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Tech-Clarity Insight:

A Risk-Based Approach to Component and Supplier Management

Mitigating Product Risks with Component and Compliance Intelligence

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Executive Overview

To achieve a sustainable profit, manufacturers must not only develop winning products but also ensure they can be delivered to the market reliably and cost-effectively. Developing and maintaining effective supply chains requires identifying, analyzing, and mitigating risks from many sources. A structured risk management approach helps companies achieve higher product ROI and prevent unexpected costs in today's complex supply chains despite threats from shrinking component lifecycles, increasingly complex regulations, counterfeiting, and an economic downturn that threatens the health of many suppliers. These issues can drive product shortages, excess expense, risky supply moves, diverting resources from innovation to redesign around supply issues and risk to product quality. No industry, manufacturer, or supplier is immune from these risks.

You have to be as proactive as you can in a lot of different risk areas, as any one of them can be detrimental to your business.
Erick Prause, Director of Supplier Development, Jabil

Manufacturers need to take a strategic look at supply chain risk. "*You have to be as proactive as you can in a lot of different risk areas,*" explains Erick Prause, Director of Supplier Development for Jabil, a provider of electronic design, manufacturing and product management services, "*as any one of them can be detrimental to your business.*" An effective risk management process must:

- Identify potential risks
- Analyze risks and their potential impacts
- Mitigate risk proactively

To support this, companies need to put in place a framework and infrastructure that provides product and component intelligence, including content and communication processes. Without the right information it is nearly impossible to identify, analyze, or mitigate supply chain risk. "*We see component lifecycle management and the management of product data and information as critical to our business,*" explains Jabil's Prause, "*So we invest in continually improving and sharing product information.*"

Without the right information, it is nearly impossible to identify, analyze, or mitigate supply chain risk.

Today's complex, dynamic supply chains require current, accurate information coupled with bidirectional communication and collaboration. This combination allows companies to mitigate risk and improve supply continuity across their product lifecycles – protecting revenue, avoiding excess expense, and ultimately increasing product profitability.

Identifying an Ecosystem of Supply Chain Risks

Today's supply chains are complex, dynamic, fast, and full of opportunities for failure. Companies need to manage a series of market scenarios and discontinuities in order to ensure the sustainability of their supply chains and profit from their products. Supply chain risks can include of host of potential issues, particularly given the instability introduced by the global economic downturn. To survive in this environment, manufacturers must understand their products and the supply chain risks they represent. "*We have to be cognizant of the contents of our products for obsolescence, compliance, and also availability and sourcing of raw materials,*" describes David Williams, Engineering Applications and Solutions Manager for BAE Systems, who develops, delivers and supports defense, security and aerospace systems on a global basis.

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David Williams, Engineering Applications and Solutions Manager, BAE Systems

Supply chain risks encountered by today's manufacturers include counterfeit parts, component and material obsolescence, regulatory compliance, sustainability, "green" initiatives, and supplier viability risk. "*Our customers are in different industries and have different risks, so it's hard to rank them,*" comments Jabil's Erick Prause. Any of these risks can add extra cost, delay time to market, or create product shortages. To make matters worse, the risks often overlap and feed each other. For example, regulations such as RoHS have driven changes to components such as the removal of lead, which in turn has accelerated the end of life for many components and caused obsolescence issues even for companies not subjected to RoHS requirements. To combat these risks, manufacturers must be proactive in identifying potential risks associated with their products. "*We take BOMs through an analysis on risk to mitigate potential supply chain risks up front,*" says Erick Prause of Jabil, "*some products have lifecycle greater than 25 years, so we have to stay on top of market, supplier and regulatory changes to make strategic decisions on how to acquire material.*"

Counterfeits and Fakes

Counterfeit parts are a supply chain risk that threatens profitability and company reputation. Counterfeits prey on shortages of supply for constrained parts, offering knock-off components to illegally make a profit. ON Semiconductor, a global provider of semiconductor technologies to the computing, communications, consumer, automotive, medical, industrial, military, and aerospace markets, is addressing these issues. "*All major international semiconductor suppliers began to see a rise in counterfeits beginning in 2006*," Theresa Haywood-McCarley, Quality Systems Director, ON Semiconductor explains, "*We continue to track any counterfeit activities and we also work very closely*

with our customers to communicate that our products should only be purchased through official company sales and distribution channels to ensure quality and authenticity."

Counterfeits threaten product quality, product performance, and regulatory compliance. The use of counterfeit parts – whether they are pure counterfeits, lower spec products, substandard parts, or reclaimed parts being passed off as new, quality parts – puts the rightful supplier at risk as well as the OEM that includes the parts in their products. It can also potentially put the safety of those using the product at risk. "*The Impact of risk is definitely financial, and can impact future business,*" says Jabil's Erick Prause, "*Our customers do not want to receive or be known to have received counterfeit parts.*"

Counterfeits threaten product quality, product performance, and regulatory compliance.

Because of the potential impact of illegitimate parts, it is important to be notified of the detection of counterfeit parts in the market. It is also important to have the right product specifications and information to help determine if components are genuine. Perhaps the best defense, though, is a strong offense. In general, better management of the component lifecycle helps prevent sourcing strategies that put companies at risk of counterfeits. "*We have a flag to warn that there are counterfeits available,*" explains BAE Systems' David Williams, "*But it is also important to be aware of 'end of life' (EOL) notices from manufacturers to recognize the potential for counterfeit risks.*" An EOL indicates that a part is planned for obsolescence, which can lead to constrained supply and create a tempting target for counterfeiters.

Obsolescence

Component and material obsolescence itself is another significant supply risk. A stellar product design is doomed to fail if the manufacturer can't source the required materials effectively. As reported in Tech-Clarity's Living with the Dynamics of Electronic Components: The Importance of Component Event Management in a PLM Strategy research report, obsolete parts can add significant supply chain costs and disruption, including the need to redesign products to replace or eliminate the component. "*One of our biggest risks is with component supply, we have major issues with obsolescence,*" says David Williams of BAE Systems.

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Obsolescence is becoming a bigger problem for manufacturers as the usable lifecycle of durable products increases to multiple decades while the lifecycles of the components

they are made from continue to shrink. This is particularly true in the Aerospace and Defense industries. Many companies are faced with maintaining a product for up to fifty years with commercial, off-the shelf (COTS) parts with lifecycles with much shorter life spans. And those component lifecycles are shortening rapidly. In addition to technical advances in components, regulations such as REACH and RoHS are accelerating component obsolescence as suppliers redesign parts to remove substances of concern such as lead.

This problem has plagued manufacturers for some time, but is becoming an even bigger issue as fixed contracts, uptime commitments, stronger service level agreements, service-based logistics and service-based pricing like "power by the hour" place this issue squarely back on the OEM. In these scenarios, the manufacturer is effectively selling the product and its related upkeep as a fixed-price service. While manufacturers already wanted to make products easier for their customers to support, many customers are pushing lifecycle support and maintenance issues back to the manufacturer – forcing them to take on even more of the supply chain risk. "*A lot of our new contracts are large, through-life contracts with availability guarantees,*" points out David Williams of BAE Systems. In this case, any excess cost due to obsolescence will come directly out of their profit margin. "*We try to help our customers mitigate the risk of obsolescence*," explains Jabil's Erick Prause. "*We focus on being as proactive as we can by monitoring and trying to anticipate what changes will happen, and then seeking and bringing our customers recommended solutions.*"

Manufacturers need the right information to design a product that fits the customers' needs today, but also one that will be sustainable over the lifecycle.

In essence, managing obsolescence risk in every phase of product lifecycle from inception to decades-long support obligations is becoming a higher priority. To avoid obsolescence, product designs should be analyzed early and monitored regularly for component lifecycle issues. There is usually no good reason to include a component towards the end of its lifecycle and build a problem in from the start, but most of the time designers don't have visibility. Manufacturers need the right information to design a product that fits the customers' needs today, but also one that will be sustainable over the lifecycle.

Regulatory Compliance

Another supply chain risk that has gained a lot of recent attention is environmental compliance. Directives like RoHS and REACH, among others, have placed a significant burden on manufacturers. The growing tangle of regulations includes general requirements such as RoHS, but also industry-specific requirements like ELV (End of

Life Vehicle), region-specific regulations (Chinese and other localized versions of RoHS), and customer-specific requirements. Simply understanding the requirements resulting from the regulations is confusing enough, but then companies must analyze their products against the mandates.

REACH is not a one-time compliance check-off like RoHS because it was designed to accommodate a growing list of substances over the life of the regulation.

RoHS requires companies to ensure that certain substances were below specific thresholds in their products. The challenge, of course, is that most manufacturers don't control the composition of products that they source. This results in significant effort to gather compliance documentation from the supply chain. While some companies adopted a strategy to understand the actual contents of their products, most chose to gather documentation from their supply chains certifying that components were compliant. Unfortunately, with new variations of RoHS by country and "RoHS2" coming out from the EU, that approach is falling short as a new set of substances is being targeted. REACH will have an even bigger impact because it addresses a larger number of substances, and the substances of concern promise to be more dynamic. REACH is not a one-time compliance check-off like RoHS because it was designed to accommodate a growing list of substances over the life of the regulation.

We are seeing customers coming to us ahead of legislation to ask what their compliance position looks like, and help them take action proactively.
Erick Prause, Director of Supplier Development, Jabil

To support better compliance risk analysis, manufacturers are moving away from a simple letter of certification to a deeper understanding of the actual material composition of their parts and products. Unfortunately, it can be very difficult to find out what materials are included in components. The information is not always available from suppliers, and when it is it frequently comes in many different formats. But as companies look to develop more sustainable approaches to developing and maintaining compliance, substance levels of at least "substances of very high concern" are becoming much more important. Understanding material composition allows companies to react more quickly to regulations and customer demands, and allows them to investigate "what if" scenarios. "*Initially when early legislation was released, there was a significant learning curve which had many chasing, and not really able to monitor what was coming up and to see where the industry was headed to position themselves to be ahead,*" observes Jabil's Erick Prause. "*Now, as legislation has taken hold and organizations have gained experience and knowledge we are seeing customers coming to us ahead of legislation to ask what their compliance position looks like, and to help them take action proactively.*"

Developing a database of the chemical composition of components provides much more accurate and timely analysis of compliance risk. "*We have had requests from disposal agencies about what's in our products. In the past, we had to get the drawings out and pore through them,*" explains BAE Systems' David Williams. "*Now, if we have the information we can access the level of chemical at the part level and run our BOMs through it.*"

Analyzing Risk

With an understanding of some of the more common supply chain risks, how can manufacturers decide where to focus risk management efforts? Clearly, companies can't afford to mitigate every possible risk, it would be cost prohibitive. But how can they strike the appropriate balance? Most risk management philosophies and best practices include an analysis that reviews the likelihood that a risk will turn into a real issue, the frequency that it might occur, and the impact an occurrence would have on the business.

- **Likelihood** – What are the chances that this issue will become a reality?
- **Frequency** – How frequently might this issue become a reality? Would it be a one-time event, or a regular occurrence?
- **Impact** – What business impact would the event cause?

Analysis helps companies mitigate risk in advance, but also helps remediate issues from events that have already occurred. For example, if a part has become obsolete, what are the options available to ensure product availability? Companies need comprehensive information to quickly evaluate the cost of redesign, the availability of alternate parts, or the potential for an alternate source of supply such as a large one-time buy. Analyzing risk requires current, complete, accurate information so that a person can make the best business decision possible.

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Mitigating Risk: Knowledge is Power

Hopefully, most risks are mitigated before they harm the company. Mitigating product supply chain risk starts in design, or even earlier with design requirements. Designers need to consider a range of information to make the best decisions about supply chain risk, including obsolescence, counterfeit risk, regulatory compliance, supplier viability, sustainability, and more. The amount of information required is staggering. But history shows that the sooner an issue is identified, the better the options are to effectively address it (see Graphic 1).

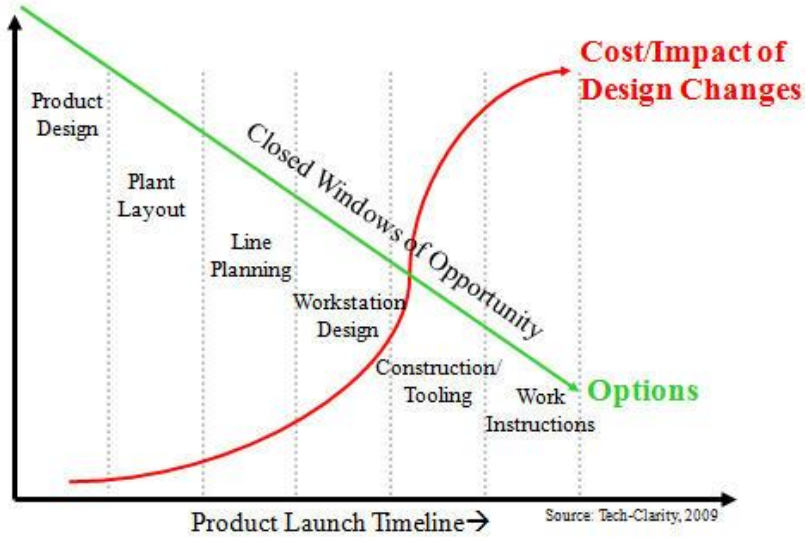

Figure 1: Closed Windows of Opportunity

General information is valuable, but the value is significantly enhanced when the information is put into the context of a company's products, BOMs, AMLs, AVLs, and product lifecycles. This allows engineers to design products in advance for supply continuity. This view needs to extend beyond the current date, and throughout the product's expected lifecycle. Predictive information and forecasts help companies make decisions proactively instead of reactively. "*If we see an item will be constrained, we take action to mitigate risk,*" says Jabil's Erick Prause. "*Knowledge is power, the more you know the better decisions you can make.*"

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Having the right information is critical to driving the right decisions. Identifying the risk is important, but that is only part of the risk mitigation process. Product knowledge can also provide potential solutions such as alternate parts, suppliers, or source of supply or offer tools to find an alternative component based on specs. "*We were advised by a supplier that a part had gone obsolete,*" explains BAE Systems' David Williams. "*It would have created a redesign, but we quickly found that the milspec part had all of the required form, fit, and function and could still be bought even though the COTS (commercial off the shelf) version wasn't available. We mitigated the risk because we found both part numbers and then did a sourcing check to make sure you could still buy the milspec version.*" Because they had the right component knowledge, BAE avoided an expensive redesign project. This is an example of how information about standards,

regulations, part specifications, part attributes, ECN, and part documentation can all play a role in mitigating risk.

Product and component intelligence can also include the analysis of existing parts, which can identify opportunities for consolidation and reuse of components – which in turn further mitigates supply risk.

Product and component intelligence can also include the analysis of existing parts, which can identify opportunities for consolidation and reuse of components – which in turn further mitigates supply risk. Reuse also provides significant cost and time to market savings by reducing direct cost through volume purchase agreements, but also reducing inventory cost, cutting overhead to test and certify parts, and consolidate suppliers.

Component and product information are key to mitigating risk and cutting cost. Many manufacturers, however, struggle with the basics of deciding what data to collect and manage it. Component intelligence is only valuable if it is consistent, accurate, timely, and available to the right people in the right context. The value of the information is significant, but the development of the required infrastructure and processes to support it are not trivial.

Mitigating Risk: Supply Chain Communication

Clearly, mitigating risk requires product and component information. Managing the information can be a challenge. Unfortunately, gathering this information is not a straight forward task either. Erick Prause of Jabil explains the challenge "*For components we don't have data on, or we are looking for an alternate, it can be very difficult to get the information we need.*" For this reasons, risk mitigation today requires strong, bidirectional supply chain communication to gather and consolidate information about products and components. BAE Systems' David Williams puts that challenge into context for an OEM. "*As a prime, we need to understand what's happening across the whole of the platform,*" comments Mr. Williams. A prime contractor or OEM requires information about their product that comes from multiple levels of their supply chain.

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Gathering and consolidating component information across the supply chain can be difficult. Even when suppliers are willing to share their information, traditional direct communication results in high exchange costs, errors, and delays. The use of industry standards like IPC 1752 or AIAG for compliance can help, but frequently suppliers are

not able to provide the exact format required. Simply coordinating the effort to gather and consolidate the information internally can be a huge effort, particularly given the different forms of supply chain risk being addressed. "*We have multiple streams of information we need to share or get, like material composition to determine compliance with RoHS and REACH,*" explains Jabil's Erick Prause.

In addition to gathering "static" information like product specifications, supply chains need to communicate about changes in the supply chain, or "supply chain events" like PCN notifications. This is a two-way street. Both the manufacturer using the part and the supplier relies on good communication. ON Semiconductor's Theresa Haywood-McCarley says, "*We take deliberate, systematic steps to ensure we notify the customer in a timely manner so they can seamlessly accommodate the change in their application.*" Distribution of notifications is critical, and provides an audit trail to document the discussion and acknowledgement to prevent later misunderstandings.

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Beyond notification of issues, manufacturers and suppliers need to collaborate on solutions. This requires that notification is made, but also that notifications contain the right information. The ideal scenario for notification includes proactive suggestions of solutions such as alternate parts. This information needs to be available when and where required, and put into the context of the manufacturer's products to help jump-start risk mitigation and resolution.

A Product Intelligence Framework for Risk Management

To mitigate supply chain risk, forward-thinking manufacturers are adopting a centralized information asset strategy. Having the right product knowledge in place helps companies optimize supply chain continuity. The framework should provide clean, consistent data to help companies:

- Identify or predict risk
- Analyze and prioritize the risk based on impact
- Examine potential alternatives and suggestions to mitigate the issue
- Act to mitigate risk

The key is to arm the decision-maker with the right information in time to act strategically. This framework should consolidate different forms of information from multiple sources, and provide it in the context of the company's BOMs, AMLs, and AVLs. "*We upload our components for analysis and then get alternate components, it*

can save a lot of time by having one interface to manage everything about component information and obsolescence," explains Jabil's Erick Prause. Needless to say, the data must be trustworthy and easily accessible across the enterprise. The framework should provide the ability to validate data, clean it, and eliminate duplicate or conflicting data.

In addition, the framework or platform should provide proactive, predictive notification of an event or risk with the required information needed to make a good business decision and act on it. This consolidated view of component information and supply chain events provides a one-stop environment that helps predict and mitigate future risk. "*We analyze our BOM against product and market data to find vulnerabilities on obsolescence, RoHS and REACH,*" explains BAE Systems' David Williams, *"In the negotiation for a fixed price contract, we got a list of parts prior to contract. After contract, it would have been our responsibility, but instead we ran the advanced parts list and identified a number of discontinued parts,*" Mr. Williams continues, "*So we didn't accept responsibility to support them and saved a lot of money.*"

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David Williams, Engineering Applications and Solutions Manager, BAE Systems

Finally, the platform should help gather the information it requires by facilitating collaboration with the supply chain. This information comes in different formats, from different sources, and is highly volatile. Erick Prause of Jabil explains the importance of technology. "*It would be impossible to do without it, any one piece of data we pull from a myriad of part numbers and suppliers. The process is prone to error, and the transactional part would be impossible because of volume. Instead, we upload as quickly as we can, and then link it to as many places as it fits – it saves users significant time. Changes to data would require constant monitoring, but the tools allow the system to manage the changes for us,*" Mr. Prause concludes. The same is true from the supplier perspective, according to Theresa Haywood-McCarley, Quality Systems Director, ON Semiconductor. "*As we acquire new companies with different change notification methodologies, managing the process manually would be impossible. The platform provides us with the capability to integrate the different methodologies into a unified, automated system for change management*," she explains, "*These systems and processes have proven to be outstanding support tools for managing all the data and enabling us to keep our customers apprised of upcoming supply changes in a timely manner.*"

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Theresa Haywood-McCarley, Quality Systems Director, ON Semiconductor

Developing a world-class product intelligence framework is an investment to mitigate supply chain risk. Most companies today do not have clean, trustworthy data, and must develop a program to create this kind of resource and make it available enterprise-wide. Achieving a comprehensive, integrated source of data for supply chain risk mitigation will take time and require hard work internally and with suppliers. Many larger manufactures will outsource at least some of the process, leveraging companies that specialize in collecting, standardizing, and communicating product information.

Conclusion

The best defense against supply chain risk is a proactive, comprehensive offense. Supply chain continuity requires accurate, timely information about products and components in a framework that addresses risk. "*Go after risks you can anticipate, and prepare for those you can't,*" suggests Jabil's Erick Prause. "*You have to be prepared if something goes wrong, and have processes and resources to manage it.*" Managing the risks from counterfeits, noncompliance, and obsolescence requires accurate component information, but that information must also be put in context. As BAE Systems' David Williams provides a real-world example of the importance of timely, accurate notifications. "*In our electronics groups, we found a backplane that was becoming obsolete. The redesign would have cost one million pounds, but we picked it up early and we went back to the manufacturer and extended manufacturing and avoided a major redesign,*" he explained.

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David Williams, Engineering Applications and Solutions Manager, BAE Systems

Jabil's Erick Prause summarizes the value of a framework of product information. "*We need to look at everything that ties to product lifecycle, including characteristics and specs, and know the history of the part, it is very valuable,*" he explains. "*The use of the data drives value – the sooner you get info into system, the sooner you can use it to provide value,*" Mr. Prause concludes. By employing a framework of information and enabling technology, manufacturers can mitigate risk and ensure continued profitability.

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The ideal implementation of a framework that covers all aspects of supply chain risk will take time, but also provide significant value. Manufacturers that start building towards this objective now will gain significant advantages in reduced supply chain risk along the

way, and result with a significant competitive advantage when they complete their framework. The key is to get started.

Recommendations

- Consolidate and integrate information and processes related to compliance, obsolescence, and other supply chain risks
- Provide a framework that integrates risk identification, analysis, and mitigation actions with product and component intelligence
- Develop a strategy to collect the right information across the enterprise, providing a clean, consistent source of product and component data
- Ensure the framework provides trustworthy information, including the ability to validate information, cleanse data, and reduce duplicates
- Collaborate with the supply chain to gather and maintain important product data
- Leverage the framework to identify potential risks and address them proactively
- Provide risk analysis and alerts in the context of products, utilizing the information in the framework to provide options and alternatives
- Provide the right product information enterprise-wide to make informed decisions to mitigate risk and act quickly to resolve issues that can't be anticipated
- Conduct a "make versus buy" evaluation in developing a world class product intelligence framework considering activities that would benefit from improved quality, lower cost, and improved specialization form third parties

About the Author

Jim Brown is the President and founder of Tech-Clarity, an independent research and consulting firm that specializes in exposing the true business value of software technology and services. Jim has over 20 years of experience in application software for the manufacturing industries, with a broad background including roles in industry, management consulting, the software industry and research spanning enterprise applications such as PLM, ERP, SCM and others.

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