Prototype to Production
of Electronic Products

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Outline

- Definitions
- The Solutions
- Items Needed to go To Production
- Establishing an Outsource Production Relationship
  - Onshore vs Offshore
  - Communications
  - Finalizing the relationship
  - 1st Articles
  - Ongoing production
  - Winding Down

First, some Definitions

- Prototype
- Pilot Run
- Scalable
- Production

What is a “Prototype” ?

- At least one unit with the form, fit & function of the product desired that has been built some way.

What is a “Pilot Run“ ?

- Production of a number of units that meet all the production requirements built with parts, materials, equipment and processes that are “scaleable”.

What is “Scalable” ?

- Scalable means that more units can be produced by duplicating or speeding up the pilot line.

What is Production”?

- Building units at the desired rate with the quality required.
  - Some would add “at the cost required” or “the lowest cost possible”.
  - Great variation in quantity; 10’s to 1,000,000.

Multiple Solutions

- Traditional OEM Approach:

  "Do it all yourself"
- Today, Production is frequently Outsourced.
- The Choices

  1. Outsource component and/or sub-assembly manufacturing
     - Consigned or Turnkey material
     - internal final assy & test
  2. Total Box-Build Outsource

Focus on Prototype to Production with the Outsourcing Model for at Least Production

Outsourcing Approaches

1. Build your own prototypes; transition to volume later
2. Use a “local” NPI supplier to prove design; transition to volume manufacturer later
3. Go to a volume manufacturer with schematic and have them build the prototype

Items Needed to go from Prototype to Production

1. A Completed Design
   - Make sure it “works”, eliminate “bugs”
   - Most changes incorporated
   - The volume, cost, test and quality requirements
2. Documentation for Production
   - BOM
   - Part Drawings
   - Assembly Drawings
   - Specialized software code complete and debugged
   - Special Instructions, if any
   - Qualification Test Requirements, if any
   - Production Test Requirements

Items Needed to go from Prototype to Production, continued

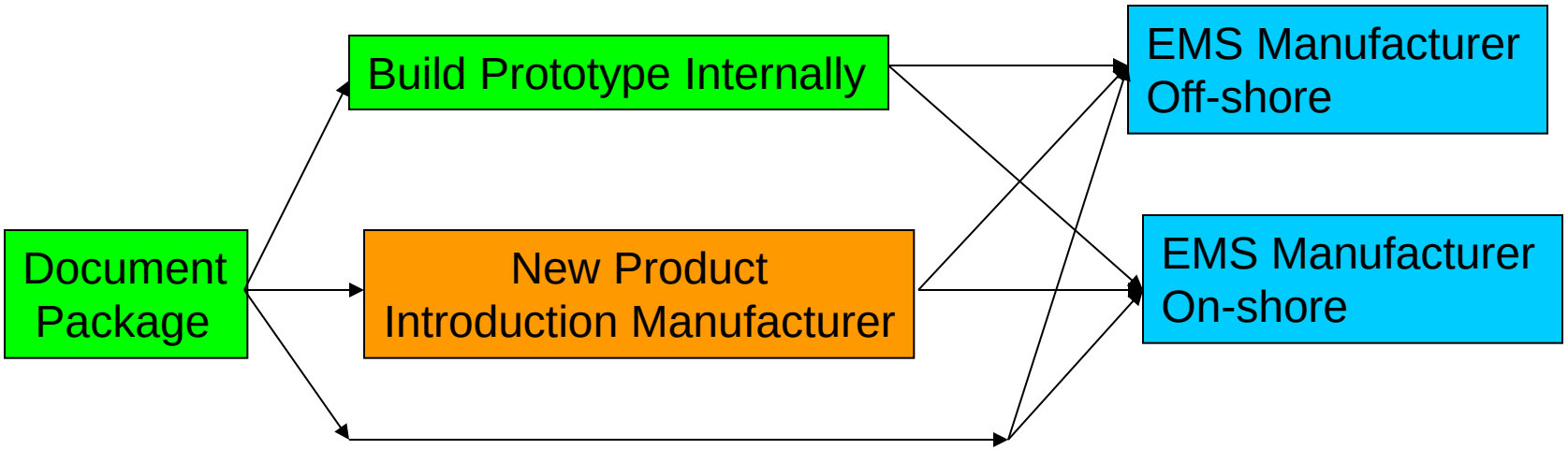
3. Business requirements
   - Vendor requirements
     - Skills & Services
     - Quality systems
     - Financial capability
   - Price, volume vs time needs
   - Services
     - Production
     - Programming
     - Fulfillment
     - Repair
     - Warranty
   - A Contract between the parties, especially for a Turnkey arrangement

A Reality

- While the above list is “obvious”, many firms are “forced” to start going to production before they have everything.
- The trick is to “manage” the situation and make sure necessary items are provided in a timely manner and that allowance is made for the inevitable delays and costs.
- This is where you separate the “Men” from the “boys” as the old saying goes and management skill is needed.

Prototype to Outsourced Production Paths

Three Basic Routes; One major variant



Sequence of Issues

- Selecting an EMS production Partner
- Finalizing the Relationship
- Building the 1st Article
- Ongoing Production

Selecting an EMS Production Partner

- Seek and compare ~3 Quotations
  - Documentation
  - Compare Apples to Apples
- Site visits
  - Services needed available ?
  - What will be “outsourced” by the EMS ?
  - Are cultures compatible ?
- Contract Review

The Onshore vs Offshore Issue

- A strategic decision for the CFO/COO not a Purchasing Manager Decision.
  - The issue is total cost, including overhead, vs unit cost
- What is the DL vs component cost split ?
  - How much $ can be saved on DL ?
  - How much $ can be saved on components ?
- How many units are to be built for how long ?
- How many changes will be required ?

The Onshore vs Offshore Issue, continued

- How much added WIP will be required offshore ?
- What are transportation costs ?
- How much engineering, quality & management travel will be required ?
- Can quality be adequately controlled ?
- How will defective units be handled ?
- How will confidential information be protected ?

Communications with the Production Firm

- Language
- Distance
- Method
  - E-mail
  - FAX
  - Phone
  - Visits
- Style
- Have periodic meetings on ”How’s it going” ?

Finalizing the Relationship

- Contract ?
- Who will do what ?
- The Terms & Conditions are crucial
- Price changes/Cost saving sharing

Building 1st Article

- Provide Complete Documents
- Consign parts in the early stages ?
- Evaluate the First Article
  - Be complete and thorough

Ongoing Production

- Making Changes
- Forecasts
- Periodic Reviews
  - Quality
  - Anticipated changes
  - Quantity Forecast
  - Communications working ?

Winding Down

- Warranty fulfillment ?
- Replacement parts ?
- Documentation retention ?
- Return of confidential info
- Return of consigned equipment or excess material

Questions, Comments, Discussion

Thank You for you Attention !

Document Package Content

- Schematic
- Bill of Materials (BOM) Controlling Document
- Assembly Drawing
- Layout of Circuit Boards
  - Gerber Files (Define circuit board)
- “Box” drawings
- Burn In Requirements
- Test Requirements
- Software to be Loaded
  - FPGA
  - Flash
- Quality Requirements
  - Documentation requirements
  - Manufacturing Condition Requirements
- Special Requirements