

Design Philosophy and Methodology

1- Objectives

The objective of this document is to highlight Shax Engineering and Systems philosophy and methodology in facilitating engineering and design projects. Additionally, we will discuss the values that govern our relationships with our clients.

In order to implement their engineering projects effectively and efficiently, engineering managers outsource certain tasks related to projects. As a way of maintaining a competitive advantage, companies assign these tasks to specialized design firms. In addition, the benefits of outsourcing include:

- Shorter product design and development cycle
- Increased competitive advantages
- Substantial reduction in capital investment
- Enhanced overall engineering operating efficiency
- Center point of accountability
- More time to maintain other business related issues
- Access to new talent and skills
- Access to new technologies
- Reduce overall risks

When engineering managers select a design firm, they are looking for a firm with experience and expertise, as well as integrity and a commitment to the work.

SHAX Engineering and Systems objective is to meet our client's satisfaction. We take pride in what we do and are committed to our clients from the start of a project to its completion. We handle projects with sensitivity and dedication and assume responsibility until the final delivery and beyond by protecting proprietary information and our client's trade secrets.

2- Feedback and Reporting

Engineering managers seek to track the progress of a project and look for design firms which have an established procedure allowing them to oversee the progress of a project. An inclusive procedure allows managers and the design firm to anticipate problems in the early stages of a project and reduce the costs if changes have to be made.

SHAX Engineering and Systems understands the importance of keeping engineering managers informed of the progress of design work at all stages. We establish a point of contact in the earliest stages of the project and create a schedule for review meetings and required deliverables.

3- Assignments

The needs of engineering managers vary and they are always under pressure to meet sales and marketing demands including delivery, cost, and specifications. SHAX Engineering and Systems understands these challenges. We offer flexibility and the ability to handle projects under challenging circumstances, always with an eye on top quality products. Engineering managers can benefit from our services and can balance the size of the team with the projects workload. Additionally, engineering managers are relieved from the task of daily supervision and have more time to manage other business affairs. The net result; our clients overall performance will be increased substantially.

Our business model envisioned two assignment scenarios.

3.1- Time Based Assignment

Time based assignment can be performed at client's site or off site. When the assignment is carried from the client's side, SHAX Engineering and Systems will provide engineers and expertise to perform design services at the customer's site. SHAX engineers will interface with the customer's technical and engineering management staff on a day to day basis to fulfill the project requirements.

3.2- Fix Cost Assignment (Time and Materials)

Prior to handling fixed cost assignments, the scope of the work and the specifications shall be clearly defined. SHAX Engineering and Systems will provide the engineering resources as well as the materials necessary to complete the project. SHAX administration as well as the engineering team ensures the final product will deliver on-time, within the budget and meeting the client's specifications.

4. Design Tasks and Flow

In the initial stage of the design, our engineering team takes the necessary steps to place the process on the forward track, as follows:

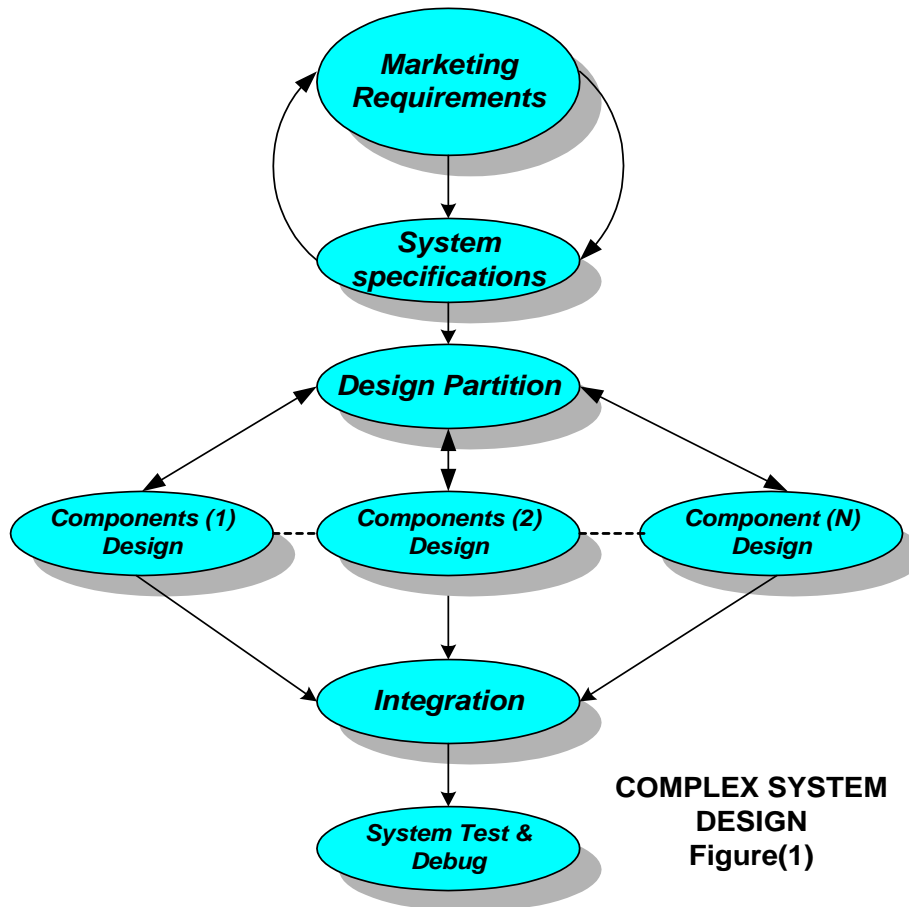
- Complete study of the requirements and clearly understand the problem
- Present possible solutions
- Allocate necessary resources
- Develop module or component blocks and sub-blocks
- Detail engineering and manufacturing methodologies
- Build, integrate, test, and modify prototype

- Document and create references

Today's mass assembly and large commodity demands create certain processes like Design for Manufacturability (DFM). SHAX Engineering and Systems engineers design with an eye towards growth and mass production. Using DFM process, strategic design objectives will be completed as follows:

- Common components and standardization parts will be used across product
- Modular platform will be accomplished
- Manufacturing process will be unified for both a high degree of standardized production and highly customized product

Figure (1) shows the complex design process we follow:



4.1 System Specifications

In all our design models, we take our customer's product ideas and enhance them to specifications. These specifications represent the product's functionality in reference to industry standards. In addition, SHAX works closely with customers to analyze their

market requirements and modify the design plan and specifications as needed. The final specification represents system functionalities, operative technical requirements, interface processes (if required) and the project timeline.

4.2 Design Partition

The second step is to model the systems and generate the blocks which represent design activities including the software and hardware. We fine tune definitions for each component through the design tune up process. This process consists of a series of design sub modeling that provide the fine details of the system's functional objectives. The design partition allows SHAX to allocate necessary engineering resources and define responsibilities.

4.3 Component Design

Figure (2) illustrates the flow of the component design process. This process involves applicable hardware and software implementation. Hardware components are implemented using schematics to capture circuit entry or hardware descriptive language (HDL) incase of FPGA and ASIC implementations. Using latest CAD-tools hardware, design is generated and converted to the necessary format for the layout process. Similarly, FPGA and ASIC design is entered using Electronics Design Automations (EDA) tools to generate, simulate, and test HDL code or design solutions. Using these analyses and tests ensures the final product is cost-effective, easy to use, and meets or exceeds our client's requirements.

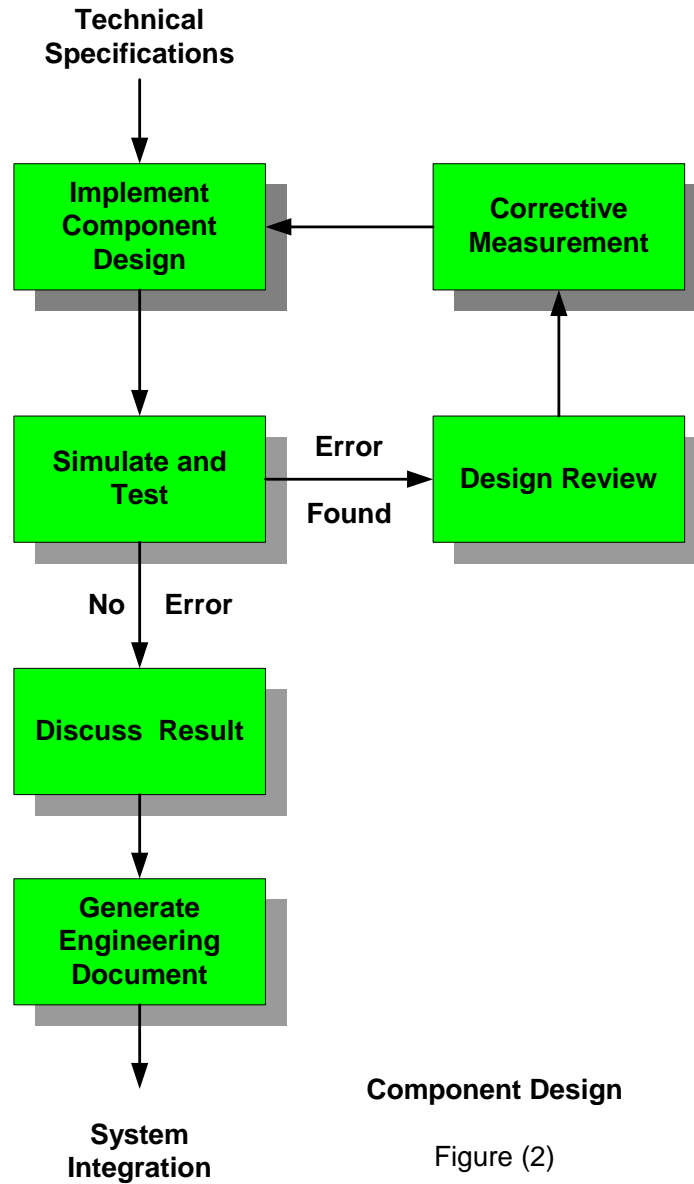
4.4 Prototype Development

A working prototype allows us to validate the performance of the product and is proof of the design concept. Information is obtained for reliability and manufacturability of the product. SHAX engineers will provide a prototype according to contractual agreements. SHAX will also provide additional technical support to demonstrate the product and help verify its market needs.

4.5 Integration

Integration is the process by which all the system components are joined together to perform the ultimate system's function. Software and hardware components are individually integrated in larger hardware and software modules. Each module is tested for sub functions and verified before being integrated into the system.

Typically, the integration process is tedious and, in most cases, time consuming when there are glitches. This is the normal part of the learning curve when the system is integrated for the first time. It is through these tests that SHAX engineers establish an integration procedure.



5- Cost effective Design

When the new product idea is conceived, cost is one of the factors determining viability of the design work. Cost is also one of the driving factors when an existing product is to be modified or upgraded. Engineering managers are always seeking cost effective solutions to their engineering problems. To satisfy these important requirements, SHAX Engineering and Systems cost effective implementation is performed when redundant tasks are minimized to produce design components or modules that are universal to the different tasks. With minimum modifications, the same module can be applied to other components or modules within the project.

Another way to reduce development cost is to provide our clients with an option to administer procurement of materials while SHAX focuses on the designing. The client can choose the suppliers and manufacturers, if requested.

6- Technical Approach

SHAX Engineering and Systems technical approach is based on sound engineering principals, consistent conduct and discipline that come from many years of engineering and design experience. We always adhere to the client's specifications and guidelines. In our initial involvement with our clients we strive to obtain a complete understanding of problems and solutions requirements. With the progression of the project, we interface with the client at every phase of the project. Design schedule meetings are conducted periodically to keep the lines of communication open, as well as bring our customers up to date on the progress of the project. We provide the following:

- Provide project schedule and timeline plan for individual task.
- Generate block diagram for the required system.
- Define each module interface characteristics including clocks, signals, buses bus etc.
- Generate sub-block diagram for each individual board incorporated in the system including the back plane.
- Select components required to fulfill system characteristics.
- Selection of FPGAs modules and design methods and tools involve.
- Generate VHDL or Verilog code represents solution required.
- Perform system integration, including testing and debugging.
- Provide recommendations for any new enhancements.

7- Deliverable

In all our models and after completion of the project, SHAX Engineering and Systems will provide its client with all engineering design documentations. As some customers prefer to handle and execute their prototype process, SHAX can deliver a working prototype according to all contractual agreements. SHAX Engineering and Systems will provide all project documents in soft and hard copy including:

- Schematic blueprints (ORCAD Format)
- Netlists
- Bill of Material (BOM)
- VHDL or Verilog Source Code
- C Source Code
- Product Functional Description
- Lab rotary test procedure
- Gerber Files