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# Managing Your PCB Work-in-Progress Data

The recent trends of shorter product lifecycles have resulted in increased customer expectations that crave quick delivery of feature-rich products. Electronic companies that haven't progressed their design process and remain stuck with the conventional way of managing their ECAD data find it to be very costly and inefficient. With market pressures that leave no margin for error, electronic companies that don't address the needs of today's complex design cycle management can be very vulnerable to the slightest disruption. Competing is no longer on one front, but on all of them; whether it is customer service, the niche you service, how intimate you are with your customer, or how well you are leveraging technologies to run a lean and mean ECAD data management process. Not only that, but in many segments, what once were areas of differentiation, have merely become the cost of entry.

Many electronics companies from recent years attest to the reality that no one is immune or invincible to disruption, and the question is: what are you doing about it? Are you leveraging technologies that break traditional divides between its multidisciplinary design teams? Are you investing in a strategic system that empowers your design team to turn your ECAD data into a true asset? Or are you still relying on manual, error-prone systems to navigate through the complex and dynamic product development process?

## IT'S STILL WORK-IN-PROGRESS

With many companies taking the strategic route (no other options really!) to expand their product portfolios and reduce the time to market while keeping quality high and costs low, the challenges they face during product development are only increasing. And one particular challenge, if not managed properly, can have a greater impact on the success (or failure) of your project; that is, how you manage change. Every electronics company that wants to stay competitive must effectively manage work-in-progress (WIP). And given how dynamic the early stages of any product development are, it's imperative not only how you manage WIP, but how you communicate it as well, internally and externally.
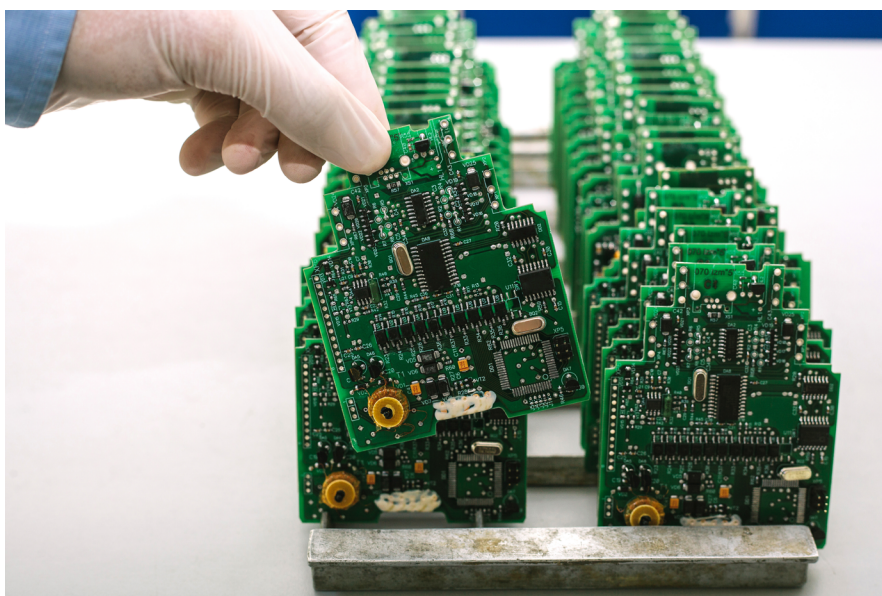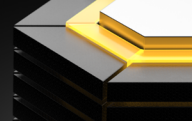
*Figure 1: To stay competitive, companies must effectively manage PCB work-in-progress.*

WIP ECAD data includes all the files associated with the PCB (Sch, PCB, Lib, 3D models, Sim models, Gerber, netlist, etc.) including component parametric data (tolerance, voltage, etc.) Any miscommunication or disconnect in regards to either the state or the version of any of this data will cause at best, excessive rework, project delays, or cost overruns, and at worst, the wrong version of the product being built in production. Many industry studies, such as the Aberdeen Group, have found that several of the issues that arise with inconsistent data are due to poor WIP ECAD data management. These poor methods are often due to manual, locked processes that lack reliable automation to communicate, track, govern, and release ECAD data. What often occurs is engineers end up spending a significant amount of time ensuring that the data they are working with is up to date, in the latest version, and in the correct life cycle state. With globally dispersed teams, the risk is even higher for teams to use the wrong version when WIP ECAD data is tracked and controlled offline. Without a holistic, transparent ECAD data management system, it's difficult to be confident that your team will always identify and use the correct version in their designs.

## ERROR-PRONE METHODS TO MANAGE WIP

During the early stages of development, change is usually happening rapidly since the requirements can be a moving target. During this phase when things are not yet locked, flaws of manual systems to manage ECAD data overall, and in WIP more specifically, are more apparent. When multiple engineers start accessing, modifying, and commenting on the same data, data integrity can be in jeopardy if no automation is in place to manage WIP ECAD data, whether it is to review, approve, track, or modify life cycle state. So let's highlight the limitations of different manual methods to manage WIP, such as file-based, manual version controls, etc.



Figure 2: Early in the development of a product, the specs are often a moving target. Poor data management as these requirements change will result in time-consuming and costly errors.

## YOUR ECAD DATA PROJECT IS COMPLEX

Even when your company tries to organize a folder structure based on projects (top level folders), and then maybe using subfolders for the project stages, you know that it is simply unsustainable and unmanageable. Allowing users to create folders without any control, and the mindset that "I'll make sure it's organized later," is a recipe for disaster. With no specific oversight on how and where the design team should structure their work, the ECAD data folder structure can become complicated and unmanageable very quickly. And what makes the matter even worse, is the nature of the ECAD Data and the need to relate to each other, something impossible to achieve with a folder structure.

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## LIMITED SEARCH ABILITY

While Windows Explorer is fine to search file names or document extensions, it cannot be used for advanced searches, to find a part, its state, or where-used for instance. Searching in this fashion would produce plain results with more time spent scrambling to find the needed document. No matter how your project folder structure is organized or how advanced the search can become, it will always be limited and cannot reach the level of what an ECAD Data management system would provide.

## MANUAL REVISION CONTROL

You've been there; before you start working on a document, you have to make a copy of it! You make a copy, and maybe you put it in the "WIP" folder before you make any modification. And you've also been there when you forgot to do this! Every time, the user has to remember these jumps and hoops, and perform them correctly. And even if we assume that most users do so, there is simply no way to control and manage the vast amount of documents that accumulate as change is taking place! No design team can rely on data with this approach of document revision control.

## GOOD LUCK KEEPING THE DISCIPLINE

With these complicated procedures of managing complex ECAD data, your company's IT is always on call to consistently maintain the structure and users. This process always leads to non-stop regular intervals of re-organizing the data structure, again and again. During which, design teams can find themselves going through another learning curve rethinking where everything is, leading to using the wrong data in your project, as design teams would be driving blind not knowing what has been released and what is still WIP.

## MANUAL DOCUMENTS FILE NAMING

With manual systems for managing your files, there are no automatic numbering schemes to update the file names as users make changes. Most organizations have different schemes that "worked" in the past or certain procedures engineers and users have to follow, naming the files based on the stage, who made the change, when, etc. This makes it difficult for design teams to find documents, and especially those that have been referenced in other documents. This is simply not sustainable.

## DUPLICATIONS

A number of studies have concluded that many documents are duplicated within organizations. Of course, this is to be expected with any manual systems to manage your ECAD data. And the question will always remain: what is the source of all truth? And even when documents are time stamped, given how globally dispersed teams are with different time zones, it's impossible to stay on top of things, and the risk of out-of-date data being used becomes extremely high.

## NO SECURITY

These file based manual management systems have limited security options, such as read only, write, no sharing, etc. With these scenarios, there is no way to change when the document becomes visible or grant access to certain users only when the document is no longer a WIP and approved. Of course, this will always translate to more "WIP", "Released", "Approved", "End-of-Life", and related folders due to this locked down method. And with users sometimes being denied access to certain folders, they will often place files in the wrong folders where they have access. This is costly, inefficient, and will always lead to confusion, wasted time, blame, low morale, and the wrong version of something ending up in your production.

## LOST, DELETED, OVERWRITTEN, OR MALICIOUSLY-REMOVED DOCUMENTS

Many companies at some point deal with lost documents as they get accidentally, or maliciously, deleted or relocated and somehow never found. Without tracking who is accessing the folders, who is changing what, and with a system that has no "undo" or "restore to last Rev" function, it's often too late by the time the system breaks down.

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## AUDIT TRAIL — NONE

Without an automated ECAD data management platform, there is no way to track changes on either top level or within the documents themselves. With many companies having confidential documents, it's difficult to determine who accessed them, or who copied them into their flash drive (just before they leave the job). The issues that can stem from not being able to audit trail your ECAD data can bring your whole organization to a halt.



*Figure 3: An audit trail is essential to your company's future health.*

## NO RELATIONSHIP

Complex ECAD data simply can not be well managed under any manual system. With these types of files often containing updates and information that link to other files, users can't track where they are used, making it easy to break interrelationships between files by moving them, editing them, or even deleting them.

## NO PROCESSES

Before ECAD data changes state from "WIP" to "approved", it needs to go through reviews, signatures, and approval. File managers do not offer any approval methods (or any other processes, really) to complete this. It often leads to integrating third party software to perform these approval tasks, and while it's better than nothing, it's not ideal, and it has its flaws as it leads designers to step outside their ECAD environment.

## NO LIFECYCLE STATE MANAGEMENT

As we mentioned above, manual systems to manage your ECAD data cannot track documents through the different stages it goes through from "initial", "WIP", "Approved", "Released", to "End-of-Life". Manual management methods to manage your ECAD data lifecycle can get very complicated and practically unmanageable.

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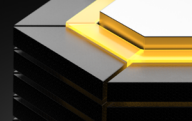
## NO REPORTING OR ANALYSIS

With no way to process the complex data with your ECAD files, your organization cannot take advantage of any possible reporting and analysis. You cannot get any insights about where things are or any simple statistics of what is still "WIP" or what has been approved. The only thing you can be informed about is how many files and folders you have, and some associated date/time information.

## CONCURRENT WORK IS ALMOST IMPOSSIBLE

Many designs require concurrent teams working on them, and manual systems can easily lead to designers overwriting each other's work. With no way to know if someone else is working on the same document, users can overwrite, move, or delete the work of another engineer. This becomes even more difficult as multiple global teams need to sync their work. It is simply one of the prices you pay when you manually try to manage complex ECAD data structure.

## DOCUMENT SHARING

Design teams often have to collaborate with internal and external stakeholders, and it is tough to share documents with either clients and vendors controllably. Using VPNs or FTP-like systems to share ECAD data will set you up for failure with no way to keep the data synchronized, control access, or ensure that the correct files you're sharing are the latest your engineers pushed. Relying on emails to distribute files is a security risk and will often result in obsolete ECAD data files floating around.

## TAKE CONTROL OF YOUR WORK-IN-PROGRESS ECAD DATA

With the nature of ECAD data being very iterative, it is expected that during your design phase a lot of data will be generated and will need to be version controlled. All the information is typically part of or related to each other. File managers are meant to be simple management tools for documents, as they don't understand complex data and are not the way to manage your WIP ECAD data. The need to reduce the risk in your design process is made possible by steering away from all error-prone manual methods. Adopting a sound ECAD data management system gives you absolute control over establishing responsibilities, procedures, granting access, automated revision control, managing and communicating lifecycles, generating intelligent reports, audit trails, and ensuring that you never delete your files.

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