



Winter 2004

Automotive

EXCELLENCE

Official Publication of the ASQ Automotive Division

in this issue:

Applying Quality Principles to Self Improvement

■ ROBUSTNESS THINKING IN DFSS STRATEGY

■ IS CERTIFICATION PAYING FOR AUTOMOTIVE MANUFACTURERS?

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ASQ Automotive Division

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To be the worldwide automotive industry's leader on issues related to quality

MISSION

To facilitate continuous improvement and customer satisfaction by identifying, communicating and promoting:

- Quality knowledge • Management's leadership role • Industry Cooperation • Professional development • Recognition • Opportunities to network

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EVENTS

March 1 - 3, 2004

AICE Quality Conference
Radisson Quad City Plaza Hotel and Conference Center, Davenport, Iowa
Reservations (800) 333-3333 or online at: www.radisson.com/davenportia (be sure to include the promotional code "AICE" to receive the conference rate)

March 8 - 11, 2004

SAE World Congress
(ASQ Member receive free admission with Membership Card)

March 22, 2004

Full Council Meeting, RDA MI 6:00 p.m.

April 21, 2004

Warranty Data Analysis Workshop with Carnegie Mellon
Space is limited. for reservation info contact Clarity Patton at (313) 965-8989 or E-mail clarity@costello.cc

April 26, 2004

Full Council Meeting, RDA MI 6:00 p.m.

May 21, 2004

AQC - DAC Meeting in Toronto

May 22, 2004

DAC Training - Toronto

May 23, 2004

Annual Meeting at AQC - Toronto, Ontario
12:00 - 3:00 p.m.

May 24 - 26, 2004

Automotive Quality Congress, Toronto

June 7, 2004

Full Council Meeting, RDA, MI 6:00 p.m.

June 9 - 10, 2004

Quality Expo Detroit, Novi Expo Center, Novi MI.

June 2004

2004 Awards Banquet at GM

HELP WANTED

Asq Automotive has a new Job Opening Coordinator his name is Marty Dodson. For complete information and details: asqauto-jobs@comcast.net

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Welcome to 2004



Hope that your holidays were good. How are your new year's resolutions and goals blossoming? If one of your goals is to network more, learn more, get involved with Quality promoting activities, you're reading the right magazine!

The ASQ Automotive Division had a very active fall and has lots planned for 2004.

For the latest on activities, check our website www.asqauto.org.

A couple of exciting activities will be the SAE World Congress, where we are putting on a presentation. In March, the AICE Conference (Agricultural, Industrial and Construction Equipment) will be taking place.

In April we're putting on a Warranty Data Analysis Workshop, which will explore radical new ways to look at data fast and be responsive to customers.

In May, the annual American Quality

Congress will have us very busy as we trek to Toronto.

In June we'll be having our annual Awards Banquet, which is always a very special event with some very high profile people and excellent, inspiring speeches.

(Awards nomination are due in April, see the website for all the awards that you can nominate your fellow quality professional and your leaders.)

In June we'll also be putting on several sessions at the Quality Expo Detroit.

If you're interesting in networking please register for any of our events. If you're interested in networking and looking to volunteer, even just as a networking contact, let me know. There's a volunteer form on the website www.asqauto.org that you can fill out. The more volunteers we have around the country and world, the more we can accomplish as an automotive industry community.

Thanks,

Lou Ann Lathrop

Editor's Letter



Welcome to the Winter 2003-2004 issue of Automotive Excellence. Great news on vehicle sales was on its way in as we went to press with this issue. Reports were stating that orders for new vehicles were up in December, com-

pared with a 1.3 percent drop in November and overall for 2003, orders for durable goods rose 2.8% from 2002, which marked the largest increase since 2000. All of us in this industry look forward to such news of continued improvements and in this issue we feature an article from Larry Smith who proposes the use of the same strategies we use in the corporate world to generate improvements to self improve.

Improved relationships and improved understanding between all parties in order to provide a robust and respected certification system benefiting all involved is the position of Trevor Davies in his article inside. Finally, to meet readers' needs, we could not close this issue without an article on improvement tools. Therefore, please

find Matthew Hu's review on improving existing products and processes with Six Sigma and Design for Six Sigma. His article has provided both a professional and personal benefit to me as I am spending my free time this season purchasing hardware and fixtures to replace everything scrapped after a recent pipe freeze and major plumbing disaster at home. I located a beautifully crafted dual cross handled design for the plumbing and was satisfied until I read Matthew Hu's article and his DFSS analysis declaring the single handled faucet as the superior design choice from an axiomatic point of view. As I head back to the plumbing distributor to make changes to my order, I wish all of you happy reading between these covers. Thank you to all contributors, volunteers, advertisers and our publisher who work together to make Automotive Excellence happen.

Very best wishes to all for a happy, blessed, healthy, and successful 2004,

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US Feedback Sought for ISO Survey on the USE of ISO 9001:2000 and ISO 9004:2000 Standards

Now is the time for US organizations to register their experiences, comments and/or concerns on the use of the year 2000 editions of ISO 9001:2000 and ISO 9004:2000 standards – it is critical that ISO get feedback on actual user experiences on the application of these standards.

The International Organization for Standardization (ISO) Technical Committee (TC) 176, Sub-committee ((SC)2, Quality Systems, has asked for international participation in a survey of user experience with ISO 9001:2000 and ISO 9004:2000. A website questionnaire has been designed to determine users' concerns and recommendations with regard to these standards, their suitability and their application. Your website response will go directly to the international ISO group responsible for these standards.

This is an excellent means of providing your feedback to the international ISO working group that developed the ISO 9000 standards. The results will provide information on how well the current standards meet your needs and provide guidance on the future revisions of these standards.

Since US organizations will be providing feedback along with all other ISO member countries, it is essential that all US experiences with the use of these standards be recorded so that US interests are represented and protected. To be represented, comments must be submitted through ISO survey located on the Internet at:

<http://isotc.iso.ch/webquest/tc176intex.html>

It should only take approximately 15 minutes to complete the survey and

anyone who has some knowledge or experience with the standards may participate. Where you indicate concerns, participants will be prompted to suggest improved wording of the clauses, if you wish to do so.

Since there is no limit to the number of people who may respond from any one organization, it is imperative that actual US users of the standards take the time to participate in order that all US experiences are adequately represented in the evaluation

Your participation is vital and your feedback goes directly to the ISO!

When the survey is completed, the results of the survey will be widely disseminated; e.g. the ISO/TC176/SC 2 web site at www.bsi.org.uk/iso-tx176-sc2. The results of the survey will play a major role in guiding the next amendment or revision of these standards.

For more information or assistance, please contact:
Robin Gildersleeve
Director of Communications – ASQ Standards Group
Phone: 877-463-6769 or 919-317-1084
E-mail: Robin@TheInformedOutlook.com

Letter from Ken Case President of ASQ

This is that special time of year when our thoughts turn to things other than the usual. We find time to enjoy our extended family, to do a little catching up, to reflect a bit on the past year, and to make (or at least consider!) some resolutions for the New Year.

Here at Oklahoma State University, things are winding down. Finals have been given. Projects are complete. Grades are out. Our faculty planning retreat has been held. I have been doing a few things for Lynn (not enough, she says) that have been on the list for months (years). And, nearly all of this week has been devoted to ASQ, including some time to reflect.

Even after 33+ years of membership in the ASQ, I continue to be surprised, amazed, and very pleased at the effort, emotion, caring, and yes - results - that our Society garners from US, our volunteer leaders. We all know the tangible pay isn't real good (how do you spell negative?); however, the intangible pay must be clear off the positive end of the scale.

As you know, we have been making some dramatic changes in the ASQ to better support Quality professionals and practitioners, with the ultimate goal being to make a real and discernible difference in the world through Quality. Through our efforts, and those of the greatest staff in the association world, we are making progress. This ship is turning, and in the right direction for the future.

Please accept a big "THANK YOU" for everything you do for the ASQ and its extended family - members, potential members, and those touched by the ASQ and the Quality movement. Even though a "thank you" seems a bit hollow, and you can't even buy a cup of coffee with it, keep in mind that the real "THANK YOU" comes to us every day from those whose lives we make better due to our efforts.

I hope you and yours have a wonderful holiday season.



Ken Case
ASQ President

Review of Six Sigma and Design for Six Sigma (DFSS)

- Robustness Thinking in DFSS Strategy

by Matthew Hu

Think about making popcorn the old fashioned way. What happened if the popcorn did not taste good or was burned? The goal is to figure out the why and what behind the failure to make good popcorn, and attack those problems such as; the sound of last pop, cooking time, the degree of temperature and etc at its source. As soon as a better way was figured out, we standardize the method for our popcorn making experience. However, such experience may not be easy to learn especially by people who never had the exposure to popcorn making.

Do things right – keep it consistent. This is the idea behind Six Sigma. Is it simple? Six Sigma does not address the original design of the process or product; it merely improves on the existing product or process.

Contrastingly, let's look at today's popcorn bag. Making popcorn becomes much easier. The quality of cooked popcorn out of each bag today is much more consistent. Anyone including kids who want to make popcorn can put a bag of popcorn in a microwave and turn on a switch. There is no need to worry about the sound of last pop and the temperature. In other words, the quality of popcorn is not sensitive to external factors, such as the popper's age and experiences. This is the idea of robust design which is a key element of DFSS. DFSS is not simply a rehash of the lessons learned in Six Sigma, but a fundamentally different and proactive methodology. DFSS complements the Six Sigma improvement methodology, but takes it one step further to address the design robustness. It seeks to overcome the traditional flaws of the product and the process during the design stage: conceiving and developing popcorn-making bag, rather than in the production quality control stage of preventing the burnt pot of popcorn.

"Do right things" is important for a company to stay in business and develop the right products to satisfy customer and of course, make bottom line profits. Six

Sigma focuses on low hanging fruits (reducing costs and improving existing designs). DFSS concentrates its efforts on developing new and better designs for the engineer to exploit. Design for Six Sigma is the "What" and "How To" of the engineering product development process. Its focus is to support the new product introduction process across the industry that:

- Translates the Voice of the Customer into an optimum design concept
- Quantifies and optimizes the design's performance and risk

A second example illustrates this well. If your company's business is producing and selling water faucet's, a Six Sigma approach would investigate the warranty returns, and examine the process... This examination would result in the discovery that the quality of seals, ability to provide consistent water flow and temperature and water knobs were inadequate and replace them. A DFSS approach would come up with a design strategy to preclude the problem from happening.

The faucet on Figure 1 (adopted from [5]) has two design parameters (DP): a hot water knob and a cold water knob. When the hot water knob is turned, temperature is affected but so is flow. Turning of the cold water knob also affects temperature and flow. If a consumer has optimized flow rate, then turns one of the knobs to optimize temperature, the flow rate is changed and is no longer optimal. Designs of this type can eventually satisfy customers only by iterating between the two designs parameters many times. Customers may run out of patience and are unsatisfied with this type of design.

However, a Design for Six Sigma

approach would take one step further and go beyond existing limited structure thinking- what can be done to improve a product functional performance and the ultimate customer satisfaction? A team would reconfirm the voice of customers (VOC) and ensure proper translation of VOC into design functional requirements. In the water faucet example, the functional requirements (FR) of water faucet are:

FR1=Control flow rate
FR2=Control temperature

The design parameters for the figure 1 are:

DP1=Hot water knob;
DP2=Cold water knob

Obviously, both DP1 and DP2 in Figure 1 affect FR1 and FR2 at the same time. This type of the design is known as coupled and the functional requirements are not independent ([3] & [6]) and, of course, the customer may experience inconsistent functional behavior and be unsatisfied. Coupling is about two functions affected by same one variable.

Consider the design on Figure 2 (adopted from [5]). This faucet has one handle and the design parameters are: lift the handle to adjust flow, and move the handle from side-to-side to adjust temperature. In this design, adjusting temperature does not affect flow, and adjusting flow does not affect temperature. From an Axiomatic Design point of view, this design is superior because it maintains the independence of the functional requirements. Of course the design needs to be further optimized to desensitize the effects of user conditions (variations).



Figure 2

Design 2 (Figure 2):
 DP1 = Handle Lifting
 DP2 = Handle Moving Side-to-Side



Figure 2

Just imagine while you are writing an important report and need to be finished in 30 minutes, and you have to answer an important phone call at the same time. The function of writing and the function of answering phone call are fighting for attention and conflict each other. Conflict causes coupling effects. Is it hard to concentrate? In reality, the designer often deals with more than two functional requirements. Imagine what happens when a designer is working in a situation with a dozen or more functional requirements. If the design is coupled, then optimization of one function may adversely impact several other functions. When these functions are fixed, the original function no longer works well. The designer is always tuning and band-aiding such a design and the customer will never be completely happy. However, if the design is created in such a way that each of the functional requirements is handled independently by the design parameters, then each function of the design can easily be optimized. From design structure standpoint, this kind of design is better and more robust due to the fact of minimum coupling effect. Taguchi's additive model (reduction of interaction effects by selecting proper system output response) can help us to obtain further information to reduce interaction effects ([3] and [4]). Interaction pertains to two design variables affecting same one function. Functional independence (Suh) or the interaction reduction (Taguchi's additive model) provides the opportunity to design and manufacture products that will attenuate all forms of unwanted variation, including variation due to conditions of customer use.

In order to be successful in today's business, any company needs to strategically

plan all development projects with the right level and the right kind of development to achieve maximum efficiency. It has been estimated that 85 percent of the problems with new products not working as they should, taking too long to bring to market, or costing too much is the result of a poor design process (Ullman, 1997). A good design process is supported by a set of efficient methodologies. It has been widely accepted that the early phases of the engineering design process are the most critical to the technical and economical success of a new product. Therefore, the use of an efficient methodology for this crucial stage is most important. DFSS is such an efficient methodology – the What and How to engineering product development process to support a new product introduction process.

DFSS also effectively supports redesign and improvement of portions of a product (e.g. fix chronic problems). DFSS uses statistical tools to understand, optimize, and control key factors that deliver critical customer attributes robustly in the presence of noise. In quantifying risk, DFSS promotes business discussions regarding product delivery quality early in the product development process, while the design can still benefit from the VOC insights.

Traditionally companies accepted three or four sigma performance levels as the norm, despite the fact that there are created between 6,200 and 67,000 problems per million opportunities. The Six Sigma standard of 3.4 problems per million opportunities is a response to the increasing expectations of customers and the increased complexity of modern products and process. Most companies have not taken the time or made the effort that is required to:

- Learn what their customers really want.
- Develop Critical-To-Satisfaction metrics in terms of design variables and the scorecard for risk assessments.
- Assess field and design robustness for testing strategy development.

Design for Six Sigma requires applying resources to finding out what the customers really want, and then devoting the entire project to meeting the needs and desires of these customers. The result of Design for Six Sigma implementation is higher profits, increased customer satisfac-

tion and high levels of quality and reliability.

The Need for Design for Six Sigma

Six Sigma succeeds by measuring defective processes, analyzing the causes of the defectives and then improving them. 'Design For Six Sigma' is more proactive by starting with the VOC and then doing the right thing. DFSS focuses on delivering the best product and developing the best process at the same time.

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Matthew Hu is a professional practitioner at Ford Motor Company in Robust Engineering and Design for Six Sigma. He earned a doctorate in Quality and Reliability Engineering at Wayne State University, Michigan. He is a senior member of ASQ, a Certified Reliability Engineer, a Certified Quality Engineer and a Certified Six Sigma Black Belt.

Applying Quality Principles to Self-Improvement

By Larry R. Smith

*The wind, one brilliant day,
called to my soul with an odor of jas-
mine.*

*"In return for the odor of my jasmine,
I'd like all the odor of your roses."*

*"I have no roses; all the flowers
in my garden are dead."*

*"Well then, I'll take the withered
petals
and the yellow leaves and the waters
of the fountain."*

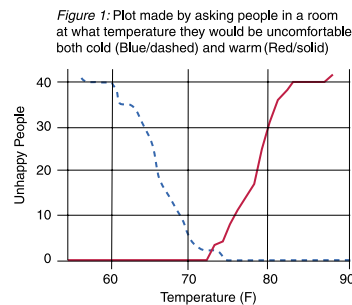
*The wind left. And I wept. And I
said to myself:*

*"What have you done with the gar-
den that was entrusted to you?"*

Antonio Machado

Translated by Robert Bly (1)

Peter Jessup, then of The Ford Motor Company, studied the audience, pointed at a thermostat on the wall, and fired a question. "If I adjust that thermostat so that the furnace came on, and the temperature in this room climbed steadily higher, how hot would it have to be before you felt uncomfortable?" Pete waited until everyone wrote down a number. Then he asked, "If I then turned down the thermostat so that the air conditioner came on, and the temperature became cooler and cooler, how cold would it have to be before you felt uncomfortable?" Again, everyone wrote down a number. Finally, using an overhead slide and counting hands raised by audience members, Peter began to plot the cumulative number of unhappy people as a function of temperature. Such a graph is shown in Figure 1, where a red or solid line is associated with people who are too warm, and the blue or dashed line represents those who feel they are about to turn blue from the cold.



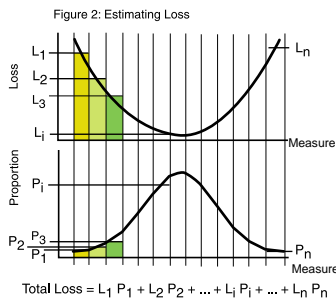
And what do we learn from such a simple, yet profound exercise? Look closely at Figure 1. First there is no temperature that will simultaneously make everyone in the room feel comfortable (proof of the old adage, that you can't please all of the people all of the time). The best you can do is set the temperature at a target that minimizes the number of unhappy people. Second, the number of unhappy people increases dramatically as you move away from this target. Most of the characteristics that we deal with in our everyday lives have curves associated with them that are similar in shape to Figure 1. Such a curve is called a loss function (2). In this article we will use the concept of a loss function to examine three basic strategies for system improvement, and then apply these lessons to ourselves!

Estimating Loss

Building on the above analogy, suppose we want to know what, exactly, is the temperature in Peter's room. We obtain a very accurate digital thermometer, take a temperature reading, and plot this point. Ten minutes later we take another reading. This measurement is different from the last, and it too is plotted. Let's continue, taking a reading every 10 minutes and plotting the data. Eventually this data plot begins to reflect the shape of a distribution, the distribution of temperature in Peter's room. What is the true temperature of the room? We have a signal. We can estimate the temperature or tell what the temperature is most likely to be. We also know the range, the coldest and warmest temperatures we measured, but there is always noise with any signal and we do not know the exact, true temperature of the room.

We can estimate the loss associated with the heating/cooling system of the room. Figure 2 shows a loss function (unhappy people

as a function of temperature) and an associated distribution (temperature of Peter's room over time). From the distribution, we learn that occasionally the room was relatively cool. It did not happen very often, but when it did, quite a few people were unhappy. Mostly the room was at a comfortable temperature, and the number of unhappy people at those times was minimal. Sometimes the room became relatively warm. This again did not happen very often, but when it did, many people became unhappy. We estimate loss by first breaking the temperature range into segments, and then estimating each segment loss (think proportion of time multiplied by the number of unhappy people at that time). Finally, adding all the segment losses together provides an estimate of the total loss associated with the heating/cooling system of the room.



A Simple Strategy for Improvement

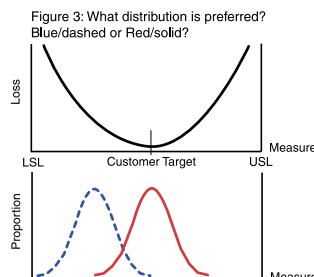
Suppose two companies produce thermostats and they are called the "blue/dashed" company and the "red/solid" company. We purchase the "blue/dashed" thermostat, install it in Peter's room, set it at a target temperature to give us the smallest loss, and estimate the distribution over time. Later, we do the same thing with the "red/solid" company thermostat. The results are shown in Figure 3. Both thermostats performed within the specification limits established by the National Thermostat Association, but we seem to get more complaints with one thermostat in particular. Which would you prefer?

The "red/solid" company thermostat is the better choice because its distribution is centered on the customer target. Dr. Deming used to say that the best thing we could do for Ford Motor Company is to make our customers so happy that they begin to brag about our products to others. When it comes

time to buy another product, not only do they purchase ours, they bring their neighbors with them. One strategy for making customers happy is to understand what characteristics are important to them, establish customer-driven targets, and then center the process on these targets.

This same principle applies in our personal lives. It begins with a personal vision of our physical, mental, emotional, and spiritual selves. Where are we now with respect to this vision? Establish targets to close the gap and then center what we do on these targets. In order to improve himself, Benjamin Franklin established standards to obtain moral perfection. He wanted to improve in: temperance (not to overeat or over-drink), silence (speak constructively or not at all), order, resolution (walk the talk), frugality, industry (waste no time), sincerity, justice (never harm another), moderation, cleanliness, tranquility (don't sweat the small stuff), chastity, and humility (3). He focused on one trait per week, keeping a tally of infractions, and would cycle through the entire set four times a year. (His greatest weakness was order. Ben was a sloppy man and eventually decided that with his great memory he didn't need to be too orderly. Humility was also an issue -- he often caught himself boasting to others about how humble he had become!)

When he was a Vice President at AT&T, Bernard Serfesetter established the following targets (4): be on time for meetings, answer the phone in two rings or less, return phone calls the same or next business day, respond to letters in five business days, clean desk and keep only same-day paper on credenza, never need a haircut, shoes always shined and clothes always pressed, weight below 190 pounds, and exercise at least three times a week. He found that a 68% reduction in annual defects was very attainable.



Harry Forsha recommends the following process (5): define your personal require-

ments, list the items you want to change, reduce the list to the most important items, describe the intended results, establish the indicators of success by which to measure the results, and establish a commitment -- do it! For example, Harry wanted to get in shape. He visualized that as he walked down the

beach, "women are amazed at the balance and perfection of my beautiful body." He measured weight, waist measurement, and muscle tone. To be fair to Harry, we should also mention that he wanted to feel useful to others. He visualized, "It is Thanksgiving and I am cooking soup at the church kitchen, so that we can feed the homeless people." He measured days of service and contributions.

By establishing targets and then centering what we do to these targets, we will make

improvements and perhaps be ready to gain even more benefits by considering another quality strategy

The Importance of Variation Reduction

To continue with our analogy of Peter's

We know the loss will be less with the "red/solid" thermostat because the distribution associated with that product is more often on target and does not reach the temperature extremes of the "green/dashed" design. This improvement strategy of reducing variation around customer targets can make huge differences in competitive performance. In the late 1970's, Sony discovered that customers were much happier with televisions manufactured in their Tokyo plant, because the distribution of color set density had less variation around target than televisions manufactured in their San Diego plant (even though the San Diego plant had made all parts within specification and the Tokyo plant had manufactured a few parts just out of specification). Ford had a similar learning experience in the early 1980's in comparing manufacturing variability and warranty costs of identical transmissions manufactured by Ford at Batavia, Ohio and by Toyo Kogyo (Mazda) in Japan (6).

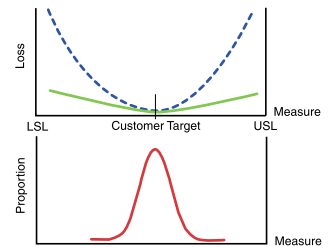
This same strategy applies in our personal lives. We gain additional benefits by reducing variation around our personal targets. Harry Roberts, a professor at the University of Chicago, noticed that his time in running marathons was much better in cold weather than it was in hot weather (4). In hot weather, he often felt sluggish after drinking substantial amounts of fluid at aid stations during the race, and thought there must be a better way to keep cool while running. So he decided to not drink fluids while racing in hot weather, but to drink large amounts of fluids before the race and to soak his running clothes before the start and at aid stations. He found he felt fine and his running times became consistent with what he could do in cool weather. Roberts also shares experiences of students who improved health by using run and/or control charts to reduce variation in diet, smoking, blood pressure, and blood sugar level.

Let's return to Peter's room to consider a third strategy for improvement, perhaps the most profound strategy of all ...

Becoming Robust, Less Sensitive to Variation

Imagine that Peter now begins to joke about the room temperature and starts to change the attitude of the people in the room. He takes them to a clothing store where each person, free of charge, is able to select a stylish outfit of light clothing to wear along with a new sweater they may wear if the room becomes cool. When they return to the room, Peter again goes through the exercise to determine the loss function associated with room temperature. This newly derived loss function, labeled "green/solid," is shown next to the old loss function, labeled "blue/dashed," in Figure 5. If you were Peter and wanted to make sure this group felt as good as possible about their room experience, which loss function would you prefer?

Figure 5: What loss function would you rather have? Blue/dashed or Green/solid?



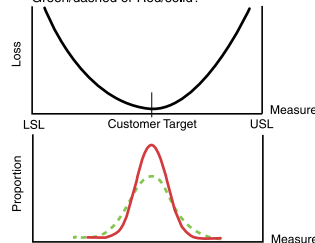
Obviously, the preferred loss function is the shallower, "green/solid," function because this loss function is less sensitive to variation associated with the distribution of temperature in the room. This brilliant strategy for improvement is from Dr. Genichi Taguchi, who reasoned that any system may be improved by finding and changing a combination of factors that can be controlled to make the system less sensitive (or robust) to variation that cannot be controlled. Dr. Taguchi is famous for applying this strategy to the INAX Tile Company shortly after World War II.

The INAX Tile Company was rejecting a significant percentage of their production ceramic tiles because they could not meet specifications associated with tile dimensions. They discovered the root cause for all this scrap was temperature variation in their tunnel kiln, but they could not afford a new kiln – it was too expensive. Dr. Taguchi worked with them and designed an experiment consisting of possible changes they

continued on page 15

room, suppose we purchase another thermostat. This one, from the "green/dashed" company, is installed in Peter's room and set to target. Over time, we take measurements and compare this distribution with that of the "red/solid" company as shown in Figure 4. In this situation, both distributions meet specification and both are centered on target, but one has more width or variation than the other. If you were in Peter's classroom, which would you prefer?

Figure 4: What distribution is preferred? Green/dashed or Red/solid?



Is certification paying for automotive manufacturers?

by Trevor Davies
Head of System Certification Operations, VCA

As the automotive manufacturers and suppliers begin implementing the second edition of the technical specification ISO/TS 16949, ISO/TS 16949:2002, Quality management systems – Particular requirements for the application of ISO 9001:2000 for automotive production and relevant service part organizations it is the right moment to ask how well management system certification is serving the sector. We will begin with the Original Equipment Manufacturers (OEM's) – OEM designates the manufacturers that actually supply the cars to the market. Automotive manufacturers have been subject to external assessment since the introduction of quality system standards. This began with second party¹⁾ audits to defence standards: the NATO AQAP series or, in the United Kingdom, the Defence Standard 05 series, where satisfactory results were required in order to tender for new contracts.

Depending on the type of product and the absence or not of design responsibility, different levels of AQAP were applicable. Interestingly, most passenger car manufacturers just needed to comply with the final inspection requirements given in AQAP 9, with only OEM's such as Land Rover and Foden needing to comply with the highest level (AQAP 1) due to their design responsibility. For OEM's, it was a change in the United Kingdom Ministry of Defence (MoD) policy in the early 1990's that required them to seek third party certification¹⁾. At that time, the ISO 9000:1987 series comprised the applicable quality management system standards.

Move to certification

This enforced move to certification was readily accepted by the OEM's who, in the vast majority of cases where they had design activities in Europe, chose to seek certification, including of their design activities, to ISO 9001. These certifications have been maintained as the ISO 9000 series has evolved, with increases in

scope and additional operations in many cases.

Both internal and external certification costs are high. In addition, the OEM's need to meet contractual requirements that exceed the minimum requirements for certification. Their efforts therefore represent more than a mere "certificate on the wall". It is also very important to demonstrate to their own suppliers that they are prepared to meet the rigours of external assessment and certification. But in all cases, they are seeking "value for money", through value-adding assessments

that help them maintain disciplines and improve their systems.

In the experience of the Vehicle Certification Agency (VCA), which has issued certifications to the vast majority of United Kingdom-based vehicle manufacturers, not all of the latter structured their

quality management systems (QMS) around the ISO 9000 clauses. Those that did so generally adapted their systems so that most of the intent of the 2000 version was already in place before the revised standard was published.

The system put in place in the early 1990's by Rover, for which the company sought ISO 9001 certification, was based around a one-page set of policy statements which covered product, policy, processes, people, customers, etc., with a matrix giving policy deployment across the organization. For each policy, there were corporate owners responsible for the high level procedures, with other relationships given as either "Prime", "Operational", "Functional" or "Support", as appropriate. Using the same philosophy, this "plan-on-a-page" approach then cascaded down to each of the operational and functional areas of the company.

The system presented a challenge to VCA, Rover's certification body, as it required greater understanding of the company's systems and a more flexible approach to the assessment. The basics of the system stayed in place until the purchase of Rover by BMW. By then, it had

already incorporated environmental management and integrated system assessments were being carried out.

Japanese manufacturers based in the United Kingdom, who took a similar approach to Rover, already had in place effective systems based on sound processes. When ISO 9001:2000 arrived, their approach was to demonstrate how their processes met the requirements, rather than align their system with the standard. With very few exceptions, the processes already adequately met the requirements and, in many cases, were exceeding them. For the Japanese, the main benefit of ISO 9000 was that it required discipline in terms of consistency, documentation and records.

Toyota Motor Manufacturing UK is certified to ISO 9001:2000 and ISO 14001. Kirsty Allen, an engineer in their Quality Assurance (QA) division, comments: "The standards are important sales assets. They provide another badge of confidence for our customers. We are impressed with the standard, which works well for us, although in some areas, such as process control, the ISO 9000:1994 series was better, as it was less fragmented."

Effective results

For manufacturers that have used the ISO 9000 standard as their QMS structure, there have been excellent examples of policy deployments and, in all cases, very good, effective and measured results to drive the business forward. Whilst these results have usually been included in audits since the 1994 version of the ISO 9000 series, there is greater emphasis on them in ISO 9001:2000, although linking them to key processes is challenging both for manufacturers and auditors.

Jaguar took an interesting approach to assessment and certification. Although starting, like all other manufacturers, with ISO 9000, Jaguar quickly recognized the additional benefits of adopting QS-9000 (the US automotive sector quality

1) "Second party" refers to audits of suppliers carried out by their customers. "Third party" audits are carried out by specialized independent bodies.

ty system requirement that includes ISO 9001:1994) as their internal standard. In particular, the company realized that improvements were available through adopting the QS-9000 core tools for quality planning and control plans, risk analysis, measurement systems and statistical control. In VCA's experience, the extent to which Jaguar implemented these tools was unique among vehicle manufacturers. Moreover, while still a new acquisition by Ford and modest in size compared to other parts of the American corporation, Jaguar was well positioned to try out different approaches compared to Ford's mainstream operations. Jaguar was one of the first parts of Ford to use the parent company's latest product development process, then known as the "World Class Timing Process". This has now developed into the excellent Ford Product Development System (FPDS). This system identifies design and development as being one of the main causes of poor quality and, in particular, a source of the reliability problems that can be so harmful to the reputation of a vehicle manufacturer.

This is also an area that causes difficulty for auditors, who are not helped by the ISO 9000/QS-9000 requirements that are still primarily focused on manufacturing. Jaguar, together with the later Ford acquisition, Land Rover, continues to see benefits in management system standards and has recently been audited to ISO/TS 16949:2002, which it has implemented in addition to existing ISO 14001-certified environmental management systems.

John Hanson, Quality Strategy and Audit Manager for Jaguar and Land Rover says: "ISO/TS 16949 is not only vital to us as an effective global quality standard, but has tangible and measurable business benefits. For example, while it is not an absolute prerequisite for government procurement, it is looked upon very favourably and, specifically, for United Kingdom Ministry of Defence contracts. Having said that, while it is essential for our suppliers to have in place a QMS, I'm not necessarily convinced of the necessity to mandate them all, down to the second and even third tiers, to the same standard. At what point does it break the camel's back?"

Legal compliance

A quality management system worthy of

the name needs to address legal compliance and, in the United Kingdom, quality management system standards are part of the mechanism for meeting legal requirements for vehicle systems and components. These legal aspects are an integral part of VCA's responsibilities to the British Government for issuing vehicle approvals.

The first link between quality system standards and legal requirements was made in the 1970's with the need for vehicle and component manufacturers to demonstrate they had in place satisfactory quality systems. At that time, the defence standards were used as guidance. Since then, not only has the guidance kept in step with quality management systems as they have evolved, but ISO 9000 certification has also become an option among the approval requirements specified in European Directives.

Ian Antill, Manager, Quality Systems Assurance, at Jaguar, comments: "We have customers in approximately 70 countries worldwide. Every one has its own relevant legislation, but ISO/TS 16949 is now accepted globally and helps to demonstrate conformity of production (COP) to product legislation, which means that our products maintain the necessary approval to meet the legislative requirements of each country, for example in exhaust emissions, braking systems and seat-belts."

Some suppliers, such as manufacturers of seat belts, safety glass, tyres and lamps, hold management system certification in support of their product approvals. In general, however, they seek certification because one or more of their customers require it. An early example of this was when Rover required ISO 9000 certification under its RG-2000 quality scheme for monitoring and developing its suppliers.

Within the automotive industry, there was a general consensus that the generic ISO 9000 standards – the 1987 and 1994 versions – did not fully meet the sector's specific requirements, particularly in respect of the component suppliers on which the car manufacturers depend. This point was emphasized by the US "Big Three" – Daimler-Chrysler, Ford and General Motors – and led to their developing QS-9000. Released in 1995, this included

ISO 9001:1994 and added specific interpretations and tools required by the US automotive industry.

The stated objective of QS-9000 was to harmonize the fundamental supplier quality system requirements and assessment tools. The Big Three also intended to reduce their own second party audits of suppliers' quality systems by relying on the assurance provided by third party audits carried out by certification bodies, thus enabling them to concentrate their resources in other areas.

Very prescriptive

QS-9000 consisted of three sections: the ISO 9001:1994 requirements, sector-specific requirements and customer-specific

requirements. In all cases, the requirements were very prescriptive, describing not only what was required but also how it should be applied. The specific interpretations gave the generic ISO 9000 an automotive slant which, together with

the core tools contained in the related manuals, provided a sound base for the quality systems required by the industry.

The same philosophies were carried over into the third, and still current, edition of QS-9000 where the (sometimes confusing) "Sanctioned Interpretations" were incorporated. The standard also took into consideration the requirements of the parallel European automotive sector standards, VDA 6 (Germany), EAQF (France) and AVSQ (Italy). This was done in anticipation of the global automotive standard published in 1999 as technical specification ISO/TS 16949, of which approximately 90% was drawn from QS-9000 and 10% from European standards – mostly VDA 6.1.

Through the evolution of the separate regional requirements (QS-9000, VDA 6.1, EAQF, AVSQ), through ISO/TS 16949:1999 to the latest ISO/TS 16949:2002, there has been a move towards concentrating on the desired results and away from describing "how to do it". While this has allowed suppliers to adopt a more flexible approach, it has also led to the need for them to incorporate a multitude of customer specific requirements in their QMS. Although this

The first link between quality system standards and legal requirements was made in the 1970 's

need was always present to a lesser or greater extent, and such requirements were always liable to auditing by certification bodies, there are still some difficulties in understanding exactly what are the expectations. ISO/TS 16949 rules that all customer specific requirements must be covered by the initial audit. The expectation is that these are therefore incorporated into the suppliers' QMS, which are then subject to audit.

This is satisfactory for the likes of the Big Three, whose Failure Mode and Effects Analysis (FMEA) issued by the Automotive Industry Action Group (AIAG) is common to Ford, General Motors and DaimlerChrysler and therefore applicable to all their suppliers. However, German manufacturers specify a system FMEA based on VDA 4, which differs from the AIAG document. These matters are important, not only for the audit process, but more importantly for the suppliers, who need to operate systems that meet the requirements of all their customers.

The views of a major component manufacturer like Visteon are also relevant. Malcolm Neill, Visteon's Quality System Manager, Europe, is in no doubt about the importance of the latest version of ISO/TS 16949: "Quite simply, possession of ISO/TS 16949 is a pre-condition of doing business – it's really an operating system. It gives us an opportunity to achieve a level of capability in the eyes of our customers, the vehicle manufacturers. The latest standard really is forcing us to address every aspect of our business."

Cascading down

To emphasise the importance of the standard "cascading down" the supply tier chain, Malcolm Neill confirms that Visteon insists that its own suppliers also conform to ISO/TS 16949: "One standard for our suppliers enables us to meet the multiplicity of requirements from the automotive manufacturers."

His only reservation about the standard, echoed by some of the other commentators, is that it is sometimes over-prescriptive. He points out: "Our cus-

tomers, the OEM's, already have detailed lists of customer specific requirements which are over and above those in the standard. The standard could reflect that." Customer specifics are not the only challenges when applying certification to automotive suppliers. There are a number of issues that are being tackled to make the process more effective:

Firstly, the accreditation bodies that approve the certification bodies as competent were not themselves seen to be fully effective in the eyes of the OEM's. As a result, the International Automotive Task Force (IATF) has taken overall control and appointed a number of oversight offices to fulfil this role for ISO/TS 16949 certification.

Secondly, some certification bodies were also judged by the OEM's not to be fully effective which, added to a certain lack of con-

fidence in third party certification itself, has led to differing levels adopted by OEM's, some of which require certification, whilst others look for conformity only. Variation in the competence of certification bodies was the main reason why the OEM's took direct control through the appointed oversight offices. Their plans now include a driving licence-type points system being introduced to provide a measure for the performance of certification bodies.

Thirdly, there is also variation among suppliers in respect of both the understanding and application of core tools. The situation has not been helped in some cases by the OEM's not working in partnership. Examples are late design changes and refusal to accept responsibility after having "moved the goal posts".

Finally, the current rules on non-conformities by suppliers can automatically result in probation and de-listing. This can lead to suppliers showing a lack of transparency in their dealings with certification bodies and a tendency to take ineffective short-term measures to deal with nonconformities, instead of developing robust solutions to prevent recurrence.

Another initiative to improve supplier performance has been the Society

of Motor Manufacturers & Traders (SMMT) Industry Forum that followed the arrival in the United Kingdom of Japan's three automotive manufacturing giants to supply the European market. Honda set up its first plant in Swindon, Wiltshire, in 1985; Nissan began production in Sunderland, Tyne and Wear in 1986; and Toyota's operations commenced in Burnaston, Derbyshire and Flintshire, North Wales, in 1992.

The arrival of the Japanese plants on British soil was to have far-reaching consequences for the British automotive industry, whose image had not been helped by years of industrial unrest and the unflattering parts per million (ppm) reject levels of components from United Kingdom suppliers, compared with those from Japan. But against this backdrop, the Japanese original equipment manufacturers were committed to using a progressively higher level of components and sub-systems being sourced from within Europe.

Total business systems

Despite a measure of disagreement by both OEM's and suppliers on certain aspects of certification, the common structure and similar purposes of ISO 9001 and ISO 14001 are making it easier for total business management systems to be developed, together with integrated audits. This is meeting the increased demand from clients, not only to reduce certification costs, but also their own internal costs to support the audits.

Kirsty Allen, of Toyota, would like to believe it possible for the two ISO management system standards, ISO 9001 and ISO 14001, to merge eventually into one joint standard, commenting, "The environmental perspective will become increasingly important. But we also believe that the guidelines for improvement in ISO 9004 will also become more important."

With an improved understanding between all the parties involved, this will lead to improved relationships being established and a robust and respected certification system that will benefit all stakeholders.

reprinted from ISO Management Systems - May-June 2003

**There has been a move
towards concentrating
on the desired results
and away from describing
'how to do it'**

Volunteer Opportunities for the ASQ Automotive Division

Name: _____
 Organization: _____
 Title: _____
 E-mail: _____
 Phone Number: _____

Please check those items that you are interested in.
 Please indicate priority (1st, 2nd, etc.)

- Membership Team-Liaisons to sections 8/9/10 International
- Membership Liaison to a student section
- Membership team-person to coordinate communications for a particular event
- Coordinate meeting with agenda/learning of target sections
- Someone to create list of university contacts (*develop excel list/and email list*)
- Develop/maintain list of business editors for PR opportunities
- Developing/maintain Auto Division Speaker lists
- People to come up with plan approach UAW for membership growth
- Plan/strategy to leverage ASQ Company members for value-is there a contact person that we should be sending info to that they can use to communicate through their company? Arrange meetings with these individuals to meet (have a standard communication promo)
- Develop a 'what's happening in the AUTO Division (i.e. past/future events, benefits, achievements and volunteer opportunities)
- McDermond Coordinator
- Help Track communication plan
- Assist with Paper Symposium
- Expand Symposium to "Spanish written section" work with HQ, post paper to our web site
- Learn about Quality Kid/any participants in our target regions?
- Marketing materials that highlight the history and role of Auto Division and ASQ
- Coordinate Business Card Advertising on Website
- Publications Team
- Programs Team
- Organizing Events
- Public Relations development
- Awards events
- Organizing ASQ Events within your company
- Attending meeting and doing work on events/task teams
- Scholarship Team
- Standards Team-understanding Quality Standards, bring interpretations to membership
- **Just want to get involved, give me a call to talk about where I could best help**

e-mail your responses to: louann.lathrop@gm.com

ASQ Automotive Division Membership Contest 2003 - 2004 Application

Contest Ends on April 1, 2004

Name of Company: _____
 Address: _____
 Contact Person: _____
 E-mail: _____
 Phone Number: _____
 Company web link: _____

Please mark the category your company fall in

- (1) Company with largest number of ASQ Automotive Division Member
- (2) Company with the largest percentage (%) of employee members of ASQ Automotive Division (companies with more than 100 employees)
- (3) Company with the largest percentage (%) of employee members of ASQ Automotive Division (10-99 employees)
- (4) Company with the largest percentage (%) of employee members of ASQ Automotive Division (1-9 employees)
- (5) School with largest number of student members of ASQ Automotive Division

For Categories 2-4, please provide the following:

Number of employees:

Number of employees that are ASQ Automotive Division Members: (Note: the final verification will be as of March 31, 2004)

Names of employees that are ASQ Automotive Division Members: (OK to attach list)

Note to ASQ Staff:

The word "Contest" refers to someone winning something. We need to explain to the readers the "contest rules, how to play, where to send in their responses and tell them what they might win

ASQ Automotive Division 2003 Scholarship and Award Banquet

Automotive Excellence Article for Winter 2003

On June 24, 2003, the American Society for Quality (ASQ) Automotive Division 2003 Scholarship and Recognition Banquet was held at the Walter P. Chrysler Museum, in Auburn Hills, Michigan. 110 people toured the three floors of informative and appealing Automotive History exhibits, while appetites were satisfied with a wonderful, savory buffet served by caterer, Aramark.

DaimlerChrysler's Vice-President of Quality, Donald W. Dees, presented the keynote address to the group at the conclusion of the buffet and tour. Mr. Dees gave a very insightful presentation on personal success and motivational drivers, that was well received by all. He was very astute to select a topic of personal interest, as well as one that has industry implications.

Automotive Division President, Harold Brubaker, then assisted Awards Chairpersons in presenting awards to a number of industry leaders. These leaders were recognized for their accomplishments during 2002, in contributing to the successes of their various organizations.

Individuals receiving recognition were:

Lloyd D. Brumfield, MSX International assigned to Ford Motor Company – Customer Service Division in Livonia, Michigan, was presented with the "Koth Award." Lloyd has been a pillar of strength for the division for many years, putting on conferences, scheduling and providing exhibits, acting as liaison to other organizations and doing what ever odd jobs that needed to be done. The Koth Award recognizes a currently active member of the ASQ Automotive Division who has given outstanding personal service for the promotion of the division and the American Society for Quality.

Bryce Currie, Vice-President of Six Sigma for TRW, was honored as the "Quality Leader of the Year" Award. This award recognizes the non-Quality Professional who provides a customer-focused quality philosophy and a defect-prevention vision in a leadership role in an organiza-

tion associated with the Automotive Industry. Mr. Currie introduced his team from TRW who were responsible for helping with his achievements.

Thomas I. Schoenfeldt, President of Schoenfeldt Services, Inc. was named "Quality Professional of the Year." Mr. Schoenfeldt has been involved in speaking and training in the quality arena on an International basis for 30 years. The Quality Professional of the Year award recognizes an individual in the Automotive Industry who has made significant contributions in: Leadership or Managerial skills in implementing continuous improvement in quality and services provided to the community towards furthering the understanding of quality systems and techniques.

Carolyn Haase, who operates her own consulting and training firm in Iowa and the Mid-West, was presented with the Judson C. Jarvis Award for her outstanding contributions to the success of the AICE Quality Conference, in Bettendorf, Iowa. The Jarvis award is presented to division members who significantly contributed to the success of an Automotive Division Conference in the past year.

"Superior" Cecil C. Craig Awards for excellence in the development and publication of technical and managerial papers were bestowed on the following Automotive Division members:

Mike R. Hill, Quality Systems Manager for BASF Elastocell, a manufacturer of microcellular polyurethane automotive and NVH components. Mike is a certified Six Sigma Black Belt and has been a member of the division since 2000.

Bharath Vijayendra, Vice-President and Senior Statistical Consultant at Research Data Analysis(RDA) Group, Bloomfield Hills, Michigan. Bharath is a certified Six Sigma Black Belt and has 10 years of marketing research experience in the automotive and transportation industries.

John Young, Director of Quality & Loyalty for Research Data Analysis(RDA) Group, in Bloomfield Hills, Michigan. John has directed several major Quality and Brand tracking studies in the automo-

tive and transportation industries. John is currently pursuing an MBA from Indiana University.

TESTIMONIAL AWARDS for exemplary service to the American Society for Quality and the Automotive Division were bestowed upon:

Cheryl Franks- Denman of Deloitte & Touche Quality Registrar, Inc.

Ken Zimmer of Delphi-Saginaw

THE JURAN SCHOLARSIP AWARD was presented to **Joshua Trudgeon**, a B.S. Product Design Engineering Technology student- Ferris State University.

DEMING SCHOLARSHIP AWARDS were bestowed upon Feiyi Jia and Jingian Wu, both from Oakland University.

Our Sponsors of this event deserve "SPECIAL RECOGNITION" for their wonderful support of this banquet. They are:

Platinum- ASI Consulting Group, LLC
Cadillac Products Automotive Company
DaimlerChrysler Corporation
TRW Automotive
Gold- Costello Communications, Inc.

Silver- ASQ Greater Detroit Section
Deloitte & Touche Quality Registrar, Inc.
Global Validators, Inc.
Goebel Consulting Group, Inc.
Guardian Automotive- Warren Plant

Our thanks goes out to the Award Chairpersons,

Jaynie Vize, Quality Professional Award
Ally Hamood, Koth Award
Carol Malone, Quality Leader Award
Mary Rowzee, Craig Awards
Josse Ven, Jarvis Award

for their dedication to the process of selecting the award winners and for a job well done!

We look forward to seeing you at the Awards Banquet in June 2004!

Chuck Tomlinson,
Automotive Division of ASQ
Awards Chair

continued on page 15

Applying Quality Principles to Self Improvement

could make in the process and in the material mixture used to make the tiles. In just eight experimental runs, they found a combination of factors that made the tiles insensitive to temperature variation within the kiln. Not only was the cost of a new kiln avoided, scrap was virtually eliminated at a piece cost savings, as the more robust mixture utilized cheaper ingredients!

Can such a strategy apply to our personal lives? Stephen Covey (7) once shared a story about riding a subway in New York City. He sat across from a father with three young children who were disturbing everyone with their wild, unruly behavior. Stephen did not think much of this father who literally did nothing to discipline his children. Finally the father looked at Stephen and apologized. He explained that he and his children had been up all night in the hospital with his wife, the children's mother. She had died very early that same morning. Now the behavior of these children did not bother Stephen at all. His heart was filled with love and compassion. It was Stephen who changed -- not the father, not the children, not the subway.

In any given situation, we can choose to change, become less sensitive or more robust to circumstances in which we have little control. Consider a diabetic whose body chemistry is very sensitive to sugar. With weight loss and exercise, diabetics can often make themselves much less sensitive to sugar intake. Our attitudes often make a huge difference in the way we respond to people and circumstances (as well as our blood pressure). I have a friend who never gets upset while driving in traffic. If someone suddenly cuts in front of him, he just smiles and says, "good move." When I am tempted to feel "road rage," I think of this and it makes me smile. Can we examine our assumptions, the way we think, and change our mental attitude?

Putting It All Together

Peter Senge (8) describes personal mastery as the ability to develop a personal vision, understand where we are with respect to that vision, and then do what it takes to make that vision real. Barry Bebb, retired Vice President of Xerox (9), recommends both projects and practice. Projects are dif-

ferent from actions. Projects involve a plan with goals, a schedule and resources. Barry says, "A list of action items seldom causes anyone to do anything important. Until an action item is turned into a project, very little gets done." Practice is also vital. "Doing new things can be very daunting at first. Practice is necessary to get good at anything. It will take most of us considerable practice to become truly robust against things that normally irritate us. Practice changes attitudes, and attitudes change actions. And real actions only happen when they are transformed into projects."

In the corporate world, business prospers when products and services are robust and delivered on target with little variation. These same strategies may be used to create a new and better reality in our personal lives.

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