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STORY OF MY LIFE AS A CONSULTANT

IN A DEVELOPED ECONOMY

It was from FEB-08-2019 to MAR-30-2019. The controller box, that I worked on, was at REV C., the Rev D has been shipped. I had to review their schematics and PWB layout for whole week. From 8AM to 5PM I worked with their power supply design engineer, analog design engineer and digital circuit designers. Here it is about my findings; (1) Power Supply designer was focused on power supply portion of the entire system design, (2) Analog circuits designer was focused on his portion of the system design, and (3) Digital circuits designer was focused on only digital circuits of this system.

The manager or else should have been taking care of the system level design aspect. This system prospect should have been working with all three designers as described above.

Now, as you may know, when first prototype was designed and manufactured, let's say it was system designated as **REV A.** This **rev A** have been produced let's say X quantities to accomplish Alpha, beta tests and also DVT tests, on these **rev A** controllers. Some modifications are required based upon test results during alpha, beta and DVT testing. The Rev B was produced to fix all findings during **REV A** cycle. Now **Rev B** has to go through all or selected alpha, Beta and DVT required tests. The **Rev C** was produced, it has to go through all or selected alpha, Beta and DVT all tests too. At this stage of **REV C** of the system, Chaman Bhardwaj was hired to analyze the EMC performance for North American (FCC-15A) and European CE mark compliance. The **Rev A, Rev B and Rev**

C, test data for EMC compliance was analyzed by Chaman Bhardwaj. I found there no improvements at all for EMC radiated emissions!

I spent first full week of 40 Hours, Infront of the Manager, power supply, analog and digital designer like a professor / instructor, analyzing the schematics, and PWB on the white board through their projector. I found out the interesting violations of the best design practices of grounding, bonding, filtering and shielding requirements. You can download these guidelines by going to www.microvolt.com and ordering through Paypal.

I recommended the required modifications for EMC compliance, and all those modifications were implemented while I checked/monitored to make sure the modifications are implemented correctly by keeping in mind high frequency effects for MODELS of EMI/EMC filter components. in the third week at their own test lab in downtown Milwaukee, WI. I went to their in-house test lab for pre-scans, there were significant improvements as compared to the test results for REV C that Eaton company had in their data base. the power supply design engineer did soldering and modifications of their EMI/EMC components/filters values I recommended to Power supply designer. The Fourth, week the product was taken to external NAVLAP approved, test lab that Eaton Company (EC) had used. We spent about three weeks at this test lab in Illinois to do A to B comparisons with different several modifications to REV C system. During these three to four weeks at test lab in Illinois I was reporting to the Manger and entire hardware and software design teams, about findings and technical solutions in the form of recommendations to find out happy solutions with input and

agreement for Power supply, analog and digital designers. Basically, I was training them all!

The manager I was working with, did something interesting, he hired another EMC contractor to work on the system in Franksville, WI. Since I was working with their team of designers in ILLINOIS. The required modifications were implemented by another EMC contractor who was paid may be less than half what I was making it was $70/hr. I have earned $90/hr., at other companies most recently. So, in about FOUR weeks after first three weeks at Franksville, WI and 1 week at their own test lab in Milwaukee, WI, downtown.

In nutshell, I can say in week #1 of me working with Manager, and three designers 1, 2 and 3 described above. The problem was like this;

(RevA) x (RevB)x (RevC) = Unknown Phenomenon.
There were lot of unknowns.

Let me put it mathematically as follows.

UNKNOWN=UNKNOWN eqn… #1

With my analysis, implementation of EMI/EMC-grounding, bonding and correct filtering. The equation became as follows;

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KNOWN= k1 (Power supply circuits, and EMI filters investigations and solutions) +K2 (analog circuits design and EMI/EMC solutions) + K3 (digital circuit design and EMI/EMC techniques investigations) --- eqn #2

Now anybody at half the rate as compared to me could fix the problems with all my e-mails plus Engineering 101 guide that I gave them and it can be ordered from www.microvolt.com . this is how manager(s) save their companies tons of DOLLARS!

I told the hiring manager, had he or his company Eaton Corporation a division of Thomas Edison, I assume you know the great Inventor, Mr. Thomas Edison! I told the hiring manager had he, hired me while they were working on REV A. The rev B would have been shipped; I can guarantee it. Anyway, during my supervision / watch, wherever or whomever I worked with, when I worked on Rev A, with some little tweaks REV B was always at all companies shipped with flying colors and no unexpected surprises at all!

EXAMPLE #2:

While I worked for aircraft designer and manufacturer. It is important to understand the entire process. The company typically builds 6 (REV A, B, C, D, E and F) prototypes and 7th (REV G) is sold to companies like Air India (if they buy brand new plane), Delta Air Lines or American Airlines etc.
The point here is this that each prototype takes six months to build, and it requires 150 million dollars in parts cost, and 50 million dollars in labor cost etc. so a total of about 200 million Dollars are spent on each build. Why six prototypes, the prototype #1 or Rev A has to through all evaluations per, electrical, aeronautical, chemical and mechanical engineering test and

evaluations. And Rev D_0 or prototype #4 goes through EMI / EMC / HIRF /ESD / Lightning testing besides, select tests per prototype #2 etc.

Now let's see or visualize the total cost R& and testing etc., that means for six prototypes it will cost and R & D cost of 6x200= $1.2Billion. This money come from tax payers in the form of grants and loans from federal government. The government knows, that once this product (Aeroplanes) is produced each or (one airplane) will sell for minimum of $400 Million dollars, depending upon options! You might have seen this when you have bought your cars.

Now, EMI/EMC and Lightning testing is performed on airplane # 4 or prototype D_0. If an expert like myself, did not do his or her job right and company has to produce an extra prototype. Let's call it REV D_1 the original being Rev D_0 (A_0 ,B_0 ,C_0 , D_0 , D_1, E_0 ,F_0)

This means extra six months of time plus 150Million dollars for parts. That will be 200Million dollars of hit on time line and budgets. That is now it will take three and half years instead of 3 years to produce a fully functional sellable plane! Chaman Bhardwaj or person like Chaman Bhardwaj can save company 200Million dollars and six months of delays in product time line. When Federal Aviation required flight hours about 2500 without any accidents or failures is produced all test data is sent to FAA. Then FCC gives approval or authorization to build new Aeroplanes. The one Aur India or other airlines can buy. The automation manufacturing process can build one aero plane as compared to manually it has taken six months!

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NOTE: This is a very snap shot of decades of my experiences in the high-tech world. In one of the meetings, I made recommendations, can we group the protype R&D evaluations such a way that we need to produce on FIVE protype instead of six. For example, if all R&D evaluations for DVT that is, design verifications & testing, can be performed on prototypes #1 and #5 only. So, we don't need to do DVT test on all protypes! This means savings of six months plus more than $200 million dollars in parts and labor!