

Product Integrity in New Technology

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Quality Management & Reliability Lab

www.qreltech.com

Definitions of Quality Concepts

Quality
(D Ryu)

Reliability
Specification-Quality

Product Integrity
(J Evans, D Ryu)

Performance
Reliability and Durability (Reliability)
Quality (Specification-Quality)

Product Quality
(D Ryu)

Performance
Reliability
Specification-Quality
Customer Perception
Fundamentals Advantage

Necessary Condition
(Product Integrity)
Required Condition

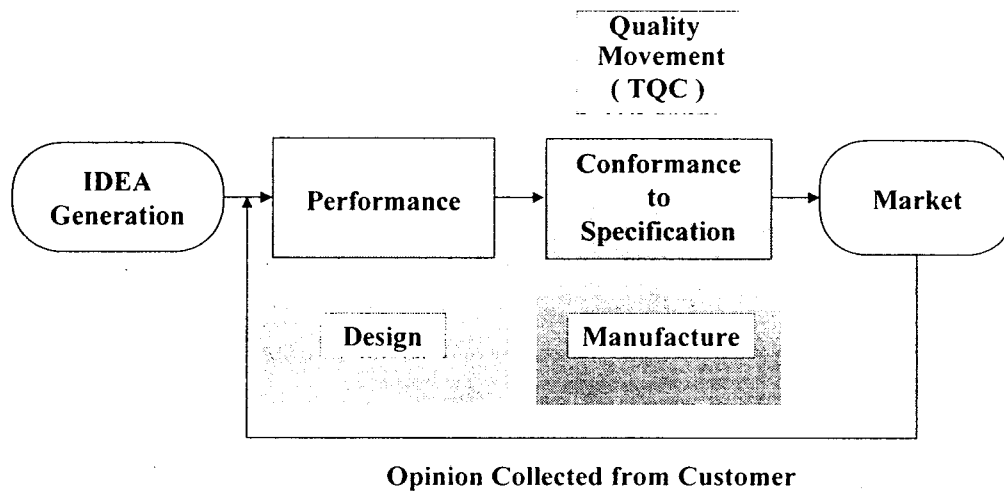
Product Value
= Customer value
(B Gale)

Quality (Product, Customer Service : Product Quality)
Price

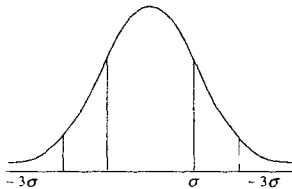
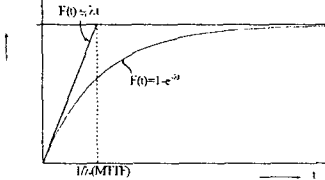
Product Value & Market Share Increase

Product Value	$V = f(\text{Product Quality, Price})$
	$V = \sum a_i Q_i + \sum b_i (1/P_i)$
Market Share	$S \equiv \frac{V^\alpha}{V^\alpha + V_1^\alpha + V_2^\alpha + \dots + V_{n-1}^\alpha}$
Oriented Value Increment	$R \equiv \left(\frac{V_N}{V_P} \right)^\alpha - 1$
Market Share Increase	$\Delta S = S_p (1 - S_p) \cdot R \cdot \frac{1}{1 + S_p \cdot R}$
Increased Market Share	$S_N = S_p \frac{1 + R}{1 + S_p \cdot R}$

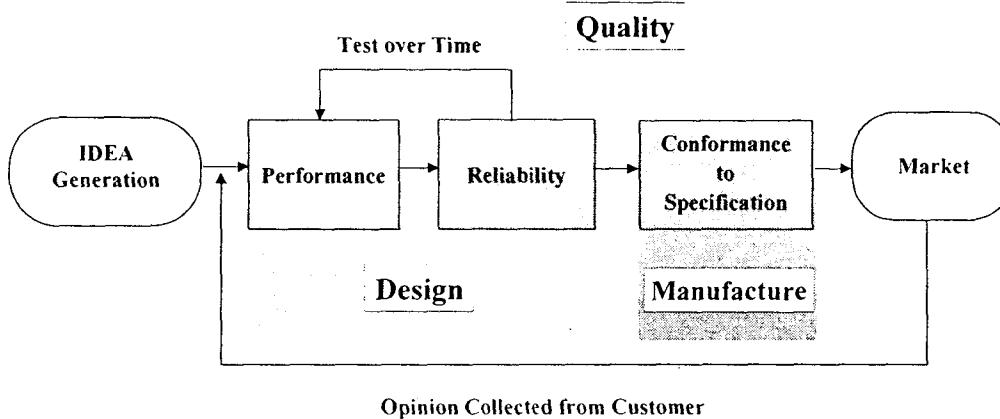
Conventional Approach for Quality



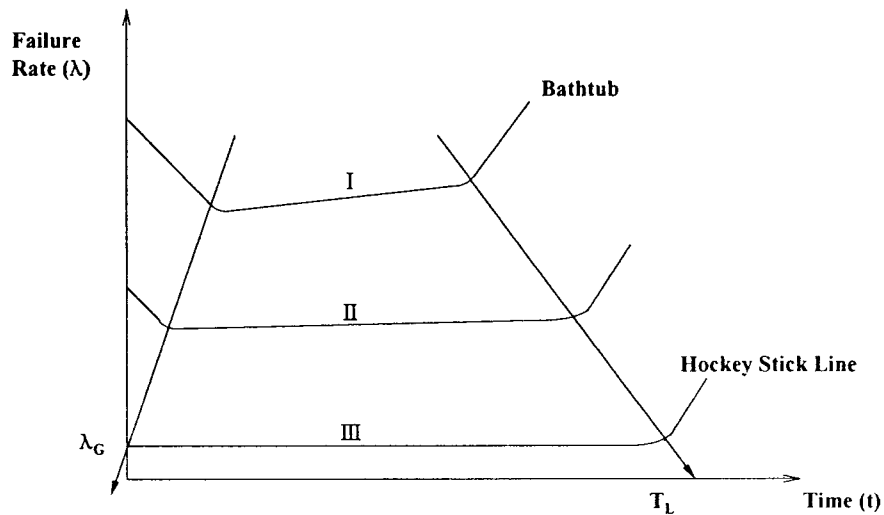
Quality defect & Reliability defect

	Quality Defect	Reliability Defect
Concept	Conformance to Specification	Failure in the Future
Dimension	None	1/hour
Unit	% ppm	%/year, 0.01%/hour Fit(1×10^{-9} /hour)
Probability Function	<p>Normal Distribution</p> $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ 	<p>Exponential Distribution</p> $F(t) = 1 - R(t) = 1 - e^{-\lambda t}$ $\approx \lambda t$ 

New Approach to Product Integrity



Bathtub Curve & Hockey Stick Line



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Quality Concept

The Double Ambiguity of Quality

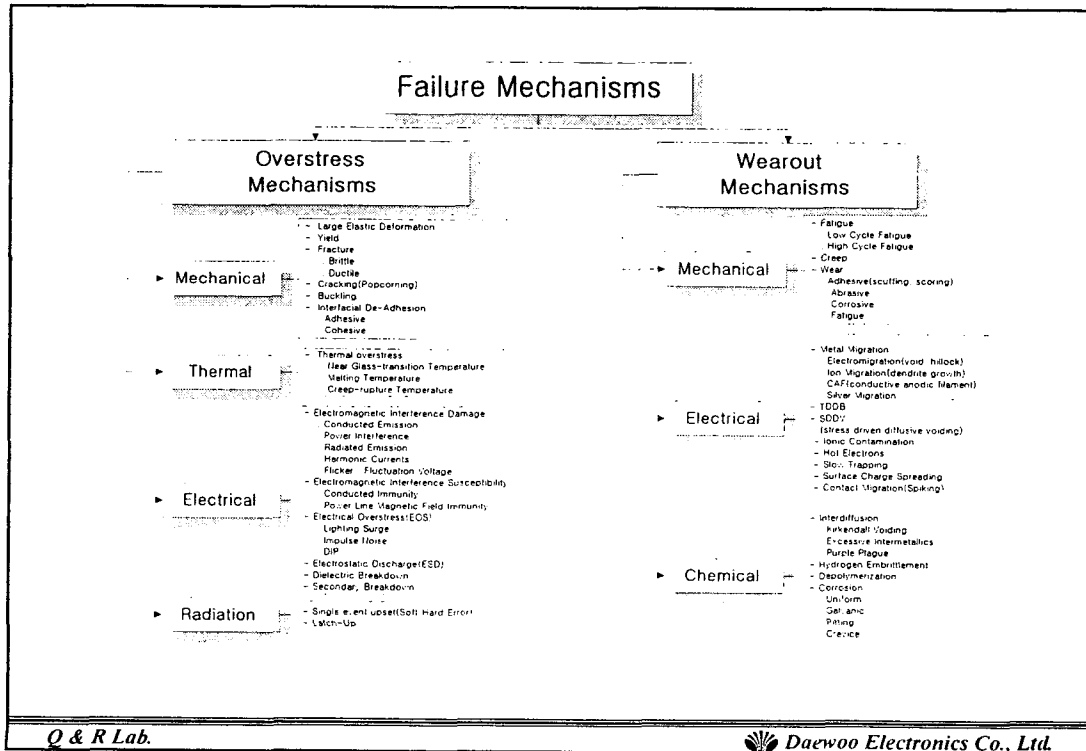
Meaning of Quality	Quality		
	Quality (Specification Quality)	Reliability (Future Quality)	
Concept		Conformance to Specification	Alteration of Specification for High Reliability
	Recommended Units	Percent ppm	Percent / Year Percent / Hour
Frequently Used probability density function	Normal Distribution Function	Exponential Distribution Function	-

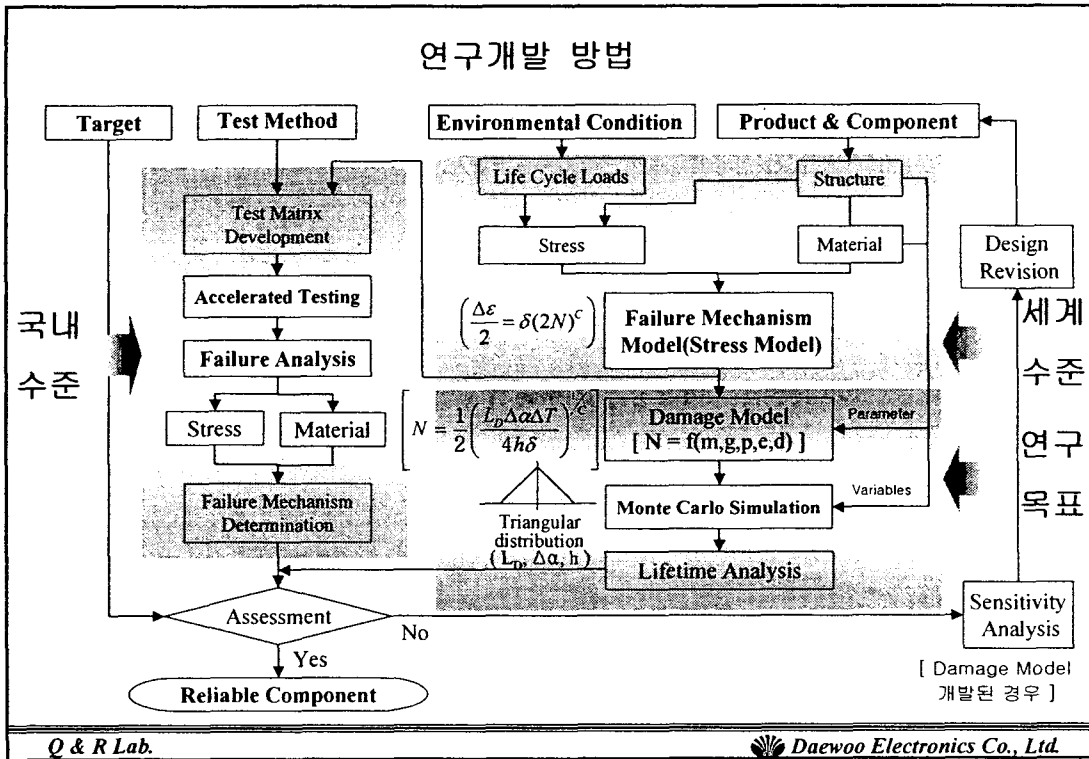
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How to Improve the Reliability

- 1) Identify the failure mode through testing over time
- 2) Analyze failures and determine the failure mechanism
- 3) Design changes according to the results and confirm the validity and the side effects of design change





Viewpoints and Dimensions of Product Quality

This shows that 4 viewpoints by Schnaars and 8 dimensions by Gavin.
This classification does not relate to the activities which can solve quality problems to achieve competitive position.

4 Views of Product Quality	8 Dimensions of Product Quality
1. Products That Work (The Working Concept)	1. Reliability 2. Durability 3. Conformance to Specifications
2. Design Excellence (The Product Concept)	4. Performance 5. Product Features 6. Serviceability 7. Aesthetics
3. Superior Satisfaction of Needs (The Marketing Concept)	8. Perceived Quality Brand Names Company Image Previous Experience with Word of Mouth Comm. Evaluative Information
4. Affordable Excellence (The Concept of Product Value)	

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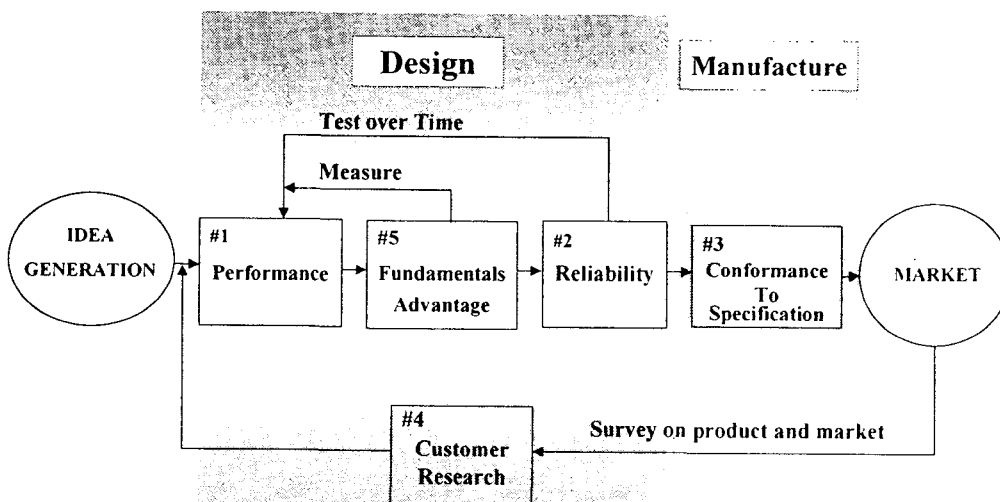
Eight dimensions and Five categories of product quality

Eight Dimensions	Five Categories
<ol style="list-style-type: none"> 1. Performance 2. Reliability 3. Durability 4. Serviceability 5. Conformance to Specification 6. Product Features 7. Aesthetics 8. Perceived Quality 	<p>Performance Reliability</p> <p>Conformance to Specification Customer Perception</p> <p>Fundamentals Advantage</p>

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Product Quality ; Creating The First Class Product



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정체 해소 및 선진국 진입

1) 설계기술 이해

- 설계기술의 기본 터득 : **Reliability Growth Technology**
- 설계기술의 첨단 추구 : **Comparative Advantage Technology**

2) 설계기술개발

- 방법론 터득 및 **Cowork** 활성화
- 공동연구나 기술개발에 대한 평가 및 지원 기준 강화
- 해외공동연구 지원 및 해외 패키지 기술도입의 제한

3) 독자기술개발

- 기술쇄국
- 선진기업에서 탐낼 기술 없으면 전략적 제휴 불가