Primary design processes

1. Design input
   This section is intended to help all parties involved (owner of product concept or intellectual property, the engineers, designers, production group, software developers) develop a common understanding of what is being created, produced and determine realistic resource, delivery requirements.
   A party intending to oversee and finance the development of a product should expect to have conversations covering all the sections below. The development team can provide guidance these subjects.
   It is assumed a Non-Disclosure Agreement between all parties has been agreed upon before any details are disclosed.

   1.1 Product definition (what it does, intended customers, requirements)
   1.2 Knowledge of customer and customer expectations for product (market research). This should not be antidotal in nature, but based in facts gathered in a neutral manner.
   1.3 Society's expectations for product review and certifications (ISO, UL, FCC, CE, etc.. requirements that are applicable)
   1.4 Requirements for Intellectual Property protection from competitors.
   1.5 Company's expectations (Return On Investment, window of opportunity for the product, etc..)
   1.6 Possible opportunities created by product (level of future enhancements, alternative related product spin offs), required to establish an appropriate development guidelines.
   1.7 Product development cycle planning. If a product is relatively simple, often only 1 iteration (cycle) is required. The more complex the product, the higher the risk of additional cycles will be required (larger window of time equates to increased likely hood of changes being introduced into the product's definition). Understanding of these risks helps in determination of the appropriate development model to be used within each cycle. Examples include:
   - Waterfall
   - Spiral
   - Evolutionary
   - Staged delivery
   - Agile (or Agile Unified Process – AUP)
   - Crystal clear
   - And many others……. https://en.wikipedia.org/wiki/List_of_software_development_philosophies Most can be applied to both hardware and software development.

   1.8 Documentation requirements of each output
   1.9 Testing requirements for each output.
   1.10 Life cycle planning and possible product disposal responsibilities.

2. Design output. Establish goals (time, resources required) for the following items.
   2.1 Electronic assemblies (doc, prototype models, production models)
   2.2 Software products (doc, source code, complied code)
   2.3 Mechanical assemblies (doc, prototype models, production models).
   2.4 Final assembly (prototype models, production models.
   2.5 Test procedures and fixtures for production.

3. Design review
   Confirm goals have been met for each design iteration.
   3.1 Review of each iteration of outputs (hardware and software deliverables).
   3.2 Documentation of each review cycle.
   3.3 Review of any product requirement changes since product development has started.

   1st development loop: All development loops are subject to multiple iterations. Sometime this is due to forces outside the control of the development team (market and customer changes) If any reviews indicate a need for changes, the process will institute appropriate changes to documentation and outputs for additional review before being submitting to Design verification (next development loop).

4. Design verification
   4.1 Testing of product in house (hardware and software).
   4.2 Review of product definition.
   4.3 Review changes to the product requirements since product development has started.

   2nd development loop. Failures or changes can be cause for new design iteration.

5. Design Validation
   5.1 Submitting the final product to beta test customers.
   5.2 Submitting product to external agencies for compliance testing.

   3rd development loop .Failures or changes can be cause for new design iteration.

6. Design changes
   6.1 Address any suggested changes from customers.
   6.2 Address any required changes from compliance testing.

   4th (final) development loop. Failures or changes can be cause for new design iteration.

   After successful completion, product is ready for production.

7. Product evolution (continuous improvement)
   7.1 Review of feedback from customer base for product
   7.2 Management determine if changes to existing product should happen or if new product is needed.

8. Product spinoffs (if appropriate) with their own development cycles are established.