

식스시그마 실행을 위한 전략적 실행공동체의 활성화*

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Cultivating the Strategic CoP for Implementing Six Sigma

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■ Abstract ■

There is no doubt Six Sigma is an excellent concept to improve quality of product or service. However, limitations to Six Sigma's implementation process have been discovered that are related to Six Sigma's foundation in statistical methods. The limitations of Six Sigma are overcome by the advantages of a strategic CoP (Community of Practice). Therefore, this research tries to build a strategic CoP for implementing Six Sigma. The method for building a strategic CoP is suggested, and then a case study of a real company is presented.

Keywords : CoP, Six Sigma, Knowledge Management

1. Introduction

Six Sigma identifies and removes the cause of defects in order to improve the quality of process outputs and minimize variability in manufacturing and business processes. Organiza-

tions have an interest in implementing Six Sigma because Six Sigma leads to measurable and quantifiable financial returns. Therefore, there is no doubt Six Sigma is an excellent concept to improve quality. However, the limitations of Six Sigma have been discovered in

논문접수일 : 2010년 12월 06일 논문게재확정일 : 2011년 02월 28일

* 이 연구결과물은 2011학년도 경남대학교 학술연구장려금 지원에 의한 것임.

** 포스텍 산업경영공학과 전략적 정보 및 기술 경영(POSIMIT) 연구실

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the implementation process.

First, the concept and toolset of Six Sigma are overly structured and rigorous. Second, Six Sigma strategies are narrowly designed to fix existing processes and do not help in coming up with new products or emerging technologies. Third, Six Sigma can easily digress into a bureaucratic exercise if the focus is on such things as the number of trained Black Belts and Green Belts. Finally, most employees are not interested in Six Sigma, because they think that it is a very difficult mathematical concept and they regard it as a part of a training program.

However, the limitations of Six Sigma can be overcome by strategies of a CoP (Community of Practice). A CoP involves a group of people who share a passion for doing something, and who interact regularly in order to learn how to do it better [32]. The CoP concept has played an important role in IBM, 3M, Xerox, Cisco and Dell [8]. The value of a CoP is as an organizational tool for stimulating innovation, sharing knowledge about business processes, promoting problem solving skills and accumulating organizational knowledge [8].

A CoP drives strategy, generates new lines of business, solves problems, promotes the spread of best practices, develops professional skills and helps organizations to recruit and retain talent. Strategies related to CoP have the ability to make up for the weaknesses of Six Sigma. Therefore, this research tries to build CoP strategies to successfully implement Six Sigma. The method for strategic CoP is suggested, and then the case study was performed to apply this method to real company.

This research is organized as follows. In sec-

tion 2, we review previous research about the Six Sigma and CoP. Section 3 shows the similarities and differences between Six Sigma and CoP. In section 4, we propose strategic alignment of CoP for implementing Six Sigma. In Section 5, we present a case study to show the feasibility of the strategic alignment. The research finishes with concluding remarks in Section 6.

2. Literature Review

2.1 Six Sigma

Six Sigma is defined as less than 3.4 defects per million opportunities from the statistical point of view [33]. From the business point of view, Six Sigma can be defined as a business strategy used to improve business profitability and the effectiveness and efficiency of overall operations [18]. A Six Sigma project usually follows the DMAIC (Define, Measure, Analyze, Improve, and Control) process [20]. In the Define step, a project team selects appropriate projects and identifies relevant project processes. In the Measure step, a data collection plan is developed and relevant process variables are measured, compared, checked, and collected. The Analysis step involves analyzing the root causes of defects and variations in the process. After the Analyze step, the project team improves the existing process using experimentation and simulation. In the Control Step, the team develops a control plan for the improved process [18, 29]. This structured method provides systematic and scientific project solutions.

There are specialists called Champions, Master

Black Belts, Black Belts, and Green Belts in Six Sigma [34]. These specialists are trained various programs such as statistical methods, project management and problem solving techniques. Schroeder et al. [28] mentioned that Champions initiate and support the Six Sigma projects, and Black Belts serve project leaders who mentor Green Belts in problem solving efforts.

2.2 Six Sigma metrics

Six Sigma highly relies upon quantitative metrics such as process sigma measurements, CTQ (critical-to-quality) metrics, defect measures, and financial measures. All of these metrics are measured and controlled in Six Sigma projects. These metrics are controlled by various statistical methods. Hence, statistical methods or techniques form the backbone of Six Sigma projects [12]. Most Six Sigma companies train and educate people to better understand these techniques, even if they are “highly educated” they may not be that comfortable with statistics. For this reason, in some cases, employees resist the introduction Six Sigma. Therefore, much time and effort is required to use Six Sigma, and as a result, some companies fail to implement Six Sigma [29].

2.3 Advantages of CoP

A CoP (Community of Practice) is a group of people informally bound together by shared expertise and passion for a joint enterprise [32]. Chua [7] defined CoP as an informal aggregation of members who are drawn by common interests to engage in sense-making activities through sharing, learning and solving problems.

According to Wenger and Snyder [32], the purpose of a CoP is to develop members' capabilities, exchange knowledge and solve problems at issue. By definition, the members of a CoP participate voluntarily with passion, commitment, and identification with the group's expertise.

CoP drive strategy, generate new lines of business, solve problems, promote the spread of best practices, develop professional skills and help organizations to recruit and retain talent. Furthermore, CoP provide value through their ability to implement existing strategies as well as develop new ones [32]. By using CoP, members of an organization actively innovate via their process mapping, knowledge sharing and practical skill application and they gain situational knowledge and learn management concepts. By operating CoP both internally and externally, CoP groups have accomplished successful performance improvements including increased core competencies, induced innovation learning, enhanced working efficiency and increased responsiveness [8]. Research relating to the benefits of CoP has been carried out using various case study and analysis tools. Furthermore, many organizations have supported the research by opening off-line meetings, constructing on-line communities and completing other activities for cultivating CoP [31].

According to the above CoP characteristics, CoP members actively share their knowledge or expertise, and practice and learn their situated knowledge or problems. As mentioned above, it is very important for companies to train their employees for Six Sigma. It is obvious that if a company applies CoP to Six Sigma, training people and solving problems may become easier.

3. Six Sigma and CoP

CoP and Six Sigma are different in perspectives of objectives, learning structure, connection with strategy, role of leaders and implementation methodology. Therefore, for implementing Six Sigma project through CoP, the concept of strategic CoP is needed. A compar-

ison of Six Sigma, CoP and strategic CoP follows as <Table 1>.

<Table 1> shows a comparison of Six Sigma and CoP. Desirable characteristics of CoP for implementing Six Sigma appear in the final strategic CoP column. The concept of Six Sigma is based on statistics, but the concept of CoP is based on knowledge management. The do-

<Table 1> Comparison Among Six Sigma, CoP and Strategic CoP

		Six sigma	CoP	Strategic CoP
Objective	Purpose	Minimizing Wastes and Low Variation [4]	Sharing and Creating Knowledge [24]	Minimizing Wastes and Low Variation
	Recognition	Device of Innovation [28]	Device of Sharing Knowledge	Device of Innovation
	Subject	Whole Organization [3]	Whole Organization [24]	Whole Organization
Learning	Importance	Importance of Learning	Importance of Situated Learning [32]	Importance of Situated Learning
	Sharing	Sharing Successive Case [28]	Sharing Knowledge	Sharing Knowledge
	Sharing	Communication	Communication	Communication
	Expert	Improvement Specialist	Knowledge Engineer [27]	Improvement Specialist
Structure	Organizational structure	Parallel [Lawler, 1996]	Parallel [10]	Parallel
	Team structure	Meso [9]	Meso	Meso
	Decision right	Decision Rights Allocation [30]	Decision Rights Allocation [2]	Decision Rights Allocation
	Multi-functional Team	Yes	Yes [27]	Yes
Connection with Strategy	Composition	Strategic Project Selection [3, 16]	Strategic CoP [1]	Strategic CoP
	Connection	Connection with Organizational Strategy	None Connection	Connection with Organizational Strategy
Role of Leader	Leadership	Leadership ngagement [11, 30]	Important Role of Leader [21]	Important Role of Leader
	CEO	Importance of CEO Intention [16]	Importance of CEO Intention [14]	Importance of CEO Intention
Methodology	Method	Structured Method (DMAIC) [28]	Knowledge Sharing and Creating	Structured Method (DMAIC)
	Decision	Top-down [28]	Bottom-up [14]	Top-down Bottom-up
	Evaluation	Connected Financial Measure [11]	Connected Qualitative Measure [21]	Connected Financial Measure

main of these two management concepts are different. This difference comes out in every aspect of their objectives, problem solving methodology, executing procedures and evaluating method. However, the limitations of Six Sigma can be overcome based on strategic CoP. The objective of the strategic CoP is implementing Six Sigma effectively.

4. Method for Strategic CoP

The newly created value is then shared by, and supported by constructive dialog and discussion within the CoP. The philosophy of an interactive learning-based CoP, where members teach and learn from each other, is important for implementing Six Sigma and can become the driving competitive advantages for producing high levels of capability. Therefore, this section presents an illustration of the method for strategic alignment of CoP.

In enterprises that rely on innovative strategy, the intellectual assets residing in CoP lead to behavioral changes, which in turn lead to positive influences that benefit the organization [8]. Therefore, the incorporation of CoP is often the result of a progressive understanding of the significant social aspects to sharing and utilizing knowledge, particularly with regard to the value of its tacit dimension in improving knowledge work [22]. One of the goals of many recent knowledge management strategies is to develop a global knowledge community where knowledge is shared and utilized across various CoP in the organization. Therefore, cultivating CoP in strategic areas is a practical way to manage activities of 6 sigma. For this, we suggest two different methods which can forge reasonable linkages between Six Sigma and CoP operations.

Business leaders using Six Sigma should maintain close links with those using CoP to share strategic perspectives [19] and the values and



<Figure 1> CoP Alignment Method(Directive Control)

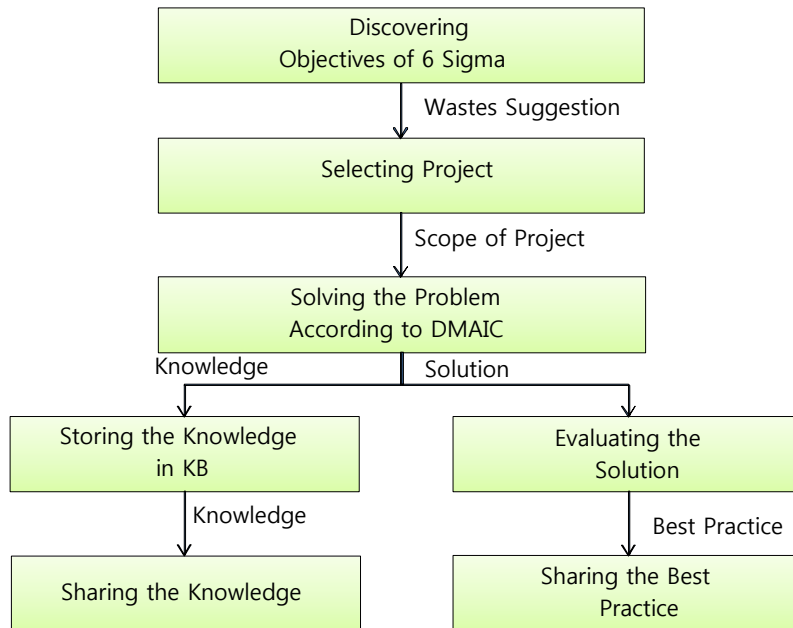
activities of CoP must be well aligned [26]. From this perspective, the close link between Six Sigma and CoP is very important but the “How” or “Methodology” to link CoP and Six Sigma remains underdeveloped. For linking Six Sigma and CoP, we require a CoP alignment and implementation method as shown in <Figure 1> and <Figure 2>. The linkage of Six Sigma and CoP operation is important and requires a process to formulate a proper connection. Therefore, there needs to be a systematic and procedural process to make a close and reasonable linkage.

CoP is a spontaneous and voluntary organization. CoP can grow and make various kinds of fruit through discussion and debate. By this CoP can contribute to enterprise objectives and vision by solving ongoing problems and issues. Some directive activity is needed to align and properly link CoP and Six Sigma with the over-

all objectives and the mission of an enterprise [19].

Therefore, CoP can contribute to organizational objectives through a CoP alignment and implementation method, although the inwardness of a CoP is a spontaneous community. CoP can become the main participant of Six Sigma by proper harmony between the directive control from the enterprise and participative control of the CoP itself.

For directive control of CoP, the CEO and advisors decide on the purpose of Six Sigma in of the context of the specific organization. A team leader and manager extract the critical theme for achieving the purpose of Six Sigma. Based on this, critical themes for implementing Six Sigma are extracted. In the next phase, the manager and team leader review the scope and range of the project. The project is derived



<Figure 2> CoP Implementation Method(Participative Control)

based on themes of Six Sigma. If the strategic CoP exists for implementing project, the project is assigned to the strategic CoP. However, if the strategic CoP does not exist, a new strategic CoP is constructed. Finally, the team leader and manager control CoP activity. This CoP alignment method (directive control) involves decision making in a top-down structure.

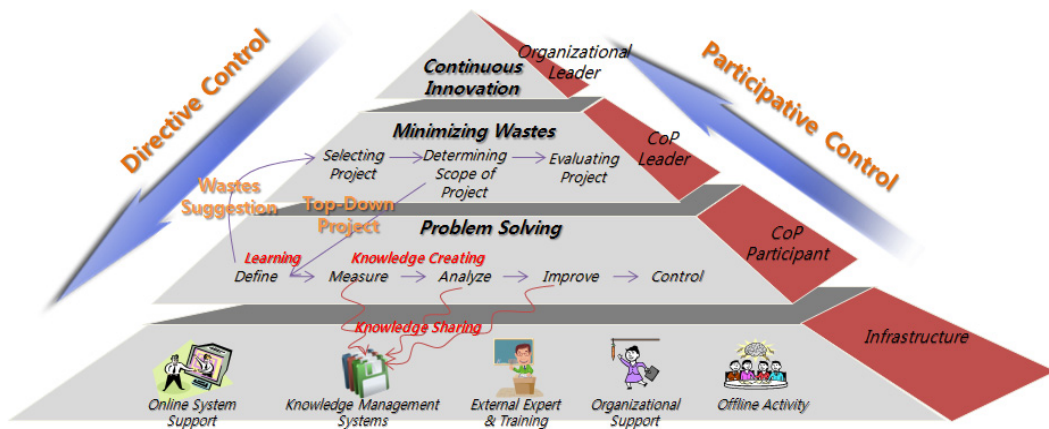
On the other hand, a different CoP implementation method (participative control) involves decision making in a bottom-up structure. A Six Sigma project is based on top-down decision making, and CoP is based on bottom-up decision making. However, strategic CoP for implementing Six Sigma utilizes two different decision making methods.

For participative control, CoP participants discover operation wastes and suggest Six Sigma projects. Managers and team leaders select proper projects among suggested candidates. Then, through DMAIC, CoP participants solve the problems and discover methods for minimizing waste. The results of a project are knowledge extracted during the project and solutions. The knowledge is stored in a knowledge base, and

the best solution is shared based on evaluations.

The strategic CoP method provides alternative ways of using CoP to implement Six Sigma. The method for strategic CoP is organizational rearrangement for overcoming limitations of Six Sigma. The method developed here consists of the three levels : organizational advisor, team leader and CoP participant.

As <Figure 3> shows, the organizational leader in the first level decides on the vision of the CoP. The team leader in the next level selects and evaluates the Six Sigma project. The team leader should have Black Belt. CoP participants are almost always operator. They execute Six Sigma projects according to the DMAIC method of Six Sigma. The knowledge created in the procedure of DMAIC is stored KMS (Knowledge Management Systems). The step of indentifying waste is implemented by participants and the CoP leader. Then CoP participants suggest the optimal solution based on on-offline knowledge sharing. For active participation, organizations should support various dimensions of help. An online system, external support, training, and offline activity are all support options.



<Figure 3> Strategic Alignment of CoP for implementing Six Sigma

Developing dialectical leadership (directive control and participative control) can help realize strategic CoP for innovative Six Sigma. To manage an organization, directive control is needed. However, participative control is also needed, because something it adds something missing to directive control. Therefore, through dialectic leadership, the team leader of a strategic CoP should provide strong leadership to keep teams focused on the Six Sigma project, while at the same time empowering team members and fostering motivation and creativity.

Cross functional CoP execute the project when the scope of Six Sigma exceeds the unit of process. The following <Figure 4> shows the alignment of cross functional CoP. Basically, CoP is constructed according to process, and then if the projects that should be needed to join cross functional employees, the multi-functional CoP is constructed.

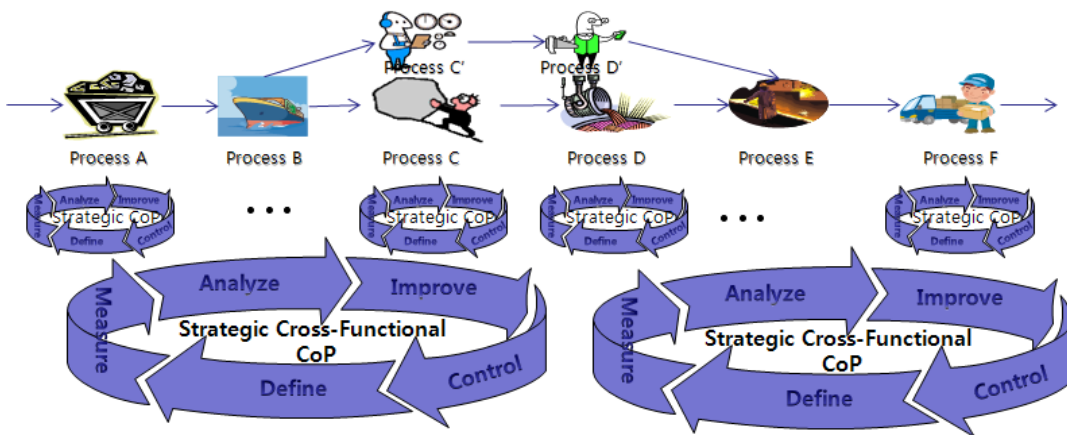
5. Case Study

Company P is one of the most competitive companies in the steel industry. Company P

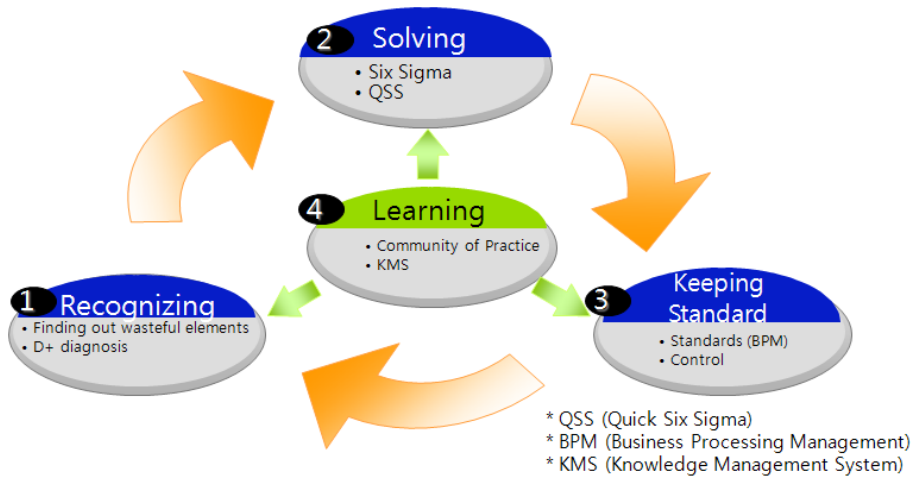
produces various products such as hot rolled steel, cold rolled steel and steel plates. Sales revenue of company P amount to more than 21 billion Won and the number of employees exceeds 17,000. The strategic goal of this company is to become a global steel leader ranked among the world's big 3.

In order to achieve this goal, since 2002, company P has been making Six Sigma Company P's DNA of management innovation. Company P has developed human resources with Six Sigma expertise and applied improved processes to actual work-site operations through process control.

Despite company P's aggressive promotion of Six Sigma, the outcome was less than satisfactory. Company P failed in their internalization due to difficulties in persuading all employees, inadequate improvement of the entire process, and indifference of non-participants. In the end, company P had to change the direction of innovation from the problem solving approach using a toolset to a mindset-oriented way of working. <Figure 5> shows company P's innovation model.



<Figure 4> Strategic Alignment of CoP



<Figure 5> PSSM : Six Sigma model of company P

5.1 Construction and Activities of CoP

In company P, a CoP consists of a CoP leader and participants. In general, Each CoP leader is a Black Belt or Master Black Belt, and most CoP participants are Green Belts. Basically, they concentrate a function of CoP and knowledge exchange. Each CoP has their own list for Six Sigma projects and idea for improve processes. Among this list, CoP members choose the next Six Sigma project. After deciding on a Six Sigma project, they exchange their idea of this project via an online CoP support system. Their knowledge exchange results are stored in the system. Therefore, every member can follow the progress of the project. Each Six Sigma project follows the DMAIC method, and the CoP leader decides to go to the next step when previous step has been sufficiently discussed. Company P simplifies the Six Sigma method although the DMAIC method remains intact. Rather than the standard Six Sigma format, Company P uses a Six Sigma project report. Therefore, CoP members simply put their project results into the for-

mat of a report and therefore do not have an increased workload. <Figure 6> shows an example of the format of a Six Sigma project report.

5.2 Supports for CoP

There are various supports to revitalize CoP activities. First of all, Company P offers each CoP a website. Therefore, CoP members can communicate with each other via the Internet. Because company P operates 3 shifts over 24 hours a day, not all of the CoP members can easily meet together.

Using an online support system, they are able to exchange knowledge and solve problems. Furthermore, the online CoP support system interlocks with the KMS. Materials related to Six Sigma activities or outputs are stored and managed by the KMS.

Company P rewards excellent CoP. In order to evaluate CoP, they make measures for evaluating CoP. Measures include the purpose of operation/activity support, innovation/practice activity and innovation/practice result. Through



〈Figure 6〉 Format of Six Sigma project report

activity content as well as result-oriented and qualitative measures, all CoP in company P are evaluated. CoP in Company P share their best practices during ‘CoP Day.’ CoP Day is organized according to theme, including presentations, posters, and publication of a case book. A number of other events including experience events are also held at the same time under a festive atmosphere.

6. Conclusion

There is no doubt that Six Sigma is an excellent concept to improve quality. However, the core of Six Sigma is statistical methods. This provides a scientific approach to improving process quality. However there is a possibility that Six Sigma projects cannot obtain expected results owing employee difficulties.

This paper tries to build strategic CoP for implementing Six Sigma. Using CoP as the main

body of practicing Six Sigma projects, Six Sigma can better penetrate a company’s culture. Combining practices and characteristics of CoP and Six Sigma results in an innovation tool that will make synergy to whole organization.

In this paper, a case study was performed to apply this methodology to a real company. After building a strategic CoP for implementing Six Sigma, employees’ resistance to Six Sigma disappeared in great measure. However, Company P is a typical manufacturing company with relatively fixed processes. Therefore, further research will be need for companies that have flexible processes such as those in the service industry. At the very least, this paper proposes a sound methodology for manufacturing companies to implement Six Sigma.

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