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# What Went Wrong At Boeing?

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<u>images.forbes.com/stevedenning/files/2013/01/Boeing-7871.jpg</u>]My article, <u>The Boeing Debacle: Seven Lessons That Every CEO Must Learn</u> (http://www.forbes.com/sites/stevedenning/2013/01/17/the-boeing-debacleseven-lessons-every-ceo-must-learn/), elicited spirited conversation. Several commentators noted that, in addition to the general lessons, Boeing made specific errors in the way it handled outsourcing and offshoring. Let's take a closer look at those specifics.

Boeing enthusiastically embraced outsourcing (www.bus545-

<u>boeing.wikispaces.com/file/view/Boeing+787+Case.pdf</u>), both locally and internationally, as a way of lowering costs and accelerating development. The approach was intended to "reduce the 787's development time from six to four years and development cost from \$10 to \$6 billion."

The end result was the opposite. The project is billions of dollars over budget and three years behind schedule. "We spent a lot more money," Jim Albaugh, Chief of Commercial Airplanes at Boeing, <u>explained in January 2011</u> (<u>http://seattletimes.com/html/sundaybuzz/2014125414\_sundaybuzz06.html</u>), "in trying to recover than we ever would have spent if we'd tried to keep the key technologies closer to home."

The right goal: add value for customers

Let's start with what Boeing did right (www.bus545-

<u>boeing.wikispaces.com/file/view/Boeing+787+Case.pdf</u>). After losing market share to Airbus (owned by EADS) in the late 1990s, Boeing could have decided to focus on reducing the costs (and the selling prices) of its existing aircraft. That would have led inexorably to corporate death. Instead Boeing decided commendably—to innovate with a new aircraft that would generate revenues by creating value for customers.

First, Boeing aimed to improve their travel experience for the ultimate customers, the passengers. As compared to the traditional material (aluminum) used in airplane manufacturing, the composite material to be used in the 787 (carbon fiber, aluminum and titanium) would allow for increased humidity and pressure to be maintained in the passenger cabin, offering substantial improvement to the flying experience. The lightweight composite materials would enable the 787 to fly nonstop between any pair of cities without layovers.

Second, Boeing aimed to improve value for its immediate customers (the airlines) by improved efficiency by using composite materials and an electrical system using lithium-ion batteries. This would result 20 percent less fuel for comparable flights and cost-per-seat mile 10 percent lower than for any other aircraft. Moreover, unlike the traditional aluminum fuselages that tend to fatigue, the 787's fuselages based on composite materials would reduce airlines' maintenance and replacement costs.

All good stuff, if Boeing could deliver. Boeing's customers apparently thought they could. And the 787 became the fastest selling plane in aviation history. The stock price popped and the C-suite received their bonuses. But reality has since set in.

#### **Overheating batteries**

We have no way of knowing whether the cause of the current grounding of all 787s—lithium-ion batteries that overheat alarmingly—is a narrow, fixable manufacturing glitch or a serious design flaw that will put the whole enterprise in peril.

It's true, as CEO James McNerny pointed out in <u>a letter to Boeing staff</u> (<u>http://www.foxbusiness.com/industries/2013/01/18/full-text-boeing-ceo-mcnerney-letter-to-employees-on-787/#ixzz2IaWJ9Uxw</u>) on Friday, that "Since entering service 15 months ago, the 787 fleet has completed 18,000 flights and 50,000 flight hours with eight airlines, carrying more than 1,000,000 passengers safely to destinations around the world." But all that will mean nothing unless and until Boeing can get to the root cause of those overheating Lithium-ion batteries.

What we do know is that the cost-cutting way that Boeing went about outsourcing both in the US and beyond did not include steps to mitigate or eliminate the predicted costs and risks that have already materialized.

# The coordination risk

Even with proven technology, there are major risks in outsourcing that components won't fit together when the plane is being assembled. "In order to minimize these potential problems," wrote Dr. L. J. Hart-Smith, a Boeing aerospace engineer, in a <u>brilliant paper presented at a 2001 conference</u> (<u>http://seattletimes.nwsource.com/ABPub/2011/02/04/2014130646.pdf</u>),</u> "it is necessary for the prime contractor to provide on-site quality, supplier-management, and sometimes technical support. If this is not done, the performance of the prime manufacturer can never exceed the capabilities of the *least* proficient of the suppliers. These costs do not vanish merely because the work itself is out-of-sight."

Boeing did not plan to provide for such on-site support for its suppliers. In fact, it explicitly delegated this responsibility to sub-contractors. When the subcontractors didn't perform the necessary coordination, Boeing had to provide the support anyway. "Boeing sent hundreds of its engineers to the sites of various Tier-1, Tier-2, or Tier-3 suppliers worldwide to solve various technical problems that appeared to be the root cause of the delay in the 787's development. Ultimately, Boeing had to redesign the entire aircraft sub-assembly process." The result? Huge additional expense, that should have been planned for and included in the project's costs from the outset.

#### The innovation risk

The 787 involved not merely the outsourcing of a known technology. It involved major technological innovations unproven in any airplane. Would the carbon fiber composite survive the rigors of international flying? Could lithium-ion batteries, which are notorious for overheating and causing fires that are difficult to put out, be safely used? No one knew for sure. The 787 also contains multiple new electrical systems, power and distribution panels. The interactions among these novel technologies, introduced simultaneously, also exponentially increased the risk of innovation.

The innovation risk implied a *greater* involvement by Boeing in the development and manufacture of the aircraft. Astonishingly, Boeing opted for *lesser* involvement, delegating much of the detailed engineering and procurement to sub-contractors. The result? Unexpected problems have kept occurring that have delayed the project and increased its cost.

#### The outsourcing risk

Complicated products like aircraft involve a necessary degree of outsourcing, simply because the firm lacks the necessary expertise in some areas, e.g. engines and avionics. However Boeing significantly increased the amount of outsourcing for the 787 over earlier planes. For the 737 and 747 it had been at around 35-50 percent. For the 787, Boeing planned to increase outsourcing to 70 percent.

Boeing didn't approach outsourcing as a troublesome necessity. Instead, like many US firms, it <u>enthusiastically embraced outsourcing (www.bus545-</u> <u>boeing.wikispaces.com/file/view/Boeing+787+Case.pdf</u>) in the 787 as a means of reducing costs and the time of development. "The 787's supply chain was envisioned to keep manufacturing and assembly costs low, while spreading the financial risks of development to Boeing's suppliers."

#### In his 2001 paper

(http://seattletimes.nwsource.com/ABPub/2011/02/04/2014130646.pdf), Hart-Smith had warned of the additional costs and risks of large-scale outsourcing. Outsourcing didn't cut costs and increase profits, he wrote; instead, it drove profits and knowledge to suppliers while increasing costs for the mother company. "Not only is the work out-sourced; all of the profits associated with the work are out-sourced, too."

Hart-Smith argued that make-buy decisions should be based on complete assessments of all of the costs: "make-buy decisions should not be made until after the product has been defined and the relative costs established." Outsourcing requires considerable additional up-front effort in planning to avoid the situation whereby major sub-assemblies do not fit together at final assembly, increasing the cost by orders of magnitude more than was saved by designing in isolation from the work-allocation activities.

Boeing didn't follow Hart-Smith's advice and outsourced the engineering and construction of the plane long before the product was defined and the relative costs established. The results have been disastrous. Boeing's 787 project is many billions of dollars over budget. The delivery schedule has been pushed back at least 7 times. The first planes were delivered over three years late.

#### The risk of tiered outsourcing

Boeing further aggravated these risks by adopting a new outsourcing model, along with the new technology. Unlike Boeing's earlier aircraft, in which Boeing played the traditional role of integrating and assembling different parts and subsystems produced by its suppliers, the 787's supply chain is based on a tiered structure that would allow Boeing to foster partnerships with around fifty Tier-1 strategic partners. These strategic partners were to serve as "integrators" who assemble different parts and subsystems produced by Tier-2 and Tier-3 suppliers.

In due course, Boeing discovered, as Hart-Smith had predicted, that some Tier-1 strategic partners did not have the know-how to develop different sections of the aircraft or the experience to manage their Tier-2 suppliers. To regain control of the development process, Boeing was forced to buy one of the key Tier-1 suppliers (Vought Aircraft Industries) and supply expertise to other suppliers. Boeing also had to pay strategic partners compensation for potential profit losses stemming from the delays in production.

# The risk of partially implementing the Toyota model

Boeing's outsourcing was modeled in part on Toyota's supply chain, which has enabled Toyota to develop new cars with shorter development cycle times. Toyota <u>successfully outsources</u>

(http://www.forbes.com/2008/05/25/foreign-labor-auto-opedcx\_jhb\_outsourcing08\_0529america.html) around 70 percent of its vehicles to a trusted group of partner firms.

However key elements of the Toyota outsourcing model were not implemented at Boeing. Toyota maintains tight control over the overall design and engineering of its vehicles and only outsources to suppliers who have proven their ability to deliver with the required timeliness, quality, cost reduction and continuous innovation. As Toyota works closely with its suppliers and responds to supplier concerns with integrity and mutual respect, it has established an impressive level of professional trust and an overriding preoccupation with product quality.

By contrast, Boeing adopted the superficial structure of Toyota's tiered outsourcing model without the values and practices on which it rests. Instead, Boeing relied on <u>poorly designed contractual arrangements (www.bus545boeing.wikispaces.com/file/view/Boeing+787+Case.pdf</u>), which created perverse incentives to work at the speed of the slowest supplier, by providing penalties for delay but no rewards for timely delivery.

# The offshoring risk

Some degree of outsourcing in other countries—i.e. offshoring—is an inevitable aspect of manufacturing a complex product like an airplane, because some expertise exists only in foreign countries. For example, the capacity to manufacture Lithium-ion batteries lies outside the US. Boeing had no choice but to have the batteries made in another country. More than <u>30 percent</u> (<u>http://articles.latimes.com/2011/feb/15/business/la-fi-hiltzik-20110215</u>) of the 787's components came from overseas. By contrast, just 5 percent of the parts of the 747, were foreign-made.

While there is nothing in principle wrong with necessary offshoring, the cultural and language differences and the physical distances involved in a lengthy supply chain create additional risks. Mitigating them requires substantial and continuing communications with the suppliers and on-site involvement, thereby generating additional cost. Boeing didn't plan for such communications or involvement, and so incurred additional risk that materialized.

#### The risk of communications by computer

Rather than plan for face-to-face communications and on-site communcations, Boeing <u>introduced a web-based communications tool called</u> <u>Exostar (www.bus545-</u>

<u>boeing.wikispaces.com/file/view/Boeing+787+Case.pdf</u>) in which suppliers were supposed to input up-to-date information about the progress of their work. The tool was meant to provide supply chain visibility, improve control and integration of critical business processes, and reduce development time and cost. Instead of people communicating with people face-to-face, the computer itself was supposed to flag problems in real time.

Not surprisingly, the tool failed. Suppliers did not input accurate and timely information, in part due to cultural differences and lack of trust. As a result, neither Tier-1 suppliers nor Boeing became aware of problems in a timely fashion. Boeing's reliance on computer communications contrasts sharply with <u>Agile practices of continuous face-to-face communications</u> (<u>http://www.forbes.com/sites/stevedenning/2012/08/01/transformational-leadership-in-agile-manufacturing-wikispeed/)</u> to ensure that everyone is on the same page.

# The labor relations risk

We do not know to what extent Boeing's enthusiasm for outsourcing and offshoring stemmed from a desire to circumvent difficult labor relations in <u>Seattle (http://www.forbes.com/places/wa/seattle/)</u>. We do know that instead of involving the employees in the decision-making about outsourcing and offshoring, Boeing's management approached decision-making pre-emptively. The approach backfired, as labor relations worsened as a result of the outsourcing decisions and a costly strike ensued.

# The project management skills risk

Given the extraordinary risks of the 787 project, one would have expected Boeing to assemble a leadership team with a proven record in supply chain management and diverse expertise to anticipate and mitigate wide array of risks. Amazingly, this was not the case.

"Boeing's original leadership team for the 787 program," write Tang and Zimmerman in <u>an important case study (http://www.bus545-</u> <u>boeing.wikispaces.com/file/view/Boeing+787+Case.pdf)</u>, "did not include members with expertise on supply chain risk management. Without the requisite skills to manage an unconventional supply chain, Boeing was undertaking a huge managerial risk in uncharted waters."

# The risk of a disengaged C-suite

The combination of the above risks constituted an existential threat to Boeing as a going concern. Where then was the C-suite while these risks were being incurred? An <u>interview in 2011 with Philip Condit</u>

(http://www.bizjournals.com/seattle/print-edition/2011/06/17/phil-conditwho-took-boeing-to.html), who was the richly compensated CEO of Boeing when the initial 787 decisions were being made, is revealing. In 2001, under Condit's leadership, Boeing moved its headquarters from Seattle to <u>Chicago (http://www.forbes.com/places/il/chicago/)</u>, a decision continued by Condit's successor, James McNerney. The ostensible reason for the move was to be neutral among the various divisions of Boeing, which were scattered around the US. In the interview, Condit makes no secret of another factor: as CEO, he didn't want to be bothered with tiresome "how-do-youdesign-an-airplane stuff," or boring meetings with Boeing's key customers (airlines) who came to Seattle.

After the move, Condit says that he spent much of his time in the Chicago business community, where he "encountered CEOs frequently gathering to nail down civic goals ranging from landing new companies to building worldclass parks. 'I was surprised by how much that happened,' Condit said. 'A meeting in which Starbucks, <u>Microsoft (http://blogs.forbes.com/microsoft/)</u>, Costco, Boeing and Weyerhaeuser and a bunch of small businesses are all in the same place — rarely happens in Seattle," he added. 'It happened all the time in Chicago.'"

So while Boeing's CEO was in Chicago, strategizing about the future of Boeing and discussing civic goals with CEOs from other companies, the managers back in Seattle were making business decisions about tiresome "how-do-youdesign-an-airplane stuff" that would determine whether there would be a firm to strategize about.

And read also:

<u>The Boeing Debacle: Seven Lessons That Every CEO Must Learn</u> (http://www.forbes.com/sites/stevedenning/2013/01/17/the-boeingdebacle-seven-lessons-every-ceo-must-learn/)

<u>Why Amazon Can't Make A Kindle In The USA</u> (http://www.forbes.com/sites/stevedenning/2013/01/17/the-boeingdebacle-seven-lessons-every-ceo-must-learn/)

<u>How Manufacturing Can Learn from Software To Become Agile</u> (http://www.forbes.com/sites/stevedenning/2012/09/24/howmanufacturing-can-learn-from-software-to-become-agile/)

<u>The dumbest idea in the world: maximizing shareholder value</u> (http://www.forbes.com/sites/stevedenning/2011/11/28/maximizingshareholder-value-the-dumbest-idea-in-the-world/)

<u>The five big surprises of radical management</u> (http://blogs.forbes.com/stevedenning/2011/07/08/the-five-bigsurprises-of-radical-management/) <u>Steve Denning (http://blogs.forbes.com/stevedenning/)</u>'s most recent book is: <u>The Leader's Guide to Radical Management</u> (http://www.amazon.com/gp/product/0470548681/ref=as\_li\_ss\_tl? ie=UTF8&tag=stevdenndotco-20&linkCode=as2&camp=1789&creative=390957&creativeASIN=0470548681)

(Jossey-Bass, 2010).

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