Inter-institutional Collaboration: Lessons Learned

Collaboration Group
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Laboratory of Analytic Sciences (LAS) – partnership between NC State University, the National Security Agency (NSA) and Industry announced 8/15/2013

Goal – to promote new advances in the science of analysis (technology & tradecraft) through innovative collaborations between industry, academia, and government

Underlying idea was to think and do differently through inter-institutional collaboration
LAS Teams: DO2/DO3
(Jan-Dec 2014)

Research Theme Investment Categories

Added 5/14: ME KRM UP CG

- FSP
- CP
- DRL

Narrative Processing
Analytic Workflow
Instrumentation
Infrastructure
Motivation for Collaboration Group

• Multi-disciplinary teams with diverse backgrounds investigating complex technical and methodological challenges
  – 11 different research themes
  – Almost 50 funded faculty members from 5 universities and 17 departments
  – 5 industry partners

• Led to communication and coordination challenges
1. Assist LAS leadership and interdisciplinary teams to optimize collaboration.

2. Conduct a research study of LAS structure & group dynamics to generate recommendations for more effective interdisciplinary research and development.

Guiding RQ:

How can academic, government, and industry participants’ better organize (reporting structure, controls & rewards) in large multidisciplinary collaborations to transcend institutional and interdisciplinary boundaries, enhance innovative output, and optimize learning?
Team Assignments 2014

- Existing teams will meet once per month (3 w/ CG)
- New teams will meet once per week (All w/ CG)
- CG will meet once per month
- June – December 2014 (Extended to 3/15)

<table>
<thead>
<tr>
<th>Team 1</th>
<th>Team 2</th>
<th>Team 3</th>
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<tbody>
<tr>
<td>Existing Task</td>
<td>Data Readiness</td>
<td>Future States Processing</td>
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<td>Level</td>
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<td>New Task</td>
<td>Mission Effects</td>
<td>User Psychology</td>
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<td>Knowledge Management/</td>
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<td>Representation</td>
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What is **Collaboration**?

1. to work jointly with others or together especially in an intellectual endeavor
2. to cooperate with or willingly assist an enemy of one's country and especially an occupying force
3. to cooperate with an agency or instrumentality with which one is not immediately connected

**Joint Action**
With someone we do not typically work with
Which one do we mean?
Iterative Process of Data Gathering & Analysis

May-Dec 2014
- Observation
- Interviews (31)
- Surveys (67) 59%

Ongoing LAS Activities
- Participation
- Observations
- Conversation

April 2015 - present
- Workshop (21) 58%
- Health Checks (13/14)
- Participation
- Observation

9 Large Groups

14 Smaller Groups CCTs
Collaboration Research Model

Initial Commitments to Interdisciplinary Integration

Job Design
- Team Heterogeneity*
- Participation

Interdependence
- Task Interdependence
- Goal Interdependence
- Outcome Interdependence

Emergent States
- Leadership
- Team Empowerment
- Trust
- Conflict/Disagreement

Team Knowledge Fusion Processes
- Communication & Collaboration
- Elaboration of Task-Relevant Information
- Team Behavioral Learning

Team Performance
- Team Productivity
- Individual Satisfaction
- Team Effectiveness *

* Constructs from records or administrators (LAS/NCSU) interviews
Observation Affinity Diagramming
# Interview Results: NVivo

## Emergent Themes from 18 Coded Interviews

<table>
<thead>
<tr>
<th>Code</th>
<th>n Items Coded</th>
<th>% of Total</th>
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<tbody>
<tr>
<td>Communication</td>
<td>257</td>
<td>19.51%</td>
</tr>
<tr>
<td>Team Membership</td>
<td>241</td>
<td>18.29%</td>
</tr>
<tr>
<td>Team Goals</td>
<td>168</td>
<td>12.75%</td>
</tr>
<tr>
<td>LAS Structure*</td>
<td>166</td>
<td>12.60%</td>
</tr>
<tr>
<td>Cultural Alignment</td>
<td>148</td>
<td>11.23%</td>
</tr>
<tr>
<td>Power/leadership</td>
<td>131</td>
<td>9.94%</td>
</tr>
<tr>
<td>Motivation</td>
<td>117</td>
<td>8.88%</td>
</tr>
<tr>
<td>Team Structure &amp; Meeting Logistics</td>
<td>89</td>
<td>6.75%</td>
</tr>
</tbody>
</table>

**TOTAL ITEMS CODED** 1317 99.95%~

*Denotes one theme that was not found in observation affinity diagramming.

-Nvivo rounding error-
Survey Data Analysis

- **Individual and Team-Based Analysis (Descriptive stats on individual items)**

- **Cross-condition comparison (no CG; early CG; late CG)**

- **Factor analyses found high correlation among the scales and the items**

- **Regression/correlational analysis in process**
The goal was more abstract and ambiguous than many team members were used to; many are used to having a specific problem, identifying hypotheses, and creating a “product.”

There was variance in perceptions, with around 60% indicating task/goal interdependence.

“At least for our group, having that vagueness has sort of forced us to try and figure out – forced a certain level of creativity in what we’re doing.”

“Grand Challenge” goal was to raise new questions & develop 3-5 year research plans to investigate.
Lessons: Job Design & Interdependence

Perceptions of task and goal interdependence (at team and organizational levels) are critical to collaboration

- Greater task and goal interdependence increases collaboration
- Understanding how individual and team tasks help achieve LAS goals increases collaboration

**BUT**

- Some level of ambiguity may stimulate innovation
- Tolerance for ambiguity may be an important part of inter-institutional collaboration
4 out of 9 teams said they did not seek external information or additional information from each other to complete their goals.

Facilitation did not always help; time was a better predictor of perception that the group made decisions together and worked on processes.

- “it's taken a good long time for people to get comfortable with each other…most people don't trust themselves to ask the questions or ask a possibly silly question…. nobody wants to sound stupid in front of a bunch of PhDs…. It’s gotten better, but it took us a solid six months to feel comfortable with each other.”
Lessons: Team Learning & Processes

Team membership changes pose a challenge to communication & collaboration by making it harder for members to share information.

Collaboration requires divergent and convergent thinking – unearthing differences and working to make sense together in new ways.

It takes time, attention to processes, commitment & ability, and supportive space, to engage in optimal collaboration.
51% did not perceive the leader was meeting the group’s needs.
50% reported task and relational conflict within their teams.

“He’s not one of the most senior people there to be sure, but he has shown a lot of wisdom in how to execute his role. So he’s really more of a structurer and a facilitator rather than seeking to persuade people and developing vision on his own and trying to persuade people on it and such.”
Lessons: Leadership & Conflict

Inter-institutional collaboration requires leaders who understand the needs of diverse team members, who can provide clear feedback about individual and group goals, and who can manage conflict to bridge different vocabularies and views.

Optimal collaboration involves low relational conflict and high task conflict.
Final Lesson: Cultural Alignment

Optimal inter-institutional collaboration requires intercultural communication.

– More opportunities for information sharing and networking are needed for all LAS members
– Development of an LAS typology might help overcome challenges of different lexicons, theoretical frameworks, research methods and approaches
– Structured and consistent advanced preparation and onboarding for all LAS performers enhances collaboration potential

“I think it’s the difference in experience, right? So – because we don’t have any similar background, there’s not that inherent understanding. I guess in some form or fashion there’s sort of a language barrier and the terminology that everybody's using is just not the same.”
Highlighted Lessons Learned: Recap

1. Job design should include task and goal interdependence among performers.
2. Performers must be comfortable with ambiguity to be open to learning from others. “Ontological Insecurity.”
3. When working in teams, membership must be clear, with introductions of new members and their role(s) on team.
4. Leaders must understand the needs of diverse team members, provide clear feedback about individual and group goals, and bridge different vocabularies and views.
5. Supportive structures and spaces must be cultivated.
6. Intercultural communication requires preparation in advance, an investment in spending time with others, & learning their language or creating a shared vocabulary.
DO5 (2015) & Beyond
April – December 2015: CCTs

• In April 2015 the team structure changed. While some of the original teams still exist, LAS created cross-cutting teams to bring more LAS performers together (e.g., government, faculty, industry).

• These teams are smaller, there are 14 of them, and some have more specific deliverables than others.

• Note that faculty and industry performers have a set of deliverables that may be separate from their CCT.

• At the end of April, CG introduced team charters & team health checks to manage expectations & processes.
CCT Feedback to Date

• Most participants agreed that the CCT Workshop was a good way to bring interdisciplinary partners together, helped understand the CCT process, and met expectations

• Participants were ambivalent about the utility of the workshop for future delivery orders

• CCT Health Checks suggest a variety of strengths & weaknesses to the format
CCT Strengths & Limitations

**Strengths**
- Flexibility to join/exit CCTs
- Changes to CCT structure are easily adapted
- Diverse group composition
- Formal and informal leadership roles emerged
- Ease of integration of new CCT members

**Limitations**
- Flexibility created disruption for some CCTs
- Leader must keep group organized & on task
- Participants’ commitment varies
- Group diversity varies
- No mechanism for leads who need additional support
- New member integration success uneven across CCTs
Goal is to explore ideas from government (3), academy (3), & industry (2) about effective collaboration.

- **Objective 1:** This CCT shall meet to discuss the various objectives of the three classes of performers, identifying what they would like to get from the others.

- **Objective 2:** This CCT shall produce a report on the various models attempted and their effectiveness at obtaining the goals of the various performers.
| Taking time to discuss and align language/terminology; identify the key ideas | Having a common goal that supports individual goals |
| Understanding the value all members bring to the project (what you can learn from others) | Clear roles and expectations |
| Sharing cases, examples, stories to help create shared meaning/experience | Common interest in the problem/focus area |
| Sufficient meeting time (for task) | Full-Time commitment to the project |
| Time to build trust/get to know others (social) | Leader who understands the needs of various partners and can serve as a bridge (speaks both or all languages) |
| Common use of technology to support file sharing & distributed interaction |
Vision

The CG imagines continued improvement of interdisciplinary science team design, implementation, and impact by:

• Serving as an advisory team to LAS on building collaborative, interdisciplinary teams, structures, and technologies

• Assessing impact of interventions on collaboration

• Working with others to develop technological processes to facilitate knowledge sharing and elaboration
CG DO5/6 Research Questions

- **How can academic, government, and industry LAS participants collaborate to construct a cooperative and productive relationship that transcends disciplinary and institutional boundaries and optimizes organizational performance?**

- **How can various LAS prototype technologies be used effectively to improve collaboration among multidisciplinary groups?**

- **How do interventions (training, facilitation, structural) help multidisciplinary groups avoid tendencies toward privileging shared over unique information and engage in collective problem solving?**

- **What might innovative team/technology collaboration interventions look like?**
Data Collection in Process

• Workshop evaluation survey
• CCT Health Checks
• Interviews with NCSU/NSA leadership on LAS creation
• Team Diversity Interviews
• Technology Prototype Interviews
• Intervention interviews
• DO5 Performer Feedback Surveys
An open invitation to collaborate!

Please share your experiences and ideas with us.

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