

Global Trend Analysis (Boeing)

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Abstract: Boeing involves dramatic penetration of its supply chain away from the regular means used in aerospace. Such dramatic penetrations can lead to risk throughout the process. Boeing's issue with their delayed deadlines is the direct results of excessive penetrations in their supply chain and inadequate quality of management team to mitigate the risk and develop coherent strategies against them. This paper discuss about the risk factors and ways on mitigating them.

Keywords: Supply Chain Management, Suppliers Strategy, Boeing 787, Trading policies, NAFTA, Mitigating Supply Risk.

1. INTRODUCTION

Boeing is aviation companies which delineates, (Christopher, 1992) assembles and vend aircrafts, rockets, and satellites etc .It is an (Bowersox, 2002) American multinational company which also provides sublease and other aviation services. This aviation (Hugos, 2003) company was established on July 15th, 1916 by William Boeing with its headquarters in Chicago (Illinois, U.S.). There are five major sectors of Boeing:

1. Boeing Commercial Airplanes
2. Boeing Defense, Space and security
 1. Phantom works
3. Boeing shared services and group
 1. Boeing Reality
 2. Boeing travel management company
 3. Boeing Supplier management
4. Engineering operations and technology
 1. Boeing research and technology
 2. Boeing test evaluation
 3. Intellectual property management
 4. Environment health and safety
5. Boeing capital

Boeing has produced about 748 commercial aircrafts, 180 military aircrafts, 5 satellites with major outputs as Boeing 737, Boeing 747, Boeing 767, Boeing 777, Boeing 787, F/A-18E Super Hornet, CH-47 Chinook, 702 satellite families.

2. OVERVIEW OF BOEING

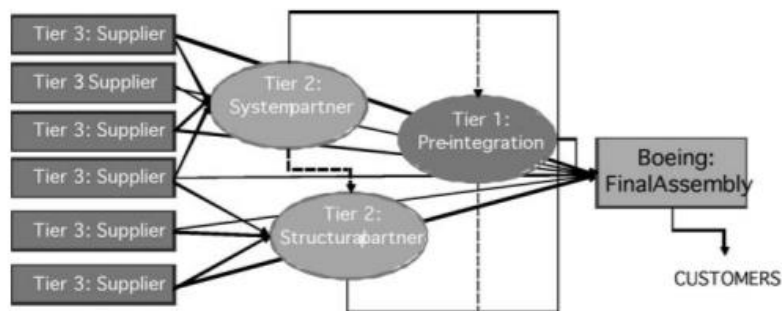


Figure 1: Supply chain functioning of Boeing

2.1 Supply Chain Management:

The supply chain is a back bone of business (Meindl, 2000) operation. Effective supply chain is one of the most important aspects of running a successful business. With maximize profitability, what makes America's multinational (mangan, 2008) corporation Boeing a leading aerospace and defense campaign on earth. Boeing has almost 157500 employees spread around more than (frazelle, 2001) 70 countries. When it comes to supply logistics Boeing has around 6443 primary active suppliers. The company's revenue by 2018 (Simichi-Levi, 2003) census was around 52.46 UD\$ and operating margin was around 3.83%.

Supply chain management is an important part for every organization to maximize its customer value and achieve sustainable (farrington, 2000) composite advantage. Boeing explores five ways mechanism for an effective supply chain management.

1. Design
2. Planning
3. Execution
4. Control
5. Monitoring

The objectives from that are to improve standardization, meet global competition, and minimizing total system cost.

Table 1: Benefits of Boeing-airliner

Feature	Values to Airlines (Immediate Customers)	Value to Passengers (End Customers)
Composite material	<ul style="list-style-type: none"> Faster cruising speed, which enables city-pair nonstop flights Fuel efficiency (lighter material lowers operating cost) Corrosion resistance (lower maintenance cost) Stronger components that require fewer fasteners (lower manufacturing cost) 	<ul style="list-style-type: none"> Faster cruising speed, which enables city-pair nonstop flights Higher humidity in the cabin air is allowed, which increases comfort level
Modular design that allows for two types of engines (General Electric GENx and Rolls-Royce Trent 1000)	<ul style="list-style-type: none"> Flexibility to respond to future circumstances (market demand) at a reduced cost Simplicity in design allows for rapid engine changeover 	<ul style="list-style-type: none"> Cost savings with cheaper and faster engine changeover may be passed on to passengers
Large and light sensitive windows	<ul style="list-style-type: none"> Lower operating costs due to less need for interior lighting 	<ul style="list-style-type: none"> "Smart glass" window panels work like transition lens—controlling the amount of light automatically—decreasing glare and increasing comfort and convenience
Redesigned chevron engine nozzle (serrated edges)	<ul style="list-style-type: none"> Reduction in community noise levels 	<ul style="list-style-type: none"> Reduction in interior cabin decibel level
Easy preventive maintenance	<ul style="list-style-type: none"> Boeing provides service so planes are in operation for longer periods of time 	<ul style="list-style-type: none"> Fewer delays due to mechanical problems

2.2 Boeing's Excessive suppliers Strategy (Sourcing Strategy)

Boeing has many specialists outsourcing air structures. This (Jacobs, 2006) American Multinational corporation has almost 28,000 suppliers collaborating with United States of America, Japan, Korea and China. The primary aim of Boeing is to increase revenue and developing primary (Bowersox, 2002) supplier selection. Using a selection robust BOEING can easily identify suppliers that have flexible supply chain and effective logistic management.

2.3 Some of the key points to discuss about Boeing's Supply chain management

1. Type of design of product-To establish a (Christopher, 1992) new model of aircraft on the basis of composite technologies can be huge risk. So Boeing has to rely on its supply chain models of their products which are well established in (Hugos, 2003) United States of America.
2. Logistics Software-Boeing prefer to use E20 open (Jacobs, 2006) applications as they have vertical supply chain network (Exoster Network). Still this network doesn't do much good to Boeing as they have many tiers of human (Meindl, 2000) suppliers which may have many unknown problems which can only be solved by better human communications.
3. Supplier collaboration- Boeing has complicated (Simichi-Levi, 2003) and intense supply chain network where 40 tier 1 suppliers manage hundred's of tier 2 supplies which further manage thousands of tiers 3 networks. The supply (farrington, 2000) chains are to produce all the tooling parts of an aircraft without any compensation from Boeing. Now the problem with this approach is that, if tier of the supply chain fail's (frazelle, 2001) to make money on the contract or they opt out of contract then Boeing can face many delays or cancellation of their further contacts.
4. Communications- Boeing has cultivated (mangan, 2008) Employees in their tier 1 who can speak different languages and are from different cultures. They also have special (Bowersox, 2002) employees who can work through problems at any point of time.

3. BOEING 787-A CLASSIC SUPPLY CHAIN FAILURE

When Boeing 787-Dreamliner appeared the (Christopher, 1992) expectations were very high as it was the first ever commercial aircraft made of composite materials. It was expected (Hugos, 2003) that Boeing 787 would be much lighter, stronger and more fuel efficient than other aluminum aircraft models. By the end of February 2013 almost 850 (Jacobs, 2006) Boeing 787 were ordered all around the globe costing 200 million dollars per aircraft. A huge success was expected from Boeing 787 because of its well balanced international (Meindl, 2000) nature of supply chain.

Unfortunately, when foreign investors are dealing with (Simichi-Levi, 2003) complex structures like Boeing-787 which are more complex and safety crucial then first think about the risk involved investments. Moreover,

Table 2: Problems in supply chain management of Boeing

Risk Factor	Potential Risk Caused by the 787 Supply Chain	Risk Consequence: What Happened at Boeing?
Technology	Infeasibility of material in flight tests, which is untested on this scale	Invisibility of development issues with tier-1 suppliers' partners resulting in major delays
Supply	Tier-1 suppliers outsource development tasks to tier-2 partners, which may not have technical know-how	Lack of knowledge about supplier selection by tier-1 partner, delay in development and manufacturing work
Process	Overreliance on tier-1 partners to coordinate their development tasks with their suppliers further down the supply chain	Need for increased coordination of supplier's activities required "traveled work" by Boeing personnel
Management	Inexperienced management team without supply chain expertise	Management failure, need for reorganization at highest levels
Labor	Union dissatisfaction with Boeing's decision to outsource more	Union strike causing work stoppage
Demand (Customer)	Publicity of problems may cause problems with airline and passenger perceptions of Boeing	Delivery delays may cause financial penalties and cancellation of orders

Boeing 787 was the first appearance of a Composite (Bowersox, 2002) based Airliner. So, the risk involved was too high as Boeing has to change (Christopher, 1992) all its supply chains and assembly processes. So, in case of Boeing-787 the risk involved might not pay off which automatically damages viability of Boeing 787. There were some cases (Hugos, 2003) Of Boeing-787 Airliner's, where there batteries getting (Jacobs, 2006) over heated and catching fire. A battery malfunction in an aircraft directly points towards faulty electrical control systems rather than battery itself. Boeing CEO Jim McNerney accepted there wrong choice in battery (Meindl, 2000) technology, which is likely to be the fault of their supply chains dealing with it.

Another problem occurred with (Simichi-Levi, 2003) outsourcing of Boeing-787 as Boeing outsourced almost 70% of 787's parts to cut down the cost of production. Issues (farrington, 2000) started when most of the parts of 787 were not delivered on time by supply chains. It was found that suppliers were dealing with the technical problems. Boeing (frazelle, 2001) didn't give much detail specifications to its supply chains and wanted them to create their own blueprints which further resulted in a logjam.

There was another flaw with Boeing 787 relevant to weak supply chains. As the suppliers built the sections of 787, the weight of aircraft increased a lot more (mangan, 2008) than expected. As a result it affected the final lift capacity and fuel consumption. The sections produced by Tier 1 and Tier 2 didn't fit together and everything went in negative results.

Boeing never recognized that outsourcing the parts would (Jacobs, 2006) require highly intense management and huge planning costs. As a result Boeing spent almost 1 billion US\$ in bringing airliner's sections back home. Therefore it is very (farrington, 2000) relevant example that reminds organizations to manage their supply chains correctly, no matter whether your product is an airliner or a mousetrap.

3.1 Trading policies affecting Boeing

3.1.1 Trump's America First Policy affecting Boeing

Boeing has a huge network of global suppliers which cannot go parallel to latest U.S. policies especially trump's America First Policy. Most of parts of Boeing's (farrington, 2000) Dream liner come from companies outside America.

1. Wings of Boeing's Airliner comes from Japan
2. Wing Tips of Boeing's Airliner come from South Korea
3. Engines of Boeing's Airliner come from Rolls-Royce in U.K
4. Thrust reversals of Boeing's Airliner come from Mexico
5. The Movable trailing of wings of aircraft comes from Canada
6. Cargo access doors come from Sweden
7. Landing gear come from France
8. Fuselage and Horizontal stabilizers come from Italy
9. The front fuselage comes from Japan
10. Floor beams comes from India

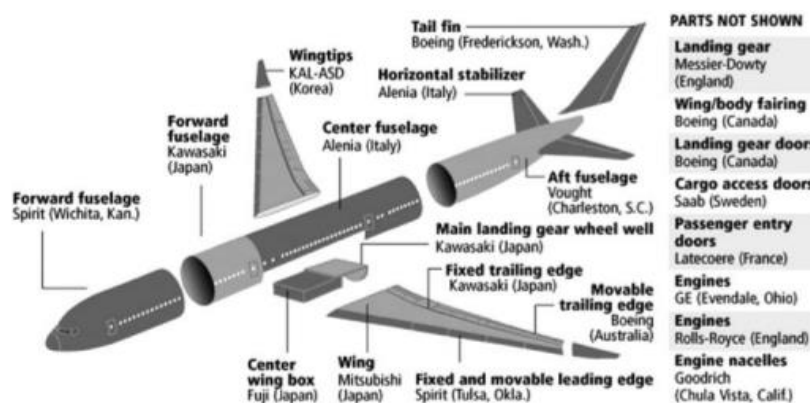


Figure 2: Excessive outsourcing of parts of Boeing-787

The above components then arrive in factories of (Bowersox, 2002) Boeing in Washington or South Carolina and then they are assembled for the final product. Then they are delivered to more than 80 countries all over the globe.

Here Trump's foreign administration policy (Christopher, 1992) has greatly affected multinational companies to sustain their business in America. While Boeing has invested billions of dollars in collaboration with its international partners.

3.1.2 Impact on NAFTA

North American Free Trade Agreement (NAFTA) between United States of America, Canada, and Mexico had been a free market for almost past 20 years. This (Hugos, 2003) trade agreement is now a down scale in recent years because of Trump's Policy. Recently, Trump's mission to build a wall across Mexican border and increased 20% tariffs on (Christopher, 1992) Mexican imports can greatly affect Boeing negatively. Thrust reversals which were built in Mexico are now a lot more expensive for Boeing.

On the other hand, Mexico's fleet carrier includes (Hugos, 2003) Aero Mexico that has Boeing aircrafts whereas Interjet and Volaris have Airbus Fleet. Now Trump's policies have increased the tariffs which made Boeing Aircrafts a lot (Jacobs, 2006) more expensive. There is Great chance that Aero Mexico might choose Airbus over Boeing.

3.1.3 China and Middle East

Boeing is expecting almost I Trillion US\$ trade with china for its commercial airliner's by next decade. But trump's policies have again caused (mangan, 2008) problems for agreements between china and Boeing.

1. According to Trump China is causing harm to U.S. business with its robust currency
2. Trump is accusing China for building artificial islands in South China Sea.

Iraq and Iran have also plans to buy aircrafts from Boeing especially Boeing-737, which could create a business of about 3.7 billion US\$ and (Patterson, 1998) 16 billion US\$ respectively. But again Trump's policies have declined business agreements between Boeing and Middle East.

1. Trump has recently banned immigration from 7 Middle East countries including Iran and Iraq.
2. White house has recently put Iran 'On Notice' for testing its ballistic missile.
3. Gulf Countries feel a lot of risk in pursuing agreements with Boeing under new American Policies.

4. BOEING'S RISK MITIGATION STRATEGY

4.1 Mitigating Supply Risk (Mitigating US policies)

Right now MITSUBUSHI holds the 20% of business of Boeing's airliners parts. Now, Boeing can increase their contract to 40% airliner parts and in return MITSUBUSHI can reduce the cost of production. Moreover, Boeing's biggest failure was about managing its supply chains because most of its parts were outsourced. Now, increasing contract with Mitsubishi, Boeing will have to invest very less to manage its international supply chains and it can rather put its management potential for other purposes.

4.2 Mitigating Process Risks

Inability to meet the deadlines has been the major issue of failure of Boeing. Boeing has to send hundreds of tier-1, tier-2 and tier-3 personals all across (Patterson, 1998) the globe for technical problems. This is the root cause of delay. Now, Boeing has to redesign its subclass assembly process and try to bring production sites to its own (Christopher, 1992) houses rather than outsourcing it.

Table 3: Reducing Risk by Proactive Actions

Risk Factor	Proactive Actions	Risk Affect
Supply chain visibility	Use IT to ensure transparency of entire supply chain	Avoided or reduced
Strategic partner selection and relationship	Use proper vetting of all strategic partners to determine their capability of completing tasks	Reduced
Process	Develop better risk-sharing opportunities and incentives for strategic partners	Reduced
Management	Establish proper working team with expertise in supply chain logistics	Avoided
Labor	Perform outreach and communicate with union heads about sourcing strategies	Avoided
Demand (customer)	Treat customers as partners and communicate better the potential for missing delivery deadlines	Avoided or reduced

4.3 Improving supply chain Visibility

Without any accurate and timely information (Hugos, 2003) about the supply chain structure and the development process, the value of Exoster network has been compromised significantly. Boeing should have strategic (Jacobs, 2006) partners and suppliers to transfer the information significantly and accurately throughout the supply chains rather than relying on alerts generated on programs.

4.4 Improve strategic supplier selection process

Boeing should spend more of its time in (Meindl, 2000)evaluating technical problem solving capability and supply chain management of its tier-1 suppliers. This will help to solve the problem of delays because of (Simichi-Levi, 2003)inexperienced active personals.

Table 4: Reducing risk by Reactive actions

Risk Factor	Reactive Risk Mitigation Strategy
Technology	Modify design
Supply	Purchase company at the bottleneck stage (Vought Aircraft Industries)
Process	Send hundreds of engineers to solve issues with underperforming partners at their sites
Management	Reorganize top management—replaced program manager with supply chain expert
Labor	Concede to labor unions—increased pay and decreased outsourcing
Demand (Customer)	Paid penalties for delivery delays; public relations campaign to reassure customers

5. CONCLUSION

Boeing involves dramatic penetration of its supply chain away from the regular means used in aerospace. Such dramatic penetrations can lead to risk throughout the process. Boeing's issue with their delayed deadlines is the direct results of excessive penetrations in their supply chain and inadequate quality of management team to mitigate the risk and develop coherent strategies against them.

With the drastic change in U.S. trade policies, Boeing must reduce the outsourcing of parts from foreign companies and start a production supply chains in its own houses. This will reduces the pressure of tariffs on Boeing and encourage more investments on their supply chains.

Linkage between Boeing's activities And LB5320 theories

During this entire case study, the primary objectives were taken from the courseware such as processing and technology, Quality management, Supply chain management, Strategy and Design, Global supply chain procurement etc. Class lectures have been very helpful the in analysis of Boeing's Supply chain management.

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