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How Elon Musk and SpaceX have Revolutionized the Supply Chain

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Whether a fan of Elon Musk or not, the remarkable impact his companies, SpaceX and Tesla, have had on their supply chains in such a short period of time is nothing if not revolutionary.

Internalization of Supply Chain

As a supplier in the aerospace industry, if you are aware of what SpaceX has done with its supply chain, you can't help but be concerned. To achieve the velocity desired by the company, many operations traditionally outsourced to the supply chain have been internalized at SpaceX, and in large degree at Tesla as well.

"If a supplier is unable or unwilling to deliver the part, we can quickly make that internally ", said Elon Musk at the 2016 Code Conference in response to how he wants to position Tesla to meet delivery commitments.

As an example of this philosophy SpaceX became experts of rotational fictional welding (RFW) in order to use less expensive materials in the construction of their rockets. They did not find the leading global company to partner with as the legacy aerospace companies might do. Instead they internalized the capability and achieved a lower cost, higher quality and shorter lead-time than would have been achieved in outsourcing the requirement. That should give suppliers something to consider because that philosophy permeates both SpaceX and Tesla. From seats in the Model S to actuators for the rocket boosters, Tesla and SpaceX are making their own products right from the raw materials stage.

SpaceX and Tesla do have large supply chains as they do not internalize everything. SpaceX recognizes the expertise and flexibility offered by certain suppliers, and it is precisely these values from which suppliers need to differentiate themselves in the future. Furthermore, highly integrated external suppliers offer a level of transparency nearly indistinguishable from internal resources.

The cost of launching the SpaceX Falcon Heavy is about 35% of the closest competitor, largely as a result of lower cost materials and its supply chain.

Think Different About Component Requirements and Cost

As Ashlee Vance describes in his book "Elon Musk", in 2004 Steve Davis, an engineer at SpaceX, needed to source an actuator for the Falcon 1 rocket. With a quote from the outsource supplier of $120,000 in hand, Davis presented it to Musk. His now legendary reply is well known: "That part is no more complicated than a garage door opener. Your budget is $5,000. Go make it work."

What might be less known is that after being told his new budget was almost 96% less than the best alternative, Davis did successfully build an actuator for $3,900 in nine months. Davis achieved his objective by designing a purpose specific solution that performed the task for which it was intended, and nothing else.

Expectations in the aerospace industry are that hardware should be super-robust, multi-redundant, hardened and expensive. However, less expensive and commonly available commercial products often offer more computing power and redundancy than many legacy systems inside the aerospace industry today. But many engineers at legacy aerospace companies do not consider commercial solutions viable.

The suggestion is not that any life or property should be put at risk. The suggestion is simply that commercial products today are substantially more robust and more advanced than the military or aerospace equivalents utilized two decades ago and which still predominantly serve as the platform of the aerospace industry. The truth is that the "military" or "aerospace" grade components in aerospace hardware is often of a lower quality than the components of the phone in your pocket.

Velocity of New Design Qualification

> "WE CAN'T MAKE A CHANGE BECAUSE THEN WE WILL NEED TO RE-QUALIFY THE HARDWARE."

If you participate in the aerospace supply chain you've heard that a thousand times from your customer. Legacy aerospace companies too often impose out of date specifications on their suppliers, require the use of increasingly obsolete components, demand year over year cost

reductions and purposefully lack innovation to avoid the cost of re-qualification.

The cost of re-qualification is often identified as the reason new designs cannot be adopted. But it would be more accurate to say "risk" rather than "cost" because in fact the hard cost is not that significant in comparison with the potential benefits of new designs. It is therefore more appropriate to say legacy aerospace companies avoid new design qualification because the risk of failure is too high.

Elon Musk drives his companies forward and he personally accepts the risk he injects in the design process. Musk has a long-term vision and accepts that failures are inevitable and should be viewed as opportunities to learn from so the next design iteration may benefit. But CEO's of legacy aerospace companies do not have such a long-term vision. They might not even be around for the next design iteration. The risk of change has no reward for them and it is therefore something to be avoided.

For a CEO at a legacy aerospace company: "I can take this definable risk. If successful, there is no personal benefit. If a failure, there is a personal cost." This mindset must change for the legacy aerospace industry to be successful.

Legacy aerospace companies must adopt a higher velocity of change because the components their designs require are becoming obsolete. Those components have been replaced in the marketplace with less expensive, more robust and more reliable components. But the leadership of the traditional portions of the industry resist change because individual risk is not rewarded and there is little long-term vision for which risk is understood in its necessity for success.

SpaceX has transformed an aging, somewhat secretive and bureaucratic industry back into the dynamic and fast-moving industry it originally was.