

Product Development Process

From Idea to Mass Production
(with Prototype Definitions)

Purpose of this document

This document explains how product development progresses from an idea to mass production. It outlines the phases, type of work involved, and clearly explains different prototype stages so expectations stay aligned.

This process is commonly followed by global product studios and Shenzhen development teams.

Overall development approach

- Development is **phase-based**
- Each phase has a clear objective and output
- Prototypes are used to reduce risk step by step
- Only approved outputs move forward to the next phase

Phase 1: Idea and Design Concept Development

Objective: Validate the idea and define what needs to be built.

Type of work

- Idea review and clarification
- User problem and use case validation
- High-level feasibility check
- Initial product direction alignment

Output

- Clear product concept
- Agreed development direction
- Inputs for industrial design

Phase 2: Industrial Design and CMF

Handled by: Industrial design expert team

Objective: Define how the product looks, feels, and is used.

Type of work

- Industrial design exploration
- Ergonomics and form factor studies
- CMF definition (colour, material, finish)
- Concept-level user interaction definition

Output

- Final industrial design direction
- CMF guidelines
- Design intent is ready for engineering

Phase 3: CAD, Renders, and Design Prototypes

Handled by: Design and mechanical engineering team

Objective: Convert design intent into precise engineering data.

Type of work

- Detailed CAD development
- Internal structure definition
- Design for manufacturability considerations
- High-quality renders for visualisation
- Early design validation

Prototype type: Design Prototype

Prototype Legend (Important Reference)

Design Prototype

Purpose: Validate look, size, feel, and usability

How it is made

- 3D printing
- Simple mockups

What it validates

- Ergonomics and proportions
- User interaction feel
- Physical presence of the design

What it does not validate

- Performance
- Reliability
- Full functionality

Phase 4: Rapid Prototyping and Design Validation

Objective: Physically validate design assumptions.

Type of work

- 3D printed samples
- Fit and form validation
- Ergonomic testing
- Assembly checks

Prototype type: Design Prototype

Output

- Physical samples
- Feedback for design refinement

Phase 5: CNC Samples and Engineering Prototypes

Objective: Validate structure, materials, and assembly.

Type of work

- CNC machined parts
- Higher accuracy materials
- Assembly and tolerance testing
- Early electronics integration

Prototype type: Engineering Prototype

Engineering Prototype

Purpose: Validate materials, structure, and assembly logic

How it is made

- CNC machining
- High accuracy prototyping
- Partial functional electronics

What it validates

- Mechanical strength
- Assembly feasibility
- Material suitability

What it does not fully validate

- Long term reliability
- Mass production behavior

Phase 6: Working Prototypes (T0, T1, T2)

Objective: Validate full functionality and system behavior.

Type of work

- Integration of electronics, firmware, and mechanics
- Iterative improvements
- Performance and stability testing

Prototype type: Working Prototype

Working Prototype Levels

- **T0:** First fully working prototype, core functionality
- **T1:** Improved performance and reliability
- **T2:** Near production level behavior

Working Prototype

Purpose: Confirm the product works as intended in real usage

What it validates

- Full functionality
- Performance
- System stability

Output

- Design freeze readiness
- Confidence to move into tooling

Phase 7: Tooling and Mold Development

Objective: Prepare for manufacturing.

Type of work

- Tool design
- Mold opening
- Tool manufacturing
- Mold trials and refinements

Output

- Production ready molds
- Approved tooling samples

Phase 8: Small Batch and Beta Production

Handled by: Third party manufacturing partner

Objective: Validate the product in real world usage.

Type of work

- Small batch production
- Assembly line validation
- Quality checks
- Beta user testing
- Packaging validation

Output

- Beta units

Add.: RM3311, 3rd Building No.58 Bulan Road Longgang District, Shenzhen City, Guangdong Province China

- Final refinements before scale

Phase 9: Mass Production

Objective: Scale production reliably.

Type of work

- Mass batch planning
- Production ramp up
- Quality control processes
- Logistics readiness

Output

- Mass production units
- Stable manufacturing process

Patent application and product certification as well as trademark application in China is not included here in this file, if you want further understanding, welcome to send email to contact@xiaodingtech.cn for further discussion