LAI Learning Assessment: Putting the "R" in Lean

An Assessment of Learning Processes in the LAI Consortium

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Introduction

The Lean Aircraft Initiative is now focusing its efforts on the extended enterprise level of implementing lean. This involves consideration of the entire value chain and crossing multiple organizational cultures and boundaries. Now, the notion of simply following a spec and meeting budget and time parameters is a necessary but insufficient condition for moving to true lean enterprise implementation. Both industry and government must show to their stakeholders that they are becoming more lean, more cost-effective, and overall smarter about their processes. However, by raising the bar to include the entire enterprise in the implementation of lean, there is also a higher demand for continuous learning. This is reflected in two of the key goals from the Phase III effort focus on learning:

- "Deploy knowledge of lean practices to facilitate and enable change."
- "Extend and enhance the collaborative nature of the project"

The challenge in implementing lean will extend to learning processes as well. How can LAI develop a "pull" process of learning in the consortium? What are the activities that will support the creation and dissemination of new knowledge in real time? How can the new technologies available support learning in the consortium, eliminating the extra time now required to digest and disseminate knowledge internally in each member organization? These are the questions that underpin this investigation

The Current State of LAI and Learning

This section describes the data supplied from the interviews with LAI members, grouped under a number of key themes.

LAI Has a Established a Viable Learning Process on Lean

There is a lot of agreement about what the LAI consortium is: "a forum," "exchange of ideas," and "a focus for lean activities." Overall, there are very positive associations between learning in consortium member organizations and the activities of the consortium. Successes that were mentioned in direct association with LAI activities included:

- **Building awareness of lean principles in the organization**
  "We have gotten awareness across the organization" [Industry member]
  " I think the actual needs are being fulfilled very well. I think the whole thing is moving along quite nicely." (Government member]

- **Creating a major knowledge resource on lean**
  "That's [the LAI website] the first place they go when they need an answer to something. If we find that we just don't know about something, we go there first to see if there's something written on that topic." [Industry member]

- **Building a common language about lean across industry, academic, and government organizational boundaries**
  "Everybody was on transmit and they didn't have a common vocabulary. But what one person meant when he said ILS, he meant instrument lading system. Somebody else said ILS, they meant integrated logistics support. It took a while to even make sure that you're saying the same things to one another. And I think we got past it; I think we've gotten the vocabulary now that everybody understands." [Industry member]

Multiple Definitions of Knowledge Exist in LAI

In alignment with the differing motivations, cultures, and histories of the industry, academic, and government LAI members, we found that each player had a different definition of what knowledge is and how it should be delivered.

- **Academia**, specifically MIT, considers that knowledge derives from the objective collection and analysis of data, and is expressed as research products, like white papers, research reports, theses, and findings. Knowledge is created by combining collection of data from industry and other written sources, and analyzing them to produce new conclusions. Academia measures knowledge through publication and reports. The language academia uses around knowledge is: "research results" "the data" "benchmarking" "knowledge capture"

- **Industry**, specifically defense aerospace contractors, may agree that knowledge derives from research, but would argue that useable knowledge must in the form of how-to guides; it must be implementable. Industry is heavily biased towards knowledge that derives directly from practice; the presentation needs to be in the form of implementable plans and steps. The language industry uses is "toolkit" "tools" "how-to" "guides"

- **Government**, or more specifically the DoD and the Air Force, have a contractual mindset. Knowledge exists as a set of deliverables that should occur at an agreed level of quality, cost, and timing. The Air Force – with its "pilot's culture" -- represents knowledge as a set of just-in-time, approved and tested set of check lists. "Tell me what I need to do when, and I will do it."

  Another aspect of government knowledge definition is also related to contracting: making sure there is compliance to lean principles in projects they oversee. At the same time, within the government, there are differences of opinions about the role of lean in working with contractors. Some feel that industry must conform to lean

principles as the road to cost reduction, and others believe that government's role is only to provide cost guidelines (the what) and let industry decide whether lean is the method to achieve those cost goals (the how). Those of the latter camp do not acknowledge enterprise-level lean, in terms of government also becoming lean, but rather see lean as the "contractor's job." In short, government as a whole is not convinced that lean is the only way to achieve cost reductions. And there are many in government who see lean as equivalent to cost reduction, rather than a comprehensive system for the elimination of waste. The language government uses is "training modules" "compliance" "deliverables" "cost reduction" "contractor program."

Time and Timing Impact Learning Capacity

Time and timing as issues in the LAI Consortium were raised in many interviews. In reference to time, members, given their demanding "day job" schedules (this was such a commonly cited impediment to learning that the term "day-job factor" emerged in the course of the interviews), nearly all expressed a frustration with not having enough time to be involved in all the LAI activities they would like to be. Members found it difficult to keep pace with the quantity of materials and projects taking place under the LAI banner. Some members deal with this by tracking only what directly concerns them in terms of job function; others stated that they routinely print out papers from the web or from conferences and read through them periodically when they can.

> "I can't keep up with everything that's going on in LAI. Nobody else can either." [Industry member]

> "On the industry side, it's people who are involved with LAI, who have responsibilities and commitments, obligations within our companies that require a lot of our time, so we're not able to devote as much time to the learning and to the activities as we could or should" [Government member]

In terms of timing, members sometimes found workshop schedules hard to meet, with meetings of different focus groups scheduled too close together. This was particularly a factor in organizations where there were only a small number of persons involved in LAI and so individuals were members of multiple focus groups. Mention was also made about the timing of deliverables in reference to workshops.

> "The other thing I noted that might be able to be changed is that a lot of the workshops are scheduled on top of each other…So, if they could spread them out a little bit better and a little bit more time in between them." [Industry member]

> "I think timeliness is very important. And the other thing is it's a matter of setting objectives and guidelines. If the objectives and guidelines for LAI are that when we have a conference, we'll make the material available at the time of the conference, we'll have everything on the Web, to my mind, it's more a matter of policy. People will work to that.." [Government member]

Networking Is a Key Benefit of Participation

One of the key values that members derive from their participation in LAI is the opportunity to build networks and engage in conversations with others in the industry. Members agreed that learning about lean in LAI is supported and deepened through the networking that takes place through the focus groups, plenary sessions, and project work that is engaged in between meetings.

Comments members made about networking as a learning mechanism included:

> "The lean forum provides a way for me to sit with Earll Merman or somebody else who's doing the latest thing about how to manage things and how to run things and to learn from him without having to read three or four books. A lot of industry people don't read. They get inundated with reading material, you know? The personal contact with somebody who understands the business that you're in [is the key benefit]." [Industry member]
>
> "It's the interaction that takes place when you go to the meetings that to me is a real deliverable." [Government member]
>
> "You absorb new knowledge and information from working with others" [Industry member]
>
> "The other thing is one of the big benefits for me of going to the LAI conference is I meet all the other people from [my company] who are doing stuff." [Industry member]
>
> "And some little thing somebody says might trigger some brilliant idea in you, but it never would have happened if you hadn't heard that little gem of wisdom." [Industry member]
>
> "We've gotten a number of names from the Web site and followed-up with more conversation later." [Government member]
>
> "Believe it not, the first [deliverable] is kind of an intangible, but [it's] the forum. It's the fact that LAI can bring these people together from all around the country, from all different companies and from government and provide a forum for those who exchange ideas, thoughts, disagreements, but it's a managed forum. There's no other place in the country you can get that many different people together in a noncompetitive, nonbusiness posture to talk about trying to make things better." [Government member]
>
> "I've met people from different companies and we've known one another now for three, four, five years. We've had dinner together, we've had cocktails together, we travel together. There's a mutual trust and respect there. So, these [focus group]

meetings can be very informal, very learning or sharing oriented, and very interactive." [Industry member]

There are Barriers to Knowledge Sharing and Dissemination in LAI

Use of Research Reports

As mentioned above, the knowledge in academia is often focused on the generation of research results, whereas industry and government tend to look only at implementation guides and how-to approaches as being valuable knowledge. A key factor in this difference is that many in industry and government are hard-pressed to increase their knowledge of lean due to deadline pressure on job tasks, the day job factor. Many claim that they do not have time to access, read, use, or disseminate the research reports from LAI.

> "I really don't think they're [white papers, reports, etc] being used very much at all." [Industry member]
>
> "They're just kind of sitting in the LAI bag that we've got at the conference right now and starting to collect dust." [Industry member]
>
> "Obviously, the papers provide something … I don't think most people read them. You've got to sit down a read those papers. But I'm not saying what [MIT's] generating isn't useful. It's just that the people that need to use it perceive they don't have the time to read it." [Government member]
>
> "The LAI website is dead storage." [LAI Staff member]
>
> "The thing is people don't read those papers. You've got to be a reader. The average person will read the first two paragraphs or something but really won't read the paper. Therein, in my mind, is the real discontinuity between MIT and industry. MIT's product is research papers. That's what they do best. So, they're busy generating research, whereas the industry people, they almost want a check list or a how to do because they don't read." [Industry member]

There were also members that found they could take advantage of the research, likely due to the fact that part or all of their job was devoted to, and rewarded by, lean implementation. These members found the research reports, and their accessibility through the LAI website, to be a strong support for their learning:

> "[a colleague].. gave a presentation showing how he was using the LEM…and underneath each of those practices, they looked at what they could do in the human resources area. So, they were using it as a guide to look and see what the practices were that they could start implementing. And that was exciting. It was a real breakthrough. [It started at] the meeting a couple of months ago we were at …I said, "Well, gee whiz, a lot of smart people spent a lot of time developing the lean

enterprise model." I said, "You know, why don't you take a look at it?" So, he did." [Industry member]

"I distribute them to the people that I think ought to see them and use them myself to get some kind of idea of what's going on, what we might do internally as a result." [Industry member]

" If we have a question on lean, the LAI website is the first place we go." [Industry member]

Competition

Those directly involved with lean implementation feel that broad sharing is possible, worthwhile, and that it is taking place, despite competitive concerns.

> "And those [open sharing of lean implementation projects between companies] are ideas among the lean community. Those are not necessarily ideas in the corporate hierarchy."

On the other hand, members openly acknowledged that knowledge sharing within the consortium is limited by competitive concerns. Directly competing prime contractors are selective about the practices they share. If one prime has a technique or training approach that they feel is a competitive advantage, there is little incentive for them to share it with the rest of the consortium.

> "There's an inherent conflict because LAI says let's share as much as we can and companies say let's keep as much secret as we can" [Government member]

> "We obviously hold some things back. It's obviously not clear how we can benchmark one another. If everybody's in the defense avionics business, I'm going to be very reluctant to turn all my cards face up." [Industry member]

Learning from Failure

The opportunity to learn from failure is limited in the consortium. When asked about failure analysis in LAI, a member said:

> "[Analysis of failure in LAI is] never done. It wouldn't be politically acceptable. There are all these blue shirts here (Air Force), so we have to be careful what we say. Of course, we know of failed projects of other companies. We do discuss our own failures internally, but we never bring them up at these meetings." [Industry member]

When other members were asked about how LAI analyzes or uses failure data, responses included:

> "I don't think they do it. And if they have or if they wanted to, it would be very hard because the industry would be very closed, right? I mean, we're all trying to make ourselves look great." [Industry member]

> "I don't remember hearing about [any failure analysis] from LAI.." [Industry member]

> "I'll give you my sense of it. Number one, we are a risk-adverse industry in general. There's nobody that wants a headline in the *Washington Post* that says this system we spent 12 million dollars on doesn't work or failed. We're very risk adverse. Number two, nobody wants to publish negative results and so it has to be a pretty sophisticated organization run by some fairly progressive management that takes those failures and says, 'Okay, let's fall back and determine the lessons learned, publicize that so that everybody else can learn from it.'" [Industry member]

> "LAI has no approach to failure analysis. We in the industry only analyze failure after the fact. There is a waiting period before failure is analyzed. If a program is cancelled, it's ok to analyze it. But still it's very careful and very sensitive. We do talk about others' failures offline, but the party line is 'we don't have any failure.'" [Industry member]

> "An analysis of failed cases would have value for me, but that's MIT's job." [Industry member]

> "I haven't come across any analyses of failure in LAI. Failures are site-specific." [Industry member]

Discussion and Implications

> *The following section applies the consultants' analysis and models for learning to the overall data provided through the meeting observations, interviews, and informal discussions.*

What we see in speaking to both government and industry members of LAI is that there is a range of attitudes and commitment to lean. Roughly, there are:

- those who are true believers, who feel that the lean philosophy is a way to cut costs, but provides more – it is a model for running a profitable and efficient enterprise.
- those who think that lean has benefits, but pursue it as one approach to addressing quality and cost reduction issues
- those who are skeptical. They feel that cost-cutting or increased profitability are the goals, and lean may not be the best way to get there at all.

In addition to these differences, MIT staff and industry members have confirmed the divide between the "doers" (line managers whose job it is to implement and use lean in making actual products) and the "helpers" (staff managers whose job it is to study and experiment with lean approaches, and train others in lean). The helpers are those that will take the time to go to the LAI website, read the research reports, and contact MIT for more data. They will also have the ability to be active in several focus group activities, travel for meetings, and give presentations.

> "Most of our points of contact are staff people. We have to be able to reach the factory floor managers to really implement lean." [MIT Staff member]

The doers, on the other hand, are burdened with the day job factor. They have little time for pursuing LAI activities, and frequently are not rewarded for doing so. The paradox here is that lean implementation requires that doers and helpers work together, but only the line managers can truly make lean implementation happen within an organization. We feel that any learning strategy that LAI pursues must include thinking about how to engage and involve the doers as well as the helpers so that lean implementation becomes a reality. Following are some models and approaches that may shed light on this process.

Consortium Learning Strategies

Building a Learning Network

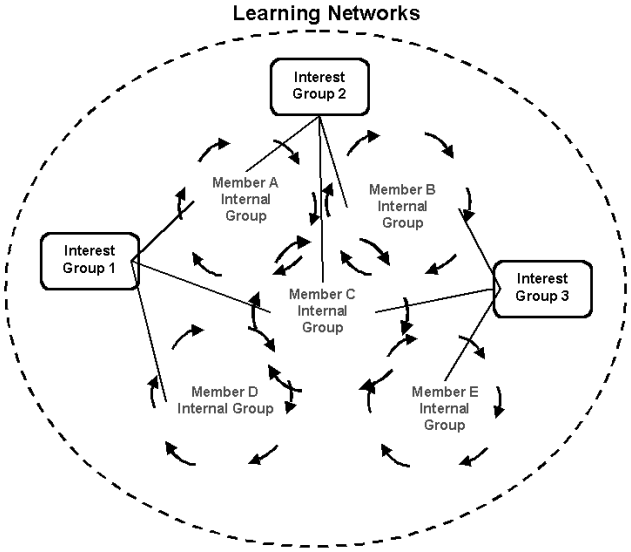
A helpful construct in thinking about how to increase involvement and learning in LAI is that of the **learning network**. A learning network is a cross-organizational forum in which internal learning groups from diverse organizations can explore challenges together. Members of the Network come together on a regular basis to give and get feedback and create new knowledge. Over time, subnetworks form ("interest groups") to explore specific issues surfaced in the network. Both the network and group activities across organizations, are shared in the internal learning groups. The internal learning group brings the outside knowledge inside the organization, contextualizes it, and then applies what it has learned to organizational change. Each of the three learning modes of the Network engages the collaborative learning cycle to generate, disseminate, and utilize knowledge.[1]

The learning network has three basic learning modes, as shown in the diagram below:

- **the network as a whole**, dealing with enterprise-level learning
- **the interest groups**, dealing with the cross-organizational level of learning

[1] See Appendix 2 for background on the collaborative learning cycle.

- **the internal groups**, dealing with the organization, group, and individual levels of learning



If we look at the structure of LAI, there has been good progress in bringing interest groups' (LAI's focus groups) activity and disseminating that activity to the consortium as a whole through the plenary sessions, and then back into the focus groups themselves. In other words, there is clear and measurable success in learning about lean by those directly involved in the consortium and in the focus groups. One caveat here is that strong leadership in the focus groups can sometimes lead members to identify more with the focus group than with the consortium as a whole. It may be helpful to rotate members on a periodic basis in the focus groups in order to build more ownership in the member organizations, and also keep a "groupthink" phenomenon from setting in.

What is less clear is the mechanism for disseminating the knowledge created in the network into each member organization. In many organizations, the burden of dissemination and promotion of LAI falls on one person, often a person who also has a day job. Points of contact said in interviews that they needed to sort through the information received at an LAI meeting, figure out who should receive the information, and then transfer that information to those individuals. Many implied that this involved a kind of reinventing the wheel each time due to shifting jobs and personnel. This dissemination job takes a low priority in the daily press of business. While this process may disseminate information to a limited group within the company, it is likely not to produce changed behavior.

There is a need for a committed internal learning group in each member organization whose purpose it is to produce the behavioral and procedural changes needed to implement lean. The internal group decides how the knowledge gained from LAI participation benefits their organization as a whole, and what new thinking or process is

particularly relevant to their organizational culture and stage of lean implementation. The internal groups would help to meet the Phase III goal of "enhancing the collaborative nature of the project," by creating a container for LAI-generated insights in each member company.

Interviews revealed that there is a broad range of internal group structures existing among LAI members. Some organizations have formal Lean Councils, headed by a director or other senior executive, whose activities encompass all lean programs within the organization including, but not limited to, LAI. The councils have regularly scheduled meetings to inform each other about lean activities across the organization. They also head lean implementation programs including training, hiring of consultants, and research and experimentation. Other organizations are just beginning to form internal groups for knowledge sharing, primarily on an informal coordination level. A third type of arrangement is organizations that have little more than an email distribution list of "those interested in lean." Often, the LAI point of contact maintains that list, and does his/her best to keep others informed, but it is a shotgun approach at best. At the least formal level, individual participants in LAI activities from the same company have no knowledge of who else in their organization is involved in LAI, and thus no ongoing communication with them.

We feel that LAI could take a stronger role in supporting, structuring, and promoting the need for internal learning groups within each member organization. This could take the form of encouraging existing groups by helping them to formalize their learning and change strategies. A key factor for lean success will be that these internal groups see their role as change agents for lean, working together to impact the organization. For those members with very loose or no internal groups, LAI could help by supplying and building up lists of internal contacts, and perhaps an onsite visit to generate interest in lean and LAI across divisions of the organization.

At both the meetings the consultants observed[2], from 4 - 12 people from each member organization attended. In most cases, members from the same organization knew their immediate collocated colleagues, but often had never met other colleagues from different areas of the country. It would be helpful for these potential internal groups to have time within the context of the LAI meeting to compare notes both before the sessions begin, and at the end, perhaps with the charter of creating an action plan based on what they have learned.

Ownership in LAI for Individuals

In concert with strengthening the internal groups, learning in LAI would be supported by stronger definition of the individual members' role in the consortium. This is not to

[2] See Appendix 1 for details of meetings observed for this study.

suggest that the corporate membership structure be changed, but rather that the individuals feel a sense of ownership and continuity in LAI participation.

At both the Lean Supplier and Product Development meetings, 1/3 to 1/2 of the attendees were at an LAI event for the first time. Informal questioning on this revealed that newcomers were either delegated to attend, or found out about the meeting "through an email" and decided to attend the meeting. There did not appear to be any newcomer program for the first-time attendees. The other half of the participants were of the core group of participants who had been involved in LAI for a number of years and knew each other well. Often they do or have served as industry or government co-leads, or some other central function in the consortium. Clearly, these core members embody a lot of consortium memory and function as key dissemination points within their organizations. As one interviewee noted:

> "if a new person comes, that person has to be brought up to speed on what was accomplished last spring, last fall. And if that person doesn't come back, then the next person is further behind and so you break that learning continuity, and so one of the things that I think people need to do as best we can is send the same people or at least make sure the new people are well briefed because otherwise you can't make the progress that you normally could make."

A process for bringing new members into the consortium will address this "break in learning continuity," and create the groundwork for strong internal groups within each member company.

Timing and Rhythm in Scheduling Events

LAI has created a very strong and well-regarded series of learning events in building the consortium. These consist of the annual plenary session, focus group workshops, executive council meetings, and focus group colead meetings. Many of these meetings are focused on presentations of new research or practices, the creation of new products, and/or the exploration of a specific aspect of lean. Overall, we can see this array of meetings as carrying forward the process of changing to lean on the enterprise level, the central point of the Phase 3 goals.

We believe that the complexity of lean implementation, requiring fundamental changes in work and thought processes, is introduced most successfully when the "absorptive capacity" of those responsible for the implementation is taken into account. A simpler way of saying this is that the rate of change must match the capacity of people for change. Many change and learning processes fail because the expected pace of change is more that the people involved can tolerate in a given period of time.

In order to build learning capability, in other words increase the capacity for change, it is helpful to establish rhythm. By this, we mean that meetings, conversations, and production and dissemination of materials are done on a predictable schedule, the pace of which can

increase over time. In the interviews, as mentioned above, time and timing were a common theme. Members are challenged to find time to participate in LAI activities. While this is a common complaint in the business world today, members' capacity for learning and change is supported by a careful focus on timing.

Modes of Learning

LAI has evolved a number of learning events and meetings in order to organize, promote and educate about lean practices. We can think of these learning events as following four modes: formal, informal, face-to-face, and virtual, as shown below, where the **bold face highlights the types of events and meetings that LAI has used frequently:**

	Formal	Informal
Face to face	**Annual meetings** **Interest group meetings** **Steering committee meetings** Internal group meetings	Networking events **"Talking in the lobby"** Small group work
Virtual	**Teleconferences** Online seminars E-Meetings Online courses	**Website materials** **"Picking up the phone"** **Emails** Web-based collaboration

Areas where LAI could expand its learning reach include the e-learning and web-based arena, and further exploitation of networking as a learning method[3]. As we saw in the interviews, the opportunity to meet with peers in a neutral setting, to have the depth of exchange LAI has fostered, is valued by many in the consortium as one of the key deliverables of LAI. Along with expanding in these media, there must be a clear strategy for linking knowledge that is created virtually and/or informally with the formal meetings and activities of the consortium.

Implementation Teams & Site Visits

Interviewees had very positive comments on times when LAI staff had visited on site. It provides an opportunity for points of contact to gather those who are involved in LAI and others who are either senior sponsors or "doers." The energy created by both preparing for and participating in these site visits help to galvanize support and enthusiasm for LAI's goals.

> "We had [MIT LAI faculty] come out and I took that opportunity to get our upper management and some key people in the company to participate in that meeting. [The MIT Faculty] gave an overview of LAI, which I asked for in order to get everybody kind of on the same level. And I think the awareness went up during the meeting." [Industry member]

Along with site visits by MIT staff, members were enthusiastic about benchmarking visits on an ongoing basis. Since lean as a process is highly visual and experiential, benchmarking visits help those doing lean to "get it."

> "that's why the people -- the benchmarking, if you want to call it, or the trips to go see other places are very effective in this endeavor" [Industry member]

> "I was just amazed at how open they were about how they were implementing lean." [Government member]

Conclusion: MIT's Role in Fostering Enterprise-Level Learning about Lean

This assessment has yielded a map of the current state of learning in LAI, revealing a number of areas for further investigation. These areas include:

- How to mediate the multiple definitions of useful knowledge that exist in LAI
- Strategies for bringing different notions of time and timing in LAI together
- Ways to enhance the value participants see in networking as a means to share knowledge about the defense aerospace industry and lean
- Approaches to dealing with the barriers to knowledge creation and dissemination, especially the use of research reports, dealing with competitive boundaries, and learning from failure

Several learning strategies were presented in the Discussion section of this assessment. In general, a focus on the internal groups and the role of the individual in LAI were presented as areas to focus on to create further support for learning in the consortium. Others notable focus areas included creating a rhythm for scheduled events, so that the consortium builds momentum and predictability for learning. The further exploration and use of informal and virtual learning modes would provide expanded avenues for participation.

Finally, in echoing one interviewees statement "lean must be seen," the continuation of site visits and benchmarking visits are critical to the dissemination of lean principles. Just as the MIT International Motor Vehicle Program had a model for lean for the automotive industry in the Toyota Production System, so LAI will encourage learning about lean by presenting visible, real-time models of excellence in lean production for aerospace. We feel that these site and benchmarking visits complement the explicit knowledge provided for in the LAI findings and durable products, and allow LAI members to tap into the tacit knowledge that underlies the successful implementation of lean.

Appendix 1: Sources of Data

Meeting Observation

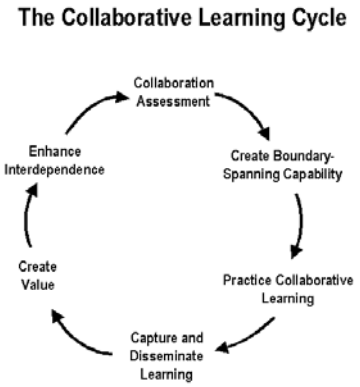
Lean Supplier (LS) Focus Group meeting in Dayton, OH, January 2000
Product Development (PD) Focus Group meeting in Folsom, CA, January 2000
LAI Plenary sessions in Cambridge, MA, March 29, 2000

Interviews

Michael Chapman, Boeing
Steve Clark, GE Aircraft Engines
Don Cook, Raytheon
Dave Dilley, USAF
John Eck, USAF
Brad Gale, Lockheed Martin
Julie Goswick, Raytheon
Ed Harmon, Northop Grumman
Cliff Harris, Northrop Grumman (ret.) & MIT LAI
Doug Jaspering, Boeing
Don Meadows, Lockheed Martin
Jeanine Miller, Aerojet
Andrew Parris, Lockheed Martin
Jim Pittstick, USAF
George Reynolds, Northrop Grumman
Brian Townsend, USAF
Shiva Ubhayakar, TRW
Paul Wade, Aerojet
Keith Weiss, Raytheon
Col. George Williams, USAF

Appendix 2: The Collaborative Learning Cycle

(from Digenti, D., "Collaborative Learning:Core Capability for Organizations in the New Economy," Reflections: The SoL Journal, V. 1, N. 2, 1999)



Phase 1: Collaborative Capability Assessment. The assessment provides both data for strengthening collaborative capability in the organization, and also data to be shared with other learning groups for input, advice, and feedback.

Phase 2: Create Boundary-Spanning Skills. The skillset that supports collaborative learning has been termed boundary-spanning skills. These skills allow the members of the collaborative learning group to develop a shared vocabulary, and build skills in boundary crossing while engaged in collaborative learning projects.

Phase 3: Practice Collaborative Learning. Collaborative learning is a practice, and therefore every opportunity for collaboration that creates value should be sought out. There are a number of collaborative learning technologies that can be engaged in building capability, including reciprocal teaching, study groups, and parallel learning systems.

Phase 4: Capture and Disseminate Learning. This is the most challenging aspect of collaborative learning -- how should learning be generalized and made most useful to the organization? Typical approaches include after-action reviews and post-mortems, use of internal publications for publishing stories supporting collaboration, and creation of Internet or database resources.

Phase 5: Create Value. If the activity of collaborative learning is not disseminated to the organization, then systemic change and improved collaboration will not result. Change agents must facilitate closed-loop processes, where they actively seek feedback and engage the learning they have received through collaborative activities. Without "working" the learning in the system, it remains the property of a few and cannot benefit the system as a whole.

Phase 6: Enhance Interdependence. This stage of the Collaborative Learning Cycle is the most challenging for U.S. organizations because of our cultural inhibitions around mixing business and personal relationships. In order for collaborative learning to continue, however, members need to develop a sixth sense or awareness of how to create strong networks among current and former collaborators, and change agents will need to foster and encourage that awareness.