

PCB DATA MANAGEMENT: HOW INDUSTRY LEADERS ARE MANAGING THEIR DATA

August, 2015

→ **Tracy Woo**, Research Analyst,
Manufacturing, Product Innovation & Engineering (PIE)



Report Highlights

p2

There is increasing pressure on companies to improve their PCB production timelines by streamlining their PCB data management

p2

The major hurdles of data management occur in integration with software tools and communication between groups

p3

Best-in-Class companies are implementing software automation and restricting access based on user ranking

p5

Software automation methods more likely to be employed by the Best-in-Class include a centralized library and DFM validation

This report identifies how top performing companies manage their PCB data for more consistent, on-time deliverables.

2

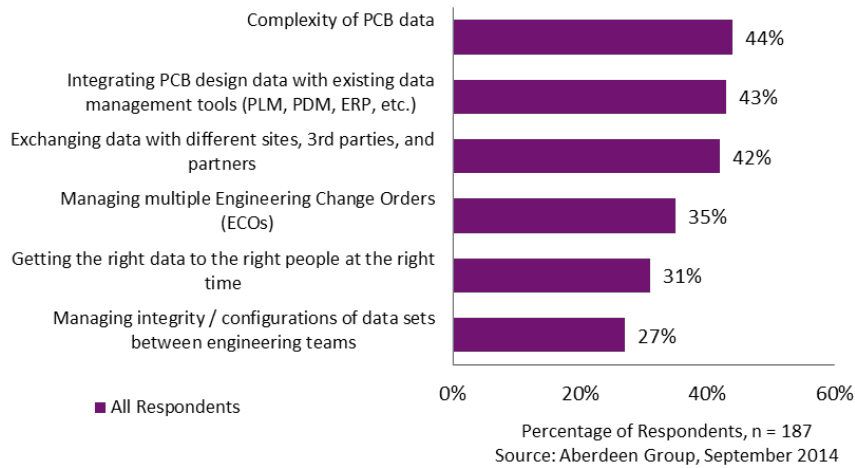
The road to successful PCB production starts by synchronizing data, communicating early and often between R&D groups, and maintaining a single source of information. Companies able to implement these practices will find themselves in the same league as Best-in-Class.

Printed Circuit Board (PCB) data management is complex and can often be mishandled. Producing PCBs requires precision between schematic and Bill of Materials (BOM), synchronicity between the different R&D departments, and transfer of the correct PCB data to the board fabricators. Poor management of PCB data can lead to delays in end product delivery or worse, malfunctioning boards. In order to prevent PCB data mishandling, companies should look to synchronize and control how the data is accessed. This process can be implemented by automating through software and involving all relevant R&D from the first step. This report identifies how top companies manage their PCB data for more consistent on-time deliverables.

The Problem with Mismanaged Data

The modern day consumer calls for products rich with functionality and features. This demand has led to an increase in electronics with more intricate and involved circuits. Increasing product capabilities result in the need to manage complex product data. A survey of 187 industry professionals, conducted by Aberdeen Group in September 2014, identified the major issues causing PCB data management errors.

3

Figure 1: Top Challenges of PCB Design Data Management

Complexity of PCB data creates room for errors in production, many of which are largely uncontrollable from a production standpoint. Best-in-Class organizations focus on controllable mitigation practices like integrating PCB data into financial and product life cycle software tools, such as ERP and PLM. A PCB that is not properly accounted for in ERP will throw a company's financials over budget. Likewise a PCB that is not properly documented in PLM will be fabricated incorrectly, and once again affect the company's bottom line. Thus, companies should focus on improving integration of PCB data into their software management tools.

Similarly, communication between all involved parties, including third party vendors and different R&D groups, is a major challenge to successfully fabricating a board. Much can be lost in translation during the file transfer of board data to third party vendor or partners used to fabricate the board. Also, several revisions may occur during the board fabrication process. Often these changes aren't communicated in a timely manner. Consequently, a board without the most current changes may be produced. To prevent against such errors, it is important to maintain proper documentation and strict data revision control

4

What is Best-in-Class?

To define Best-in-Class (top 20% of performers) companies and All Others (bottom 80%), Aberdeen used four key performance criteria to measure the success of an organization's PCB design program, not only in terms of how it met product targets, but also the overall change in development time:

Product Cost Targets met:

- 87% – Best-in-Class
- 68% – All Others

Product Launch Targets met:

- 87% – Best-in-Class
- 63% – All Others

Product Quality Targets at Release:

- 91% – Best-in-Class
- 79% – All Others

Change in PCB Development time

- 10% Decrease – Best-in-Class
- 11% Increase – All Others

of the PCB itself. Moreover, all groups involved in the board fabrication must be consistently kept in the loop with each change.

Steps to Improve the Process

To address the challenges in managing PCB data, Best-in-Class (see sidebar) companies have implemented a number of capabilities (Table 1). Foremost among these methods is synchronizing the schematics and BOM with the PCB. Best-in-Class companies are approximately 33% more likely to synchronize these two. Without consistency in data between these crucial documents, the board will not be fabricated properly.

In addition, PCB data should be streamlined to one source to maintain consistency. Best-in-Class companies are 43% more likely to use version control. An additional precautionary measure is to limit revision rights. User access should be based on their role in the board fabrication. For instance, a user with a secondary or tertiary role would have “read only” access to the document, whereas the board designer would have full read and write access to the PCB data.

5

Table 1: Best-in-Class Implementations

Metric	Best-in-Class	All Others
Schematics and PCB layout are synchronized	95%	77%
Access to data is controlled based on user role	81%	58%
Schematics and BOM are synchronized	76%	57%
A single source of data exists for the PCB project	65%	57%
There is version control for each data element on the PCB	57%	40%

Source: Aberdeen Group, September 2014

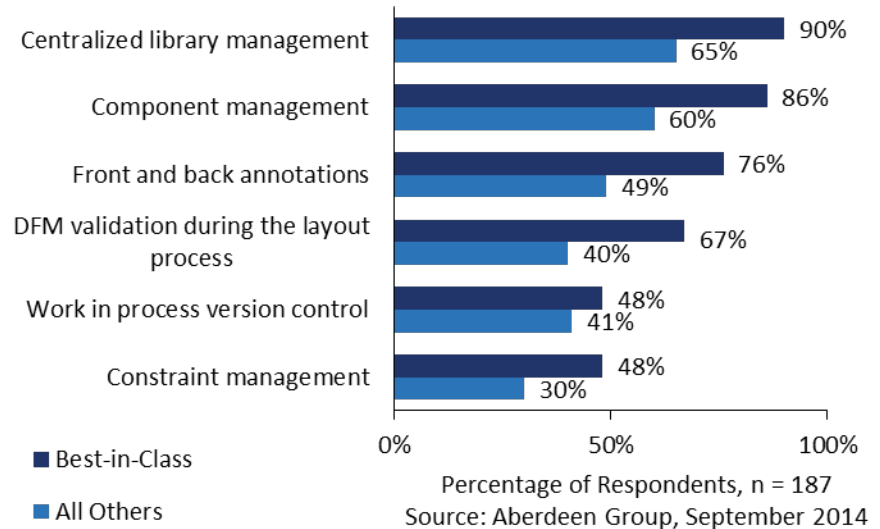
Given short timeframes placed on the PCB development team, no time can be wasted fixing data integrity issues. Incorporating these capabilities into the PCB design process can lead directly to improved product target performance of the Best-in-Class.

Implementing Best-in-Class Techniques Through Software Automation

Many companies have implemented software automation into their board fabrication process. Notably, Best-in-Class companies are 38% more likely than other companies to use a centralized library to manage their data. This provides a single source for the PCB components and files. In addition, a Design for Manufacturing (DFM) validation during the layout process is important but often overlooked due to schedule constraints or plain carelessness. Schedules are often held back due to the layout not fitting the manufacturing constraints. A majority of Best-in-Class companies have such a validation procedure (Figure 2).

6

Figure 2: Automated Software Methods for PCB Data Management



PCB data is inherently complex. Combine it with a short development schedule and an area ripe for inconsistencies is created. Automated processes implemented by Best-in-Class companies help prevent these inconsistencies from occurring. If these errors are not caught until fabrication, manufacturing cross and schedule delays will occur (see sidebar).

Key Takeaways

Synchronizing data between the different parts of fabricating a board is crucial. Ensuring the schematic and BOM are closely revisioned with board layout changes will help prevent against costly mistakes. Many of the issues that arise with inconsistent data can be solved through automated software processes and by maintaining clear and consistent communication between all parties involved. To perform on the level of Best-in-Class, companies must:

- ➔ **Maintain a central library for all PCB data.** Using a single source for all PCB footprints, parts, schematics,

Additional Metric Performance (over the past 2 years)

Change in warranty costs:

- **Best-in-Class – 22% Decrease**
- **All Others – 2% Increase**

Change in fabrication re-spins:

- **Best-in-Class – 20% Decrease**
- **All Others – 1% Decrease**

Change in scrap/rework:

- **Best-in-Class – 28% Decrease**
- **All Others – 16% Decrease**

Change in physical prototypes:

- **Best-in-Class – 17% Decrease**
- **All Others – 2% Increase**

Change in ECOs after release to MFG:

- **Best-in-Class – 15% Decrease**
- **All Others – 2% Increase**

7

and layout to help maintain consistency during the design and revision process. This allows for built in precision between users. It also means fewer errors, if any, during handoffs between design departments and third party vendors. Over a period of 2 years, Best-in-Class companies experienced a drop of 20% in board re-spins. All other companies had a drop in re-spins by only 5%.

- **Perform DFM validation during the layout process.** An often overlooked process, DFM will help keep board re-spins to a minimum. It allows the manufacturer the chance to offer helpful advice to the designer in preventing errors such as acid traps, slivers, and starved thermal pad connections. These are costly mistakes that can severely impact board yield and manufacturing costs. DFM users were 16% more likely to bring in their expected revenues.
- **Strict revision control during board changes.** During a hectic manufacture and design build, strict revision control will ensure all parties are using the most current data. Changes to the design should be communicated to all parties in one place to allow the most accurate transfer of information.

Management of PCB data is the best step companies can take in reducing their manufacturing costs. A single repository of information, along with including manufacturing in the early stages of design, helps keep a project on schedule and on budget.

8

For more information on this or other research topics, please visit www.aberdeen.com.

Related Research

[NPI Velocity in Discrete Manufacturing: The Hidden Cost of Late Products](#); November 2014

[PCB Design: A Guide to Optimizing Design Engineers](#); March 2014

[The Engineering Workforce Problem: Doing More with No More](#); April 2013

[How Successful OEMs Improve Product Quality while Saving Time and Money with PCB NPI...and How You Can Do it Too](#); September 2012

Author: Tracy Woo, Research Analyst, Manufacturing, Product Innovation & Engineering (PIE)
(tracy.woo@aberdeen.com)

About Aberdeen Group

Since 1988, Aberdeen Group has published research that helps businesses worldwide improve their performance. Our analysts derive fact-based, vendor-agnostic insights from a proprietary analytical framework, which identifies Best-in-Class organizations from primary research conducted with industry practitioners. The resulting research content is used by hundreds of thousands of business professionals to drive smarter decision-making and improve business strategy. Aberdeen Group is headquartered in Boston, MA.

This document is the result of primary research performed by Aberdeen Group and represents the best analysis available at the time of publication. Unless otherwise noted, the entire contents of this publication are copyrighted by Aberdeen Group and may not be reproduced, distributed, archived, or transmitted in any form or by any means without prior written consent by Aberdeen Group.