

Putting First.
Quality

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Choose freedom.

TOSHIBA



Putting Quality First.

Quality is not easily defined but it's something every discerning customer expects. Products in the PC arena are becoming increasingly commoditised as intense price competition continues to grow. When price dictates the market, quality tends to suffer. The potential for compromising quality is too great a sacrifice.

After more than 15 years of leading the way in mobile computing, Toshiba can still claim that its product quality and innovative use of technology are key differentiators.



What is Quality?

Many people believe that brilliant design and innovation automatically result in a quality product. Others feel quality is something that's achieved by rigorous product testing. Both views are correct – but they still only address ways of achieving quality. They don't define what quality is.

Quality is a philosophy. It's a belief system that needs to be embraced across every department and function to ensure that all products and services meet the appropriate requirements. This drive for perfection is reflected in all stages of a product's lifecycle. If a quality product is expected at the end of the production line, then the quality process has to start at the beginning, the design phase, and continue through the entire product lifecycle.

There are many stages in a product's lifecycle, from conception and production to delivery and service. On the way from the drawing board to the customer, a lot must happen to ensure that what is delivered is as good as it can be.

True quality does not cut corners. It does not try to make up for shortcomings that occurred in the early development of a product with extra tests later on. At the end of the day, no amount of testing and quick fixes will disguise a poorly designed, specified or built product.

Management Initiative (MI) 2001 – A company-wide initiative

MI2001 is Toshiba's term for the Six Sigma management system developed by Motorola in the 1980s. It is part of a company-wide quality initiative started by the Toshiba Corporation in late 1998.

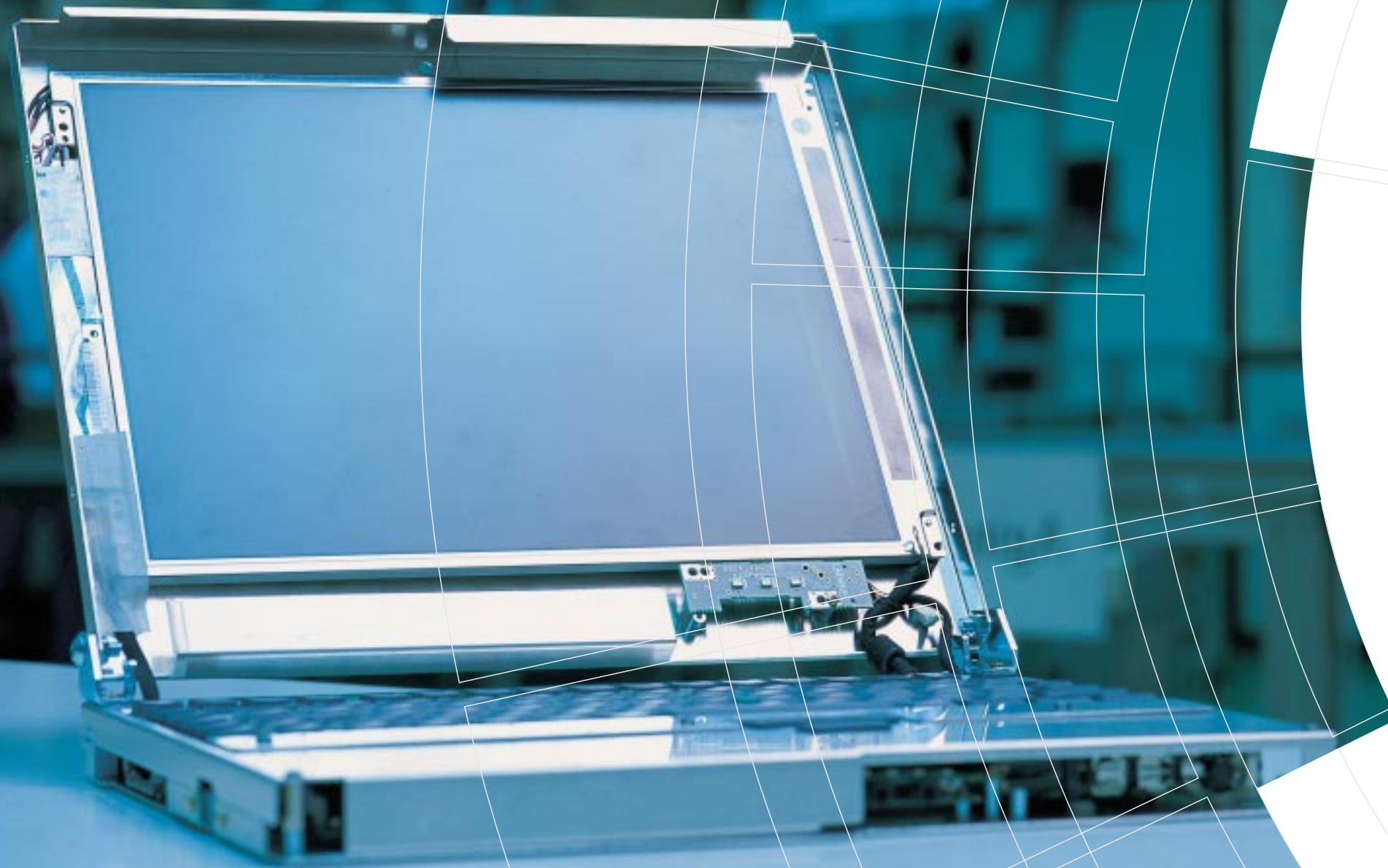
Six Sigma is a management philosophy that focuses on understanding customers and their needs. It means that Toshiba can arrange processes that best address those needs. In this way, companies can replace the 'I have a gut-feeling' approach with getting out there and finding out the whole story from the customers.

Six Sigma is also a means of analysing and assessing quality. The word 'Sigma' is a statistical term used to describe how much a particular process deviates

from perfection. Technically, Six Sigma means a failure rate of 3.4 parts per million, so the closer you get to Six Sigma, the closer your products and services are to being perfect.

In reality, however, Six Sigma is about much more than just numbers. It is now a complete management system that can be applied to almost every aspect of a business. It's a system that puts customers first by concentrating on their needs and structuring the rest of the company, from processes to people, around those needs.





product design

Designing a product well from the beginning leads to fewer problems down the road. Moreover, the earlier you eliminate a defect, the cheaper it is to fix. Saving pennies on some components is false economy if it leads to spending a lot of euro on field calls later on. The advantages of superlative product design for Toshiba are clear in terms of cost savings, but the real benefit from this proactive, problem-solving approach is for our customers. Our focus is clearly on producing an innovative, high-quality product.



procurement

When the design teams are satisfied with the initial design and layout of the system, a prototype is built.

But prior to this, testing is performed on the components that will make up the new product. As third-party suppliers are used for certain components, from memory to the thousands of components on a motherboard, it is vital that Toshiba exercises tight control over quality.

To this end, Toshiba has strict guidelines for all of its third-party suppliers. From initial plant inspections to regular spot checks, the company strives to ensure that the highest levels of quality are maintained. When the components have been tested and chosen, the first of two prototypes (the first being the engineering prototype, the second the commercial prototype) is assembled.



Skye Heat Analysis
with heatsinks

Heat dissipation simulations

Computer models and simulations are used to test heat dissipation within the chassis. Notebooks can generate a lot of heat and the faster the processor, the hotter it gets. In order to ensure that heat doesn't affect other components or cause any performance problems with the notebook itself, simulations are used to rearrange the internal components to find the best layout. This is just one of many ways that the Toshiba design process not just creates new products but helps solve problems even before the first prototype is built.

product design



production

Once the manufacturing process gets under way at Toshiba's Regensburg plant, ensuring quality takes on a more complex and rigorous dimension. Most of the quality work carried out in the concept, design and pre-production phases involves computer models, components and some prototypes.

When dealing with a production facility like Regensburg, capable of outputting thousands of notebooks a day, quality has to be implemented on a much larger scale.

The people factor

At Regensburg, quality is not only about testing processes and sophisticated management tools, it's also about people. Toshiba has created an environment where everyone has a say in how things are done. Employees are encouraged to suggest improvements to assembling and testing products.



process planning

The engineering prototype is sent to internal engineering teams based in Europe, the USA and Canada. These teams form part of the Design Qualification Working Group, which is comprised mainly of engineers and technicians. Within this group there are seven sub-groups, covering the following functional areas:

- Design
- Safety
- Software
- Compatibility
- Reliability
- Manufacturability
- Serviceability

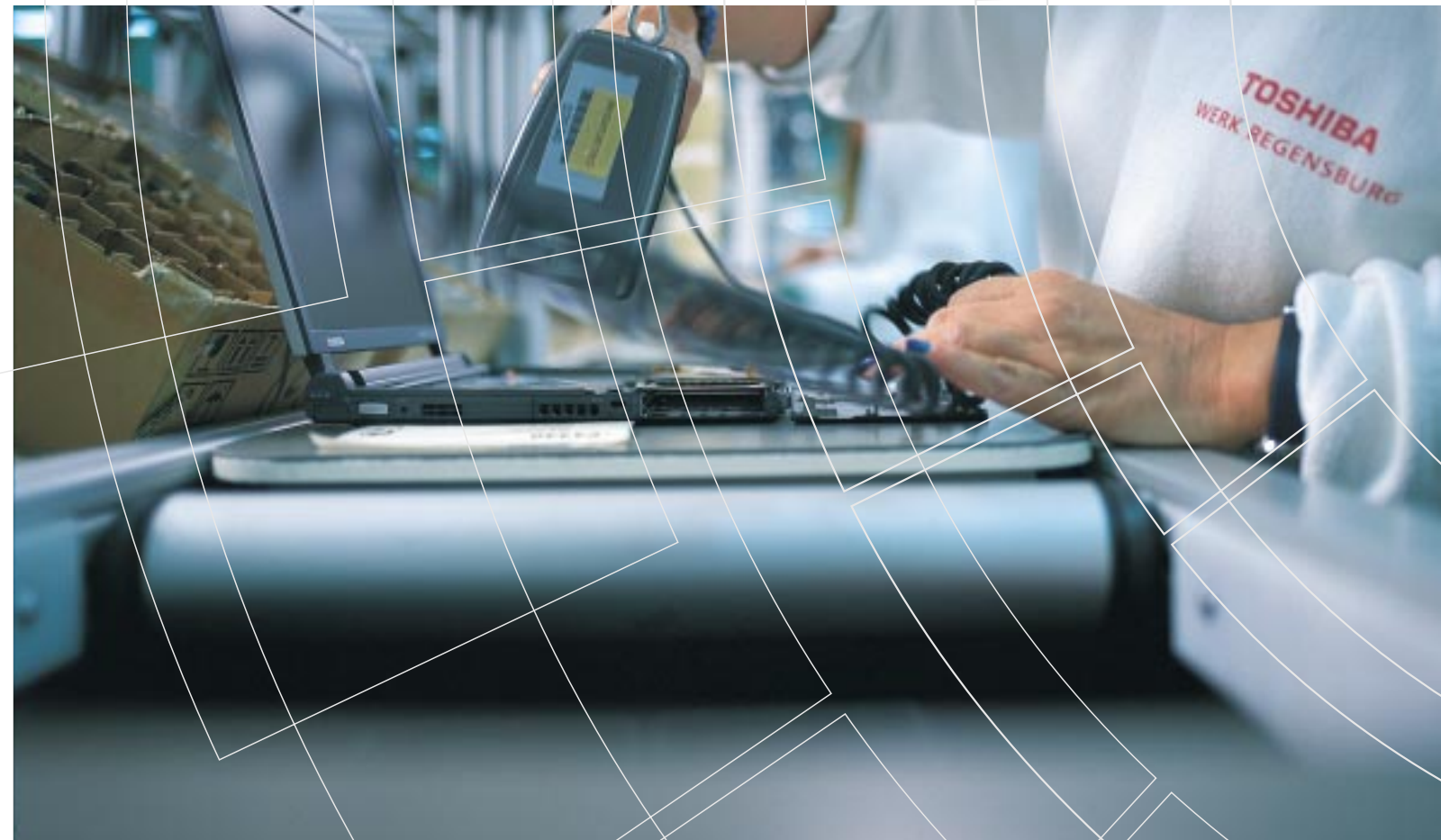
Once testing has been completed, reports from each group are sent back to the design teams in Japan, where any changes or recommendations can be implemented.

Then the second prototype – the commercial one – is produced and sent back out to the evaluation teams.

Testing a single notebook without docking peripherals and running a single operating system – such as Windows 2000 – takes around two weeks. For faster notebooks that have several docking solutions and operating systems, testing can take up to 4 weeks.

Finally, before volume production begins, a final pre-production prototype is produced for a final set of tests. The evaluation teams provide final reports to the product design teams.

After any final changes have been made to the product, volume production can begin. Clearly, eliminating any technical issues is essential before large-scale manufacturing commences. In 1999, the evaluation teams handled some 40 products.





testing

Testing is an ongoing process at Regensburg. Before shipping to the customer, each notebook is subjected to an array of tests, both during and after production. Our focus on getting things right first time is reflected in the 99% pass rate for all computers manufactured at Regensburg.

Each motherboard is fully tested three times before it is used. These tests include a visual check, an AICT (analogue in-circuit test, which involves testing 1600 electrical points on each board) and a functional test.

Once these tests have been carried out, assembly begins and the focus of testing changes to monitoring the larger components.

T&D (Test and Diagnostic)

The Test and Diagnostic routine lasts four minutes and is used to ensure that key notebook components such as the hard disk drive, diskette drive, CD-ROM drive, display, ports, memory and keyboard are working properly. Each notebook is tested fully during the assembly stage. It also verifies the correct configuration, essential given the more than 1600 different product variations produced at Regensburg.

Ageing

Once the notebook has been assembled and the T&D checks have been carried out, the machines are stress tested by the ageing process. This is an intensive up to eight hour routine that is likely to highlight any performance problems. During this test, every byte on a 10 GB hard disk drive, for instance, is written to and read from up to four times. In addition, writing to and from floppy drives and reading from CD-ROM is tested along with a series of memory and display tests.

Software download

Since all machines are shipped with pre-loaded operating systems, it's important that this software is also thoroughly checked. During the software download, anti-virus software is used to ensure a clean load. In addition, a CRC (Cyclic Redundancy Check) ensures that the system software has been loaded successfully.

At this stage every notebook will have passed all of the tests needed in order to be suitable for shipping. However, there is still a final set of random checks waiting. One in every 50 notebooks on the assembly line undergoes a spot check.

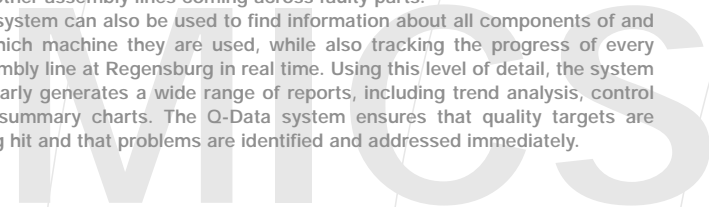


Managing the Quality Loop

Monitoring such a sophisticated quality system is no mean feat. The MICS (Management Information and Control System), developed at Regensburg, is at the heart of European operations.

MICS is a real-time data system that captures data at all stages of the production operation every time a component is scanned by one of the workers. From quantity to quality, everything is logged and tracked. For instance, faulty parts at different assembly lines can be checked to see if they came from the same batch. If this is the case, that batch of components can be set aside to avoid any other assembly lines coming across faulty parts.

The system can also be used to find information about all components of and in which machine they are used, while also tracking the progress of every assembly line at Regensburg in real time. Using this level of detail, the system regularly generates a wide range of reports, including trend analysis, control and summary charts. The Q-Data system ensures that quality targets are being hit and that problems are identified and addressed immediately.





packing/storage

Shipping high-tech goods like notebooks also calls for careful attention to detail, and the Toshiba quality system therefore includes packing materials. Before introducing new packaging, fully packed notebooks are drop-tested from approximately 100 cm to ensure that accidental drop damage is minimised.

In addition, every notebook shipment is checked by weight to ensure that all accessories are included in the package. What's more, Toshiba conducts spot checks on one in every 30 notebooks leaving the warehouse.

Finally, Toshiba maintains an extensive EDI system that allows us to track and determine the location and destination of all consignments currently in transit.



sales

Throughout Europe, Toshiba deploys local sales staff to interface with our business partners and channel/distribution partners.

Sales meetings are documented in internal databases so that customer feedback and requests can be shared and distributed throughout the organisation.

A series of end-user advisory council sessions are regularly held throughout Europe, attended by key customers. These day-long sessions provide customers with a platform for voicing their concerns about product issues, ranging from availability through to product quality.



service

But quality issues don't stop once the computer has left the factory. Service and support are essential elements in every customer experience.

A full three-line support system handles both end-user service calls and more complex engineering enquiries from larger corporate accounts. Moreover, a service website contains drivers and BIOS updates for all Toshiba computer products.

Clearly, even the best design and production methods cannot totally eliminate technical issues connected with deploying leading-edge products. Toshiba monitors all service interventions worldwide to turn technical problems into evolutionary changes that enhance our products. Every month service teams around the world pass this data to top management and to the design teams back in Japan.

To ensure a comprehensive and effective support network, Toshiba's business partners attend special seminars. There are more than 10,000 service centres throughout Europe, with service personnel receiving formal training. Qualification as a Toshiba Certified Engineer (TCE) guarantees the necessary knowledge and skills to provide quality service.

Dedicated people in the local organisations work together to help customers. With the support of our authorised service partners requests can be solved either directly or by referring the customer to the right local organisation. Toshiba's International Service Line helps end-users in remote locations. Our pick-up and return service, operated by Unisys, Toshiba's Global Service Partner, ensures that end-users receive a high level of service.



disposal

The disposal and recycling of parts and components is an important aspect of any production process. Toshiba has an internal disposal system to handle component recycling, including items such as keycaps or PCB leftovers. In addition, there are set procedures that detail the appropriate disposal methods to be used for different materials.



marketing

It's essential in any quality initiative that companies listen to their customers. The MI 2001 initiative, with its underlying Six Sigma methodology, therefore has a clear focus on customer requirements. Not that this is anything new for Toshiba. For many years now, our marketing specialists have been collating customer feedback throughout Europe and handing it on to the design teams in Japan.

Summary

The life of a Toshiba PC does not begin – as many people believe – with the customer unpacking the box. It starts much earlier than that. From concept and design to production and shipping, up to four months can elapse before the product reaches the end-user. Four months full of rigorous tests and tightly monitored processes, software simulations and expert scrutiny. All with the sole aim of ensuring that every Toshiba product fulfils our quality promise.

Certification



External certification

In early 2000, Toshiba commissioned the German product safety organisation, TÜV, to conduct an extensive series of tests on both notebook and desktop products. These tests examined a variety of product characteristics, including robustness, display quality and service-friendliness. The results were positive and Toshiba was awarded the TÜV service and quality certificate for its Tecra 8100 notebook series and Equium 3100 desktop series.





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Toshiba's manufacturing facility in Regensburg, Germany, is the heart of its European computer system operations. Established in early 1990, it employs over 600 people and produces thousands of notebooks every day.

In addition to being the main European manufacturing site, Regensburg is also home to the European Logistics Centre, Service and Support Centre and Spare Parts Warehouse.

However, it's not the vast quantity of products produced here that counts – it's the quality. At Regensburg, quality is not just "part" of the process, it "is" the process.

TOSHIBA EUROPE GmbH
Computer Systems
Hammfelddamm 8
D-41460 Neuss
Germany
Tel. +49(0)-21 31-1 58-01
Fax +49(0)-21 31-1 58-5 58

www.toshiba-europe.com/computers

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