Digital Customer Collaboration at BAE Systems: Trust in the Supply Chain

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Collaboration is not negotiation, nor is it just learning from the customer. True customer collaboration involves reliance on the unique expertise and experience of customers, and delegation of a share of meaningful decision-making. Customer collaboration involves putting one's trust in the customer.

Trust is defined by organizational theorists as "being willing to rely on another party in a significant way, absent monitoring or control."[1] As companies implement collaborative software tools with their customers, the concurrent changes in technology, structure, work process, and organization depend on and impact trust within the supply chain. Companies should consider issues of trust and control as they make these changes.

Consider the case of BAE Systems Regional Aircraft, a UK-based company that provides post-sales customer support for regional aircraft operators such as SWISS, Emerald Airlines and Air Wisconsin. BAE Systems recently implemented collaborative software in its MRB process, the process by which BAE Systems and its customers (the operators), under the oversight of regulators, review and revise the Maintenance Review Board Report (MRBR) for each model of aircraft. The competitiveness of both BAE Systems and its customers has increased through this collaboration. And trust issues are being addressed along the way.

Improving Competitiveness through Global Customer Collaboration

BAE Systems is responsible for Customer Support, Engineering, and Asset Management activities covering a world-wide base of 160 customers operating over 1,100 aircraft, in addition to managing a trading-and-leasing portfolio of some 350 aircraft.[2] BAE Systems currently supports the BAE Systems 146/Avro RJ, ATP, JS41, and JS 31/32 commercial aircraft models.

As part of its customer support activities, BAE Systems maintains the regulator-mandated MRBR for each model of plane. This manual is used by operators to create their maintenance programs. While there has always been an opportunity to update maintenance procedures based on the experience of operators, relatively few changes have been made to these manuals. Updating has been limited by the labor-intensiveness and structure of the MRB process, as well as by the lack of collaboration with customers in this area. For example, as of 2004, while the BAe146/RJ model was 23 years old, the MRBR was on Revision 11. The fact that it was still a typewritten document also impeded updates.

[1] Mayer, R.C., J.H. Davis, F.D. Schoorman (1995), "An Integrative Model of Organizational Trust," *Academy of Management Review*, Vol. 20, No. 3, 709-734.
[2] BAE Systems press release, January 2006.

The regulator-approved MRB process progresses as follows (see Figure 1). A proposed change (item) is introduced by an operator. The item is then discussed, analyzed, and voted on by the Working Group, a group including representatives from BAE Systems, major operators, and the regulating agencies (FAA, CAA, and Transport Canada). Each operator in the Working Group gets one vote. If the item is approved by the majority of those casting votes, the revision to the MRBR is drafted and submitted to the Industry Steering Committee (ISC), a group including higher-level representatives from BAE Systems, the operators, and the regulators. If the manual revision is approved by the majority of ISC-member operators casting votes, then it is incorporated into the next revision of the MRBR. Finally, operators revise their maintenance programs to reflect the revised MRBR.

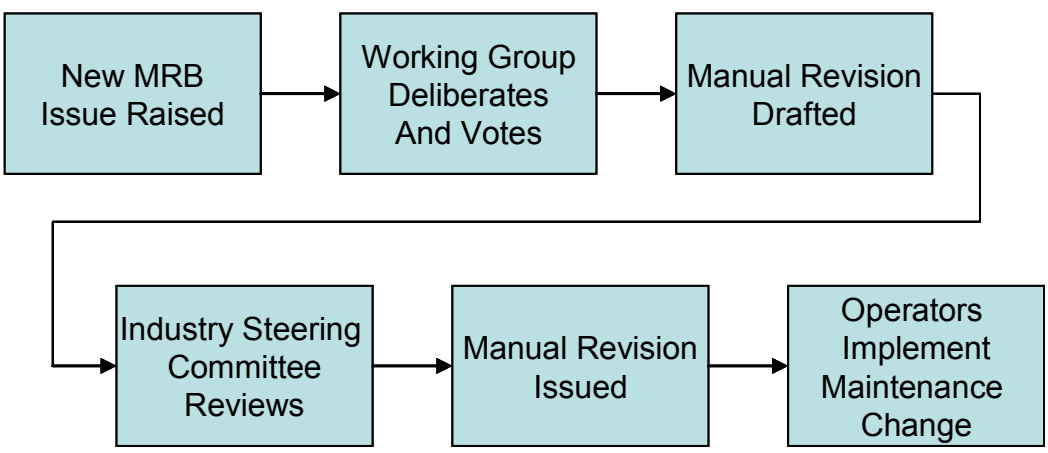

Figure 1. Maintenance Review Board (MRB) Process

Traditionally, the intent was to issue a new revision of the MRBR once a year. BAE Systems accumulated and analyzed items submitted by the operators, and then submitted them as approximately two 250-page packets for discussion at an annual three-day meeting of the Working Group. Based on that meeting, approved items were submitted as a group to the annual three-day meeting of the ISC. Thus, the number and depth of items that could be addressed was limited by the deliberation time per item and the meeting length. During the 1990s, an average of 20 changes per year were made to the BAe146/RJ, and an average of 10 items were carried over to the next meeting due to lack of time. (The 2006 MRBR for the BAe146/RJ includes 1722 maintenance tasks.)

Things started to change in mid-2004, when BAE Systems saw the opportunity to improve the competitiveness of its planes and reduce the operating costs of its customers by lengthening the maintenance intervals (time between scheduled maintenance) for its planes. This could only be done through close collaboration with the operators, as they had both the reliability data and the experience-knowledge that would be needed for making these changes without adversely impacting safety or availability of aircraft. Furthermore, it would be the operators that would cast the votes determining whether or not the changes would be adopted.

In mid-2004, BAE Systems established the Maintenance Optimisation Programme (MOP), an 18-month effort to review 'A' Check and 'C' Check items for its BAe 146/Avro RJ and ATP models. The program would involve analyzing all 1722 maintenance tasks for the BAe 146/RJ model and 555 maintenance tasks for the ATP model.

BAE Systems proposed to the operators and the regulating authorities that they implement a collaborative software tool called ForumPass developed by Parametric Technology Corporation as part of its Windchill collaboration suit, which would allow the Working Group to discuss proposed maintenance changes online as a stream of individual items, rather than in an annual face-to-face meeting as a large group of items. ForumPass was hosted by Exostar, an aerospace and defense exchange for collaboration and procurement. After doing a pilot project, the group approved the implementation.

Under the MOP program, 13 operators and BAE Systems discussed the 1722 maintenance tasks for the BAe 146/Avro RJ models over a period of six months. Lengthening of the intervals was approved for 70% of the tasks — roughly 1200 tasks. The AMM was reprinted six months after the commencement of the program using ForumPass.

The MOP program has benefited both the operators and BAE Systems. Maintenance intervals have been lengthened by 25% or more on the BAe 146/Avro RJ and ATP models. The operators have lowered the cost of ownership for their planes, as well as the cost of collaboration with BAE Systems. Operators of the BAe 146/RJ fleet will see a reduction in Direct Maintenance Cost ranging from $9 to $31 per flying hour, depending on the model.

BAE Systems has benefited by having more competitive planes, which has boosted demand. In addition, BAE Systems can incorporate the knowledge it has gained through the MOP into the maintenance programs for those planes. Last, BAE Systems has increased customer loyalty towards its service and spare parts business.

Trust and Control Issues

With or without ForumPass collaborative software, trust among BAE Systems, its operators and regulators is necessary for the Working Group and ISC to rely on each other and on the process. At the same time, monitoring and control mechanisms reduce uncertainty about the quality of the work being done. It's useful to examine how trust, monitoring, and control come into play in the Working Group's deliberations, and how the implementation of the ForumPass software and the launch of the MOP program have relied on and affected trust, monitoring, and control.

The structure of the collaboration (as shown in Figure 2) is as follows. The deliberation among BAE Systems and the operators regarding a given item is a *reciprocally dependent* process; each member of the Working Group contributes and leverages inputs and knowledge from other members. The quality of decisions depends on sufficient quantity and quality of discussion by the participants. The voting process is a *majority-rules* process. Thus, group members rely on each other to foster sufficient, well-informed discussion and are dependent on the vote outcome.

The quality of the decisions made is not proven out until operators gain years of experience with the revised maintenance procedures. Thus, group members must trust in or be assured of the quality of the deliberation and decision-making itself. In particular, the regulators — FAA, CAA and Transport Canada — while participating through oversight of the process, impose monitoring and control of the process, before approving (and relying on) the process.

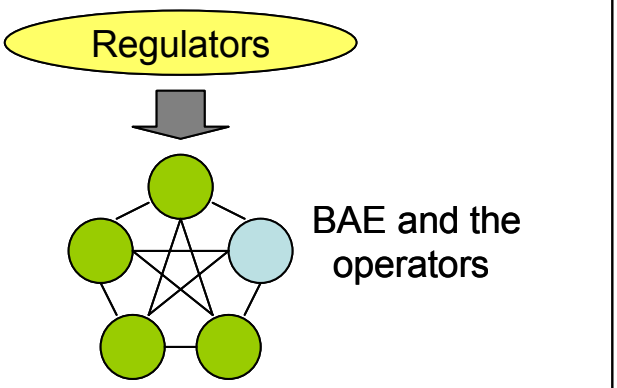

Figure 2. Customer Collaboration at BAE Systems

Under the traditional Working Group process, both trust-building and control mechanisms fostered a willingness to rely on the participants and on the process. These included:

- Minimum qualifications and experience expected of all representatives; especially of voting members. While each organization selected its own representative freely, participants observed that representatives were well-educated and had significant experience, with BAE Systems aircraft and/or other makers' aircraft.
- Common mission and sense of importance. Through socialization, Working Group members came to share the same intent and goals.
- Participants were expected to justify their inputs and votes with analysis and explanation. "Quiet" meeting participants were probed about their views.
- Personal relationships. Working Group members served for the length of time that they operated the aircraft. They knew each other well, from both the Working Group and other connections.
- Sufficient time given to discussion. Items were discussed thoroughly; if there was not enough time in the meeting, items were carried over to another meeting.
- Expertise from BAE Systems brought in as needed.
- Meeting minutes were taken, to record the flow of the discussion, so that if a safety or reliability issue occurred in the future, the discussion and decision could be revisited. This made members give even more weight to the importance of quality inputs.
- Discussion was closed only when a majority consensus was achieved.
- The policy of "one operator, one vote" assured each operator a voice.

Implementation of the ForumPass software was accompanied by changes to the Working Group structure, work process and organization. Rather than being structured around an annual face-to-face meeting of a year's accumulation of items, the structure of the discussion interaction is now an ongoing online threaded discussion of a small group of rotating items. Work is done at the operators' (and the BAE Systems representative's) home sites, rather than at the BAE Systems site. The size of the working group has expanded, from 8 voting members to 13 voting members, and from 3 additional non-voting members to 6 additional non-voting members. (Travel time and cost was no longer a factor limiting participation.) Several of these new members are operators with fewer, more recently purchased BAE Systems aircraft, so have less experience with those aircraft. A quorum is set once 70% of the members have responded online, and an item is approved if more than 50% of those responding vote "Accept."

The new ForumPass-based process depends on trust to a greater extent than does the traditional meeting-based process. Members must trust that other members are doing "due diligence" — conducting their own analyses, spending time thinking through the implications of the proposed change, and consulting with experts within their own organization. While some members are "talkative" — write long, detailed comments that shed light on the thought processes they followed before casting their vote — others simply write, "I accept," unless they want feedback from the group. The question is open as to what minimum number of fully participating members will lead to a "good" (i.e., well-informed) decision. And the regulating authorities, while having given initial approval to the use of the ForumPass process, are not yet fully satisfied with (trusting in) the quality of the discussion. They intend to observe discussions over an extended period of time before passing final judgment.

This suspicion of potential shirking has some basis in the fact that under the new process, members must fit in their Working Group work with their other competing work. Under the traditional process, members became dedicated to the Working Group work when they walked into the Working Group meeting. Also, it was customary and acceptable to probe "quiet" participants under the traditional process; this wasn't a custom in the new process.

Regulators are also concerned about the way and extent to which the new ForumPass process records the audit trail for the discussion and decision rationale. Under the traditional process, a meeting attendee acted as scribe, and produced 30-40 pages of minutes detailing the flow of discussion and decisions made for the 40 items discussed. Under the ForumPass process, the trail of threaded comments is the audit trail. Thus, the comments must be complete enough and must sufficiently represent the individuals' and group's analyses and thinking. Regulators are working with BAE Systems to assess and improve the quality of the new process's audit trail.

In order to improve the record of discussions and decisions and to show due diligence in making sure that the discussions are adequate, BAE Systems is working to implement a workflow whereby the Working Group Chairman will provide a final sign-off on each item after voting has taken place and prior to presentation at the ISC level.

As time passes, there will be turnover in group members, which may affect the level of trust within the group. Under the new process, members do occasionally meet face-to-face, but the overall level of face-to-face interaction is much reduced. It is also a larger group, and arguably

more anonymous, since people are at their desks, rather than in a room together. Also, new members who participate with only limited comments may not be trusted to have "done their homework," at least by the regulators. On the other hand, socialization is strong, and perhaps continued socialization will occur in other ways as time passes.

Conclusion

For many years, BAE Systems and other aircraft makers have engaged in customer collaboration, relying on their customers to initiate, deliberate (with BAE Systems) and vote to approve proposed changes to maintenance procedures, procedures that in the long run will determine the safety and reliability record of the aircraft.

BAE Systems has taken customer collaboration a step further by implementing collaborative software for its Working Group process. The implementation has made salient the role of trust-building and monitor and control mechanisms in reducing uncertainty and thereby increasing the willingness of participants to rely on each other and on the process. The implementation has increased the need for trust, particularly in the short term, as participants can no longer "watch" others as they do their "due diligence." It is likely that this will be addressed through adjustment of control mechanisms, such as socialization of participants as to the nature and content of "acceptable" comments and focus on improving the content of the audit trail.