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Minimizing Time to Market for your Mixed Signal Designs.

The focus of this paper is to provide an overview of improvements to the design process, which will accelerate your time to market (TTM).

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Introduction

The intent of this document is to define methodology improvements for the IC design process that will accelerate time to market, eliminate schedule slips and improve overall quality. Discussion will center on areas of the design process that will produce a more predictable design plan.

My experience in managing IC design teams is that unexpected surprises along the development path have tended to be based on insufficient communication mechanisms being in place. Solid communication can be defined as insuring that all disciplines in the

Communication is
key to a Successful
Project!

product development process are keenly aware of the who, what, where, when and why of any deliverables due back to the project. If everyone is not aware of the detailed expectations of the items they owe the project, the team will be surprised. This frequently occurs when someone “thought” or “believed” they understood their delivery to the project, but upon delivery it was not in sync with the project expectations. If you have members making any assumptions about their deliverables, the team may end up dealing with that assumption as an unexpected surprise when the design come together down the road. Sounds pretty simple, right? It really is.

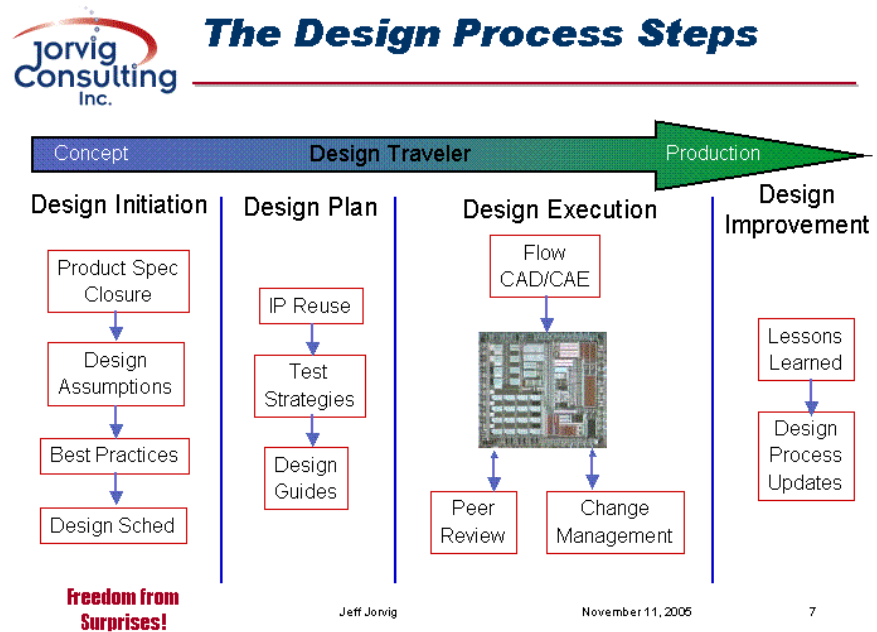
The essential project communications that will keep execution on a predictable plane can be driven via the “design process”. This paper will describe the design process and how it is applicable to insuring your team knows what they are delivering and what they will be receiving.

If improved TTM is what your looking for then I suggest looking seriously at your design process and the significant improvements that could be gained in that area.

The Design Process

What is the design process?

The design process is the sequence of the design activities from concept all the way through to production. It's how we move through the various phases of the design. Who is involved, what, when and how will they deliver their item back into the project. The breakdown of the design process sequence is a very common contributor to schedule slippage on design projects. To keep schedule surprises from impacting your projects the focus must be on the design process steps and how they can impact your team's execution. The diagram below is a representation of many of the steps that make up the design process for an IC project.



As the design moves from concept to planning, each one of these steps or sub-processes must be considered and planned out in detail. Anything left to chance in these areas is an opportunity for an unplanned diversion during design execution, resulting in a schedule slip.

Key Design Process Steps

This section will describe several of the key design process steps to consider in detail for your projects.

Checklists & Travelers – Design Process Guide

Everybody loves checklists, right? They are documents and/or lists that are completed to make sure nothing that should be done on a project, is left out. I actually prefer the term traveler to a checklist since a checklist implies something that is filled out when a significant milestone is reached. A traveler is something that is used to define the progression in real time movement from one step to the next. The two documents may be highly similar; it's just how you present them that will differentiate how they are utilized. If you want checklists completed real time, "traveler" is a much better name for the document and the checks must be organized as sequential steps.

The traveler should contain all of the steps in your design process, thereby acting as the design process guide for your chip development. Don't make any assumptions about what team members expect to happen and what's to be delivered by them or received from someone else. If it is an item that must be completed, make sure it is in the traveler. The traveler is the document that defines and documents your complete design process. A thorough traveler will have every step and every deliverable captured in its content.

Schedule Planning Process

The schedule contains the details of your design process step by step. The difference between the traveler discussed earlier and a schedule is that the schedule has a lower level of detail for the task and includes a time/resource element. Schedules tend to include tasks with a time/resource and at least one predecessor and more directly captures the sequence for a given project. The traveler describes in greater detail what each step encompasses and includes any deliverable information from the step with little or no mention of timing, resources or predecessors. Each traveler step should be reflected as a step in the actual schedule. The traveler is the guide for the agreed steps in the design process along with their associated deliverable expectations. As such it makes an ideal template for the schedule development activities and should be a part of that process.

When you are ready to build the schedule it should not be done by one or two people. The entire team must develop the schedule in a large group brainstorm setting. This will insure that all the required steps are captured and the necessary commitment is received from the team. Anything less than the entire team and I guarantee you will end up missing several of the details and your project will begin it's slip as you discover the items that were not part of the original schedule.

Design Review Process

The review process is another activity that should be a part of the design process. This step is completed to catch any design related errors. The review should not only cover the basics of the design but also cover how the design was validated via review of the stimulus used, corners run, and discussion of the designers concerns. It should also explain why the designer thinks his/her design is going to be successful for the intended application.

I have found that large audience reviews are not as effective as a smaller group "peer reviews". My definition of a small group peer review attendees would include the designer, the layout person and 2 designers (reviewers) that are not familiar with the design. Of the two reviewers, one should be senior and one should be junior. The senior has battle wounds from previous design issues and the junior asks a lot of good, probing questions that create the makings for a good discussion.

The output of this review should cover any areas of concern plus specific actions that came out of the discussion. This should be forwarded to the design manager for final resolution and to the program manager for tracking.

Change Management (Feature Creep)

The definition of feature creep is the ever-evolving requirement changes that come in to the team, causing disruptions to the task at hand and prevents the team from staying to the plan. Feature creep is an inevitable part of design; it must be managed to prevent unexpected slips.

MANAGING FEATURE CREEP

Feature creep must be monitored carefully during the project execution. Keep a close eye on the marketing/design interface since that is where many changes will originate. If this is left unattended,

every feature that comes in can easily end up as part of the design requirement with little regard for schedule or cost. Marketers are doing what they do best in bringing to the table what the customer loves. The designers are doing what they do best in accepting a new design challenge. The result of unmanaged changes is that the schedule slips away with little formal evidence as to why ground has been lost. No one is necessarily in the wrong here. There must be awareness that any changes will impact the schedule and cost of the design and that must be dealt with by the project consciousness. The overall project management team must determine if a feature comes or goes and has the responsibility of formally managing the change process.

Design Management

Design management is about managing the details of the design process itself. It cannot successfully be left up to program management to monitor the details of how the design steps will be completed. Making an assumption that program management is watching over the details of the design process is surely a recipe for surprises during execution.

Technical Management

Managing the technical aspects is where most organizations focus their energy. These typically are the details of the specification including electrical parameters, block diagrams, architecture etc. The person in the role needs to be highly technical in nature and is able to make all the decisions related to how the actual design will be implemented and validated. In most cases this individual is either the technical lead and/or the design manager within the organization.

Design Process Management

This role frequently may not formally exist, or is assumed to be the technical management individual. The “design process manager” role exists to ensure that the design process is flowing well and is being managed for success. This individual must know the nuts and bolts of the design process and must be experienced in design tools and design flows and takes a “bug picture” view of how the design will come together. A program manager for the overall project will typically not possess the breadth of design skill necessary to act as the design process manager.

The development of an IC is complex in nature due to the necessary synchronization of activities, interactions and deliverables of the team members. The individual traits for a highly technical manager typically do not coexist in someone who is skilled at managing the design process details. Both roles must be supported to achieve the desired new product development success demanded by today’s competitive landscape. If you do not have someone minding the design process of

your team, you will repeatedly end up with unexplained surprises and your schedule will slip away.

CAE Management

You also must have a dedicated CAE support individual as part of the design team. This person's role is to act as the go-to for the designer when the tools and /or flows are not working as needed. If this role does not formally exist your design engineers again will do what they do best and solve the problem themselves, without the skills or time to do so. You would be surprised at how much time a designer may spend on making a design tool work for them. It's not time that's easily noted in the schedule, it just shows up as taking longer to complete their design work. The person in the CAE role should ideally report to the design process manager.

Six Simple Rules Of Design Management

Below are six simple rules of managing design teams, that when done well will produce a project flow with a high level of predictability. These are not difficult rules to follow although some of them may push beyond the boundaries associated with typical design ownership on a project.

Rule 1

“Commit only after doing your homework. Be creative, be aggressive, keep your vision broad and commit only when you have a means to get there.”

Without a plan to get you to the end goal you will be hard pressed to commit to any project. A quote that sums this up nicely is “A Goal without a Plan is a Wish.” Are you wishing or hoping to meet a particular endpoint on your project or do you have a roadmap to get you there? A misplaced commitment will come back to haunt the team at some point on the project so it is best to commit only to what you have a plan to achieve.

Rule 2

“Keep a keen eye out for the unknown. It is always there, waiting to disrupt your plan.”

Any project will end up with some level of surprises that will impact a project. The source of those surprises are the unknowns on a project that came up due to a lack of adequate scoping of the activities or not identifying and/or mitigating a risk associated with a project. Are all the tasks for the project captured or are assumptions being made?

Rule 3

“Are things progressing as planned, or is a correction to the plan and/or deliverables in order?”

The plan must continuously be monitored in progress towards the end goal. Does the plan still make sense? Has anything changed about the

project objectives that should alter what steps need to be completed and/or the type or content of any task deliverables?

Rule 4

“Verbalized plans, instructions and decisions should never be considered communicating. Write it down to keep it crisp, concise, thorough and communicated”

A project that relies on verbal communications will likely be riddled with surprises during execution. Written plans will help solidify the plan, work through the details and map out a strategy for surprise free execution. The communication effectiveness in writing down and distributing plans, objectives, deliverables, meeting notes and strategies are indisputable. Don't fall in to the trap of not having enough time to properly capture written material. The lost time and then some will come later in the project as tasks end up being reworked due to lack of clarity.

Rule 5

“Leave no room for ambiguity or interpretation in your requirements for success. Say what you need”

This one is an essential ingredient for every member of the team. Everyone on the project is either receiving or delivering something at any point in time. The key for a smooth flow of activities for a project is in making sure that the deliverable and receivable expectation for each task match. Deliverable expectations must be communicated and agreed upon and each team member must be clear about what they need for optimal performance on their tasks. Each member must be encouraged to speak up about their requirements for success on their tasks.

Rule 6

“Due diligence on plans and schedules will reinforce predictability for your design project”

Spend the time up front to plan out the tasks for the project. A quick plan that is lacking all the steps may enable a favorable commitment but it is one that will never be achieved and leaves the project behind at the starting gate. The project will be guaranteed to be unpredictable.

Summary

This paper provided a brief overview of areas to consider in migrating your design team towards a more predictable realm of design execution. The emphasis of this document has been in focusing on the details of making the design progression more predictable. This is accomplished by insuring that the necessary planning takes place via the design process steps, thereby removing expectation disconnects that typically cause slippage.

By following this type of methodology I would expect that you should be able to approach 1st time success with highly complex mixed signal designs. Faster TTM is a sure thing!

Key Points to Consider:

1. Must have your design process Captured in a Traveler.
2. The schedule must be built with the entire team.
3. The design review process should be a small group peer review setting.
4. You need to manage changes (Feature Creep) very diligently.
5. You need both technical and process management for design.
6. Must have local CAE support for the design team.
7. Follow the six simple rules of design management.

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