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COIMBATORE, 641 035, TAMIL NADU



DEPARTMENT OF AEROSPACE ENGINEERING

19MEE304 Total Quality Management

Topic: House of Quality

1. Introduction to House of Quality (HoQ)

✦ Definition:

The House of Quality (HoQ) is a **structured matrix tool** used in **Quality Function Deployment (QFD)** to translate **customer needs (Voice of the Customer – VOC)** into **design and process requirements**.

✦ Purpose of HoQ:

- ✓ Aligns **customer expectations** with **technical specifications**.
- ✓ Ensures **cross-functional collaboration** among teams.
- ✓ Reduces **product design changes** and **defects**.

✦ Industries Using HoQ:

- ✓ Automotive (Toyota, Tesla)
- ✓ Aerospace (Boeing, Airbus)
- ✓ Electronics (Apple, Samsung)
- ✓ Consumer Goods (Nike, P&G)
- ✓ Healthcare (Medical Device Design)

2. Structure of the House of Quality (HoQ)

🏠 HoQ is a matrix with multiple sections, resembling a house structure:

Customer Requirements (WHATs)	Design Feature 1	Design Feature 2	Design Feature 3	Design Feature 4
Requirement 1	●●●	●●	●	●●
Requirement 2	●●	●●●	●	●
Requirement 3	●	●	●●●	●●●

● = Strength of relationship (Weak, Medium, Strong)

Main Components of HoQ:

- ◆ **Customer Requirements (WHATs):** List of features customers want.
- ◆ **Technical Requirements (HOWs):** Design and engineering parameters.
- ◆ **Relationship Matrix:** Shows correlation between WHATs and HOWs.

- ◆ **Competitive Benchmarking:** Compares competitors' products.
- ◆ **Correlation Matrix (Roof of House):** Identifies conflicts between design features.
- ◆ **Importance Ratings:** Prioritizes features based on customer demand.

3. Steps to Develop a House of Quality

◆ Step 1: Identify Customer Requirements (WHATs)

- Collect **customer feedback** via surveys, interviews, and complaints.
- Example: **Smartphone users want longer battery life and faster charging.**

◆ Step 2: Identify Technical Requirements (HOWs)

- Determine design features that meet customer needs.
- Example: **Increase battery capacity, optimize charging circuits.**

◆ Step 3: Develop the Relationship Matrix

- Define the **strength of relationships** between WHATs and HOWs (Weak, Medium, Strong).

◆ Step 4: Analyze the Correlation Matrix (Roof of HoQ)

- Identifies **design conflicts** (e.g., increasing battery size may impact phone weight).

◆ Step 5: Competitive Benchmarking

- Compare **customer ratings and technical specifications** with competitors.

◆ Step 6: Prioritize Features & Implement

- Assign **weightage to customer needs** and focus on critical features.

4. Industrial Applications of HoQ

✓ Automotive Industry (Tesla Model 3)

- Customer demand → **Longer battery range** → **High-density lithium-ion cells.**
- HoQ helped Tesla optimize **battery efficiency and weight.**

✓ Aerospace Industry (Boeing 787 Dreamliner)

- Customer demand → **Fuel efficiency & lightweight design.**
- HoQ guided material selection (Carbon Fiber Composites).

✓ Electronics Industry (Apple iPhone)

- Customer demand → **Improved camera quality & low-light performance.**
- HoQ influenced **AI-powered image processing and lens technology.**

✓ Healthcare Industry (GE Healthcare MRI Machines)

- Customer demand → **Quieter MRI scans for patient comfort.**
- HoQ led to **soundproofing and silent scan technology.**

5. Benefits of House of Quality

- ✓ **Customer-Centric Design:** Ensures customer needs drive product features.
- ✓ **Reduces Design Iterations:** Minimizes costly changes and defects.
- ✓ **Enhances Cross-Functional Collaboration:** Brings together marketing, engineering, and production teams.
- ✓ **Competitive Edge:** Helps benchmark and outperform competitors.

6. Case Study: Toyota's Use of HoQ in Car Design

✂ **Problem:** Customers wanted a **fuel-efficient and eco-friendly vehicle.**

✂ **HoQ Analysis:**

- **WHATs:** Low fuel consumption, high safety, affordability.
- **HOWs:** Hybrid engine, aerodynamic design, lightweight materials.
- ✂ **Outcome:** Toyota Prius became the **world's best-selling hybrid car.**

7. Conclusion

- **House of Quality (HoQ) is a powerful tool** for customer-driven product development.
- **It connects customer needs with technical solutions** to ensure high-quality designs.
- **Leading companies use HoQ** to enhance innovation, efficiency, and competitive advantage.