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QUALITY IS JOB ONE FOR CUSTOMER SATISFACTION!



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WHITEPAPER

Quality and customer satisfaction go hand in hand when buying dvLED. There are many options. Let the LED Experts Group help find the “perfect fit”.



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The objective of this white paper is to explore the dvLED display industry from a product development and manufacturing perspective; specifically, as it relates to the concept of quality and the relationship between customer's expectations and gratification. Suffice it to say there is a gap in the quality of products in the dvLED display world worthy of discussion. To understand the effects of the gap it will take some background exploration first.



Today the concept of quality tends to be assumed. Most of what we buy has the appearance of good quality... but as you will experience that is not necessarily the truth. In the not-too-distant past we have had good, better, and best as it related to quality. We could buy a Chevrolet, a Buick, or a Cadillac. They were all automobiles, but at varying degrees of quality from basic to luxury. Prices were indicative of the levels of quality, and it was obvious to the buyer... the point is that your expectations were set in proportion to what you bought and paid for. Keep this in mind for later reference.

Let's begin with one traditional dictionary definition that has stood the test of time. "Quality is the degree to which an object or entity (e.g., process, product, or service) satisfies a specified set of attributes or requirements. The quality of something can be determined by comparing a set of inherent characteristics with a set of requirements." In other words, what you see is what you expect.

A newer definition provides an expanded view but one that is inclusive and not contradictory. "Quality is conformance to customer expectations." Think perception is reality. The newer definition makes customers' satisfaction even more central to delivery of quality. As we expand the perception of quality's value, this definition aligns us with revenue, product development, manufacturing, and ultimately sales and marketing. With this definition, quality isn't working to a market requirement list owned solely by others (R&D, marketing, sales), but rather at the front end of the product lifecycle. It sets a company's internal expectation that they must correctly interpret customer expectations into requirements and deliver on those requirements to meet expectations.

It is important to note that satisfying the customers' needs and expectations is the main factor in all these definitions. Therefore, it is an imperative for a company to identify such needs early in the product/service development cycle. The ability to accurately define the needs related to design, performance, price, safety, delivery, and other business activities and processes will place a firm ahead of its competitors in the market.

In this white paper we want to focus on quality as it relates to manufacturing and how the quality attainment process fits into a concern about the burgeoning dvLED display industry. The quality revolution began in the 1950s with Dr. W. Edwards Deming. He was responding to the need for quality control and consistency that was woefully missing not only in the industrial USA but in manufacturing around the world. The focus at the time (and in some companies continuing today) was in cost reduction with little to no connectivity to quality. The mantra was to build it easier and cheaper where a penny here and a dime there added up on the bottom line. Deming's outlook on quality was simple but radical. He asserted that organizations that focused on improving quality would automatically reduce costs while those that focused on reducing cost would automatically reduce quality and increase costs as a result. He outlined his ideas and theory of management, in his book *The Deming Theory of Profound Knowledge*.



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Deming's work was not universally accepted in the USA at the time, but he was receiving international acclaim for his work by the 1950s. In 1950, a group of forward-thinking Japanese businessmen invited him to come to Japan to teach them about his methodology, and as a result, Japanese manufacturing became world-renowned for its high-quality output. Because of the consistent quality of production output, Japan began a rise to manufacturing excellence and to dominate the automotive industry, among others.

In his book he taught what he called the 14 Point Theory. The following are a few highlights:

- There must be a "constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business".
- Eliminate mass inspections by building quality into the product in the first place.
- Improve the system of production and service, to improve quality and productivity, and thus decrease costs.
- Institute training on the job.
- The aim of supervision should be to help people and machines to do a better job.
- People in research, design, sales, and production must work as a team, to foresee problems of production and in use that may be encountered with the product or service.
- Remove barriers that rob workers their right to pride of workmanship.
- Remove barriers that rob management and engineering of their right to pride of workmanship.
- Institute a vigorous program of education and self-improvement.

Over the years, and out of the original teachings of Deming, came the business concept of Total Quality Management (TQM) and the standards and process adoption stages of the International Organization for Standardization (ISO).

TQM is a management framework based on the belief that an organization can build long-term success by having all its members, from low-level workers to its highest-ranking executives, focus on improving quality and, thus, delivering customer satisfaction. The concept of TQM rests largely on four principles:

1. Produce quality work the first time.
2. Focus on the customer.
3. Have a strategic approach to improvement.
4. Improve continuously.

ISO is an independent, non-governmental, international organization that develops standards to ensure the quality, safety, and efficiency of products, services, and systems. ISO 9001 certification certifies that a management system, manufacturing process, service, or documentation procedure has all the requirements for standardization and quality assurance. ISO 9001 has defined requirements for the establishment of documented procedures and records to provide evidence of conformance. The concepts of TQM permeate quality systems that are based upon ISO 9001:2008 requirements, in other words, TQM and ISO 9001 go hand in hand with quality management and consistency of processes leading to consistent quality control resulting in customer satisfaction.

From decades of study and applying the concepts of TQM and ISO 9001 it is logical to assume that all is well in the world of quality and customer satisfaction. In some cases that is true and in others it is not. Where it is predominantly true is in major industries like the automotive industry where



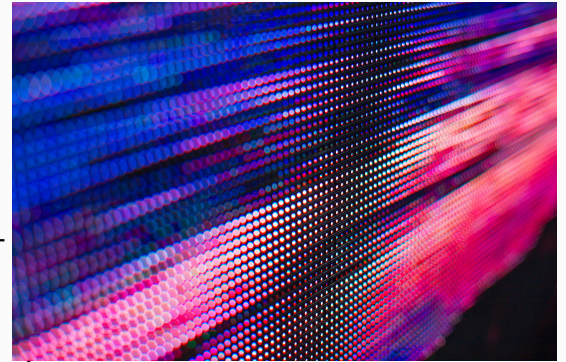


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the quality level has risen over the years to the point that most cars are very reliable and meet or exceed expectations. Where it is not yet true is in small industries or high growth industries that can be thought of as immature or as not yet fully developed. This is where the majority of the dvLED display industry resides.

Let me be clear. There are certainly examples of companies that are involved in manufacturing dvLED displays that do apply TQM and follow a certified ISO 9001 process, but they are the exception rather than the rule. Keep in mind that just because a claim is made on a website does not mean that it is accurate or even true. Of course, this begs the question of what the obstacles are standing in the way of expanded adherence to verifiable quality and customer satisfaction.

The story begins with the sheer numbers of companies (mostly out of China) that claim to be dvLED manufacturers. According to manufacturing export data out of China, nearly 2,000 companies claim to be dvLED display manufacturers. Stating the obvious, the 2,000 are far from equal. By that I mean a few are large corporations with a global footprint, many are medium sized regional companies, and the majority are what we in North America might call "mom and pop" operations that are manufacturers in name only. These are basically parts assemblers buying disparate parts from the lowest priced vendors and putting them together (in a kit form) to create a dvLED display. Looking at the finished product at a cursory glance one dvLED display may appear like another, but as experience has taught us, they are far from similar. Think of the iceberg metaphor where 2/3 of it is unseen with potential danger lying beneath the surface.



Research tells us that there are actually between 100 and 200 dvLED display companies that would qualify at a level above the majority who are simply parts assemblers. This more select group or sub-set also has differences. A few are fully integrated manufacturers who literally build all or most of the parts (sans the core LED) that go into their dvLED displays. They control the parts and the process with understandably more consistent results. Others are partially integrated meaning they outsource some parts to suppliers that may have an expertise in a certain area. One key example of an outsourced part is the core LED, another may be specialized circuit boards, and yet another that is common is the dvLED display video processor. Most use NovaStar or variations of that since they have shown expertise in this area. No need to reinvent the proverbial wheel.

Suffice it to say that the real differences are beneath the surface. The quality and performance of the end product lies in the sum of its parts. It is the combination of the design of the parts, the quality of those parts and individual components, and the quality of assembly and testing that tells the tale in a product that ends up meeting customer expectations or not. We have all heard the phrase that the "devil is in the details" and that applies... but more importantly in dvLED displays is the admonition to look for the "weakest link" in the chain. A single component on a circuit board that is not properly tested or installed can render a huge dvLED video wall useless.

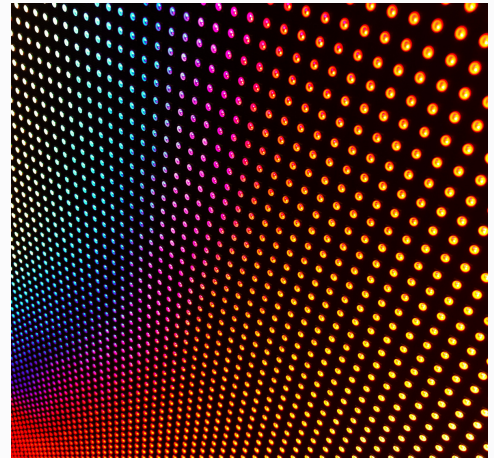
Some point to the LCD flat panel industry as a comparison but that industry has had years to work through these quality and manufacturing issues. The LCD industry is mature. The LCD "glass" is made by a few major companies and sold under their own brands or in an OEM relationship with boutique display companies serving various niches or vertical. From the circuit boards to the power supplies and even the overall manufacturing process there is basic standardization that has been tested and proven over time. In other words, they have (for the most part) worked



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through the “bugs” resulting in products that can carry a 3-to-5-year warranty on site with both parts and labor covered. In short, dvLED displays are not there yet relative to maturity. There are too many variables in parts and processes. This is one of the reasons we see such wide variances in quality, performance, and longevity.

When we speak about variables perhaps the biggest is in the LED chipset. There are 9 companies (approx.) that manufacture the core LED. The application will drive what LED is selected and what manufacturer to use. Among the 9 there are huge differences in quality, light output, colorimetry, longevity, and price. For LED displays a high level of quality is required due to the application keeping in mind there is no one set of standards that guide what is used and when.



There are 4 manufacturers that stand out and have earned a solid reputation in LED displays. They are Cree, Nichia, Nationstar, and Kinglight. Others less well known may be used but with exploration you will find there are tradeoffs. It is not as simple as just picking one. They each have different grades in their product lines. They must work hand in hand with the dvLED display manufacturers to select what is best suited to their designs.

Other hardware variables include IC chips, circuit boards, power supplies, and internal wiring. A significant set of variables resides in R&D, engineering, the manufacturing processes, testing and quality control. The point is that what you see at first glance on a website or marketing brochure is not necessarily what you get. It is the job of the reseller to dig beneath the surface and verify all that is promised. As a famous politician once admonished, “trust, but verify”.

It is a fact that the defect and failure rate of dvLED displays is greater than with other display technologies such as LCD flat panels and projectors. The variables in those mature technologies are better known, easier to control, and in many cases standardized. dvLED is not there yet... but is improving steadily.

The story should not be construed as bleak but rather one that is taking a shape of its own. Be aware and get to know (and verify) those who adopt quality control, testing, and continuous measurable improvement as their “north star” and there will be a happy ending. Specifically, a dvLED display manufacturer should adopt and adapt their processes to the following:

- Proven adherence to and adoption of TQM as a management tool.
- Certified R&D, Design, and Engineering to ISO 9001 standards
- Quality tested components (circuit boards, LED chips, IC, power supplies, processors, cabinets)
- Testing for performance and mean time between failure (MTBF) and mean time to repair (MTTR)
- Manufacturing and quality control certified to ISO 9001 standard

Ultimately it is about customer satisfaction. There are 5 accepted levels of satisfaction:

- Not Satisfied. This is pretty simple.
- Slightly Satisfied. A slightly satisfied customer may have some expectations that are being met but others are not.
- Satisfied. A satisfied customer is one who gets what they expect.
- Very Satisfied.
- Extremely Satisfied.




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Our “holy grail” is (or should be) customer satisfaction, but this requires more work on the part of the reseller of dvLED displays than they might originally think. There is much that lies beneath the surface that will determine the failure or success of a project. Knowledge is strength and picking the “right” dvLED display partner is a journey that needs to be taken. One size, one type, and one manufacturer does not fit all. Time for homework, where the final grade will show how well you did!



Let's collaborate!

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