

COMMUNICATIONS

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COOPERATION REQUIRES COMMUNICATION

Scientists and university faculty members are often caricatured by stereotypes inimical to good communication: The wooly-headed, white-coated scientist who is totally self-absorbed and speaks a language understood only by seven other colleagues studying the same arcane problem, and the absent-minded professor who rarely remembers the day of the week and rambles on so long that he forgets the question half way through the putative answer. While we all may know someone who exhibits a few of these traits, the stereotypes are counterproductive in the arena of modern scientific research, which is very much a cooperative process. Cooperation puts a premium on the scientist's ability to communicate with other scientists and with funding agencies, administrators, technicians, graduate students, and editorial boards. Add to that list the industrial representatives at I/UCRCs and it becomes clear that today's successful scientists (and scientific administrators) must be well versed in the art of communication.

Communication theory—the study of systems and techniques that encourage or impede the transfer of information and understanding—is both a science and an art. As a science, communication theory began in the 1940s with the work of Shannon, Weaver, and Wiener. To a great extent, the information society, with its computers, satellites, and coming super highway, is built on their

work and the realization that information may be mathematically modeled. But these discoveries have little to do with successful communication between individuals or within organizations, which relies much more on the art of communication. Today, social scientists are rigorously studying all aspects of interpersonal communication in order to determine the best methods for conveying information and understanding (Werner, 1995). The section titled *Cooperation Requires Communication* in this chapter surveys that work. It is presented as a series of questions and checklists that the reader may use to assess the communication environment within his/her organization, and to improve personal communication skills. The section titled *Requirements for Internal Communications* in this chapter details formal communication tasks faced by a center.

In addition to a matrix that catalogs these tasks along with their rationale and the party responsible, sample letters, lists, outlines, and agreements are included.

Communicating Within an Organization

Center Directors are responsible for more than their own personal communications; they also are responsible for establishing a center culture that facilitates effective communication. To be sure, corporate culture has become something of a meaningless buzzword, but it masks an underlying truth: all organizations have both stated and unstated values which form an organization's culture. The I-We-Them-It Principle is a way to understand an organization's culture.

- I** How are individual staff regarded by the organization? Is there a premium put on individual initiative or is the premium put on organizational unity?
- We** How do individuals relate to each other within the organization? Is the structure hierarchical (authoritarian) or interpersonal (democratic)?
- Them** How does the organization view its "clients?" Are they seen as part of an extended family or as customers whose needs must be met?
- It** How does the organization perceive its major task. What does it do? Is the job to produce the best product possible or is it to help clients make the best possible use of its products?

There are, of course, no right or wrong answers concerning which values to choose. While most centers will want to embrace and communicate I/UCRC values like industry relevance, cooperation, and teamwork, there are successful centers with authoritarian management styles just as there are successful centers with democratic management styles; there are successful centers that treat their industrial members as part of an extended family and there are successful centers that view their industrial members as a customer base. It is the communication of the chosen values, rather than the values themselves, that is the hallmark of a successful center, and that communication must begin with the Center Director. This position must communicate what the center stands for to both the center staff and the outside world. What are its core values? While there are many means for accomplishing this, three rules (or opportunities) seem foremost.

Use the Socialization Process to Communicate the Corporate Culture

This is a key example of watch what we do, not what we say. New staff and graduate students will learn more about center values from observing how their colleagues interact, how the industrial members are treated, and how students and the professional staff relate than they will from speeches. Centers are high turnover organizations; students, faculty, and IAB members are continually joining and leaving the center. Research indicates that the initial weeks of contact are a critical period for the manager to exert influence and that this influence wanes after the first month or so. This means that recruiting contacts, semi-annual meetings, the hiring process and early training are especially vital in transmitting the center's values.

Link Specific Behaviors with Center Values

By definition, values are abstract concepts, but they can be made concrete by linking them with specific behaviors that model the value. For example, a center that believes itself to be run democratically needs policies and procedures that allow everyone to have his or her voice heard. A center that is committed to seeing its research commercialized might have a checklist that contains all the steps it will take once the research result is transferred out of the center to the IAB firm. A center which believes in team work will set aside some funding for multi-investigation projects. Once again, communication need not always be in the form of words.

Maintain an Open Door Policy

The easiest way to stifle communication is to let word get out that top management isn't interested. An open door policy doesn't mean that literally, but it does mean that the organization has a procedure (e.g., suggestion box, anonymous e-mail, specific times) that allows all staff, and in the case of centers, members, to make suggestions and vent their frustrations. The evaluation system described in Chapter 7 and elsewhere is an example of this approach. All successful organizations know that good ideas can come from any member and many corporations have employee incentive programs designed to encourage communication of ideas.

Information Flow Within the Organization

Perhaps the most efficient way to conceive of an organization's paper flow is through a table or matrix. The I/UCRC Information Flow Matrix presents a detailed listing of task categories with its producers and recipients (Figure 7-1). It provides a quick overview of a center's information flow. More detailed tables may be produced for each subtask.

However, communication involves more than routing patterns. A Center Director also must understand factors which facilitate or impair the flow of information. The following five strategic principles are rules of thumb for managing that flow.

The More Links in a Communication Chain, the More Likely That the Message Will Get Distorted

This argues for shorter chains or feedback mechanisms to ensure accuracy. For example, I/UCRCs may want to communicate directly with bench level scientists at their member firms while such communications may typically be transmitted through IAB representatives or managers. In order to avoid the distortions that such communication links may generate, centers might encourage IAB firms to send bench scientists to the semi-annual meetings, request that center researchers give at least one symposium a year at each member facility, secure distribution lists from member firms so that research reports can be mailed directly, or make reports available via computer bulletin boards.

The Form in Which the Information Is Presented Can Be As Important As Its Substance

In order to encourage high standards for both quality and presentation, Appendix 7-5 contains guidelines for preparing technical

Figure 7-1 Information flow matrix.

	Semi-Annual Meeting	Formal Reports	Internal Communications	External Communications
Center				
Staff	P	P	P/R	P
Faculty	P/R		P	
Students	P/R		P	
University				
Administration	R	R	R	R
Financial	P/R	P/R	P/R	
Departments	R			R
Public Relations				P
Membership				
Technical Reps	R			R
Management	R			R
Scientists	R			R
Sponsoring Orgs.				
NSF	R	R		R
State	R	R		R
Other	R	R		R
Public				
Other Centers				R
Member				R
Public Media				R

Key: P = Producer of Communication R = Recipient of Communication

presentations. Unfortunately, the rule governing form and content is uni-directional: splashy graphics and typesetting cannot turn poor results into award winning research, but unintelligible graphs and an illegible typeface can fail to communicate even the best research.

The Message Is Never Independent From the Source

Communication is a social act; as such, knowledge of the sender's identity is usually a vital piece of information for our interpretation of the message. The successful manager must know how to manipulate that context, (e.g., the differences among a communi-

cation from the Center Director, Professor Smith, or Jack although all are the same person) and when it must be masked entirely (e.g., blind reading of proposals, frank personnel appraisals).

The Quality of Information

The quality of information in a message decreases as it moves further away from the sender's expertise and experience. Professor Smith may be the ranking expert on chemical lasers, but is there any reason to think that his memo on the office's new mailing equipment deserves to be given expert status. Do not confuse the message with the messenger. As Center Director, you need to be aware of your staff's qualifications and expertise.

Be Aware Of Each Individual's Information Load And His or Her Ability To Handle It

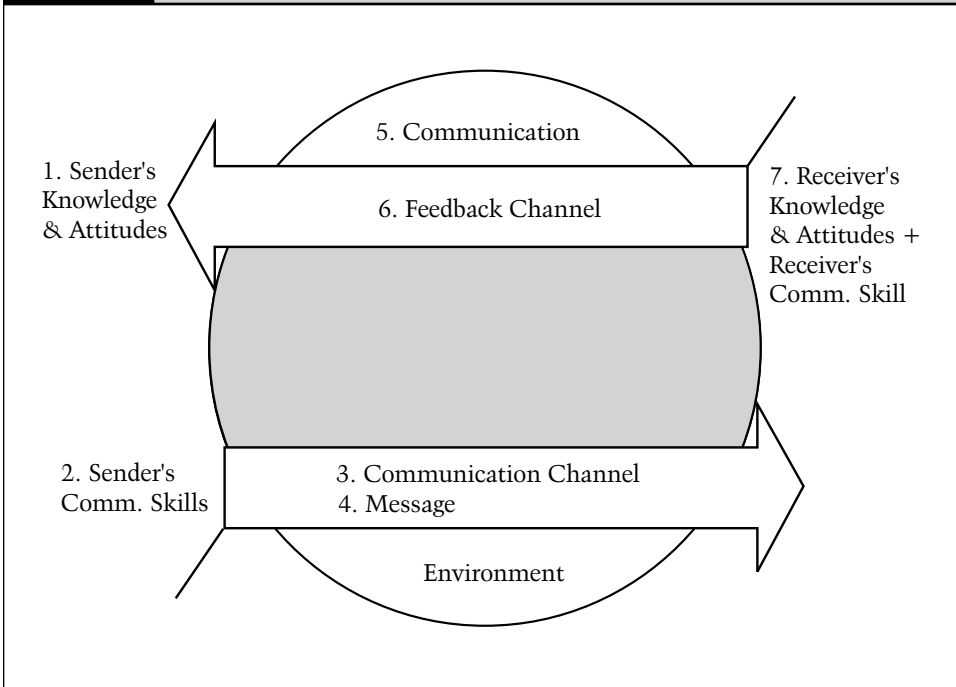
Cases of information overload can often be ameliorated by answering a few specific questions: Does the organizational structure create information bottlenecks? For example, must all reports from PIs to the IAB go through the Center Director? Does everyone on routing lists really need the information? Can the decision-making process be streamlined? Can a decision regarding allocating new funds be handled by conference call or fax vote instead of arranging a meeting? Are reports being generated for which there is no real audience? Can reports that are being prepared for different audiences (e.g., NSF and University administrators) be merged to prevent duplicated effort?

Unfortunately, following these principles does not ensure a well-oiled communication machine. Yet, failing to heed them will almost certainly guarantee an organization that does a poor job of communicating.

REQUIREMENTS FOR INTERNAL COMMUNICATIONS

Even if an organization's values and information flow design support quality communication, defining that quality remains. Too often, we focus solely on the message itself. If we prepare a memorandum, or talk, or proposal we assume effective communication is bound to occur. Unfortunately, this fails to acknowledge the interactive nature of communication.

The following seven clusters of suggestions that correspond to the seven numbered steps in Figure 7-2 are designed to help you maximize your communication opportunities. No one has the

Figure 7-2 The seven components of communication.

time to review all the steps every time they need to communicate. Awareness of their existence, as well as explicit referral for those critical communication chores, especially when you're having a communication problem, will help ensure that you've maximized your messaging abilities.

1. Inventory your own knowledge and attitudes regarding the information you wish to communicate. Before beginning "external" communication, have an internal dialogue: What is the purpose of my message? Why am I communicating? Is my purpose to simply convey information (e.g., report to NSF), persuade someone of my point of view (e.g., sell a new recruit), begin a dialogue (e.g., refine a research program)? Do I understand all the ramifications of these ideas?
2. Inventory your ability to formulate and send messages. Given the type of message you need to send, which medium do you feel most comfortable using. In considering your communication strengths, you also need to consider the suitability of different types of communications channels.

3. Choose the best medium to express your message. There are sixteen recognizable methods for communication. Each lends itself to different kinds of situations. These include inter-personal channels (face-to-face, telephone, electronic mail, voice mail, teleconference, and hotline) which are high on potential for feedback, written communication channels (memorandum, postal mail, facsimile, publications, and bulletin boards) which are high on the breadth of information they can transmit and their scanability, and presentational channels (group meetings, formal presentations, audio-video tapes, computer conferences, and video conferences) which can be expensive but can accommodate great breadth and complexity and allow group interaction. Virtually all can play a role in a center's communication strategy but each must be applied to the appropriate communication need.
4. Produce the simplest, clearest message possible (see section titled *Message Quality Checklist* in this chapter).
5. Inventory the communication environment. There is no sense in preparing an excellent message if it can't get through to the intended receiver. Successful communicators need to assess the potential blocks (e.g., time, subordinate screening, delays in feedback) in the environment and devise strategies for avoiding them.
6. Leave a communication channel open for feedback. This may be the most important and overlooked aspect of effective communication. Good communicators are good listeners. At its simplest level feedback lets you know that your message was received. Feedback shows the receiver that you are open to ideas, and it gives you an opportunity to learn how the ideas contained in your message might be improved and how you may be able to improve your communication skills. This principle is just as important for written communication as it is for face-to-face oral communication. There are many opportunities for centers to demonstrate that they are listening and open to suggestions.
7. Understand the receiver's ability to receive your message. The biggest mistake a communicator makes is to think that just because he has created a simple, clear message, his work is done. Effective expression is not equal to effective communication. Successful communicators understand that the receivers of their messages are really interpreters of

their messages. For example, pitches to prospective corporate members must take into account the roles that different individuals play at the corporation: opportunities for technical information exchange may be what the research staff is interested in, while financial managers may be more interested in tax and overhead benefits.

Message Quality Checklist

The following are tried and true ways of avoiding distortion of your message. Reviewing these guidelines (and sharing with center staff periodically) should help improve your communication efficiency.

Decide Your Real Purpose in Communicating

Try to make the message and the intent consistent. Is the purpose simply to convey information (e.g., the results of a study) or persuade someone (e.g., convince a firm to join the I/UCRC) or begin a dialogue (e.g., what direction should we take in the future?). Each purpose dictates a different tone and content to the message. As described above, purpose will also affect the choice of communication channel (i.e., formality vs. personal warmth).

Reduce the Number of People Through Whom a Message Must Travel

It is better to spend some time deciding who is the best person to receive your message than just sending it to a large firm and hoping it gets to the right individual. Distributing reports directly to a member's technical staff may ensure valuable information gets to where it can do the most good.

Orient Your Message to a Particular Receiver

Many faculty are used to making presentations to other academics who may be interested most in theoretical results. Alternatively, industrial scientists may be interested more in the tools embedded in a research project. Good communication requires being able to understand the receiver's motivations and needs.

Limit the Amount of Information in Your Message

Most I/UCRCs get good results using short report and presentation formats.

Preview and Review the Material in Your Message

Practice the rule of three: Tell them what you're going to tell them, tell them, and tell them what you told them.

Simplify Your Messages

Distinguish between important and unimportant information. You cannot tell your audience everything you know about a research project in 15 minutes. Who is the audience? What will be of most interest to them? What's changed since the last time you spoke?

Report Details In Order

Use some form of consistent organization such as chronological, spatial, or cause-effect sequencing. Place important information at the beginning or end of your message, never in the middle.

Highlight Important Information

Use headlines, type sizes, and key phrases to make the key points.

Use Visuals for Oral Presentations

When making oral presentations slow down, use handouts, and make sure that all slides/overheads are visible and understandable from the back of the room.

Consider the Consequences of Your Communication

What if everything you propose is attempted? How will it affect you? the organization? Never "open the door" unless you are willing to take suggestions seriously. For instance, don't solicit input on the center's research agenda unless you're willing to follow it.

Summary

Up to this point we have tried to convey some of the general principles of effective communication and how they might apply to a cooperative research center. In the remainder of the chapter we will discuss strategies for improving critical I/UCRC communication transactions in four areas: the semi-annual meeting, formal reporting, internal communications, and external communications. Each section will include a table which lists significant communication transactions or tools. Where appropriate, copies of tools or communication specimens are included in the appendix.

For instance, Appendix 7-1 is a master calendar of communication commitments.

THE SEMI-ANNUAL MEETING

The semi-annual meeting focuses interaction between the university researcher and the IAB member. Since most industry and university communication takes place at the IAB meetings, it is natural to conclude that IAB meetings are the single most important communication opportunity for a center. In order to maximize this opportunity, we have identified the aspects of a successful meeting. Figure 7-3 provides a list of meeting communication transactions and related tools.

Planning and Preparation

Good meetings just don't happen, they are the result of meeting logistics (time and location, facilities, materials and supplies) and advance communications. Formal letters of invitation signed by the Center Director should be sent to IAB members, representatives of outside agencies, university officials, and guests, eight to ten weeks before the meeting. One month before the meeting, an interim information package containing a final meeting agenda, a sheet detailing transportation and lodging options, a membership update, and any briefing papers that attendees are expected to read before the meeting, are sent to attendees.

Preparation of the agenda is crucial (see Figure 7-4). All IAB meetings should give members a status report on the center's operations and technical information and ask for feedback on the current and proposed research problems, opportunities and initiatives.

Technical Presentations

The major reason for semi-annual meetings is the technical presentations. The appendix provides suggestions to make certain they are optimal. As the Center Director, you need to establish a format and ensure enough lead time so that all presentations are polished by the time of the meeting. One large center suggests that presenters and schedules must be finalized six weeks before the meeting to print the program in time. Hard copy materials are due to the Center Director three weeks before the program is finalized. Mail presentation materials two weeks before the meeting.

Figure 7-3 Semi-annual meeting communications matrix.

WHAT	WHO	WHY
Meeting Checklist (7-2)*	Center Staff	Account for all meeting details.
Facility Checklist (7-3)	Center Staff	Detailed list for venue.
Supplies Checklist	Center Staff	Detailed list for material and supplies.
Meeting Agenda	Director	Overall meeting plan and objectives.
Research Proposals (7-4)	Faculty, Students	New initiatives for IAB consideration and selection.
Presentation Guidelines (7-5)	Faculty, Students	Report status of ongoing research.
LIFE Forms (2-5 and Chapter 5)	All	Assessment of new and ongoing research.
Poster Feedback (7-6)	IAB	Feedback to student presenters.
Closed IAB Meeting (7-7)	IAB, Eval., NSF	Overview of center administration and research.
IAB Business Agenda (7-8)	Dir., IAB, Eval, NSF	Center status, select new projects, IAB feedback.
IAB Minutes	IAB Chair	Record of meeting.
Additional Activities	All	Meetings may include scheduled activities such as workshops, demonstrations, and special talks designed to facilitate the transfer of information.
Informal Meeting	All	Successful meetings include unscheduled time for networking and exchange of information.

*Appendix references in parenthesis.

Videotaping rehearsals are scheduled two weeks prior to the meeting. Finally, posters are due the day before the meeting begins. A map showing the location of individual posters is distributed at the morning IAB meeting.

A 15-minute technical presentation for all projects before the entire group is not written in stone. While we recommend brief

Figure 7-4 Typical semi-annual meeting outline.**FIRST DAY:****Morning Session**

Welcome, Introductions, Opening Remarks, Review of Schedule

Technical Review

Reports of On-going Research

(Allow between 10 and 20 minutes with time for questions and written comment.)

Brief break mid-morning, Networking

Noon

Lunch and Networking

Afternoon Session

Presentation of new proposals and/or research reports

(Allow for completion of LIFE forms, analysis, and posting.)

Brief break mid-afternoon, Networking

Poster Session, On-going Research and/or New Research Proposals

Evening Session

Dinner and Networking

(Some Centers have special speakers.)

SECOND DAY**AM Session**

Closed Meeting with IAB and NSF program manager and evaluator

(Held before IAB meeting.)

IAB Business Meeting

Note: Some Centers meet for longer than a day and a half, depending on size of the Center, the number of research projects, etc.

one page executive summaries for all projects, many centers have experimented with projects presented as tutorials, sessions run in parallel, poster sessions for projects for which there is no time or reason for a full technical presentation, videos, presentations by IAB members about their firm's research, and non-I/UCRC speakers. In principle, there is no restriction on presentations except that

they communicate what needs to be communicated, by whom, for whom, and for what purpose.

Operational Activities

Business meeting topics include budget; personnel including center staff, faculty researchers, and graduate students; research status and direction; and any changes in the bylaws. Because the business meeting is an established part of every semi-annual meeting, it should be possible to routinize the reporting of information beforehand to allow for decision making at the session. For example, a summary overview of the source and application of funds and revenue available for new project support should indicate to the IAB how much funding is available for allocation to new research. Likewise, a chart of center statistics showing past performance and current status (e.g., inputs—members, faculty, graduate students, staff, and outputs—articles, patents, conferences) is useful. Mailing a version of the Evaluator's Annual Report well in advance of the meeting and allowing the center evaluator to make a brief presentation regarding the process questionnaire results also helps. Orientation of new IAB members can be facilitated by early mailing of materials and arranging for new members to arrive half a day early to meet with center staff. Assigning a knowledgeable person to stay with the new member during the meeting is advisable. Business meetings should be short and simple. Meeting time is too valuable to waste.

Industry Feedback

Good meetings require formal and informal industry feedback. Of course, the most obvious is industry reaction to technical presentations. I/UCRCs have developed a Level of Interest Feedback Evaluation (LIFE) form and process for assuring such communication (see Chapter 6). The appendix has a LIFE form that may be customized for poster or technical presentations. Using the forms (see Chapter 6) to track levels of IAB interest may be a good way to determine their commitment to your center.

Less formal, but no less important, is the opportunity at meetings to receive industry feedback regarding new policies, research directions, and funding initiatives. Listening is important. If you are doing more than a quarter of the talking, you're not doing a good job of listening. Do not monopolize the meeting explaining your ideas, proposals, and initiatives. They should be written out

and distributed prior to the meeting. The focus of the meeting should be answering questions and exploring alternatives.

Finally, the entire meeting must be seen as an opportunity to swap ideas. The savvy Center Director knows that sometimes presentation structure can get in the way of conversation, so good meetings have plenty of unscheduled time built into them. Unscheduled does not mean unproductive.

Conducting the Meeting

An agenda is like a road map, but it doesn't tell you how smooth the trip will be. The quality of the meeting is a function of the interactions that occur.

- Don't deviate from the pre-meeting agenda. Participants arrive with expectations. The interim information package gives them time to plan which sessions to attend and which to skip; so avoid changes. At worst, many changes can torpedo the whole meeting by creating confusion.
- Consider various modes of presentation. Sitting for more than a day and being talked at is a prescription for listener burn-out. Are there presentations that can make use of different communication media? Even if most of the presentations must be lectures, how can feedback be ensured? A passive listener is often a bored and ineffective listener. Consider questions, discussion groups, bulletin boards to solicit interactive participation.
- Practice, Practice, Practice. While every meeting has its own unique dynamics, the typical IAB meeting is a series of research presentations. Each of these presentations should be prepared, rehearsed, video taped if possible, and polished. Use the information for effective research presentations.
- Effective Chairperson. Effective chairing of a meeting requires attention to both tasks and human relations. Starting on time and keeping to the agenda are the bare bones tasks. Participation can often be facilitated by making a clear, initial statement of the meetings goals, emphasizing that all contributions are valuable and probing to clarify ideas or concerns.

Use the final session to come to closure by restating the objectives, synthesizing the key accomplishments, explaining the next actions, and thanking everyone for their participation and reminding them when the next meeting will be held.

The Informal Meeting

Of course, as with most meetings, quite a bit of the important business is the result of one-on-one conversation between formal sessions. Centers must program as much informal time as possible (pre-meeting cocktail hours, coffee breaks, PI-IAB networking sessions, and group dinners) and try to capitalize on the communication opportunities. This type of informal communication puts a premium on listening skills. Whether you are talking to the IAB chair or a first-year graduate student, effective listening is important. The following principles should help ensure you receive the most information from each communication opportunity.

Keep an Open Mind

Remember that thought is faster than speech so it is always possible to jump to erroneous conclusions. While difficult, try to suspend judgment until you've heard and understood the speaker's main point(s). Fight against stereotypes and past, unpleasant associations. The IAB representative from Universal Widgets may generally be a cranky complainer but he may have something very valuable to say.

Listen for Ideas

In reading, we've taught ourselves to skim the passage until we reach the central idea. Listening has no skim button, therefore it is essential not to get bogged down in anecdote or embellishment. When in doubt, always ask politely, "What's the most important idea you want me to take away from this conversation?"

Resist Distractions

IAB meetings can be like three ring circuses. There is always some distracting noise, or activity, or interruption. Part of being a good listener is putting co-conversationalists at ease, letting them know that they have your undivided attention. This probably means that conversations will have to be short. Give each person you talk to your maximum attention and offer to speak with them at a future time if it is not possible to conclude the conversation in the time allotted.

Use Summary Notes

The faintest writing is sharper than the brightest memory. Take notes during the conversation that include the speaker's name

and a one line summary at the end of a conversation to allow for follow-up.

Meetings are complex functions that can take on a life of their own. Experience has shown that early planning, paying attention to details, rehearsing presentations, facilitating feedback, and listening are the important keys to a successful IAB meeting.

FORMAL REPORTING REQUIREMENTS

Formal reporting requirements need to be filed according to a well-established schedule. The key to these communication tasks is to develop a system for routinizing them (see Figure 7-5). In the NSF program, the Evaluator Annual Report, Process Questionnaire, and Exit Interview are the center evaluator's responsibility. The Director's Questionnaire and Proposal Renewal are the responsibility of the Center Director, Evaluator, and staff. Other government programs will have their own reporting requirements. Keep to a defined annual schedule. Begin collecting process data in the summer so the report will be ready for inclusion in the renewal proposal deadline. Review last year's reports, the Center Director's

Figure 7-5 Formal reporting communications matrix.

WHAT	WHO	WHY
Evaluators Report (8-1* and Chapter 8)	Evaluator	Progress, challenges, opportunities facing center.
Process Questionnaire (Chapters 6, 8)	Evaluator	Data from faculty and IAB, expressing their views of center operation.
Enter Interview (7-9)	Evaluator	Establish baseline expectations for new member.
Exit Interview (Chapter 6)	Evaluator	Ascertain reasons for leaving.
Director's Report	Director	Basic data regarding center operation.
Proposal Renewal	Director, Evaluator	Continue NSF funding. Add yearly evaluator report.

*Appendix reference in parenthesis.

report should not fluctuate much year to year. Prepare important documents for IAB meetings with enough lead time to ensure a proper review, revision, and production cycle. Maintain a distribution list so that all relevant parties receive the required reports.

INTERNAL COMMUNICATIONS

Budgets, personnel evaluation, and progress reports are internal communications with which every organization must comply. These communication tasks present no special problems (see Figure 7-6). However, other internal communication tasks are complicated by the fact that the I/UCRC has faculty members from many departments, its ultimate goal is the commercialization of research, and its audience is both the research community and the IAB.

On most college campuses, departments are autonomous. They make independent hiring and tenure decisions, secure outside funding from different sources, and often report to different ad-

Figure 7-6 Internal communications matrix.

WHAT	WHO	WHY
Proposal Summary (7-10)*	Researcher	
Quarterly Report (7-11)	Researcher	Monitor research progress report.
Annual Report (7-12)	Researcher	Present project results, opportunities to IAB.
General Administrative	Center Staff	Budgets, contact lists, lists of publications, general record keeping, reports.
Informal Contacts	All	Complete record of contacts with member firms (visits, correspondence, e-mail, phone, conferences).
Variance Analysis	Director, Assoc. Dir., Evaluator	Significant variances in budgets operating and research targets, must be examined and appropriate action taken.

*Appendix reference in parenthesis.

ministrative units. The successful I/UCRC must conduct meaningful interdisciplinary research despite academic autonomy and competition. Center culture should emphasize that all ideas, from any quarter, are valued and that research itself takes precedence within the I/UCRC over more parochial concerns. One method for doing this is brainstorming. Brainstorming adheres to these rules: (1) ideas are generated, not evaluated, (2) the more ideas the better; (3) building on the ideas of others is encouraged, and (4) far out ideas are welcome. Additional strategies include seminars, co-authoring papers, guest lecturing in colleagues classes, shared responsibility for theses committees, and assigning graduate students from different disciplines to the same research project. Judicious use of a research tracking report should also help. In an interdisciplinary world, the isolation of autonomous university departments has long outlived its usefulness. I/UCRCs communicate that message.

Since I/UCRC research supports the field and commercialization efforts, two communication strategies are necessary. First is the formal communication that takes place between the IAB and the university researcher: the initial research proposal, the use of LIFE forms at the meetings, the preparation of research reports. Each of these is designed to inform the IAB of progress and intentions, and to elicit comments about how to proceed in order to best meet industry's needs. Second is I/UCRCs' informal communication regarding research: talks at the industrial site, site and reverse site visits, industry staff spending an extended time on campus, short courses, and, of course, poster sessions. The wise Center Director realizes that informal communication need not be haphazard communication. Taking informal communication seriously by regularly contacting each IAB member each quarter, keeping a record of that communication, and being responsive to queries is one good way to avoid unpleasant, formal communication. These communication activities make sure that I/UCRC research is cooperative research.

EXTERNAL COMMUNICATIONS

External communications transcend a given center and the I/UCRC program. It includes administrative reporting to the university, newsletters, press releases, videos and public outreach (see Figure 7-7).

The development of a center newsletter is an important communications decision (Figure 7-8). It serves to inform readers about

Figure 7-7 External communications matrix (university, other centers, institutions, prospective sponsors)

WHAT	WHO	WHY
Administrative Oversight	Director	Status of center within the university.
Patents and Legal	Director	Status of Intellectual Property, IAB membership.
NSF TIE Grants	Researcher	Coordination of projects between centers.
NSF Debriefing	Director, NSF	Feedback following semi-annual meeting.
Newsletters, Brochures (7-13)*	Staff	Center accomplishments, plans.
Technical Publications	Researchers	Research accomplishments.
Public Education, Publicity	Staff, Director	Center accomplishments.

*Appendix reference in parenthesis.

Figure 7-8 Contents of a typical newsletter.

<p>Basic</p> <ul style="list-style-type: none"> ■ The name of the center—the address/ phone. ■ The name (and logo) of the university. ■ Listing the center as government sponsored (e.g., NSF I/UCR) center. ■ Listing of sponsors—their locations/ phones—the names of the IAB members. ■ Listings of the center faculty, students and staff. <p>News</p> <ul style="list-style-type: none"> ■ Information about center publications and instructions about how to obtain them. ■ Brief summaries of center research projects. 	<ul style="list-style-type: none"> ■ Topical articles by center faculty. ■ Invited articles by sponsor representatives. ■ Listings of recent publications and Center patents. ■ A calendar of center events—listing of professional meetings and conference notices. ■ Recent activities of the research faculty and student researchers. ■ Announcements about new center sponsors and center personnel. ■ Information about special center educational programs and workshops. ■ Feature articles about technology trends and breakthroughs in the field. ■ Messages from the Center Director.
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both highlights and progress of center research and activities. A newsletter can be circulated easily by the sponsors' representatives to internal work groups or teams, etc. and/or via a regular mailing list. The center newsletter also provides a series of concise measurement of the research accomplishments and activities of the center that might not be communicated in any other way. A newsletter can be used to promote the center to potential sponsors, the university and the public in general. It may also enhance a feeling of belonging among center students, staff, etc. who may not otherwise be aware of the big picture. Typically, newsletters are published semi-annually or quarterly. The frequency depends upon the needs of the center, the resources available, and the complexity and length of the newsletter. Also to be considered are the downside concerns about a center newsletter. Will the benefits of publishing a regular newsletter pay off relative to the effort and resources required? Is the center newsletter a duplication of effort? Will the center newsletter find enough new information or articles after the first few editions? A newsletter that peters out may cast a negative image on the entire center.

Public education and relations are the things with which the average Center Director has the least experience. Fortunately, most universities have full-time public relations staff and their job is helping you to get your message out.

Campus public affairs officers and video production offices know how to write press releases, informational stories, and produce videos. They also know how to work with researchers. Publicity is a matter of having both the proper material and the proper outlet. Such campus offices have the technical expertise to help you produce the best message possible; they also have the contacts to see that your information gets into the local newspaper or on the local news. But your job is to be clear about your message. Hopefully, the principles discussed in the section titled *Cooperation Requires Communication* in this chapter will help you address this challenge.

SUMMARY

Unlike budgeting, evaluation, or research, which we tend to think of as skills requiring special training, few of us ever bother to study communication. It is simply a given; after all, we've been communicating for as long as we can remember. Yet, if we are honest, we realize that many of our problems (with the Dean, PI, or IAB member) arise from a failure of communication. Sometimes

we fail to make ourselves clear; sometimes we fail to properly interpret another's message, sometimes the communication never happens. The underlying premise of this chapter is that with a little work each of us can become a better communicator. Part 1 has presented some basic strategies for improving overall communication skill levels. Part 2 has harnessed those strategies to the particular needs of an I/UCRC Director. We believe that both parts, together with the appended samples, form a cohesive communication package, and that improved communication will improve center operation.

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APPENDIX 7-1
Communications—Master Calendar
JANUARY

- NSF Director's/ Evaluators Meeting, D.C.
- Complete IAB Oct. Minutes
- Develop Meeting agenda for IAB Apr./Dir. Report
- Give ideas for new research to faculty
- Make arrangements for IAB meeting location, etc.
- Submit Questionnaire data to NSF
- Center Budget Review

FEBRUARY

- Prepare research reports
- Faculty develop new research proposals
- Newsletter preparation
- Advise Administration of IAB mtg.
- Center Budget Review

MARCH

- Mail new research proposals to IAB
- Mail research reports (30 days before IAB meeting in April)
- Send April meeting agenda to all parties
- Mail minutes of Oct. Meeting to IAB
- Meet with Center students about plans and presentations for April IAB meeting

- Meet with students about plans and poster session for April IAB meeting
- Sponsors prepare for IAB meeting
- Center Budget Review
- Evaluator report to Director & NSF

APRIL

- Hold IAB meeting, technical reviews: select new research (L.I.F.E. form)
Center students make presentations and student poster session is held
- Hand out Center Newsletter to IAB
- Report NSF questionnaire results
- Center Budget Review
- Process Outcome data / evaluator's report
- Submit NSF Renewal Proposal

MAY

- Main Marketing/Visits to Sponsors
- Write draft of Minutes of IAB Mtg. April
- Center Budget Review

JUNE

- Main Marketing/Visits to Sponsors
- Old budget year ends
- Center Evaluator's meeting (D.C.)
- Center Budget Review

JULY

- New budget year begins
- Main Marketing/Visit Sponsors
- Submit History to NSF
- Make arrangements for IAB meeting location, etc.
- Center Budget Review

AUGUST

- Prepare research reports
- Complete IAB meeting minutes (Apr.)
- Develop new agenda for IAB Oct./Dir. report
- Newsletter preparation
- Advise Administration of IAB mtg. date
- Center Budget Review

SEPTEMBER

- Send October meeting agenda to all parties
- Mail minutes of April Meeting to IAB
- Mail research reports (30 days before IAB meeting in October)
- Meet with Center students about plans and presentations for October IAB meeting
- Meet with students about plans and poster session for October IAB meeting
- Sponsors Prepare for IAB meeting
- Center Budget Review

OCTOBER

- Hold IAB meeting technical reviews, request ideas for new research from Sponsors.
Center students make presentations and student session is held.
- Hand out Center Newsletter to IAB
- Administer NSF questionnaires
- Deliver History to IAB
- Center Budget Review

NOVEMBER

- Write NSF Grant renewal (or on anniversary date)
- Write draft of minutes of IAB meeting
- Center Budget Review

DECEMBER

- Deadline for new research ideas from sponsors (mid December)
- Center Budget Review

APPENDIX 7-2**Center Semi-Annual IAB Meeting Checklist**

Note: Some tasks will vary.

Category	Item/task	Deadline/By Whom
Meeting items	date and location	
Meeting items	day 2 date and location	
Meeting items	arrange for mike, amplifier, ext. cord	
Meeting items	arrange parking / obtain parking pass	
Invitations/letters	send 1st ltr of invitation to paid members	
Invitations/letters	send early ltr notifying payment status	
Catering	reserve dinner facility	
Rooms	reserve meeting rooms	
Invitations/letters	verify payment status of members	
Research reports	send researchers notice re: Research Reports	
Research reports	obtain center statistics for meeting booklet	
Research reports	prepare budgetary info. for meeting booklet	
Catering	arrange break/lunch catering	
Posters	obtain poster materials for researchers	
Catering	arrange payment of caterer	
Catering	request entertainment expense permission	
Research Reports	complete projects chart for meeting booklet	
Invitations/letters	send invitations to Center faculty/other	
Research Reports	make meeting booklet of reports/send to copy cntr	
Research Reports	edit research reports	
Newsletter	obtain copy from director/s	
Certificates	arrange for printing	
Invitations/letters	obtain RSVPs from faculty and students	
Invitations/letters	send second letters w/agenda and reports	
Newsletter	edit articles, prepare camera-ready copy	
Presentations	arrange rehearsals and send reminders	
Catering	finalize faculty and students RSVPs/dinner	
Certificates	arrange for framing	
Newsletter	copy newsletter/send to copy center	
Misc.	make hotel reservations as requested	
Misc.	update center publications list	
Certificates	finalize membership certificates/framing etc.	
Posters	posters due from students	
Late news	material due from students	
Presentations	research presentation material due	
Posters	arrange for set up	

Category	Item/task	Deadline/By Whom
Misc.	assemble binders	
Misc.	compile list of attendees	
Name tags	prepare from list of attendees with extra blanks	
Packets	assemble packets	
IAB meeting	prepare copies of minutes of prev. IAB mtg.(confidential)	
Report	prepare directors report for IAB meeting	
Posters	copy posters	
Posters	set up at meeting location	
Misc.	prepare maps, pads, pencils, packets for mtg.	
Forms	prepare LIFE forms/feedback forms	
Meeting	prepare late list of attendees	
Meeting	prepare receipts for attendees/deposit checks	
Meeting	set up signs for meeting if needed	
Meeting	set up name tags, packets etc. for pickup	
Meeting	collect unused parking permits/name tags	
Meeting	collect materials and prepare for next cycle	

APPENDIX 7-3
Facility Checklist for IAB Meetings
Space Check Out

- | | |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <input type="checkbox"/> size and shape of space | <input type="checkbox"/> access to meeting room(s) |
| <input type="checkbox"/> electrical outlets | <input type="checkbox"/> lighting |
| <input type="checkbox"/> microphone outlets | <input type="checkbox"/> name of custodian, engineering,
where to be reached |
| <input type="checkbox"/> acoustics | <input type="checkbox"/> telephone access for messages
and calling out |
| <input type="checkbox"/> doors | <input type="checkbox"/> exhibit space |
| <input type="checkbox"/> bathrooms (where,
number can accommodate) | <input type="checkbox"/> wall space for newsprints, etc. |
| <input type="checkbox"/> stairs | <input type="checkbox"/> emotional impact (color,
aesthetics) |
| <input type="checkbox"/> elevators | <input type="checkbox"/> access to photocopier |
| <input type="checkbox"/> heat/cold regulation | <input type="checkbox"/> others |
| <input type="checkbox"/> ventilation | <input type="checkbox"/> |
| <input type="checkbox"/> parking facilities (number
and access) | <input type="checkbox"/> |
| <input type="checkbox"/> registration area | <input type="checkbox"/> |
| <input type="checkbox"/> location | <input type="checkbox"/> |
| <input type="checkbox"/> transportation, access
to facility | |
| <input type="checkbox"/> room set-up arrangements | |

Materials and Supplies

- | | |
|-----------------------------------------------|---------------------------------------------------------|
| <input type="checkbox"/> name tags/tents | <input type="checkbox"/> pamphlets |
| <input type="checkbox"/> small tip felt pens | <input type="checkbox"/> visual aids |
| <input type="checkbox"/> large tip felt pens | <input type="checkbox"/> masking tape |
| <input type="checkbox"/> paper clips | <input type="checkbox"/> resume of resource people |
| <input type="checkbox"/> crayons | <input type="checkbox"/> directional signs (to meeting) |
| <input type="checkbox"/> pins | <input type="checkbox"/> chalk (various colors) |
| <input type="checkbox"/> scissors | <input type="checkbox"/> file folders |
| <input type="checkbox"/> stapler | <input type="checkbox"/> others |
| <input type="checkbox"/> glue | <input type="checkbox"/> display materials |
| <input type="checkbox"/> newsprint paper | <input type="checkbox"/> instruction sheets |
| <input type="checkbox"/> scratch paper | <input type="checkbox"/> others |
| <input type="checkbox"/> carbon paper | <input type="checkbox"/> |
| <input type="checkbox"/> reprints of articles | |
| <input type="checkbox"/> copies of reports | |
| <input type="checkbox"/> books | |
| <input type="checkbox"/> posters/charts | |

APPENDIX 7-4**Presentation Guidelines and Checklist for Graduate Students**

The opportunity to make a technical research presentation before a group of industry representatives is not afforded to all graduate students. **When you make your presentation about your research which is the primary goal**, you are also presenting and selling yourself. Even though you may not be hired by any one firm in the center, you are practicing for the future and the contacts you make may be very valuable. Don't sell yourself short or fail to recognize the opportunity.

— **Outline your talk with the guidance of your faculty advisor.**
(Appendix 2-5)

- For your **talk** and your **overheads or slides**, include: Your **name** and your **advisor's** name; **Title** of the research; **Goals/objectives**; **Relevance** to industry, and to center goals, plans or road maps of technology in your field of research; **Progress** to date or since last time; **Difficulties** encountered; **Results**; **Plans** for the future; **Acknowledgments**, e.g., the center for supporting the work, individuals or company or companies for providing assistance, materials, etc. Be sure that your talk can be given within the time indicated. Allow for questions. (See presentation feedback sheet.)
- At the end of your talk, **ask if there are questions**. This question and answer interaction is very important for both your research work and yourself. It is helpful if you arrange with someone to take notes for you on the questions for future reference.

— **Preparation of your slides or overheads.** (Use information which is applicable.)

- Check for readability in the place you will make the presentation.
- Keep the phrases short and to the point. Minimize the use of complicated formulas.
- Check the sharpness and readability of the slides or overheads from where the audience will be sitting.

- Provide **copies** for distribution to the audience before your talk or according to center deadlines.
- Watch for dark slides. If it is necessary to reshoot your slides, “bracket” them first to save time. It is helpful to the projectionist to have a brief description of slides available if, during the questioning, you need to instruct the projectionist to switch to it.
- It works best to advance your slides yourself with a hand held control.
- Experience has shown that it is best to use a microphone especially in large settings; the voice does not tend to drop off when speakers turn to look at their slides or overheads if a microphone is used.
- Check to see if others use a consistent graph plot format.
- Ask questions, especially of students who have presented before. Team work is essential.
- Have your name, academic background, research topic and expected date of completing your program up front in your slides/overheads.

Rehearsal and Presentation.

- Complete the dry run in the actual setting if possible; Rehearse 3 times if possible before a critical audience, e.g., professor/peers.
- Use a pointer (metal, wooden or laser) with overhead or slides on the screen. **Do not** use the pointer, your hand, or pen directly **on the overhead screen projector. Use a pointer on the screen.** Position yourself with your best side to the screen and face your audience, e.g., right-handed stand to the right of the screen as the audience sees you. Dress professionally.

Technical, Poster and/or Review, Question and Answer Sessions.

- Have research notebooks available for reference.
- Take notes and write down who asked the questions.
- Ask for business cards at review and poster for future reference.

- Have your name, academic background, research topic, and expected date of completing your program posted.

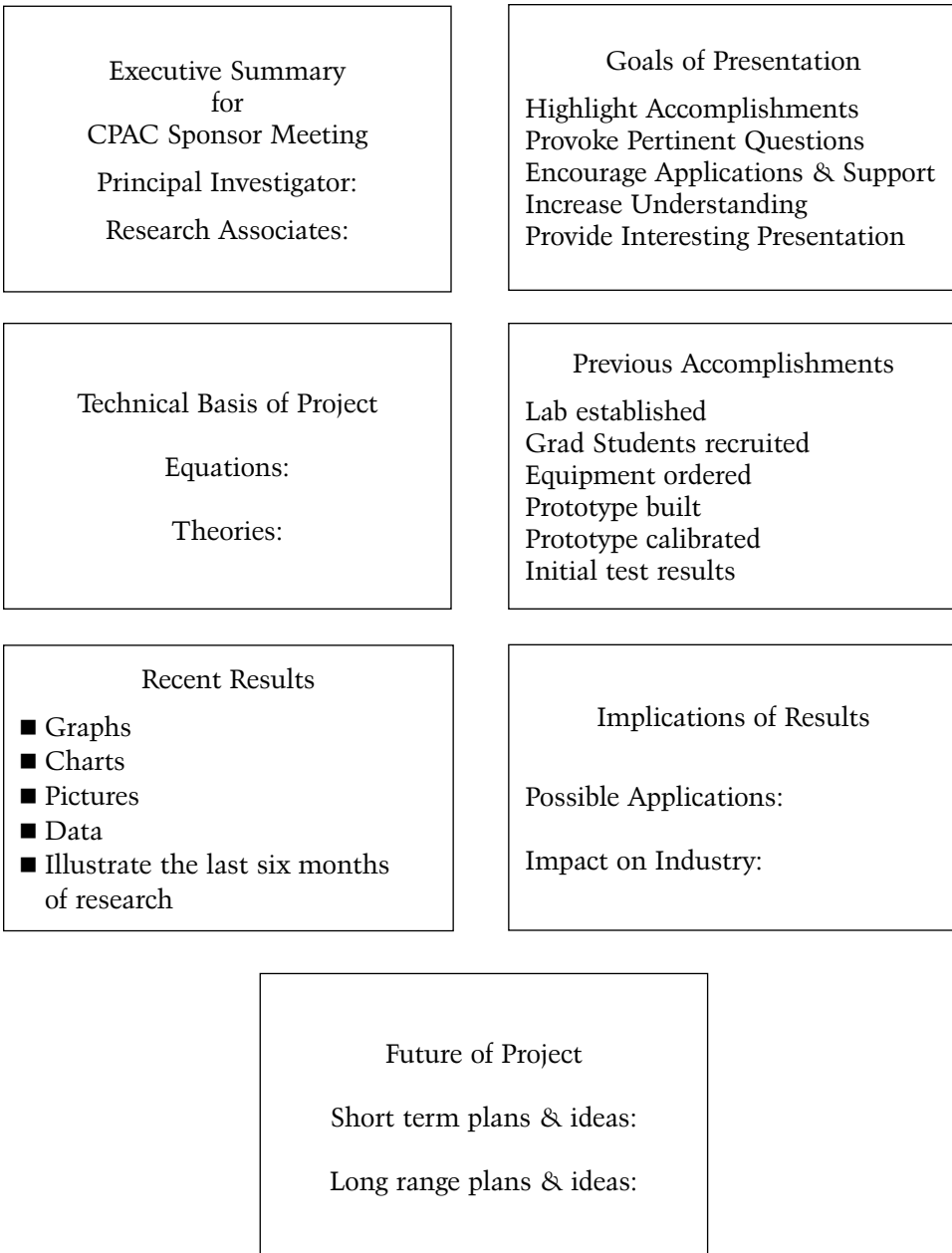
___ **Debriefing.**

- Meet with your faculty advisor to review the results and make plans for the future. Also obtain feedback and notes from your student partner.

___ **Use of the presentation feedback sheet is suggested.**

- This can be used in both rehearsal and in the actual presentation.

___ **Other ideas, add below:**

APPENDIX 7-5**Executive Summary for Technical Presentation***

*Also see Appendix 7-10, which is more generally used.

APPENDIX 7-6

Poster Session Feedback

(For use by Center director faculty, students, IAB members, and industry technical advisors.)

Project Id. Number: _____ Date _____

Name of Researcher: _____ Advisor: _____

Title of Research _____

Research Goals/Objectives presented: Yes ___ No ___

Relevance shown to industry, Center goals, long range plans, or technology roadmaps: Yes ___ No ___

Comment: _____

Progress to date or since last time included: Yes ___ No ___

Difficulties encountered mentioned: Yes ___ No ___ Not applicable ___

Comment: _____

Results presented: Yes ___ No ___

Plans for the future included: Yes ___ No ___

Questions/suggestions/comments about the research:

Name: _____ Representing _____

Phone _____

APPENDIX 7-7

Outline for a Typical Closed Meeting

Introductions and meeting usually conducted by the current chairperson of the IAB.

Questions from Minutes of the previous IAB business meeting.

Review and discussion of Technical Sessions.

 Summary of Comments

Other concerns

 Summary of Comments

Comments from NSF

 Program Officer

 Evaluator

Adjournment

APPENDIX 7-8

Outline of a Typical IAB Business Meeting Agenda

(The length is usually a half day)

Welcome, Introductions, and Opening Remarks

Approve Minutes of previous meeting.

Review and finalize the meeting agenda.

Presentation of the Director's Report:

 Status of the Center since the last meeting:

 Staffing, activities, center development, review of
 Technical Sessions, future abstracts for approval,
 budget review, recruitment—sponsors, students
 and faculty, etc.

 Visits to/from sponsors and visitors.

 Previous action items.

Discussion and approval of report and budget.

Comments from:

 IAB closed meeting

 NSF representatives

 Graduate student representative

 Other

Break—networking

Old business from previous action items

New business as needed and identified.

 Selection of new research

Determine dates for next semi-annual meeting.

Adjournment

APPENDIX 7-9**Outline for New Company Interview**

Organization:

Name:

Phone:

Title:

1. The Decision to Join

Probe: How did the company find out about the Center?

How was initial contact made?

How did the interviewee get involved?

Is the interviewee a technical representative? IAB member? Describe the company's decision process. How is the Center funded in your Organization? By whom? Is there any mechanism to consider supplemental funding?

Does the company have any formal tracking mechanism to judge the success of its Center membership?

2. Benefits of Joining

Probe: Does the organization have specific objectives (e.g., specific technologies)?

Has any technology been transferred to your organization?

Into any company products?

Personnel goals—use the Center as a means of updating company R & D staff. Use graduates as a recruiting pool?

How important is the contact with other companies?

Are any contacts made/kept aside from the Center meetings?

3. Organizational Dissemination

Probe: Who in your company is involved with the Center? (e.g., outside R & D?, how high up?)

Who else in your organization should be included on the dissemination list?

What might the Center do to help you to institutionalize the Center within your organization?

4. **Formative Check**

Probe: Are you satisfied with your Center membership to date?

Thoughts about the IAB meeting?

Anything the Center might do in order to be a better resource for your company?

Have you/are you considering two-way visits? Short courses?

Summary:

APPENDIX 7-10**Project Proposal Form**

Program Name: _____ New: _____

Program Manager: _____ Continuation: _____

Description:

Experimental Plan:

Related Work Elsewhere:	How ours is different:
-------------------------	------------------------

Related work in:	Milestones:
------------------	-------------

Deliverables:	Budget:
---------------	---------

Economics:

Potential Member Company Benefits:

Progress to Date:

Knowledge Transfer Target Date:

APPENDIX 7-11

Quarterly Progress Report Format

TITLE OF PROJECT
(QUARTERLY PROGRESS REPORT)

Principal Investigator, Affiliation

1. Project Summary

This should be a one paragraph synopsis of the project goals and approach.

2. Milestones and Goals

This section will summarize the milestones, goals, and objectives planned for this reporting period and will discuss the status of each. If planned objectives were not achieved, the major obstacles should be sketched.

3. Research Planned

This section will summarize the milestones, goals, and objectives planned for the next reporting period. Unachieved objectives from previous periods should be discussed here.

4. Research Output

This section should list the research products and other evidence of research activity achieved during this reporting period.

5. IAB Contacts

This sections should summarize contacts with IAB members and SIGS during this reporting period.

6. Financial Status

This section should indicate the status and adequacy of current funding levels and the spending progress of the project toward planned levels.

APPENDIX 7-12**Annual Report Format**

TITLE OF PROJECT
(STATUS REPORT)
Principal Investigators
Affiliation

1. Long-Term Goals

In this section the main focus and target of the research is presented. This is basically the explicit formulation of the research's core problem. The expected time frame is three years.

This sections should be organized into two parts:

Plan: Describe the original long-term goals

Actual: Describe the changes made to the long-term goals

2. Background for Long-Term Goals

In this section the historical and/or systematic context of the research is described. Why is the problem important? What is its relevance to the IAB? What are the main contributions or position related the this problem? How original is the current approach? Relationships with other projects should also be highlighted in this section.

This sections should be organized into two parts:

Plan: Describe how the original goals were perceived.

Actual: Describe any changes from the original perceptions.

Highlight any new contributions to the research literature or other research developments that may have affected the approach.

3. Intermediate-Term Objectives

In this section the objectives of the current year are presented. These are major phases of the yearly progress toward the long term goal.

This section should be organized into two parts:

Plan: Describe the original stages for the current year.

Actual: Indicate any changes in the staging of research activities

4. Schedule of Major Steps

In this section, concrete steps to achieve yearly objectives are listed. Main entries are dated as major milestones. This enumeration may comprehend the whole year as its focus, or a six-month time frame.

This sections should be organized into two parts:

Plan: What milestones were planned?

Actual: What milestones were actually achieved? What portions of the schedule slipped?

An attached milestone chart should represent the same information in graphical format.

5. Dependencies

This section is optional. It contains the list of materials and products needed for the actual conduct of the research: tools, publications, equipment, etc.

6. Major Risks

This section highlights major concerns related to the proposed research, especially those risks related to the dependencies in Section 5.

7. Budget

This sections should present the planned and actual direct costs required to perform the proposed research. All budget categories should be included.

8. Staffing

This section should list planned and actual scientists participating in the research and should explain their roles.

9. Category of the Current Stage

In this section, the current stage of the research is classified according to whether it is Assessment, Feasibility, Prototype, or Development. Transitions between categories should be noted.

10. Contacts with Affiliates

This sections should discuss the contacts with affiliates and the plans for future interactions.

11. Publications and other Research Products

This sections should describe the planned and actual output of the project in terms of deliverable items such as reports and software.

APPENDIX 7-13**Outlines for Contents of Center Brochure****Center Brochure**

Center Name, Logo, University, Location

Identify as a NSF-I/UCRC Program

Purpose—Center Goals/Objectives

Operation of the Center

Director(s) name(s)

Benefits of joining the Center

Scope of Research

Facilities available to the Center

List Faculty—highlight their special expertise

University Information

Degree Programs

Sponsor Opportunities for seminars/workshops, etc.

Contact information/address, telephone, fax, e-mail, and website (if any)