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Managing your Design Process

Managing your design process is a complex task that requires close attention to detail. This paper will discuss how you can ensure your managing the process and not just allowing it to happen.

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Introduction

When looking at your design execution are you confident that the details are being managed; or is there a fear that things are just happening and then being dealt with as the design comes together? If the design process is being managed in enough detail there should be very few surprises as the design proceeds from concept through shipment.

The interactions of all of the various steps and decisions necessary to produce a high quality design are very complex. Most organizations invest significantly in formal program management for their projects. Why would you not have the same level of formal management techniques applied within the design details themselves as you do at the project level? Historically, the design details are an area that does not tend to receive the necessary level of formalized management.

This paper will discuss organization and skills to ensure your design process is being managed for success. The focal point of discussion will be on managing the design steps themselves along with the interfaces to the rest of the product development teams. If you find your team frequently dealing with surprises and disconnects then read on for some ideas to minimize these through formal management of your design process.

The Design Process

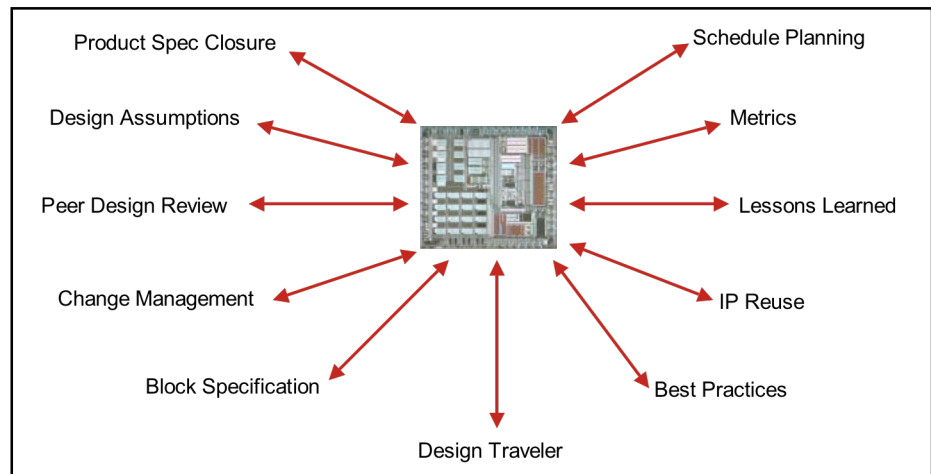
What is the Design Process

The design process is the aggregate of steps required to define, execute, validate and ship a design from your design organization. This covers both the steps taking place in design as well as the interfaces and any deliverables from design to and from the business, marketing, product engineering, test engineering and the final customer. The design process includes how you handle the flow of information as well as the flow of the steps required AND any decisions that must be made.

The design process is NOT your design flow, however, your design flow is a subset of your design process. This distinction is very important to allow you to visualize the breadth of management necessary to ensure a minimal set of disconnects during design execution. If you are only managing your design flow there will be missed expectations, mostly from the non-design members of the product development team.

Typical Elements of an IC Design Process

The diagram below identifies the typical steps that are most likely the



major elements of your design process. To keep your design project flowing smoothly you must manage all aspects of these steps focusing on scheduling, deliverables, resources and closure.

The design traveler step noted is what most would view as the design flow and covers all the tool specific steps including schematic capture, RTL coding, simulations, layout, P&R etc.

Results of Failing to Manage your Design Process

If you fail to adequately manage the complex details and interactions of a mixed signal design you will be faced with missed expectations of the design team, Test, Product engineering, Marketing, the business unit or the end customer. This usually will result in a schedule slip, or in the worst case you end up with silicon that will not meet the intended application. If you are not managing the process the result will be that the design activities “just happen” with results that will not be predictable.

Formalized PM within Design

Formalized Program Management for the Project

Almost every organization recognizes the importance of formal program management for their projects. The goal for program management is to ensure the proper flow of information, identify the tasks, track task completion, manage expectations and provide corrective actions to ensure the project proceeds as planned. This provides an excellent mechanism for tracking and managing the execution of the project at the top level.

What is not provided by this PM methodology is the management of the design details and decisions, although many falsely believe that this is the case. If the project PM does not understand the details of design there is no way to assess that the proper steps and decisions are in place to capture all aspects of the design process. The project PM must rely on the design organization's ability to break the design process down to the tasks that must be managed.

If your project schedule only contains design tasks for schematic, layout and simulation for each of your blocks that is a good indication that you do not have design broken down into enough detail. Your schedule must also contain design tasks related to flow closure, tool closure, simulation model closure, chip spec closure, block spec closure, traveler/checklist details, validation/simulation procedures etc.

Pushing PM methods into Design

The same effective approach to PM at the project level, if pushed down into design details, will provide results that define and keep your design procedures flowing smoothly. The detailed design task breakdown, decision points, deliverable expectations and managing daily activities tasks all would need to be covered. The tracking of

The Design Process Leader

specific tasks could and probably should remain at the project level to maintain one consolidated schedule.

On a mixed signal design you cannot afford to only define and track the design via the large ticket items such as schematic, layout and simulation. You must also define and track tasks related to the “how” of design, which is an area that is typically not done in the detail necessary to avoid surprises during execution. You must spell out and track all the details.

How to Manage PM Principals within Design

To push program management into design you will need skills in an individual on the design team that knows both the details of the design process and is well versed in program management. The individual must be an integral part of the design team. They must possess a process oriented mindset with a thorough breadth of knowledge in the design “how to” details. I have identified the individual with these skills as the “Design Process Leader”.

What is a “Design Process Leader”?

The “Design Process Leader” is an individual on the design team that is responsible for managing all aspect of the design process. He or she is responsible for all the decisions as to how the design will be completed. They do not drive the technical decisions for the design, only the procedural decisions. The technical lead of the design is responsible for technical tradeoffs, specification details, architectural decisions, design partitioning etc. The table below will help expand upon the delineation of responsibilities between the technical design leader and the design process leader.

Task	Design Process Leader	Technical Lead
Design Resources	X	
Design Review Procedure	X	
Power Consumption Plan		X
Simulation Validation Procedure	X	
Architectural Tradeoffs		X
Design Partitioning		X
Design Task Breakdown	X	
Design Review Content & Procedure	X	
Block Level Specifications		X
Design Flow	X	
Chip Engineering Spec		X
Back Annotation Requirements	X	
Work with CAD/CAE for new capability.	X	

The Design Process Leader Skill set

Following are the skills you would need for the ideal Design Process Manager:

- Leadership & people skills
- Highly process oriented.
- Understands all aspects of a design flow.
- Can identify where holes may exist in a design flow.
- Good oral & written communication skills.
- Understands the importance of keeping everyone current (design & non-design team)
- Continuous improvement mindset.
- Must be able to stay the course when a decision is made.

Organization for Design Process Management

Design Manager or Design Process Leader?

At this point you may not see a clear distinction between a Design Manager and a Design Process Leader. This would be the case if you have defined your design manager role with a focus on the design process. If your current design manager role is as the technical lead I suspect you see the Design Process Leader role as different from the Design Manager.

One important aspect that you must work through is do determine if the Design Process Leader role reports to your Design Manager or “is” your Design Manager. This is something that will vary, depending on the organization and historical factors about the design manager role. In either case you must be explicit about the roles and responsibilities for the technical lead and design process leader roles to ensure that you do not leave any responsibility gaps.

A few Thoughts on Design Organization

Over the years I have seen organizations where the design manager is either the technical driver or the design process driver. In most cases if the design manager was the technical driver for the organization the design process was not a key area of focus during the development. The technical aspects were usually well thought out and the product was viewed as innovative. What tended to happen is the execution of the design was drawn out due to unplanned activities and multiple silicon spins.

In the case where the design manager was also the design process leader there was a technical leader within the design organization that provided the innovation and technical direction. The design manager

acted as a facilitator of closure to make sure things kept moving along and that the proper steps were in place to keep the team synchronized in execution.

Summary

This paper described the design process along with its elements and then identified the need for managing the results of each of the process steps. If you do not manage the process your design will “just happen” and you will end up with multiple disconnects and setbacks that will force your schedule to slip away from you.

If you are serious about managing your design process you must have an individual in place, within the design team, that wears the Design Process Leader hat. If you don't have someone on the hook to manage your process it will not be managed, and keep in mind, if it is not being managed then it is “just happening”. Be careful about being caught up in the thinking that you have a Program Manager, therefore your design process is being managed. That is not going to happen!

I suggest you think through the structure of your design organization and understand how you are going to cover the Design Process Leader role. I favor the structure that has the Design Process Leader skills within the Design Manager and strong technical leaders reporting to them. This has worked well for organizations I am familiar with.