DISCOVERY & SOLUTION CASE STUDY

This document is a case study that summarizes work completed for improvements to the engineering workflow process for a product development organization of a large US based semiconductor company.

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Situation Appraisal

A product development organization of a large US based semiconductor company was interested in opportunities to provide improved project predictability, a higher throughput and improved first time success. The expectation was that Test, Product Engineering, packaging, project management and design must reach a higher level of alignment to objectives in order to achieve this heightened productivity and the minimization of silicon spins. The business motivation was purely a reduction in time to revenue.

Potential deliverable/receivable disconnects within design, as well as to their product development partners were identified as the primary focus for improving the efficiency of the overall NPD team execution. Projects were progressing at a generally acceptable level; however, there was a desire to identify opportunities to step up the productivity of the team. There were well known issues to be resolved in addition to an emphasis upon finding unknown challenge areas that needed to be understood and resolved. Indications of unknowns were displayed as expectation disconnects between individuals as well as recurrent project redirections that would divert the team from the mainstream execution plan.

For the purposes of the case study disconnects are a missed expectation between a task deliverer and task receiver. A disconnect occurs when a team member does not receive what they need to be optimally successful in the completion of their task. A challenge is typically the result of disconnects in expectations and will also include a lack of ability to complete a task expediently due to missing or lacking information (what, how or why). This project specifically targeted the identification of both disconnects and project challenge areas.

Jorvig Consulting Inc. (JCI) was engaged to facilitate, organize, plan and drive this project under the direction of this organizations design manager.

Objectives

- Provide a mechanism for discovery of challenges that exist within design and to or from their external interfaces.
- Generate solutions to the identified challenges for design.
- Understand the root drivers of schedule slips.
- Any issues with deliverables from design to non-design organizations must be uncovered and solved. Facilitate the definition and support of individual members success factors.
- Document the product development roadmap into a form that guides the design process. The roadmap document must capture pertinent information and become the primary container of the all design activities and results for a given design project.

Measures of Success

- Agreement by the NPD team that the solutions defined will improve the overall product development process.
- A solid understanding of each other's individual requirements and the reasons for those requirements.
- A solid understanding of both the challenges discovered and the solutions for design and their organizational interfaces.
- Deliver a document template to act as a roadmap for the design process. This document will be detailed enough to steer the design review, guide the sequence

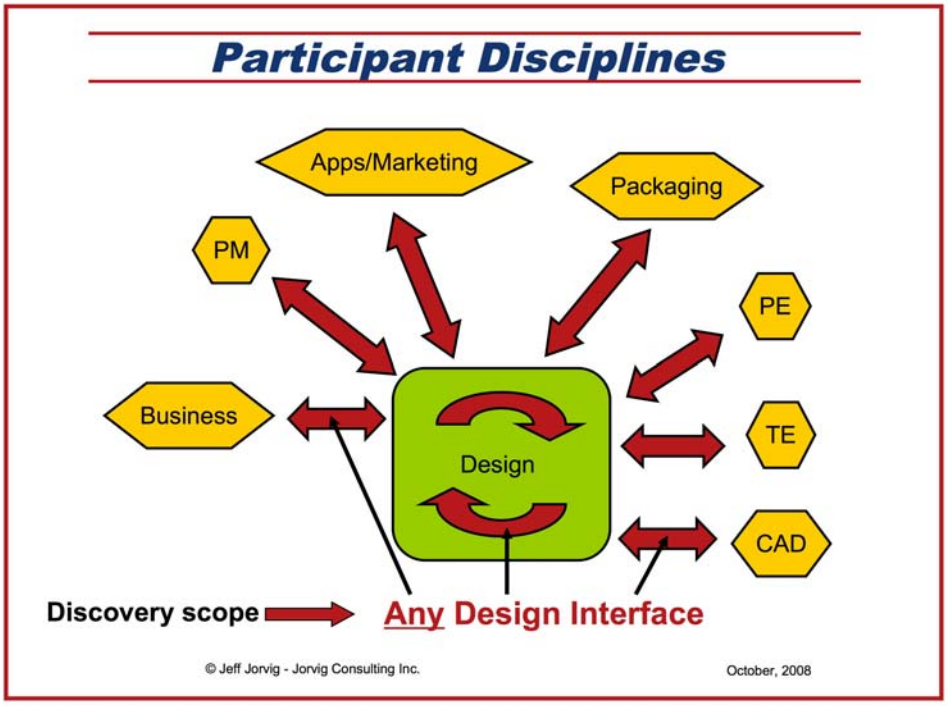
of design activities and act as containers for key design information. This will be the reference and go to document for all information relating to design for both the design team itself and the full NPD team.

Approach Used

Discovery and Solution

Discovery and Solution was the first level of activity and the starting point or kickoff for this effort. This set the foundation of activities for this project and was considered the springboard for implementing improvements to the Design workflow. The objective was to identify and resolve project challenges.

Success of this process hinged greatly upon the ability of the team to feel that candid sharing of the issues and challenges each person faces would not produce negative feelings and/or somehow impact their work situation. For this reason JCI held a participant kickoff meeting that set the ground rules of how the process would work and how the information would be shared. Anonymity of each member of the team was stressed in the information that they would share. The scope of participation for discovery and solution is represented in the diagram below.

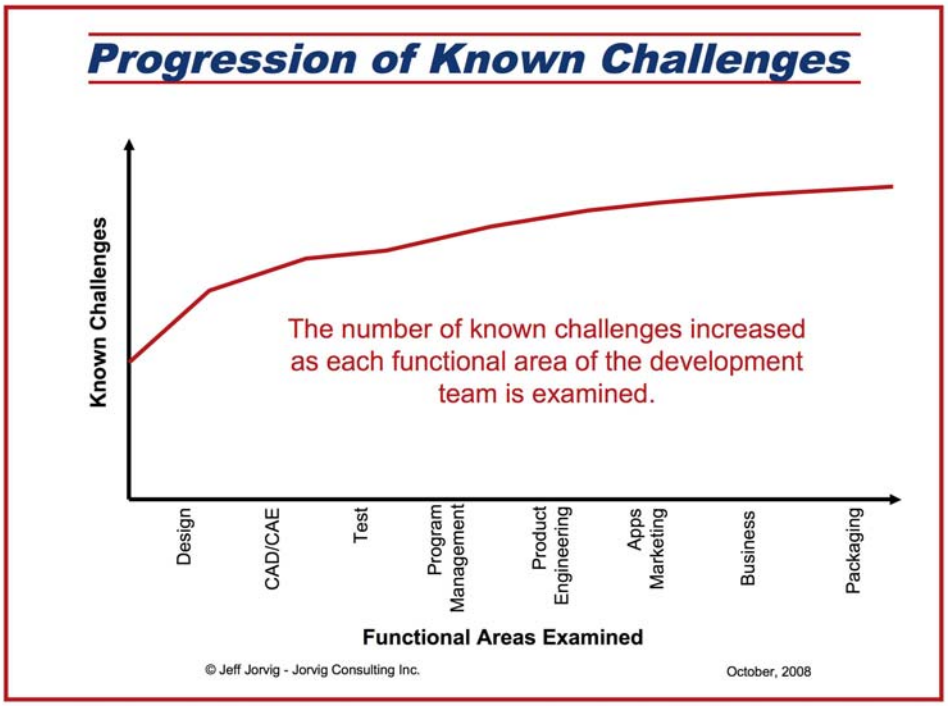


The primary purpose of this effort was a formalized discovery activity to identify the existing challenges that exist within design and to/from the remainder of NPD organization. The perspective of this endeavor was from the engineering ranks responsible for new products. The discovery of challenge areas was completed through a series of interviews with design, test, product engineering, assembly and project management as well as formal brainstorm sessions.

Five key questions were crafted for each one on one interview to maximize the probability of uncovering a situation where a lack of information, data, capabilities or deliverable expectations was hindering project flow. These strategic questions were shared with all participants during the kickoff meeting to ensure there were no questions about their meaning and to begin the team members thought process in preparation for the one on one discussion.

The diagram below represents the expectation of the known project challenges as each

functional area was examined.



The results of discovery were summarized and were then fed into the solution process. Again interviews with design, test, product engineering and project management as well as formal brainstorming sessions were utilized to generate a suite of solutions for each challenge.

The output of the discovery and solution process was filtered and consolidated by JCI, under guidance from the design manager; to produce a document that identifies the key challenges and proposed fixes to those challenges. This report and the information it contained was the input to the design renewal process that followed through the implementation of the design guide.

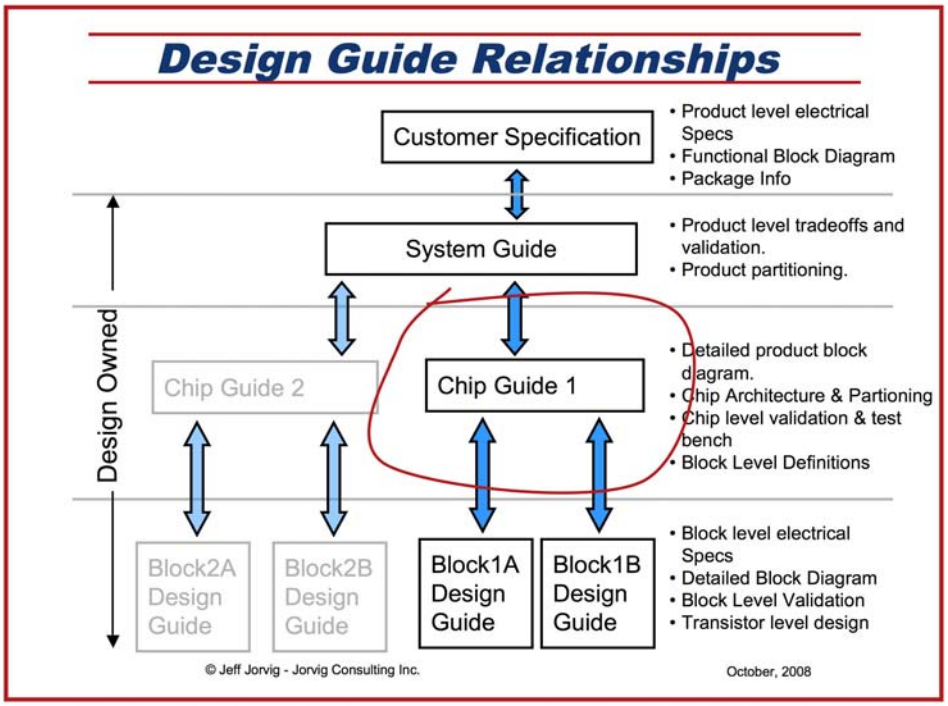
Design Guide

This phase of the project developed a design guide template to provide the following benefits to the design team as well as the entire NPI team:

- Guides the design process tasks that have been predetermined as “best practices”.
- Roadmap of agreed activities for a high quality product.
- Hierarchical Information transfer from product requirements to detailed design.
- Repository for key deliverables back to the project for downstream tasks.
- Addresses information requirements beyond schematics, simulations and layout that are to be managed by design.
- Thorough enough to drive the design reviews.

For the purposes of this project the design guide is best described as the merging of the design specification, the design checklist, the design flow and the design process. The design guide was created in a template form to pilot this organizations design process through the various NPD phases from initial concept to production release. Any information or directives that defined how the design team is to operate as the design work progresses was included in the design guide template. The deliverable expectations out of each design activity were also

captured in the guide, creating a roadmap document for the work to be completed as well as a documentation reference package for the completed design work. The figure below identifies this particular design guide in relation to other guides that could be created for a project.



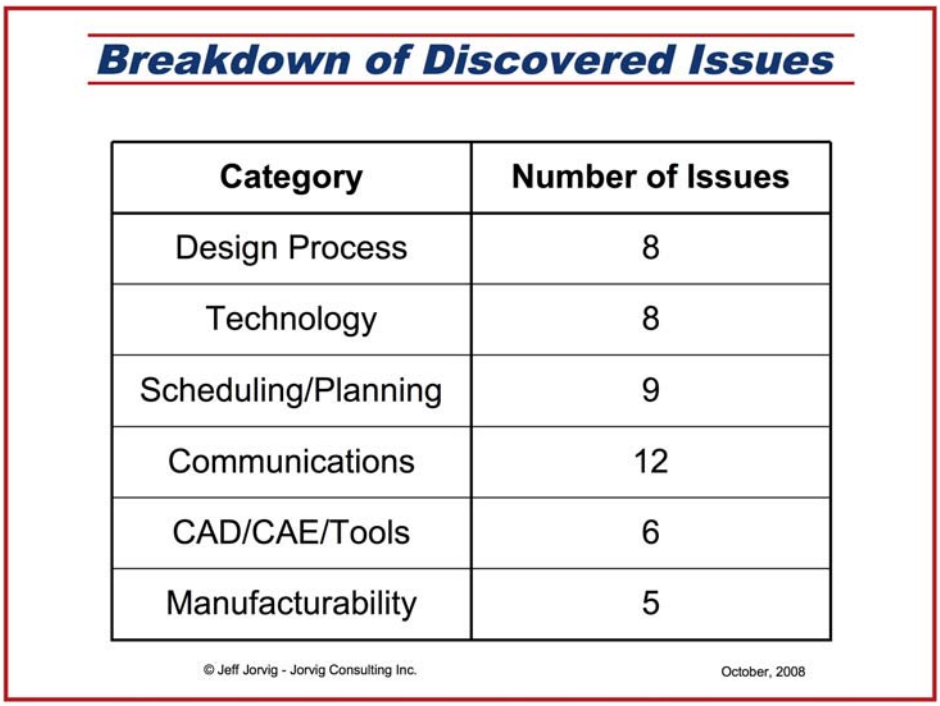
The design guide for this project covered the design deliverables for all NPD project phases including early system trade-offs, design partitioning, design sequencing, design analysis requirements and results as well as test modes and requirements. The guide became the conduit of information exchange within design as well as to all organizations that design interfaces with. The inputs to the design guide content came from the baseline discovery and solution process noted above, direction from the core team and previous experience of JCI.

Results

Discovery & Solution

The Identified Challenge Areas

The output of the discovery process generated 48 execution challenge areas. These challenges were partitioned into six major categories as defined in the table below.



Breakdown of Discovered Issues

Category	Number of Issues
Design Process	8
Technology	8
Scheduling/Planning	9
Communications	12
CAD/CAE/Tools	6
Manufacturability	5

The issues identified were generally known to the particular discipline most effected by the deficiency, however the issue was not elevated to the point where resolution could occur at the project level. None of the challenges/issues that were identified were dismissed as having no value. They all made sense and could easily be seen as a benefit to project execution if resolved. However, some would certainly be more difficult to solution than others, which required some intelligent prioritization.

SOLUTIONS

This phase of activity was to brainstorm solutions to the key items identified out of the Discovery process. The project scope was specific to design; therefore the list of 48 items to be resolved was reduced to 20 items, only including items that were design centric.

Input: 20 Issues that Represent the Challenges to a higher level of design productivity.

Attendees: Packaging/assembly, design, project management, Test, design management, systems engineering, product engineering and myself.

Output: Multiple solutions for each of the 20 challenge areas.

The final resolution of each of the challenges noted was the responsibility of the design manager, based on one on one inputs as well as the brainstorming session. The final resolution to each challenge area was included in the design guide activity that followed solutions.

Design Guide

The design guide was developed and reviewed over the course of a one-month period. The content of the guide includes all activities, data and decisions to be made by the design engineering team. The guide also includes the agreed solutions to the challenge areas identified out of the solution process.

The key deliverable was a completed design Guide template in FrameMaker format, with content agreed to and reviewed by the core team. The content within the document was the key deliverable out of this exercise. Ideally the team has the intention of rolling this design guide into a web-based environment, allowing greater accessibility by the entire organization.

The scope of this project did not include that activity.

Summary

This project successfully uncovered 48 challenges (information, activities or deliverables) that the team members had identified to better improve their ability to execute on their tasks. Of these 48 items 20 of them were resolved and agreed by the NPD team for the purposes of inclusion in the Design Guide. The remaining 28 items were beyond the scope of this particular project and were retained for later resolution.

The Design Guide that was completed and agreed upon has captured the entire Design process and all the deliverables necessary for design, verification and test. The twenty challenge areas identified out of the discovery process have been resolved and are included in the content of the design guide.

Completion of this project has provided the design team with resolution to their primary issues. Additionally, the team now has a document that guides the team through the entire design process as well as retaining the key engineering data and documentation. The design process, design documentation and design checklist are all in one place, allowing a consistent and jointly agreed upon path for all projects.

The diagram below represents an activity summary of this project.