DEPARTMENT OF AEROSPACE ENGINEERING
19MEE304 Total Quality Management

Topic: Quality Function Deployment (QFD)

1. Introduction to QFD

📌 **Definition:**
Quality Function Deployment (QFD) is a **structured method** used to translate **customer requirements (Voice of Customer – VOC)** into specific design, engineering, and manufacturing processes.

📌 **Objective:**
✔ Align **customer needs with product design**.
✔ Improve **quality, efficiency, and customer satisfaction**.
✔ Reduce **design changes and production errors**.

📌 **Industries Using QFD:**
✅ Automotive (Toyota, Ford)
✅ Aerospace (Boeing, Airbus)
✅ Electronics (Apple, Samsung)
✅ Healthcare (Medical Device Design)
✅ Software Development

2. QFD Process – Steps Involved

🔷 **Step 1: Identify Customer Requirements (VOC)**

- Collect **customer expectations** through surveys, interviews, and feedback.
- Example: **Customers want an electric car with long battery life and fast charging.**

🔷 **Step 2: Develop the House of Quality (HoQ)**

- **House of Quality (HoQ)** is a **visual matrix** that links customer needs to design requirements.
- It consists of:
  - ✅ **Customer requirements (WHATs)** – What customers want.
  - ✅ **Technical requirements (HOWs)** – How the company will meet those

needs.

✔ **Relationship matrix** – Strength of correlation between WHATs and HOWs.

✔ **Competitive benchmarking** – Comparison with competitors.

◈ Step 3: Prioritize Engineering Characteristics

- Identify key **technical parameters** affecting product performance.
- Example: **Battery capacity, charging speed, motor efficiency for electric vehicles.**

◈ Step 4: Develop Product Design and Specifications

- Convert key design requirements into **engineering specifications**.
- Example: **Battery capacity = 100 kWh, Charging time = 30 minutes for 80% charge.**

◈ Step 5: Translate into Process Planning

- Convert design features into **manufacturing and quality control plans**.
- Example: **High-precision assembly for battery components.**

◈ Step 6: Implement and Monitor

- Ensure continuous **evaluation and improvements** using QFD.

3. House of Quality (HoQ) Example

Customer Requirements (WHATs)	Battery Life	Fast Charging	Compact Design	Durability
Battery Capacity (HOWs)	● ● ●	● ●	●	● ●
Charging Speed	● ●	● ● ●	●	●
Material Quality	●	●	● ● ●	● ● ●

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

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4. Types of QFD

1 Product QFD

- Focuses on translating customer needs into **product specifications**.
- Example: Designing **lightweight and high-strength aircraft components**.

2 Process QFD

- Maps **product design requirements into manufacturing processes**.
- Example: **Optimizing assembly line for high-precision medical devices**.

3️⃣ Service QFD

- Applies QFD to **service quality improvements**.
- Example: **Improving patient experience in hospitals by reducing wait times.**

4️⃣ Software QFD

- Aligns **user needs with software features**.
- Example: **Developing intuitive UI/UX for a mobile banking app.**

5. Industrial Applications of QFD

✅ **Automotive Industry (Toyota)**

- Used QFD to design **fuel-efficient and low-emission hybrid cars**.
- Customer demand → **Improved engine efficiency → Hybrid engine technology**.

✅ **Aerospace Industry (Boeing)**

- Applied QFD for **lightweight aircraft designs**.
- Customer demand → **Fuel-efficient aircraft → Advanced composite materials**.

✅ **Electronics Industry (Apple)**

- Used QFD for **iPhone camera improvements**.
- Customer demand → **Better night photography → AI-powered image processing**.

✅ **Healthcare Industry (GE Healthcare)**

- Applied QFD for **MRI machine noise reduction**.
- Customer demand → **Less noise for patient comfort → Advanced sound insulation**.

6. Key Benefits of QFD

✔ Aligns **customer needs with product design**.
✔ Reduces **costly design changes and production errors**.

✔ Improves **cross-functional team collaboration**.

✔ Enhances **innovation and competitive advantage**.

7. Conclusion

- **QFD ensures customer-driven product development** by integrating quality at every stage.
- **House of Quality (HoQ) is a core tool** that links customer expectations with engineering solutions.
- **Industries worldwide use QFD** for designing innovative, high-quality products and services