

# Application of Hoshin kanri for a Six Sigma improvement strategy: an empirical study in Taiwan

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## Abstract

This paper provides a comprehensive perspective on using the Hoshin kanri methodology to implement Six Sigma, which has three steps that are used to build the organizational consensus, formulate Six Sigma strategy, and determine an action workout plan using a Six Sigma project. According to the implementing experience in Taiwan, a critical successful factor is to conduct a comparative study on the improvement stages of the Six Sigma implementation project. This paper will be valuable for quality professionals and management personnel in aerospace-related industries.

## 1. Introduction

Six Sigma has become the most prominent trend in quality management, and this process is used in the manufacturing and service industries and for non-profit organizations and government institutes<sup>(5)(9)</sup>. Hoshin kanri (Japanese: 方針管理) is a comprehensive process with closed-loop management planning, objectives deployment, and an operational review process that coordinates activities to achieve desired strategic objectives. *Hoshin kanri* can be described as a management control system for a company's strategic focus. The word "*Hoshin*" (Japanese: "方針") refers to the long-term strategic direction that anticipates competitive developments, and the word "*kanri*" (Japanese: "管理") refers to a control system for managing the process<sup>(7)</sup>.

Although the literature contains many accounts of successful Six Sigma applications, few studies have examined the Six Sigma system in a Taiwanese context. In Taiwan, there are a few enterprises that have implemented Hoshin kanri using the Six Sigma system. The Aerospace Industrial Development Corporation (AIDC) was selected as a case study to explore how widespread the current use of the *Hoshin kanri* process in a Six Sigma system needs to be, how full Hoshin kanri application in the Six Sigma system in terms of breadth and depth of coverage can be explored, and what kinds of *Hoshinkanri* factors should be targeted by Six Sigma systems.

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## 2. A review of the literature on Six Sigma and Hoshin kanri

### 2.1 Six Sigma methodology

Six Sigma is a customer-driver with a focus on input and output procedures. The input processes cover feedback regarding customer requirements that is immediate, accurate, and integrated to improve information flow (based on customer needs and market surveys). The output procedures include reducing and eliminating defects, reducing variations in processes, and increasing process capabilities<sup>(2)</sup>. Six Sigma is a logical approach and method, and its successful implementation can be a key success factor that enables enterprises to achieve near zero defects<sup>(8)</sup>. Six Sigma can help companies to formulate and deploy business strategies and bring about broad transformational change. Pressly<sup>(4)</sup> indicated that Six Sigma represents a complete organizational strategy that entails rigorous training, managerial commitment, and multiple levels of employee involvement.

### 2.2 Construction Quality Surveillance System

The basis of the Hoshin kanri approach was set out in the 1950s. It is thought that the conceptualization of the approach started at a course on quality control that was sponsored by the Japan Association of Science and Technology<sup>(6)</sup>. The foundation is thought to be a blend of Edward Deming's lectures in Japan on the Plan, Do Check, and Action (PDCA) cycle and causes of variation and process control together with Peter Druckers "Management by Objectives(MBO)" philosophy<sup>(1)</sup>.

Hoshin kanri is a management compass that consists of breakthrough objectives that are deployed from the top down within an organization. This process is powerful once these objectives are linked to continuous improvement work (Japanese: Kaizen), which is the linking of top-down and bottom-up<sup>(3)</sup>. A *Hoshin kanri* process converts overall objectives into specific objectives down to organizational units and individual members. The concept of Hoshin kanri is closely related to performance management techniques that are still in use within many organizations. The Hoshin kanripolicy is a way to align all efforts in a company toward its major goals.

Figure 1 outlines the basic model demonstrating how the Hoshin kanri is executed, focusing on the PDCA cycle. Each stage has particular challenges that need to be addressed for the whole system to work effectively. These steps are explained below.



Figure 1. The Hoshin kanri process

### 3. An empirical study in Taiwan

The AIDC, which is based in Taiwan, was established to produce the most advanced aircraft engine parts and to provide services related to the assembly, testing, maintenance, and production planning. The AIDC Quality Management System has been approved by many leading aircraft and engine manufacturers, such as Boeing, Airbus, Bombardier, Bell, Sikorsky, General Electric Aircraft Engines (GEAE), Rolls-Royce, and Honeywell.

AIDC participated in Raytheon GE Taiwan Executive Program (RGETEP) courses to learn implementation of Six Sigma at GE methodology. RGETEP offers courses in Six Sigma concepts including leadership development at GE, work-out, change acceleration processes, specialist seminars, communities of practice, and strategy management.

Quality management transformation from Hoshin kanri to Six Sigma is a continuous improvement. Table 1 shows that integrating Six Sigma with the *Hoshin kanri* framework is based on the following three stages: consensus, formulation, and action-planning. Each stage has its own processes and implementing approaches. The results of using improvement approaches based on the Hoshin kanri processes to implement Six Sigma are interpreted as described below.

Table 1. Integrating Six Sigma with Hoshin kanri framework

Stage	1	2	3
Step	Consensus	Formulation	Action-planning
Objectives	to build the consensus of Six Sigma development	to formulate and implement Six Sigma strategy	to integrate with Six Sigma project
Processes	<ul style="list-style-type: none"> <li>■ Set and review Organizational Objectives</li> </ul>	<ul style="list-style-type: none"> <li>■ Transforming objectives to employees</li> <li>■ Encourage Participation in Goal Setting</li> </ul>	<ul style="list-style-type: none"> <li>■ Monitor improvement progress</li> <li>■ Evaluate and Reward Performance</li> </ul>
Approaches	<ul style="list-style-type: none"> <li>■ Management philosophy</li> <li>■ Competitive analysis</li> <li>■ Setting objectives focuses on customer requirements</li> </ul>	<ul style="list-style-type: none"> <li>■ Strategy formulation</li> <li>■ Steering organization</li> </ul>	<ul style="list-style-type: none"> <li>■ Project management</li> <li>■ Action workout project</li> <li>■ Evaluate performance</li> <li>■ Evaluate performance</li> </ul>

Table 2 shows three steps for the AIDC Company to implement Six Sigma. After finishing the RGETEP courses, upper management decided inviting RGETEP consulting to provide the Six Sigma system, and AIDC learned the Six Sigma system skills. Consequently, at step 3, AIDC managers used the company’s solid infrastructure to develop Six Sigma from their existing Hoshin kanri mechanisms.

Table 2. The three steps of the AIDC Six Sigma implementation

Step	1	2	3
Approach	Consulting to provide the Six Sigma system, AIDC learned Six Sigma system skills	Implement the Six Sigma system, and consulting supports the Six Sigma system	Implement the Six Sigma system on their own.

### 3.1 Consensus stage

AIDC transferred the government-owned company into a private-own establishment in the 2000s. There was organizational and individual resistance where employees were experiences fear and emotional paralysis during the privation process. It is important that the key resistance to Six Sigma initiative is identified. AIDC improvement methods include building new management philosophies that transform from task-oriented to profit-oriented philosophies on the basis of customer requirements.

A company’s management philosophy is to promote strategy execution when its values are strategy-supportive and its practices and behavioral norms add to the company’s strategy execution efforts. To clarify the need for Six Sigma within an organization, the following questions must be confirmed: 1) what will happen to AIDC if Six Sigma is successfully implemented? And 2) what will happen to AIDC if Six Sigma is not successfully implemented?

### 3.2 Formulation stage

Strategy formulation represents the ability to select, prioritize, and remove barriers to Six Sigma projects in a matter that integrates planning, management, and accountability. Figure 2 shows the AIDC business goals, which include on-time delivery, inventory reduction, quality, productivity, and cost.

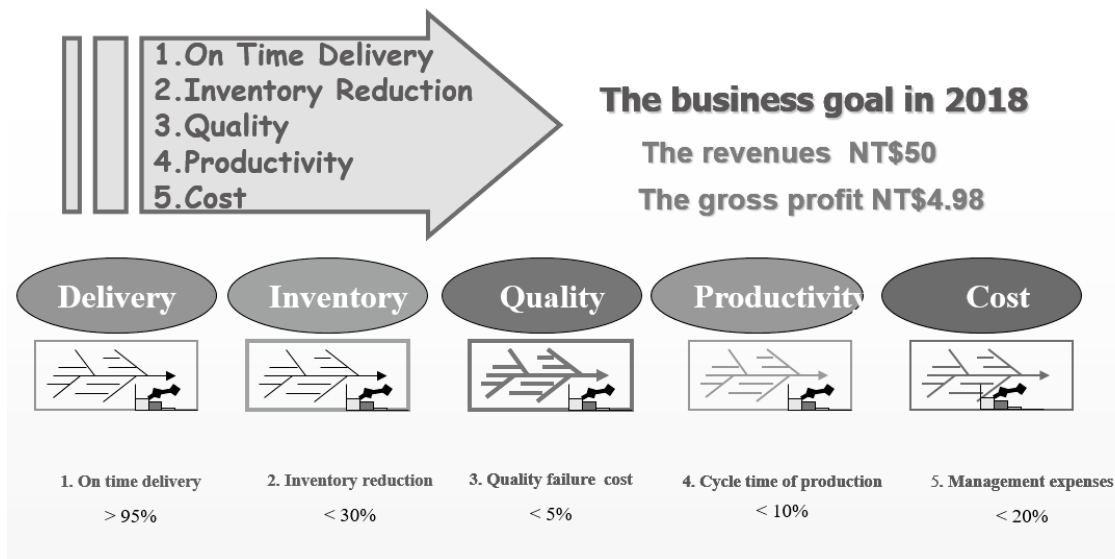


Figure 2. Six Sigma projects and business objectives

AIDC’s Six Sigma involves highly trained employees called Master Black Belt (MBB), Black Belt (BB), and Green Belt (GB) who have undergone rigorous statistical training and lead teams to identify and execute projects. Decisions on the steering organizational committee structure are driven by Six Sigma objectives, implementation plan, budget, and existing staff and resources. Figure 5 shows that the cluster leader of the improvement team is a MBB who is a certificated Six Sigma who is certified in Six Sigma and who has gone through Six Sigma training. The sub-leaders are BBs who are cross-departmental personnel such as from the productions department and quality department.

### 3.3 Action planning stage

AIDC demonstrates that effective project management is essential to the success of Six Sigma projects. Figure 3 shows that the Six Sigma quality policy is divided into quality assurance and customer satisfaction. Each department and section of the project management team has the ability to select, prioritize, and remove barriers to Six Sigma projects in a matter that integrates planning, management, and accountability.

AIDC’s Six Sigma training schedule is based on a 4-month training and application program and successful completion of Six Sigma projects. The participating project staff have 10 days for Six Sigma training and three are three meetings which report their Six Sigma project schedules during Six Sigma implementation.

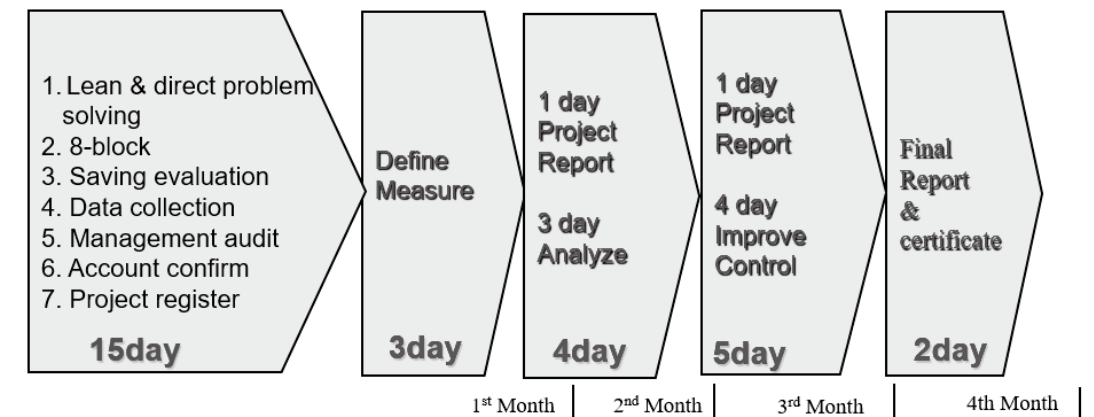


Figure 3. Six Sigma action workout project

## 4. Conclusion and implications

### 4.1 Conclusion

AIDC Six Sigma initiatives place a strong emphasis on the customer’s voice by setting up a common language among the enterprises that are involved by understanding the customer’s demands and meeting the customer’s requirements. To keep pace with customer requirements, AIDC connects and analyzes customer information and tries to understand all of the information. Using customer information ensures that AIDC’s products, service, and procedures meet customer requirements.

For the quantitative outcome (shown in Table 3), AIDC’s business performance has improved after application of Hoshin kanri for a Six Sigma improvement strategy. Customer cost reduction has decreased from 6% to 4%. The reductions in lead time were sharply reduced to 35 days. Schedule adherence performance showed improvements from 70% to 95%, and quality defectives (parts of per million, ppm) decreased from 6500 to 300.

**Table 3.** Performance after implementing Six Sigma

Item / Year	Before improvement	After improvement strategies
Customer cost reduction (%)	6	4
Lead time reductions (days)	180	35
Schedule adherence (%)	70	95
Number of key suppliers	230	10
Quality defectives (ppm)	6500	300

The AIDC case of implementing Six Sigma quality history showed that the Six Sigma system is both a skills-based approach and a business strategy process. The AIDC formulated Six Sigma strategy development based on MBO mechanisms by aligning departmental goals and subordinate section objectives throughout the organization. The steering organizational committee took a cluster approach to build the cross-departmental improvement team. The cluster approach that was taken by the steering organizational committee integrates different departments to solve the root problem.

If the organization wants to use Hoshin kanri with Six Sigma implementation to improve business performance, the action plan must extend through the bottom line. For the action plan to have an effect on the bottom-line there needs to be a detailed improvement project. The AIDC's improvement plan for the Six Sigma projects is to improve step by step, which confirms the required improvement points at the first step and evaluates the improvement performance at the final step.

#### 4.2 Implications

The choice to integrate Hoshin kanri with Six Sigma activities should be based on how valuable it is to the organization, how badly the process is broken, and what the impact upon the organization would be if the process were improved. We should choose what process we want to improvement, and thus, we can achieve the expected business performance.

Hoshin kanri is prime component of Six Sigma, and the author found that adding a Six Sigma program to AIDC's business strategy system gave them almost all of the elements of *Hoshin kanri*: current business strategy system + Six Sigma project management = *Hoshin kanri*. The combination of the current business strategy process and Six Sigma provided the organization with the best overall value. Based on this formula, Hoshin kanri as an integrated quality program remains prevalent in modern industry, and the example of AIDC suggests one way of extending this kind of formula to incorporate a strategic element.

#### References

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