

TYPICAL OUTSOURCING PROCESS FOR THE DEVELOPMENT OF NEW PRODUCTS

Product Development Phases:

- Requirements Definition Phase
 - Proposal Generation
 - Contract Award
 - Prototype Phase
 - Hardware and Software Design
 - Prototype Printed Circuit Board
 - Enclosure / Mechanical Considerations
 - Prototype Build and Test
 - Customer Acceptance Testing
 - Regulatory Certification (FCC, UL, etc., if required)
 - Manufacturing Phase
 - Redesign and Circuit Board "Rollover"
 - Manufacturing Readiness (parts procurement, kitting, etc.)
 - Manufacturing Assembly and Test
 - Final Product Delivery to Customer (usually in lot/month)
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Requirements Definition / Initial Contact:

The initial contact is correspondence between the customer and HED which generally describes what is desired for the product. Typically a Non-Disclosure Agreement (NDA) is exchanged during this early stage. If HED determines that the proposed project is compatible with our capabilities then the requirements are formalized in a document. This document is usually written by the customer but depending on the scope of the requirements, this document can be generated by HED. Once the requirements have solidified the job can be quoted and a proposal written.

Typical requirements might include:

- General circuit operation and function. If the device employs an RF radio link, the frequency, desired operating range, antenna requirements, etc are considered.
- Interfaces to other equipments (RS232, USB, digital or analog I/O, etc.)
- Desired user interface (keypad, display, indicator lights, audio output, etc.)
- Power requirements and desired battery life (if applicable)
- Software functionality and interfaces to any existing software components
- Software structure and desired language
- Enclosure requirements (size, weight, panel layout, plastic vs. metal tradeoffs)
- Regulatory Requirements such as FCC, UL, etc.
- Anticipated Production Quantities

- Desired recurring cost or selling price
- Desired schedule for development
- Desired schedule for production

Proposal Generation and Contract Award:

Once the requirements have been defined, HED typically prepares a proposal which summarizes the requirements and describes the approach. Sometimes separate technical and cost proposals are created. These documents are reviewed by the customer to ensure compliance with technical specifications and cost goals.

Payment to HED can take a variety of forms, but usually only one is proposed. The cost and technical proposals are usually the focus of negotiations between the customer and HED.

- **Cost Plus Contracts.** In this type of contract, a ballpark cost figure is usually given, but the customer is contractually obligated make progress payments. HED quotes "cost plus" for jobs where the requirements are not well defined, where the acceptability of the finished product depends on subjective conclusions, or where the project is deemed high risk.
- **Fixed Price Contracts.** In this type of contract, a single dollar value is proposed and HED is obligated to provide the goods and services for that price, regardless of the actual costs involved. HED usually quotes "fixed price" for follow-on contracts or for contracts which are deemed straight-forward or low risk.
- **Fee plus Royalty.** This approach is usually not taken, but if the customer grants HED a portion of the final profits, and if HED is thoroughly convinced of the products final success, HED may take a nominal fee to provide the goods and services in the hope that revenues from the final product will make up the balance. This approach is only taken if HED determines that the customer has a viable and solid business plan.

Prototype Phase:

Once a contract has been negotiated, the real fun begins with developing the prototype. HED excels at providing high quality, quick time to market designs. Typically, one or more prototypes are built. It is in the prototype phase where the meat-and-potatoes of the design effort occurs. Cost tradeoffs are made, and the hardware and software are designed, tested, and debugged. Typically a printed circuit board (PCB) is fabricated for the prototype and any required mechanical or enclosure issues are addressed.

After the prototypes are built they are tested using a procedure that ensures that the product meets the stated requirements. Depending on the project this procedure can be generated by the customer or by HED.

Customer Acceptance Testing

Once HED has deemed that the prototype satisfies the stated requirements, one or more prototypes are supplied to the customer for evaluation, test marketing, field testing, etc. If the results of the Customer Acceptance Testing are favorable then any necessary regulatory certifications can occur.

Regulatory Certifications:

After acceptance testing there is typically some level of re-design involved in getting the product ready for regulatory compliance. Quite often, a "final" version of the PCB is produced, as well as the final enclosure. When the finished product is ready, HED may subcontract a certified test lab to put the product "through its paces" to make sure it complies with government and regulatory specifications.

FCC testing costs \$500 to \$1000 per day of lab time, plus additional costs for document generation. There is usually a 6-8 week turn around time once FCC testing is finished until "certifications of compliance" are received by the customer. Any testing other than FCC (such as UL or C-Mark) can occur in parallel. It is always unwise to begin production of the final product prior to receiving the necessary certifications.

Manufacturing Phase:

Once the finished product has been "blessed" by the test labs, manufacturing begins. HED has the in-house capability to manufacture and test low volume production quantities. For higher volume production HED calls upon its network of domestic and overseas Contract Manufacturers.

Most of our customers find it beneficial to allow HED to serve as the Original Equipment Manufacturer (OEM) for the products which HED has designed. Since we have done the original design we are already familiar with the product and can quickly address any problems that may occur during manufacturing.

Upon conclusion of the project, or at various stages during development, HED can provide design documentation detailing all aspects of the products design, manufacturing, programming, and testing activities.

Once finished, the product is shipped to the customer for final sale, distribution, and **PROFIT MAKING !**