Product Development Challenges

In general, there are several challenges in product development that can make or break a project. The main reason for projects failing to meet their end result according to studies are related to financing or project funding. One may ask why financing if all or most of the financial details of the project such as costs, deposits, milestone payments, etc, have been worked out?

The answer is simply sought in money management, whatever the size of the project. Unfortunately the answer varies depending on the circumstances of the project as every project differs…

In this paper, we will address in summary technical challenges of hardware and firmware developments within a project.

Hardware Design Challenges

- Power constraints: isolation, grounding, heat dissipation

This relates to spacing and properly grounding the components in power section of the board. Isolation usually plays a crucial role in AC-DC primary (w/ transformer) and rectifier circuits. Grounding can be for deploying several types (analog, field, digital) and/or simply for noise reduction.

- Tracing width for various sections of board

The power (current) levels applied at various parts of the circuit can vary, usually high current signals require thicker trace widths depending on other aspects of the signal.

- Thermal management for board

One notable feature for thermal feature within a circuit is to use heatsinks, however the space requirements for the heatsink can be crucial to a device as far as size is concerned.

- Size constraints: Small form factor

Small form for a device can be set as several steps to achieve, if possible. Although the goal is to have the final product small, there could be several revisions for assuring all functionalities are met before having the (desired) size.

- RF or other wireless syndrome rules not fully/partially followed

Depending on the RF (targeted frequency, bandwidth), there are rules that need to be followed such as spacing requirements, interference or other standards. Also, antenna design requirements fall into this category.

- EMI/EMC issues

The challenges faced in this respect could be related to power supply section as well as other mediums such as motors (DC, stepper, etc.) or motor control…

- Tolerance for various components

This could be very tedious challenge in determining the tolerance (or range) required. The tolerance is usually determined when in testing phase of the circuit. Besides most commonly passive components, solid state components (transistors, FETs, etc.) can be an influence as well.

Firmware Development Challenges

- Interrupt routines

Depending on number of interrupts or their conditions, the timing and performance of each can lead to miscalculated conflicts and encounters. Usually the interrupts can be set or defined as a timer to reduce this risk but trigger/response time is a different challenge.

- Debugging mode

Depending the abilities of the used environment… This usually should be tackled as process by itself.

- Compiler settings/configurations

The tedious part of tools and one familiarizing itself with their settings, configurations… usually should be resolved with good support from processor manufacturer.

- Coding revamp/optimization

Depending on features available within an environment, optimization can be set in a way to reduce overlaps, delays and response times but does not necessarily mean performance is not immune.

- Interfacing with Hardware

The most crucial phase of the project is when hardware is to communicate with firmware…