma

The widespread process improvement methodology of Six Sigma was introduced by Bill Smith at Motorola in the 1980s (Chadwick, 2007) and made famous when implemented by John F. 'Jack' Welch at General Electric (GE) in the 1990s (Eckes, 2001). Based on Japanese improvement methods, Six Sigma was designed to fit an American corporate culture. Since then, Six Sigma has spread far and wide and is now used by many companies around the world. Even though Six Sigma is a very structured method, each company has to adapt it to adopt it as something that fits the culture of the specific company and country.

Six Sigma is in essence a structured way of solving problems in an existing process based on analysis of real process data, i.e. facts (see e.g. Magnusson, Kroslid and Bergman, 2003). Motorola called the procedure MAIC, which at GE became DMAIC, for Define, Measure, Analyse, Improve and Control; for the phases of the Six Sigma process. One could argue that DMAIC is nothing new but a set of long well known tools but, on the other hand, without Six Sigma these tools would probably still be in the possession of a limited number of people. What makes DMAIC into something new is rather the structuring of the individual tools to the process itself, which is basically the Shewhart cycle (Shewhart, 1931, 1939), also known as the PDSA cycle for Plan, Do, Study, Act (Bergman and Klefsjö, 2010), put into the context of a project management model. The DMAIC process may also be regarded as a short version of the Quality Story which was developed in Japan in the 1960s (Dahlgaard et al., 1998; Dahlgaard and Dahlgaard-Park, 2006).

Six Sigma is often referred to as a 'statistical method' (i.e. a quantitative method), because decisions are made on the basis of statistical analysis of quantitative data. That is only one part of the truth. Another part that should not be forgotten – especially in Six Sigma implementation and training – is that, without qualitative methods, Six Sigma does not work. The alternate use of quantitative and qualitative methods in the DMAIC process is described below.

The Define phase and the beginning of the Measure phase are mostly qualitative. A problem to be solved needs to be formulated from people's experiences. Sometimes quantitative data from process evaluations are used. The rest of the Measure phase and the beginning of the Analyse phase are mostly quantitative. It is here where the statistical analysis takes place, *but* the statistical analysis does not by itself reveal the underlying root causes. It rather indicates where to look deeper into the problem. If, e.g., a correlation between two variables has been found, the Six Sigma team still needs to discuss, by using e.g. an Ishikawa diagram, what the possible underlying root causes may be, and how these could be avoided. Hence, the rest of the Analyse phase and the Improve phase are mostly qualitative, even though causation – not only correlation – should always be quantitatively verified before starting improvements. Finally, the Control phase is mostly quantitative since the improved process is measured and monitored.

To be a Black or Green Belt, i.e. a Six Sigma project leader, you must master both the quantitative and the qualitative approaches, and use a combination of these. In this respect it is very similar to pragmatic research. The use of qualitative methods to find the root causes in the Analyse phase is very similar to what the pragmatist John Dewey wrote. "*Suggestion is the very heart of inference; it involves going from what is present to something absent. Hence, it is more or less speculative, adventurous. Since inference goes beyond what is actually present, it involves*

a leap, a jump, the propriety of which cannot be absolutely warranted in advance, no matter what precautions be taken." (Dewey, 1910). One can see the influences of Dewey, which via C. I. Lewis inspired Shewhart and Deming to develop the PDSA cycle (Mauléon and Bergman, 2009). It later evolved into the Six Sigma process DMAIC.

Originally, as developed by Motorola, the Six Sigma methodology was mainly based on statistical analysis with the aim of reducing variation in process outputs, typically to a 'process sigma' of six, corresponding to a defect level of 3.4 defects per one million opportunities. (A 'process sigma' of six corresponds to 4.5 standard deviations due to Motorola's introduction of 'the 1.5 sigma shift' for long term variation of the mean.) Still today, emphasis is put on the statistical tools when conducting DMAIC training, some of which are quite complicated to learn and use correctly. But Six Sigma has evolved and today it is also used to improve processes where there are limited amounts of data to analyse. As applied at General Electric (Eckes, 2001), and used by many other companies, this type of approach is called the 'process door' as a contrast to the traditional 'data door' approach. In the 'process door', even though quantitative data may be limited, there are often qualitative facts to analyse; but once the root causes have been found, they still need to be verified quantitatively by some experiment or investigation.

At the beginning companies were primarily using DMAIC to improve their manufacturing process. Still today, some people associate the word 'process' directly with manufacturing. Since then the usage has spread to all types of business processes and today many see Six Sigma as something much more comprehensive than just an improvement methodology. In some companies it has become a business strategy of top management (Antony and Banuelas, 2002).

Implementing Six Sigma

The success factors in the introduction and implementation of a Six Sigma program in a company have been investigated by several authors. In a literature review Schön (2006) found success factors, suggested by Henderson and Evans (2000), Goldstein (2001), Pande et. al. (2000), Antony and Banuelas (2002) and Sandholm and Sörqvist (2002). Schön compared the suggested success factors and found extensive overlap. Fourteen success factors were selected. Furthermore, the importance of the fourteen suggested success factors was ranked in a study on how Six Sigma had been implemented in three major Swedish companies: Volvo Cars, Ericsson and SKF. Schön's ranking was based on how frequently the success factors were mentioned by the respondents at the companies.

The six success factors that were found to be most important were (Schön, 2006):

- Management commitment
- Focus on Training
- Project selection
- Strategy for implementation
- Linking Six Sigma to business strategy
- Focus on results

In their book "Leading Six Sigma" Snee and Hoerl (2002) compare very successful and less successful case studies of Six Sigma implementations and identify the following attributes as characteristics of the successful companies:

- Committed leadership
- Use of top talent
- Supporting infrastructure

As a contrast, the less successful companies had only 'supportive' leadership that did not really believe in Six Sigma; whoever was available was appointed Black Belt; and there was no supportive infrastructure, i.e. no formal project selection process, no formal project review process, only part time resources, and no integration with the companies' financial systems (Snee and Hoerl, 2002, p. 43).

In our own research we found the following success factors for implementing Six Sigma at a major gas turbine company (Cronemyr, 2007) which corresponds very well to what have been given in the literature:

- Management commitment
- Supporting infrastructure
- Adaptation to local organisations' situation and needs
- Project selection and methodology selection
- Use of talented full-time resources

There are no controversies about this. Everybody seem to agree that without these conditions you will not succeed with a Six Sigma implementation (see e.g. Henderson and Evans (2000); Pande, Neuman, and Cavanagh (2000); Goldstein (2001); Antony, and Banuelas, (2002); Sandholm, and Sörqvist, (2002); Snee and Hoerl (2002); Bergman, and Klefsjö (2010); Magnusson, Kroslid, and Bergman (2003); Schön (2006)).

In addition, the following success factors for implementing Six Sigma were also identified in the gas turbine company case study, but here it is unclear whether the literature suggests these success factors. They have been mentioned, but only sporadically:

- Committed driver (mentioned by Magnusson et. al. (2003))
- Learn from history (mentioned by Schön (2006))
- Coaching (mentioned by Snee and Hoerl (2002))
- Middle management involvement (mentioned by Schön (2006))
- Take psychological aspects into account (mentioned by Antony and Banuelas (2002) and Wiklund and Sandvik-Wiklund (2002))
- Take cultural aspects into account (mentioned by Sandholm and Sörqvist (2002) and Schön (2006))

Here, for the first time in the lists of success factors, the word *cultural* appears. What do we mean by culture?

National patterns of corporate culture

To understand the concept of culture you first have to leave your own culture and experience someone else's. When still in the culture you were raised and work, you will not take notice what behaviour is culturally determined and what is not. Trompenaars and Hampden-Turner (1997) state "*Culture is like gravity: you do not experience it until you jump six feet into the air.*", or in other words; culture is not something you think of until you leave your own.

The first thing you notice when coming in contact with a new culture is not the set a values or the rich history, it is the basics like; food, clothing and language. That is because culture exists in different layers illustrated in Figure 1. The outer layer consists of explicit culture that is observable; food, fashion or art for instance and even specific gestures. Norms and values, the second layer, defines "right and wrong" (from norms) along with "good and bad" (from values). Norms can be laws or an understanding within a social group and can be manifested in a feeling of how one should behave (Lenkeit, 2013). Values can be seen as targets for how to behave. For example; if there is a queue a European person will automatically stand at the end of it (norm). If the person is asked why he did that the answer might be "I don't want to upset the other people in the queue" (value). The norms must reflect the values or it is likely that there will be tension and instability in the society (Trompenaars and Hampden-Turner, 1997).

The core in in our culture can be described by people's basic assumptions. A good way to test if something is a basic assumption is to ask "Why?" and observe the reaction. If the person gets annoyed or confused a basic assumption has probably been found. The reason for this reaction is simply that the answer to him or her is so obvious that no one should even ask the question.

The layers (Figure 1) describe the order in with a culture is experienced; outside-in, from explicit to implicit.

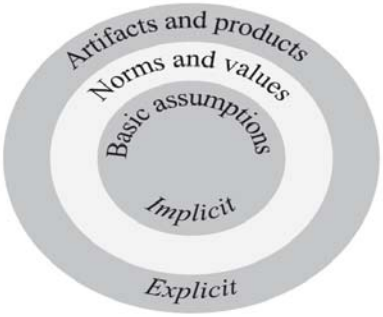

Figure 1 – Cultural layers (Trompenaars and Hampden-Turner, 1997)

Trompenaars uses a two-dimensional model (Figure 2) to describe national patterns of corporate culture (Trompenaars and Hampden-Turner, 1997). The model uses two scales – 'status' from egalitarian to hierarchical and 'orientation' from person-oriented to task-oriented – to separate four different archetypes of corporate culture. These are (counter clockwise from lower left):

- *Power-oriented culture – 'Family'*

  Description: Family relations with an experienced 'father'. Work for the good of the group. Individuals are important parts of the family.

  Examples: Japan, China, India, Spain.

- *Role-oriented culture – 'Eiffel tower'*

  Description: Centralised collective effectiveness with a focus on reaching the goals of the business unit. Individuals should not be singled out.

  Examples: Germany, Netherlands.

- *Project-oriented culture – 'Guided missile'*

  Description: Everything is aimed at achieving a strategic target, conducted in small project teams with less top management control. Celebrate individuals' achievements related to the common goal.

  Examples: USA, UK.

- *Fulfilment-oriented culture – 'Incubator'*

  Description: The organisation should serve as an incubator for the individuals' self-fulfilment with minimal hierarchy. As individuals grow, so does the organisation.

  Examples: Sweden, Norway, Canada.

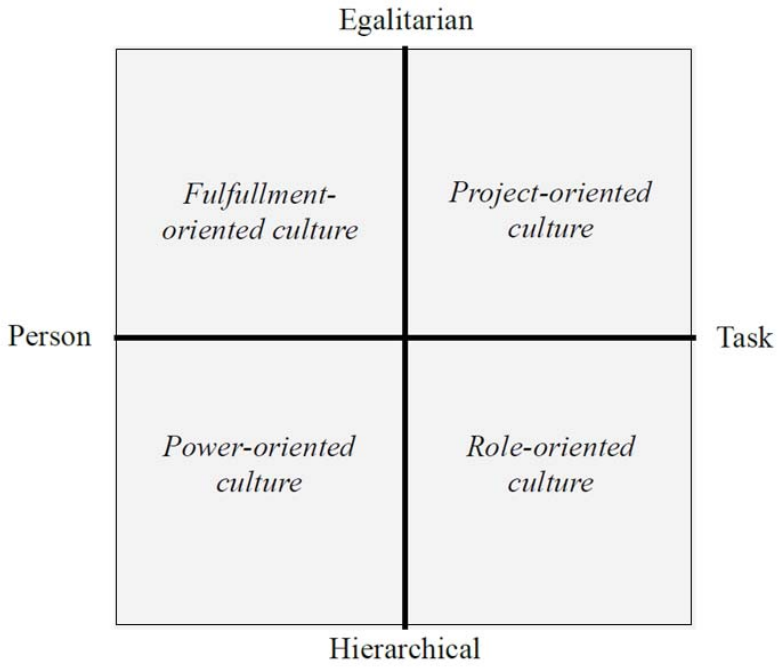

Figure 2. National patterns of corporate culture (Trompenaars and Hampden-Turner, 1997)

Hofstede (1980) uses other dimensions of culture; power distance and individualism. He writes about the power relationships between manager and employee where he explains that in some countries (including China) some employees believe in their superior's decision making solely upon that superior's position of power. Unlike western countries, e.g. USA and UK, where skill and quality of leadership is the key factors for being a good manager, this is because of the culture differences between Asia and West. Successful work in a Chinese business environment will mostly depend on the willingness for a westerner to accept a different role of authority, and the other way around for Chinese people. This connects with Hofstede's second dimension of culture, individualism, which in this case correlates good with; High individualism – low

power distance (West), Low individualism – High power distance (Asia/China), in other word collectivism.

In China it is more important to feel that you belong and contribute to something (a group) rather than achieving personal gain and even sometimes neglect individual career opportunities if it somehow impacts the group in a negative way. In western countries the individualism is high and the personal role to the group is not seen as an extension of the group but instead a part of something, such as the company and the role in the company. (Triandis, Brislin and Hui, 1988). Furthermore, particularistic societies such as China have a strong tendency to divide people in into two categories; people they know and trust (in-group) and strangers (out-group). The treatment of the two groups is very different and that explains why it is hard to do business with Chinese people before reaching personal trust and solidarity to the group (Chang and Holt, 1991).

Face in the metaphorical sense is a universal phenomenon existing in all cultures. In terms of communication the importance of face describes the degree of indirectness of communication between people. In cultures like China face plays an important role where communication between people is different depending on the level of trust and if the information exchange is in-group or out-group. Since social status and prestige are major sources of face in China, enhancing and saving face are as important as causing people to lose face. For a Westerner this can sometimes be a problem in terms of communication where the communication is direct without any intention of hurting the person receiving it (losing face). For a Chinese it is the opposite, the information shared is indirect and carefully communicated so it would not lose someone's face. (Bond and Lee, 1981; Eriksson and Jakolini, 2013).

Implementing Six Sigma in a non-American culture

Implementing Six Sigma is an endeavour of change. Several authors have stressed the importance of taking the culture and context of the company into account instead of recommending silver bullets that could be used anywhere.

Klefsjö, Bergquist and Garvare, (2007) think that the difficulties of implementing methods within Quality Management have been dealt with in too sketchy a manner by many of its proponents. They argue that it is not certain that Six Sigma, with its American background, could seamlessly suit organisations in other parts of the world, or even suit the culture of a neighbouring firm in similar branches.

Sandholm and Sörqvist (2002) feel that a standardised approach can lead to a nonoptimised program. "*Relevant conditions such as the employees' level of training, attitudes and working climate, as well as the company's financial situation and management's commitment and knowledge will also help determine the design of a Six Sigma program. Even factors like country and culture can be important.*" (Sandholm and Sörqvist 2002, p. 20).

Crom (2000) and Schön (2006) have used Trompenaars' model of archetypes, or national patterns, of corporate culture (Trompenaars and Hampden-Turner, 1997), see Figure 2, to describe how national cultures influence a Six Sigma implementation.

Schön (2006) used the model to classify three major Swedish companies: Ericsson, Volvo Cars and SKF. She found that, while Ericsson had a fulfilment-oriented culture, i.e. a 'Swedish culture' according to the model, Volvo Cars (owned by the American company Ford) and SKF had more project-oriented cultures.

Steve Crom (2000) elaborates on the cultural aspects of implementing Six Sigma in Sweden: "*To a Swede, an organisation is a vehicle through which the individual expresses him- or her-*

self and can realise his/her full potential. It is an incubator. To generate enthusiasm for Six Sigma, one must anticipate the question, "How will Six Sigma help me be more creative?" The answer is, "When half of today's problems are avoided through better processes, you will have more time to be creative!" Six Sigma frees up the capacity of individuals to grow and learn. Its success depends on it." (Crom, 2000)

Crom concludes: "*Six Sigma is universally applicable, though how one communicates the purpose of it and implements it should differ depending on the predominant national culture. Companies operating in Europe should beware of implementation approaches that are based on a U.S.-style emphasis on the capability of talented, well-trained individuals to get results 'no matter what it takes'.*" (Crom, 2000).

Magnusson et al. (2003) discuss the reasons why Six Sigma has not achieved the same high level of attention and deployment in Europe as in the USA. Two of the reasons – related to culture – are:

- "*There is an evident mistrust and lack of interest by senior management and other stakeholders to apply yet another improvement strategy of US origin*", and
- "*There are some implementation aspects of Six Sigma that work well in the US but may be at odds with the European cultures and management styles.*" (Magnusson et. al., 2003, p.28).

To sum up, one should be conscious that Six Sigma is American in its design and that it may not always fit in companies with other cultures without some adjustments.

Case studies of implementing and using Six Sigma

In this paper we analyse the results from two major case studies of implementing and using Six Sigma. The first was conducted globally during several years in a major gas turbine company. The second was smaller in scale and was conducted as a M.Sc. thesis project during half a year at a major train equipment company with a facility in China.

Naturally there were many interesting observations and learning points of many different types from these research endeavours but in this paper we are only presenting some of the findings related to the cultural aspects.

One important aspect of studying cultural differences is not to judge or rank cultures as better or worse in any sense, but only to describe differences. As mentioned before, to describe one's own culture is difficult. Hence the findings given below are mainly based on differences identified from when it became apparent that there were misunderstandings or differences in opinions and values.

More detailed descriptions of the case studies can be found in Cronemyr (2007) and Eriksson and Jakolini (2013).

Experiences from implementing and using Six Sigma in a major Gas Turbine Company in Sweden, Germany, UK and USA

The major research for this paper was conducted as action research at a major gas turbine company during 2001 to 2007. The author was employed as a manager of Business Excellence, a Black Belt and eventually a Master Black Belt (MBB) responsible for implementing and conducting Six Sigma globally. As in many global companies, the management structure was rather complex and will not be described in detail here. Simply put, the main office of the company was in Germany but the division under observation was managed from Sweden, so the home

base was located in Sweden with company (division) sites in many countries. The most active sites were located in Sweden, Germany, UK and USA. Other locations were UAE, Russia and Netherlands.

In the beginning Six Sigma projects were mainly conducted on a local level in one country. Even so, they were followed up on a global level, so-called Six Sigma management. After some years Six Sigma projects were also conducted across the business, involving several countries.

On one occasion in a Six Sigma management web conference the author presented Trompenaars' model to the colleagues in Germany, USA and UK and said "*now do you understand why we don't understand one another?*". As one could expect, presenting a scientific paper did not give an immediate response, but there was an awareness of the differences based on some earlier experiences. Some of them are given below.

The Americans had been using Six Sigma somewhat longer than the colleagues in the other countries, who in turn had been trained by American Six Sigma training consultants. So, there should not be any real differences, but there were.

In USA, UK and in Germany there was much focus on 'hard savings', while in Sweden (at least in the beginning) most projects focused on 'soft savings'. Swedish projects were often focusing on improving customer satisfaction or employee satisfaction or improving the relations to sub suppliers. Swedish management considered these projects to be 'strategically important' but they were very difficult to translate into business benefit on the bottom-line results. When the Swedes were 'forced' into estimating the business benefit from these projects, the numbers were sometimes zero and sometimes very high, based on loose assumptions. The colleagues from USA, UK and Germany were not impressed. Furthermore, when a project resulted in reduced number of man-hours needed for a certain process or task, it was requested in Germany, UK and USA that the reduction was turned into 'real' reduction of labour-costs, otherwise the reduced time was only turned into 'more coffee breaks' (which they thought Swedes had enough of already). As a contrast, in Sweden the reduced time needed did not lead to lay-offs but instead 'time to do more and better' but that was not as easily translated into hard savings. A clear difference between Sweden on the one side and Germany/USA/UK on the other side. Later, Swedish projects were focusing more on hard savings while German, British and American projects accepted soft savings.

Another clear difference was between Germany on the one hand and USA/UK/Sweden on the other. This time it was about the scope of the projects. Sometimes Six Sigma projects has a tendency to have a very narrow focus, while in its original scope, a complete cross-organisational process should be analysed and improved from a customer's point of view. German projects often optimized the output from a certain department, instead of a broader process involving many departments. This was brought into attention from Swedes but German managers considered their department to be 'their process' and the German employees seldom argued with their managers. After some time though, German projects were getting broader in scope, but still with many structural obstacles like e.g. "*Who will get the bonus for the improvement?*".

Yet another cultural difference was how to implement the roles of Six Sigma. Strangely enough, the roles in Six Sigma are very hierarchical. Strange, because USA – the origin of Six Sigma – is not considered to be very hierarchical but it is clear the roles were influenced by the hierarchical Japanese culture they were trying to copy. The roles in a Six Sigma project are, from top to bottom: MBB, Black Belt, Green Belt and Team Member; while in Six Sigma management the roles are: Champion, Sponsor, Process owner and Business Controller/Analyst. In the very egalitarian (i.e. non-hierarchical) Sweden, as one could expect, these roles were very hard to implement. Swedes are not supposed to 'be someone' leading to people feeling stupid and be-

ing ridiculed by colleagues if they were appointed as a 'Belt' of some kind. Naturally, the roles of Six Sigma were implemented without any problems in Germany. After a couple of years the roles became 'naturalized' in Sweden while the hierarchies in Germany (at least in Six Sigma projects) were somewhat flattened out.

Experiences from implementing and using Six Sigma in a Train Equipment Company in China

In early May of 2012 two Swedish M.Sc. students (see: Eriksson and Jakolini, 2013) at Linköping university (supervised by the author of this paper), contacted a Canadian company in China and offered to help with improving quality at their production facility by implementing and conducting a Six Sigma project. In return they would get help with their thesis project. After discussions by email and telephone the general manager, who was Swedish, along with the head of quality agreed to let the students conduct the thesis project on their site.

The Canadian company started its business in China in 1997. The facility is responsible of producing electrical motors for trains. It started production in October 2009. Since then production has been steadily ramped up and planned to reach its full capacity in the middle of 2013.

The general manager of the site was Swedish, some managers were German and French, while the majority of the managers and all employees were Chinese. Most employees that participated in the Six Sigma project were Chinese. The impressions of the students were that the company had a very Chinese culture, not to any great extent affected by Canadian, Swedish, German or French cultures. Of course, that was the subjective views of two Swedes.

The Chinese facility had built its quality improvement work around inspections and had no communicated strategy how to find and solve root causes. That meant that Six Sigma would be a giant leap forward. The case study showed that implementing Six Sigma in such an organization can be a challenge but not in any way impossible.

Although Six Sigma is a well-known method within the Canadian company and several employees were trained the view on what a Six Sigma project consisted of and what it should result in varied greatly between individuals. One common opinion was that a project should be completely driven by numbers and statistics and there was no room for qualitative data. This led to lengthy discussions with the team during the case study because the amount of quantitative data to analyse was very limited. A contributing factor to this issue might have been that the opinions of the blue collar workers were not valued high enough. To solve this, the students explained and gave concrete examples of the importance of getting information from the people working with and in the processes. This gave the quantitative data more credibility in the project. It certainly increased the process awareness among the employees who were used to think in matters of the hierarchical organization.

Many of the misunderstandings between the students and the team had less to do with the language they communicated in (i.e. English) but more how they communicated. For example, when a team member was asked in front of the team if he could finish his task on a specific day the answer was always "*Yes*" but that did not mean that task would be done by that day. It just meant that the team member did not want to lose face in front of the team when questioned. This kind of reaction was expected since Chinese people value the personal relation higher than the business itself. This created friction within the team several times, team members saying yes to everything but delivering half of what they had promised. As the Swedish project leaders trusted the team members' word and planned accordingly to what they said and when only half the work was done when it was supposed to be finished, problems occurred but the most important was to maintain harmony in the group.

A similar issue was the role and the authority of a local manager, who participated in the team. When the Swedish students asked the manager a question in front of the other team members, they unknowingly put him in a very bad spot. They just asked questions in a rather Swedish style, "*Do you know why…?*" in an investigative style, trying to get to the root cause of the problem. Even though the students were quite young, they were considered older than they actually were (due to height and beard). Also, the fact that they were foreigners, gave them authority and made them appear like 'managers from corporate functions', even they were not. All put together, when the local manager could not answer the question, he was humiliated and lost face in front of the other employees. The Swedes were naively ignorant of this until later, when they had to try to repair the damage. Even so, after a while the team, including the manager, 'loosened up' a little and found themselves more comfortable with this less hierarchical way of working.

Analysis and Discussion

We will now analyse the experiences from the case study in the light of the theories of Six Sigma and National Patterns of Corporate Culture.

Interpreting the experiences based on National Patterns of Corporate Culture

Using the experiences from the case study, we now classify the studied countries according to Trompenaars' model of national patterns of corporate culture.

In the study,

- Sweden was person-oriented and egalitarian, hence a Fulfilment-oriented culture,
- UK and USA were task-oriented and egalitarian, hence Project-oriented cultures,
- Germany was task-oriented and hierarchical, hence a Role-oriented culture,
- China was person-oriented and hierarchical, hence a Power-oriented culture.

So, no new findings here, other than that Trompenaars' model fits very well to the experiences of the case studies, i.e. it is correct. That is off course for the over-all classifications of the national cultures.

We would also like to see if there are any specific Six Sigma issues related to the national cultures and whether implementing and using Six Sigma has had any impact on the cultures of the companies in the different countries.

Extending the model for Six Sigma

Trompenaars' model does not mention Six Sigma, it is more general in scope. In the applications of Six Sigma we saw that task-oriented cultures (Germany, USA and UK) were more focused on internal business benefit, what we call 'hard savings', while the person-oriented cultures (Sweden and China) focused more on maintaining and improving relations; what we call 'soft savings'. Since the original American design of Six Sigma emphasizes the savings from a project in dollars – from the business benefit estimation in the Define phase as the rationale of the project all along to the proved business benefit in the Control phase as 'hitting the target' – it is not easy to justify focusing on customer, employee and supplier relations, as long as it does not directly decrease costs or increase profits. In person-oriented cultures it is natural but in task-oriented cultures it is something that you have to accept.

We also saw a clear difference in the scope of the projects between hierarchical cultures (Germany and China) where the scope is narrow, limited to the local organisation, and the egalitar-

ian cultures (Sweden, USA and UK) where broader processes crossing organisational boundaries were analysed.

Hence we could extend the model – for use in understanding application of Six Sigma in different cultures – to include 'hard/soft savings' on the x-axis and 'organisational/process focus' on the y-axis. This might help Six Sigma practitioners cooperating over boundaries, to understand one and other.

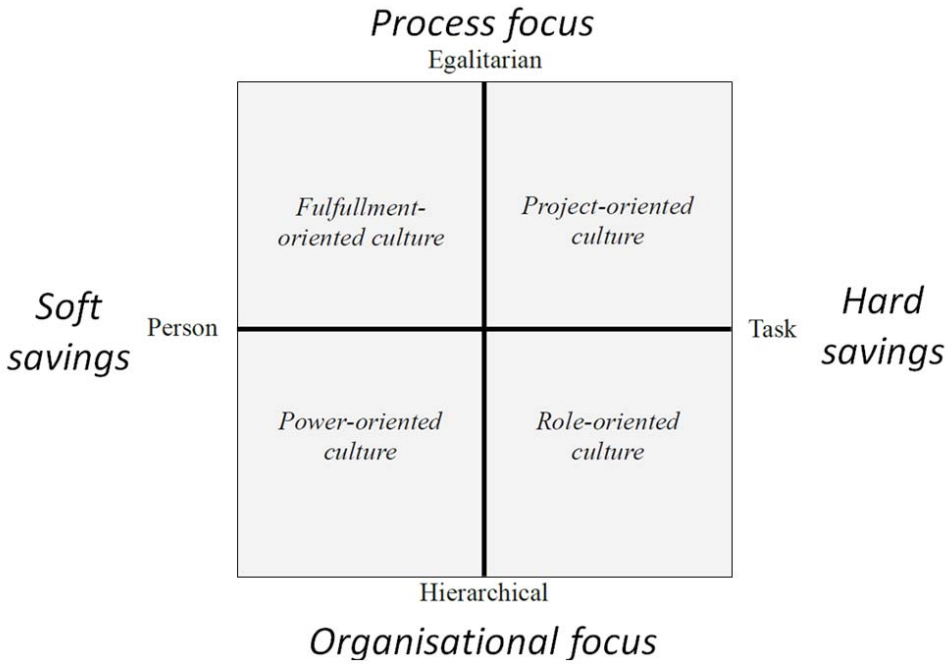

Figure 3. Focus areas of Six Sigma projects, mapped on Trompenaars' model for National patterns of corporate culture (adapted from Trompenaars and Hampden-Turner, 1997)

The impact and evolution of TQM and Six Sigma

As mentioned in the introduction, Six Sigma is a mix of Japanese and American influences. Improvement methods of Japanese companies were moulded into an American 'hit-the-target' project management model. Many American companies, including Motorola had tried to apply 'Japanese' TQM initiatives, but failed to 'make it work' in the American culture. It is clear that the Japanese and American corporate cultures are very different so it is not surprising. Still, TQM was a great inspiration for developing Six Sigma.

On the other hand, when Six Sigma became a success in the USA, many companies in other countries with other national cultures tried to implement Six Sigma, and that did not always work out-of-the-box. Depending on the level of difference to the American culture, Six Sigma had to be adapted to the local cultures to be adopted by the local companies. In many countries, e.g. Sweden and Germany, TQM had already been implemented more successfully than in the USA, but also with different adaptions to fit the local culture. When first implementing TQM and then Six Sigma, the results in the different countries – as we could see in the case studies –, not surprisingly, looked quite different. It is necessary to realise this when trying to cooperate across cultural and national boundaries.

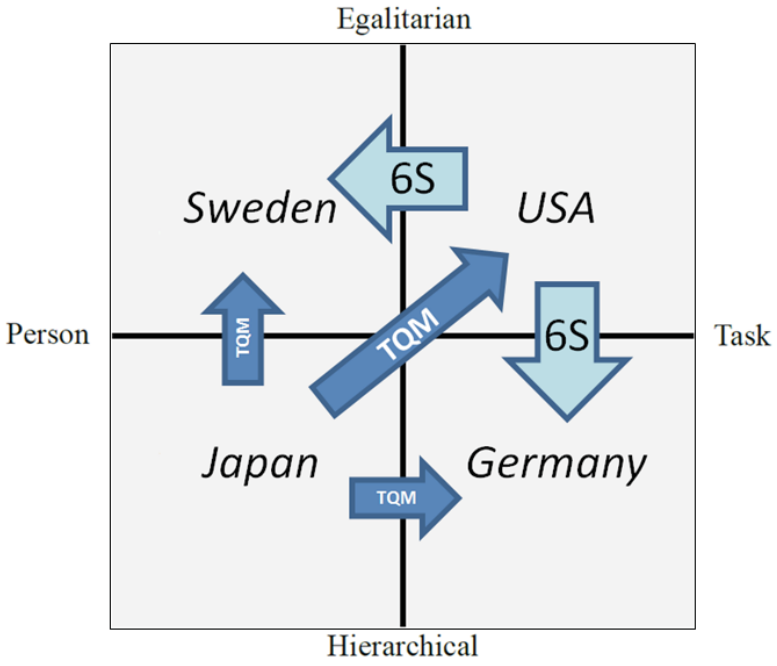

Figure 4. The impact and evolution of TQM and Six Sigma, mapped on Trompenaars' model for National patterns of corporate culture (adapted from Trompenaars and Hampden-Turner, 1997)

The impact of Six Sigma on the Culture

We have seen that Six Sigma has to be adapted to the local culture to work. When we are talking about adaptions, it is really just minor or contextual adaptions. We have not identified any need to change the basic DMAIC cycle and the ways different tools are used. In that sense, Six Sigma is robust and well-structured.

What we have seen though, is that implementing and using the robust and well-structured Six Sigma, sometimes causes changes of the national culture, what we call 'cultural drift towards the middle' – meaning the middle of Trompenaars' model.

Below some examples from the case studies are given. The company(s) in…

- Sweden had to focus more on 'hard savings' which made them more task-oriented.
- Germany, USA and UK had to accept 'soft savings' which made them more person-oriented.
- Germany broadened their scope outside their department making them more process focused and somewhat more egalitarian.
- Sweden accepted the 'hierarchical' roles of Six Sigma making them more hierarchical.
- China went from inspection to Six Sigma, which was a major step in quality management, making them more task and process-oriented.
- China adapted to a less prestigious way of communicating, making them a little bit more egalitarian.
- Sweden, or rather the Swedish people in China, had to adapt the Chinese way of communicating to be more hierarchical.

So what we see is that all countries using Six Sigma in some sort of international cooperation experience a 'cultural drift towards the middle'.

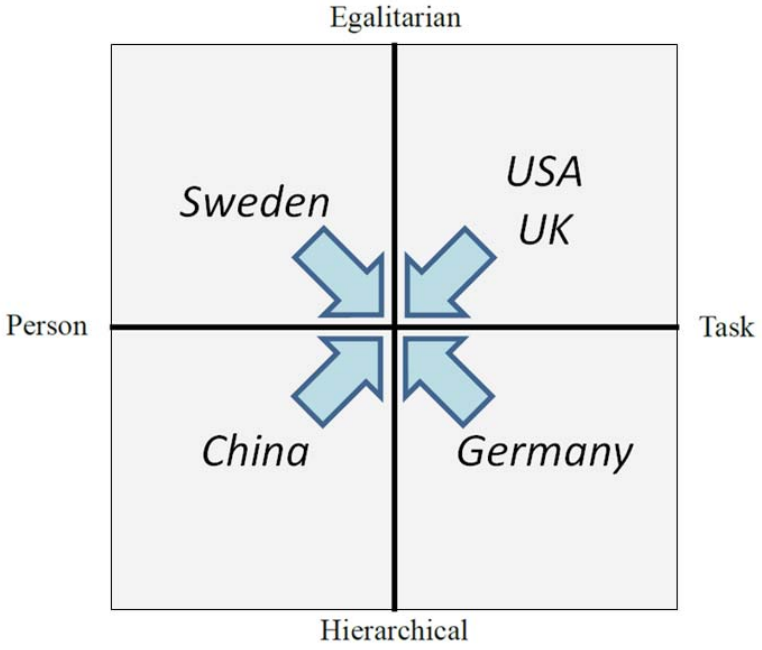

Figure 5. The impact of Six Sigma on culture, mapped on Trompenaars' model for National patterns of corporate culture (adapted from Trompenaars and Hampden-Turner, 1997)

Conclusions and future research – Towards Six Sigma Diplomacy

Conclusions of the paper

Revisiting the research questions of the paper we conclude the following.

How do national cultures influence implementation and application of Six Sigma?

Depending on if the culture of the company is a Fulfilment-oriented culture, a Project-oriented culture, a Role-oriented culture, or a Power-oriented culture, will have an impact on the way the company will implement and conduct Six Sigma. There will be more or less focus on hard/soft savings and organisational/process scope. We have also seen how the evolution of Six Sigma, with its roots in Japan, via the USA and spread to many other countries have been influenced along the way by the local cultures.

How could understanding of national cultures help to implement and apply Six Sigma in international cooperation within global companies?

The raising of awareness in issues concerning cultural differences between colleagues from other countries than your own has been very beneficial to the participants. As seen in the case studies, misunderstandings and differences in scope and priority have been easier to deal with.

How do implementation and application of Six Sigma in international cooperation within global companies influence the national cultures?

Six Sigma is a structured approach to quality improvement activities. This structure is a common banister for all to hold on to when using Six Sigma in international cooperation projects. In doing so, sometimes small changes of the national culture have been made. We all experience a 'cultural drift towards the middle'.

Due to this evolution we now understand one another much better, and cooperate better than before. This is the consequence of cooperating in a global organisation; cultural differences languish. Six Sigma only provides the structure.

Could 'Six Sigma diplomacy' be used to enhance understanding and cooperation between people from different national cultures?

Based on the results presented in this paper we define 'Six Sigma diplomacy' as implementing and applying the structure of Six Sigma within global organizations, taking into account the different cultural aspects defined by the framework of National Patterns of Corporate Culture. With that definition, the answer to the concluding somewhat frivolous question, is a serious *yes*.

Research implications and future research

Given that the major part of this research was conducted as action research, there are limitations concerning generalizability but, as generalizability is not the main purpose of action research, the outcome of the case studies were clear and helpful for the participating organizations. Given these limitations, more applications in other settings would be valuable in providing more generalizable results.

Still, it is our opinion that this paper fills a gap in management research literature between 'general success criteria for Six Sigma' and 'implementing and applying Six Sigma taking cultural context into account'.

Managerial implications

Organizations implementing Six Sigma sometimes do it without adapting it to the local culture and needs. Often, in major global organizations Six Sigma, and other initiatives with 'flavour of the day', are implemented as big standardized programmes where there is little room for adaptions. It should then be taken into account the differences in management cultures in different countries. Both to make Six Sigma work as good as possible in the local country, but especially to make international cooperation possible and effective. Cultural differences are a strength of an organization, to be used, not a weakness to be overlooked.

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