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## Paper Session II-A - A Process to Help Assure Successful Commercial Space Ventures

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# **A Process to Help Assure Successful Commercial Space Ventures**

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**Abstract.** The purpose of this paper is to describe a process for successful space business ventures – a methodology used by highly successful commercial ventures, but relatively new to space business enterprises. What do highly successful commercial business ventures have in common? How do these companies differ from most commercial space ventures? The answer is the implementation of a state-of-the-art customer satisfaction process. Take the case of the latest winners of the Malcolm Baldrige National Quality Award. What did they do that helped to achieve this performance? The answer is they implemented an effective process that measures and achieves the highest possible level of customer satisfaction. The same process can be implemented by space enterprises to achieve comparable commercial results. This paper describes three recent Baldrige winners and the six-step process, including examples of each step. It concludes with the strong recommendation that this process be implemented to assure success in the commercial space world.

## **WHY COMMERCIAL SPACE NEEDS A NEW STANDARD**

What do your customers really think of you? Are they really satisfied with your products and your services? Is there real value added by buying your product or service? Is the relationship between your customers and your company representatives friendly and desirable?

And what do your customers think of the competition? Are they more or less satisfied with their products and services? How do your competitors treat your customers? Better or worse than you or your representatives?

Even if you don't know the correct answers to all these questions, you are already on your way toward making improvements for success. Most importantly, if you don't know the answers to these questions, you can find them through a modern process called Customer Satisfaction Measurement (CSM). In this paper, I will describe one process that embodies the latest techniques used by successful commercial businesses. This process is also taught at the latest seminars on Customer Satisfaction, such as the ones given by the American Management Association.

## **EXAMPLES OF HIGHLY SUCCESSFUL VENTURES**

Before describing the CSM process, it is useful to review organizations that have employed this process and the results they've achieved. Four examples of such benchmark organizations are recent winners of the Malcolm Baldrige National Quality Awards and the President's Quality Award. The winners include Texas Nameplate Company, Solectron Corporation, Arnold Engineering Development Center and Boeing's Airlift and Tankers Division.

Texas Nameplate won the 1998 Baldrige award in the small business category. They make custom nameplates for attaching to various products, tools and other applications. They were founded in 1946 and have a current employment of 66 employees. Their customers number over 1000 worldwide and they have 2,239 competitors.

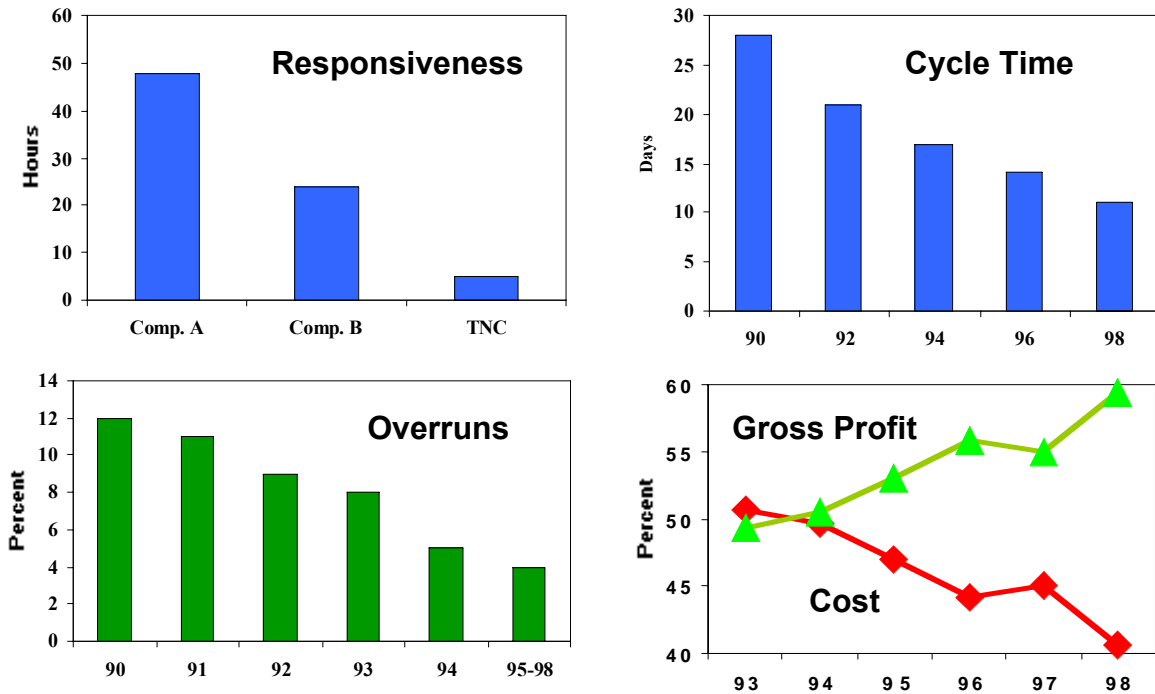


FIGURE 1. Results at Texas Nameplate Company

What Texas Nameplate did in 1992 was to recognize the value of total quality management. They implemented statistical process controls and a company-wide CSM system. Then they kept taking actions on the results of the measurements and kept improving on the CSM system.

The successful results are depicted on Figure 1. Remarkable results include faster responsiveness to customer inquiries, reduced cycle time to fill orders, higher quality in production resulting in reduced overruns and lower costs that resulted in higher profits.

Soletron Corporation, a 1997 Baldrige winner, is headquartered in Milpitas, California, and is a worldwide provider of electronics design, manufacturing and support services to leading original equipment manufacturers (OEMs). They offer a broad range of pre-manufacturing, manufacturing, and post-manufacturing solutions. Founded in 1977, Soletron is a publicly held company with facilities in 17 locations around the world.

By partnering with Soletron, OEMs can focus on their own core competencies, such as research and development, sales and marketing. Soletron offers its customers competitive outsourcing advantages like access to advanced manufacturing technologies, shorter product time-to-market, reduced production costs and more effective asset utilization.

Soletron's business results during the last eight years testify to its success in implementing a key customer satisfaction process. A few examples of the company's results are seen in Figure 2. Revenue growth is a key measure of business success and the results for Soletron from 1991 through 1998 are excellent - an average annual growth rate of 47%. As a result of the growing business, their stockholder's equity has grown from \$104 million in 1992 to \$1.181 billion in 1998. And most important for the stockholders is the rise in value of the common stock - from \$100 in 1990 to over \$10,000 in 1998, a one hundred-fold return on investment.

So what was the process that helped lead to this remarkable growth? It was a Customer Satisfaction Measurement System using the Baldrige system as the corporate roadmap. Soletron started by implementing a periodic Customer Satisfaction Index survey in 1985, then improved on the process using the Baldrige system as a guideline. The key

Employment  
10000

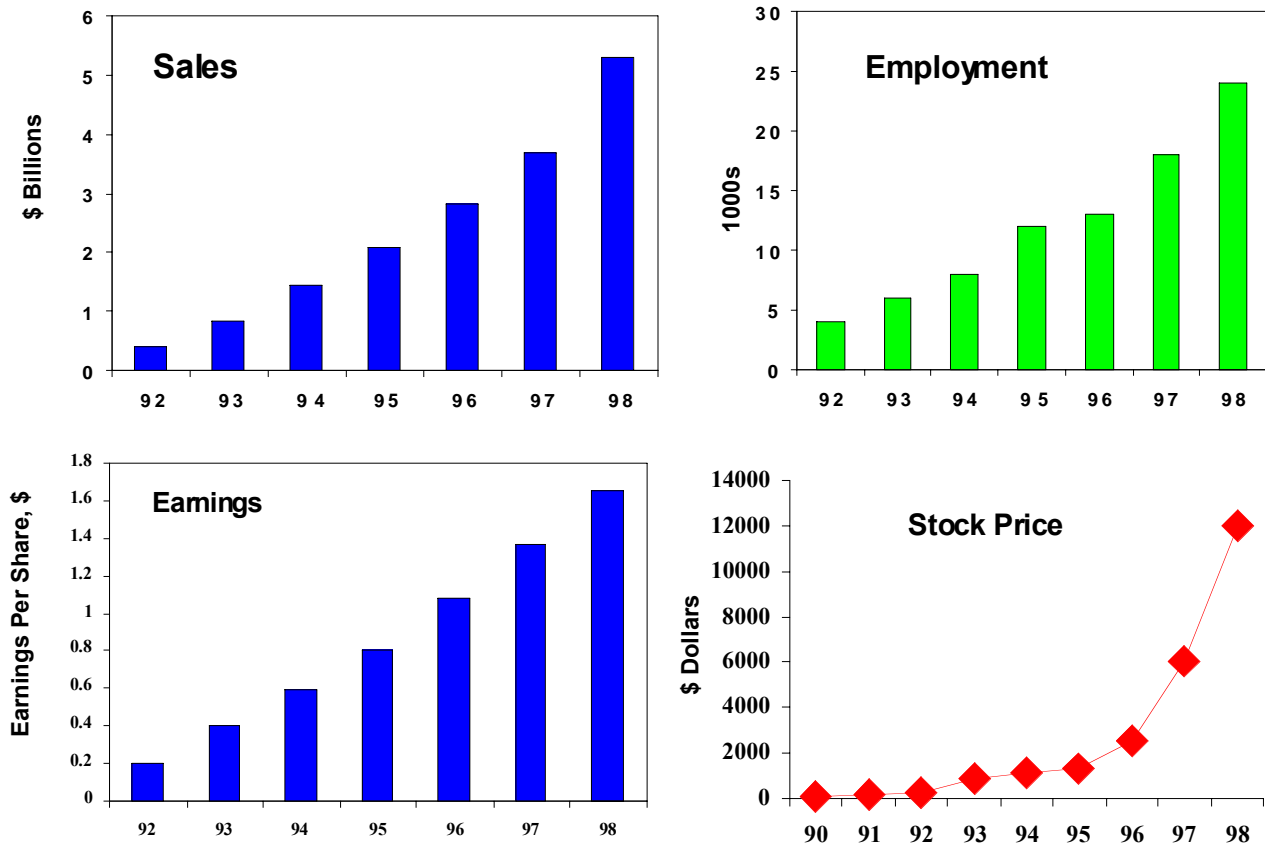


Figure 2 – Results at Solectron

to success was taking action on feedback from Solectron’s customers during the late 1980’s and continuing through the 90’s.

A government organization that has implemented the CSM process is the Arnold Engineering Development Center (AEDC) at Tullahoma, Tennessee. AEDC was created in 1979 with the objective of incorporating the best of commercial industry suppliers. At the outset, a basic CSM process was implemented. However, in 1990 a major improvement was made in the process – the results of CSM were integrated into AEDC’s strategic planning process. Then a focus was made on the most critical findings of CSM: (1) reduce cost, (2) reduce cycle time between requesting a test and completing the test and (3) improve supplier compliance with AEDC’s requirements. As a result of this process, AEDC achieved the significant results shown on Table 1.

TABLE 1. Results at Arnold Engineering Development Center

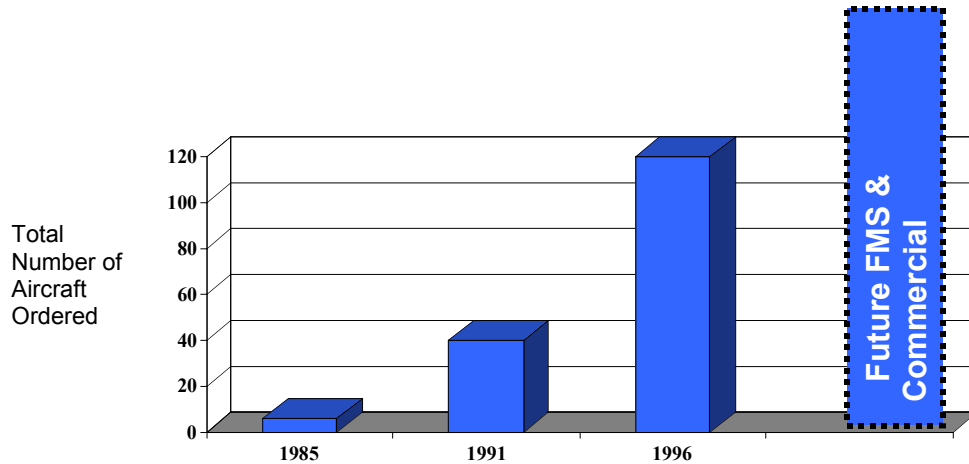
**Cost Reduced by 25%**

**Cycle Time from Requesting Test to Completion reduced by 30%**

**Suppliers’ conformance to requirements increased from 45% to 95% +**

An example closer to the space business is the winner of the 1998 Baldrige award in the large manufacturing company category – The Boeing Airlift and Tanker Programs. Starting in 1985, Boeing’s Long Beach Division had the right product at the right time – the high performance C-17, which had superior characteristics compared to the C-5 and other competitors for combat airlift. But performance alone did not lead to success.

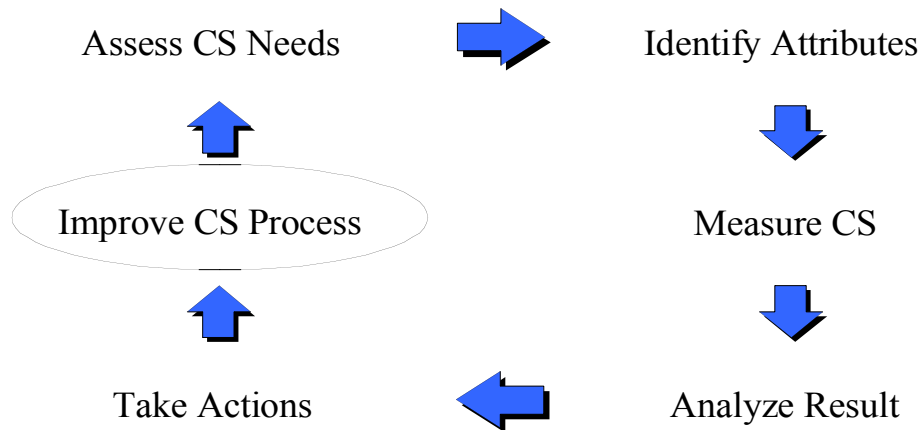
On C-17, Boeing introduced a basic CSM process and later refined it with a multi-source CSM system. The company kept working improvements based on the results of the CSM inputs. That process led to a very large backlog of Air Force orders and the future for new foreign sales and commercial sales is even brighter, as seen on Figure 3.



**FIGURE 3.** Results of C-17 Program

### THE CSM PROCESS

The highly successful Solectron process embodies the latest state-of-the-art features in measuring customer satisfaction. The desirable Customer Satisfaction Measurement process is a six-step activity (Mihara, 1998) that begins with an understanding needs and ends with improving the process (Figure 4).



**FIGURE 4.** The Six-Step Customer Satisfaction Measurement Process.

## Needs and Attributes

The first step, *Assessing the Needs* (Dutka, 1994) is the most important. The purpose of the study must be identified prior to completing all subsequent steps. For example, if the objective is to achieve higher sales and share of the market, understanding your customers' views of your products and services, as well as their views about your competitors, should be emphasized. If the objective is to prepare for a major investment for a new product line, the focus should be on understanding what features your customers desire on the product and how they are dissatisfied with existing suppliers.

Frequently needs are identified in the mission of an enterprise or department seeking to grow to capture the leadership position in the market, or to provide the highest possible return on equity to investors. The key to identifying the best needs is to discuss them with top management and obtain their support to conduct this CSM effort.

The next step, *Identify Attributes*, is a key activity (Naumann, 1995). Attributes are parameters of satisfaction, such as the quality of the product or service. You have all seen survey questionnaires from airlines or hotels or car rental agencies. Where do they get those questions? If the surveys are done correctly, the customers determine the questions, or attributes. Company employees who work with customers should not create attributes. The best way to obtain attributes is to ask the customers.

A good starting point is to start with the following five attributes. They have been shown by many studies to be common parameters of satisfaction for most commercial products and services. These five general attributes are :

1. QUALITY
2. PERFORMANCE
3. COST
4. SCHEDULE
5. RELATIONSHIPS

For example, one question might be: "From a quality standpoint, what is the most important parameter of satisfaction on my product?" The response might be "Reliability over the expected lifetime of use." Another question might be "What is it about Relationships that are important to you?" The response might be "Whether the customer contact employee is friendly and keeps me informed." So these attributes make up the basis for survey questions.

A set of attributes that applied to a client in aerospace is shown in Table 2 as an example. The identification of these important parameters and their order of importance will be used as the template for the remainder of the study.

TABLE 2. Example of Attributes on an Aerospace Project

<b>Attribute</b>	<b>Importance</b>
<b>Quality during life</b>	<b>1</b>
<b>Quality on delivery</b>	<b>2</b>
<b>Price</b>	<b>3</b>
<b>Friendly service</b>	<b>4</b>
<b>Performance</b>	<b>5</b>
<b>On-time delivery</b>	<b>6</b>
<b>Customer follow-up</b>	<b>7</b>



FIGURE 5. Quadrant Analysis Provides A Format for Action.

## Measurement and Analysis

The third step is to measure customer satisfaction by obtaining information and views from customers. There are many ways of obtaining information from customers – there are at least 37 different ways. The most common method in the commercial marketplace is to prepare and send questionnaires to as many different customers as affordable. There are many survey organizations that provide such service. For the aerospace field, this mailing system is not a desirable approach. There are two pitfalls – the response rate is relatively poor, averaging 20% to 30% at best. The second problem is that there are not that many customers in the space business – relatively few people make decisions concerning future business direction and procurement selections. A personal interview, therefore, is the preferred approach on commercial space projects.

Once the responses are obtained, an analysis is conducted. There are many choices for the format of the analysis outputs. A simple tabular listing of the degree of customer satisfaction versus attribute is a common method of presentation of results. A visually more interesting and useful method is to show results that include both importance and degree of satisfaction. An example of this preferred format is seen in Figure 5. The desirable approach to analysis is to examine these results and locate those points that lie in the upper left quadrant. These are major problem areas that need corrective actions. After corrective actions are taken, the survey is conducted again using the same attributes to see if the points move toward the desirable region in the upper right quadrant. In the case of the example, improving PRICE and RELATIONSHIPS should take priority over SCHEDULE.

## Taking Actions and Improving the CS Process

Many customer satisfaction studies end with paper results and actions are limited for any number of reasons. Taking effective actions and reapplying the process frequently is the key to a successful system. As demonstrated in the Sollectron case, those who rigorously apply the principles of CSM frequently and with dedication achieve the best rewards. At Sollectron, customer satisfaction inputs are reviewed weekly by both managers and employees at each major location worldwide. These reviews are augmented by a third-party survey of executive customers. Management keeps up to date on customers' future business plans and requirements. Sollectron keeps focusing on achieving the best in areas of quality, delivery, service, technical capability, material management and overall

satisfaction. The CSM process points the way to improvements in capabilities that Solectron must make to meet future expectations and build new business.

Pursue corrective actions, motivational steps and Benchmark (Spendolini, 1992) to improve the overall Customer Satisfaction Process. The process aims to create a work environment in which all individuals can maximize their potential by doing what it takes to satisfy the customer. Compensation and rewards are extended to all members of the workforce. Rewards are tied to revenues, profits, customer satisfaction and operational performance.

## **SUMMARY**

The end result is a highly successful commercial venture that continues to rapidly grow and improve, providing benefits for all – both employees and customers. The modern Customer Satisfaction Process can be very effective and rewarding to all commercial space ventures.

The author invites all readers to forward questions and comments, including requests for more information on this process.

## **ACKNOWLEDGMENTS**

The author recognizes the contributions by the staff of Solectron, Inc. for the inputs provided through Solectron's Quality Seminar on September 11, 1998, at Milpitas, California. Also, many thanks to the Customer Satisfaction staff at the Boeing Company, Long Beach, CA, at Texas Nameplate Company in Dallas, TX and at Arnold Engineering Development Center, Tullahoma, TN.

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