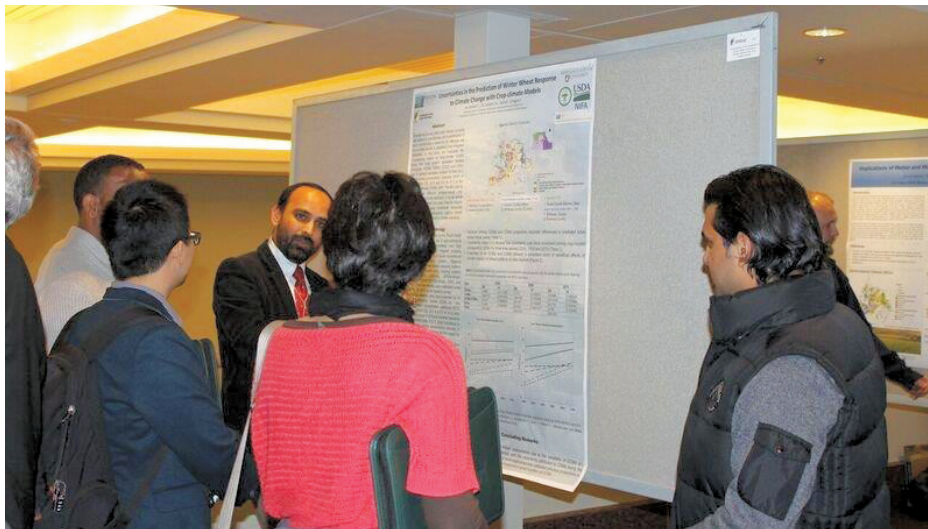# 3. CREATING A CULTURE OF COLLABORATION IN SOCIAL-ECOLOGICAL PROJECTS | Julie Thompson Klein and Lois Wright Morton

Why Collaborate?

Projects involved in social and ecological systems (SES) research tackle spatial, temporal, and human institutional scales of enormous complexity. This type of research requires diverse skills, knowledge, theories, approaches, methodologies, and perspectives that can only be derived from collaborative approaches that seek answers to the complex questions SES poses. The particular project you direct will involve a variety of participants, including scientists, students, and staff from many disciplines and institutions; practitioners with specialized skills and knowledge; stakeholders who are affected by the immediate problem; and perhaps also government, non-governmental organizations (NGOs), and industry partners (see Section 8, Partner and Stakeholder Relationships). The project's vision and objectives provide a common platform for working together. However, as director, you must be purposeful in setting an example and implementing strategies so that collaboration will occur seamlessly within the team and with external partners to achieve the objectives and realize the project's vision. Each team member and partner brings different skills, knowledge, views, and resources of value in untangling and discovering the mechanisms and processes unique to the social-ecological system your project is studying. Collaboration is the mechanism by which the whole (your team) becomes much greater than the sum of the parts (a group of talented individuals).

Project accountant Lori Oh and Extension lead PI, Jamie Benning of the USDA-NIFA sponsored Sustainable Corn CAP take a break from coordinating the many details associated with developing a high-performing project. Credit: Lois Wright Morton

Conversation at the USDA-NIFA/University of Idaho/REACCH-sponsored conference to promote an international collaborative community on semi-arid cereal systems, Minneapolis, 2015.
Credit: Anonymous

As project director, you will need to develop a culture of collaboration that brings together the "right" people and their *knowledge* to address system-level complexity. Identifying the right combination of scientists, practitioners, and stakeholders for a cohesive and complementary team is a first step towards integrating many kinds of knowledge. Because your co-PIs and staff may not have collaborated in the past, they may lack skills and understanding of the process needed to integrate the knowledge and approaches of others. To be successful, project leaders must be purposeful in constructing a platform for exchanging ideas, theories, beliefs, values, and data that enable synthesis of different inputs. This platform provides the structure for a collaborative culture to emerge and grow.

A collaborative culture is dynamic and adaptive. The project's culture must not only create, but also sustain intellectual space that draws scientists, practitioners, and stakeholders together for five major purposes:

1) To learn from each other;

2) To bridge multiple forms of knowledge that may be based on differing assumptions and methodologies;

3) To mentor the next generation of scientists;

4) To stimulate and challenge experienced faculty;

5) To build capacity for the project platform to assemble diverse components, team members, and subgroups focused on accomplishing goals and objectives.

Defining Traits of Collaborative Cultures

A *culture* of collaboration is about creating conditions for the development of a set of customs and behaviors that reflect the cooperative and collaborative beliefs, values, and norms of the project that members accept and reaffirm by their words and actions with others. Building a collaborative culture in a project requires identifying points where members' interests and expertise converge, resources can be leveraged, and capacity for integration is increased to accomplish shared outcomes. One role of the project director is to weave this culture into the structure and administration of the project including procedures and policies; resources and infrastructure; and recognition, rewards, and incentives.

A diagram of the multiple components and linkages within your project is a helpful way to establish systems thinking from the start and construct a roadmap to guide project development. You will necessarily have an organizational chart and you can annotate this to identify specific connections and roles. In order to encourage participation and collaboration, invite project members to draw their versions of relationships among different components of the project and to discuss how they envision collaborative relationships within the project. Once the group has a "working" diagram, refer it to frequently to reaffirm collaborative goals and modify the diagram throughout the project's life cycle to reflect changing conditions. Returning to the diagram will help keep you and your team members focused on the shared vision and objectives while making adjustments as needed.

Collaboration takes many forms, from two individuals working together within the same discipline to large teams combining inputs of multiple disciplines, professions, organizations, and stakeholders. Members of "multidisciplinary" teams work on separate aspects of a common problem or question. In contrast, "interdisciplinary" teams cooperate, combining approaches in order to create an integrated product or solution. "Transdisciplinary" teams generate new conceptual and methodological frameworks and may involve stakeholders in the research process (Klein 2017).
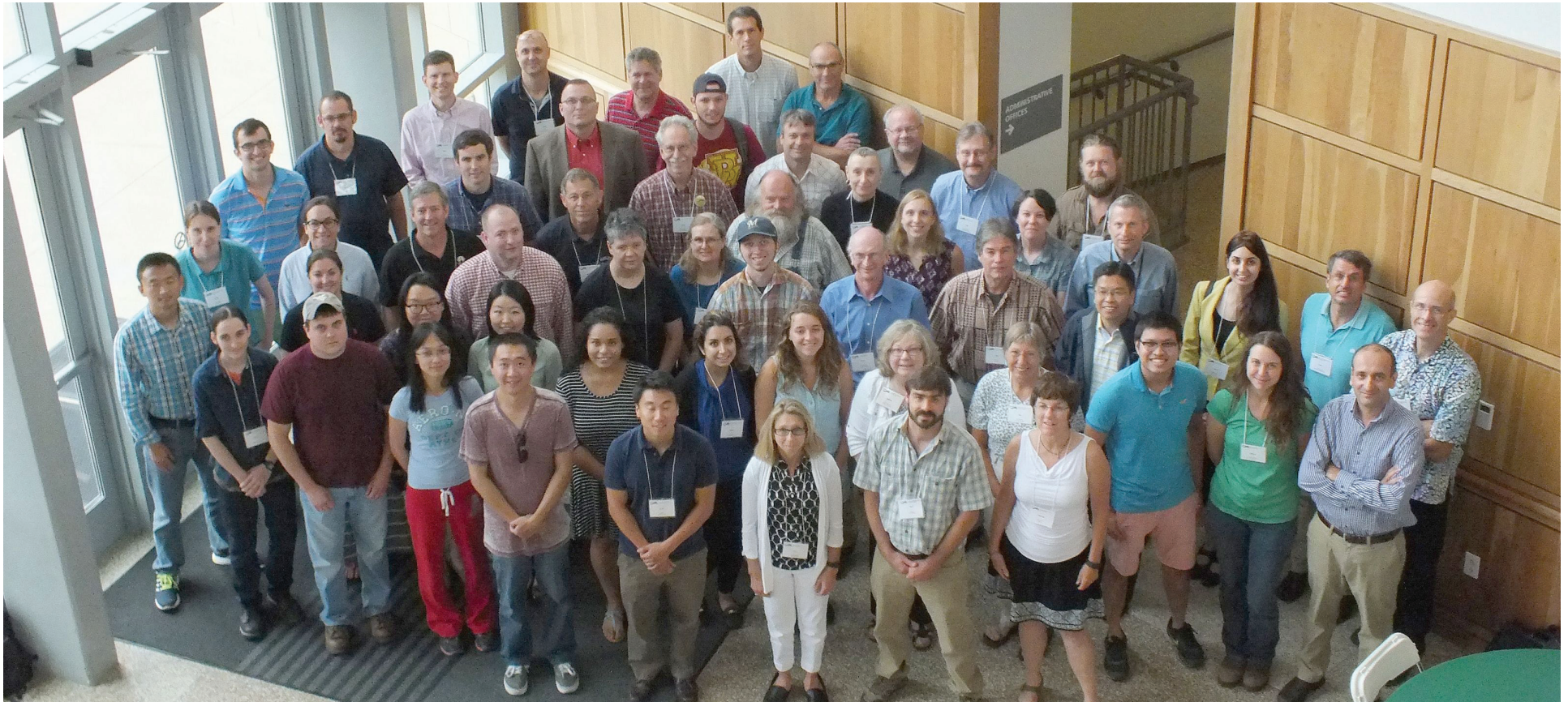
Project meeting for the USDA NIFA-sponsored Northeast Woody "Warm-season" Biomass Consortium (NWWBC) CAP. Credit: Anonymous

Kicking off a project with short examples of collaboration and ways that other inter- and trans-disciplinary projects use them to accomplish their goals can help establish the value of building a culture of collaboration. Shared expectations can be returned to periodically by asking each other, "How are we doing?" Groups can also use collaboration training tools such as the "Science of Team Science" module at Team Science.net (http://www.teamscience.net/moduledescriptions.html).

Integration is a process of merging separate parts into a new whole, whether solving a problem in a small-scale project, synthesizing subsystems in a large program, or creating a new paradigm or field of study. This process can involve two, three, or many more members of the team working together to identify and select bodies of knowledge and methods appropriate for a particular goal, building a common understanding and shared definitions. They then need to weigh different aspects of the problem and potential solutions, working with an integrative framework that is focused, but open to new findings across stages of the research process.

University of Idaho IGERT project field tour at the USDA ARS Reynolds Creek Experimental Watershed. Credit: Sanford Eigenbrode

Collaboration in SES Projects

High functioning collaborative teams work continuously at building and sustaining relationships of trust and cooperation that underpin exchange of both disciplinary and local forms of knowledge. These relationships are essential to a safe and innovative environment where project members can learn from each other, communicate effectively, leverage diversity of thought and action, challenge each other's assumptions constructively, and co-create science. The greatest challenge for a project director is creating and overseeing the space and conditions for working jointly while utilizing tangible and intangible incentives to systematically and intentionally sustain this culture.

A culture of collaboration is not built overnight. It requires long-term investments that start before developing a proposal and assembling a team. A director who recognizes collaborative values and norms in potential team members is well

Project personnel and stakeholders East African Woody Invasive Weeds project, Baringo District, Kenya. Credit: Anonymous

positioned to bring them together and leverage them to sustain momentum. The project stage, members' experiences, and their willingness to engage all forms of knowledge influence which elements of collaboration you need to initiate and incentivize. Table 3.1 identifies aspects of a culture of collaboration and phases in the project life cycle when special attention should be paid to its development. Promoting collaboration and creating relationships, are especially useful when beginning to develop the proposal and assembling a core group to take on a SES project. This effort will pay off when awarded the grant. As the project evolves and grows, relationship building and other aspects of collaboration, innovation and creativity will need your close attention, as well as a culture of co-learning; leadership; integration strategies and infrastructure.

TABLE 3.1
DEVELOPING A CULTURE OF COLLABORATION

	PHASE I	PHASE II	PHASE III	PHASE IV
	PROPOSAL	**GETTING STARTED**	**PERFORMING**	**FINISHING STRONG**
Promoting collaboration	x	x	x	x
Antecedents	x			
Contextual Factors	x			
Strategies for Sustaining		x	x	x
Creating relationships	x	x	x	
Strong ties	x	x	x	x
Weak ties	x	x	x	x
Innovation and creativity	x	x	x	x
Value of inclusiveness	x	x	x	x
Conditions for generating novelty	x	x	x	x
Leadership	x	x	x	x
Styles and types	x	x	x	x
Leadership in collaborations	x	x	x	x
Culture of co-learning	x	x	x	x
Individual learning	x	x	x	x
Group learning	x	x	x	x
Integration strategies and infrastructure	x	x	x	x
Collaborative platform and spaces	x	x	x	x
Attribution signals and support to collaboration (credit)	x	x	x	x

Promoting Collaboration

Antecedents to collaboration

A number of antecedent conditions prepare a group of people to effectively collaborate in order to accomplish the common goals of a project. Figure 3.1 below, based on work by Stokols, et al. (2010) depicts generic factors that can help you identify antecedents and processes to put into place to achieve desired outcomes. Antecedents span intrapersonal, interpersonal, social, physical environmental, organizational, and institutional variables. An inventory of antecedents during the proposal development stage can be particularly useful. For example, facilities and space needs in the physical environment for research should include both shared and separate spaces for office work, meetings, and for some projects laboratory and field activities. If current space is not available or appropriate, work with your institutional administrators to help reconfigure or find new space in preparation for launching the project (see Section 9, Institutional Resources and Support). Planning ahead by budgeting for communication among team members to address intrapersonal and social relationships within the project organizational structure will also mean identifying electronic and face-to-face communication mechanisms for geographically dispersed teams (Olson & Olson 2013). In addition, organizational context should be assessed during the proposal and budget development stage as well the start-up phase to determine adequacy of existing infrastructure and incentives for teamwork.
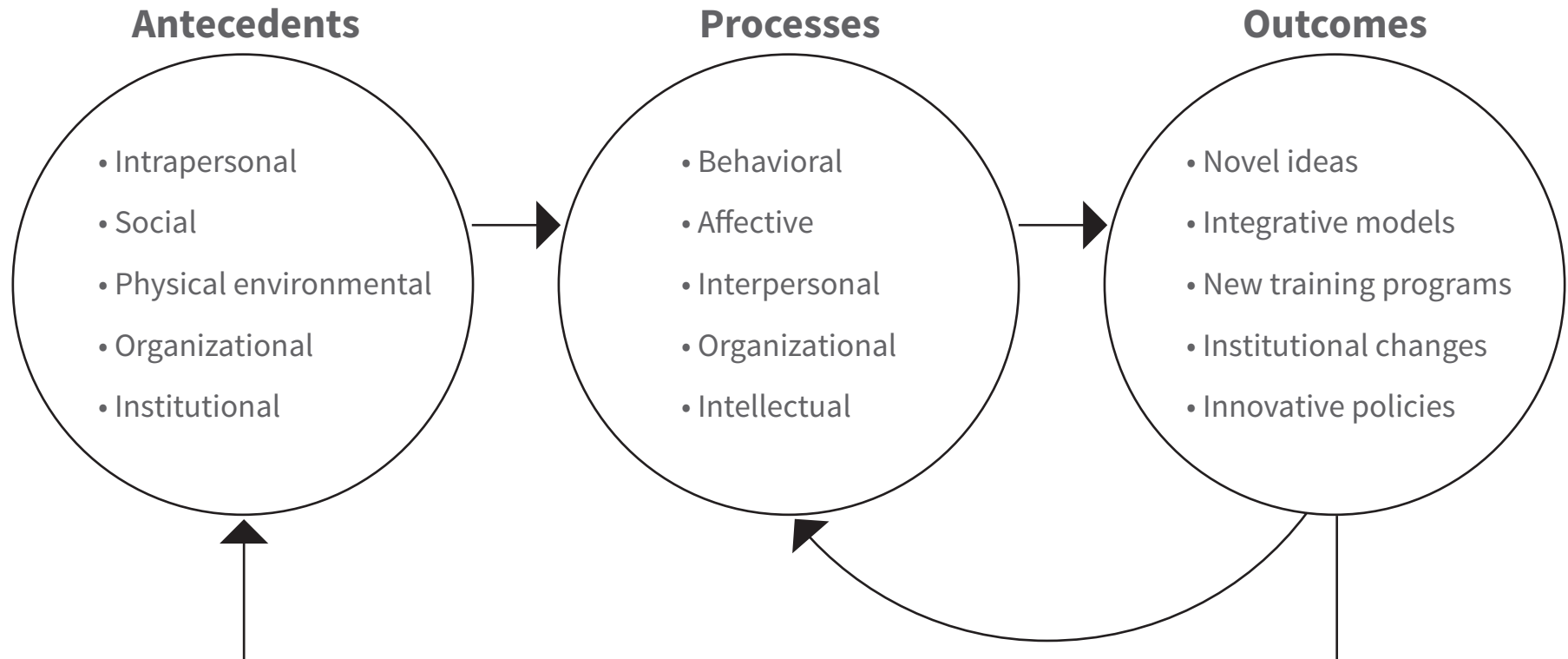

FIGURE 3.1
ANTECEDENTS, PROCESSES, AND OUTCOMES FOR SUCCESSFUL COLLABORATION. ADAPTED WITH PERMISSION FROM STOKOLS ET AL. (2010)
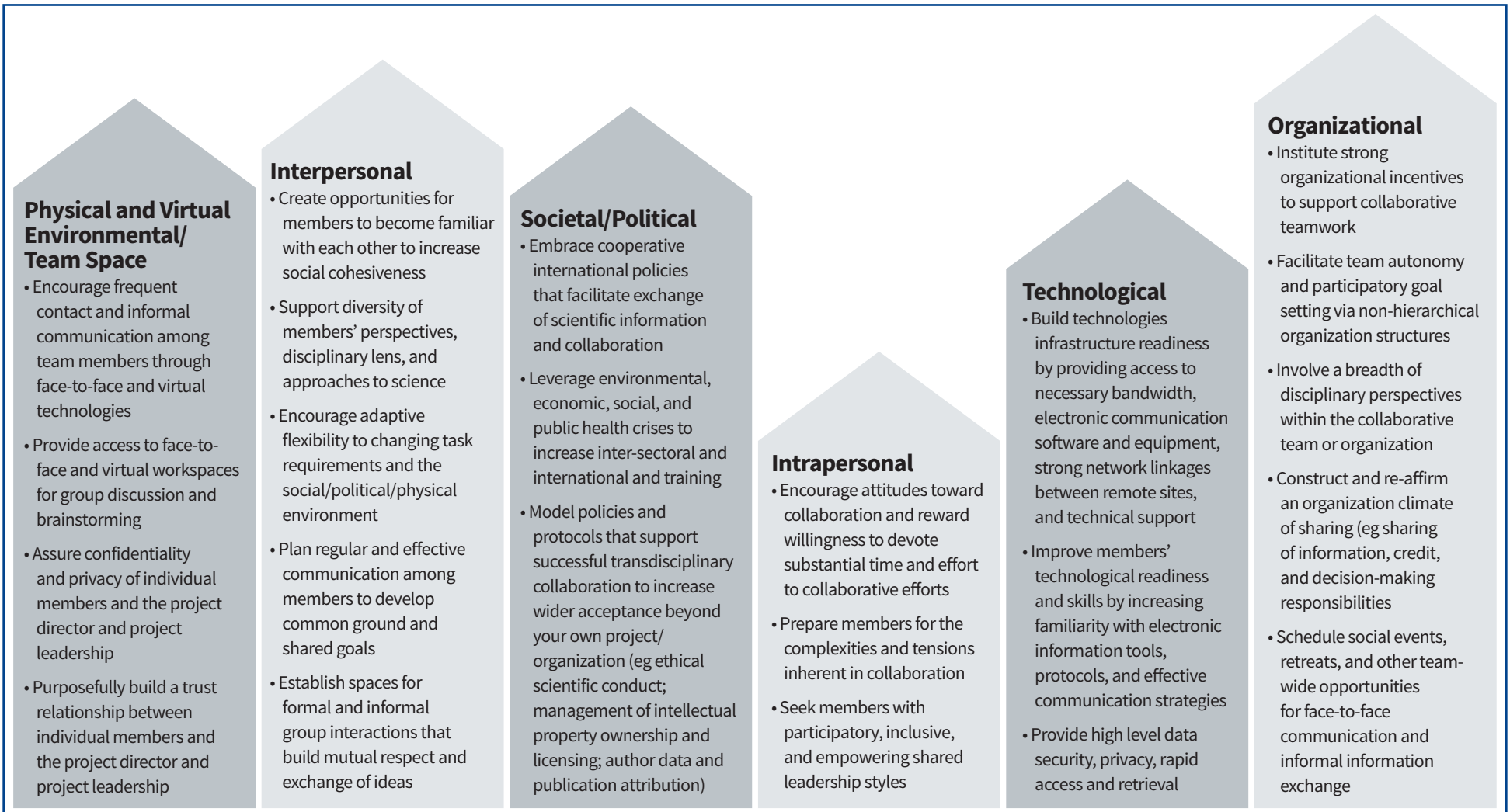
Field tours of the project research sites promote a collaborative culture for team members from different disciplines as they listen, learn, and exchange knowledge. Credit: Sanford Eigenbrode

Contextual factors for effective collaboration

The readiness of project members to collaborate on teamwork will vary depending on past relationships they bring to the project, disciplinary cultures, and past experiences working jointly with others who have quite different knowledge and fields of study. As project director, you should be aware of the several contextual factors that can influence the success of cultures of collaboration, to enable you to assess and increase your team's readiness and to initiate and strengthen a culture of collaboration within your project. Figure 3.2 depicts six contextual areas (intrapersonal, interpersonal, organizational,

technological, societal/political, and the team space environment) that influence prospects for success. Within each context box, specific strategies for constructing and increasing the culture of collaboration within your team also appear.

Working with your project manager and co-leaders you should pay attention to these factors in launching and sustaining collaborative momentum, including talking together about these strategies and identifying the most relevant ones for developing your particular team.

Physical and Virtual Environmental/ Team Space

- Encourage frequent contact and informal communication among team members through face-to-face and virtual technologies

- Provide access to face-to-face and virtual workspaces for group discussion and brainstorming

- Assure confidentiality and privacy of individual members and the project director and project leadership

- Purposefully build a trust relationship between individual members and the project director and project leadership

Interpersonal

- Create opportunities for members to become familiar with each other to increase social cohesiveness

- Support diversity of members' perspectives, disciplinary lens, and approaches to science

- Encourage adaptive flexibility to changing task requirements and the social/political/physical environment

- Plan regular and effective communication among members to develop common ground and shared goals

- Establish spaces for formal and informal group interactions that build mutual respect and exchange of ideas

Societal/Political

- Embrace cooperative international policies that facilitate exchange of scientific information and collaboration

- Leverage environmental, economic, social, and public health crises to increase inter-sectoral and international and training

- Model policies and protocols that support successful transdisciplinary collaboration to increase wider acceptance beyond your own project/ organization (eg ethical scientific conduct; management of intellectual property ownership and licensing; author data and publication attribution)

Intrapersonal

- Encourage attitudes toward collaboration and reward willingness to devote substantial time and effort to collaborative efforts

- Prepare members for the complexities and tensions inherent in collaboration

- Seek members with participatory, inclusive, and empowering shared leadership styles

Technological

- Build technologies infrastructure readiness by providing access to necessary bandwidth, electronic communication software and equipment, strong network linkages between remote sites, and technical support

- Improve members' technological readiness and skills by increasing familiarity with electronic information tools, protocols, and effective communication strategies

- Provide high level data security, privacy, rapid access and retrieval

Organizational

- Institute strong organizational incentives to support collaborative teamwork

- Facilitate team autonomy and participatory goal setting via non-hierarchical organization structures

- Involve a breadth of disciplinary perspectives within the collaborative team or organization

- Construct and re-affirm an organization climate of sharing (eg sharing of information, credit, and decision-making responsibilities)

- Schedule social events, retreats, and other team-wide opportunities for face-to-face communication and informal information exchange

CONSTRUCTING A CULTURE OF COLLABORATION

FIGURE 3.2
CONTEXTUAL FACTORS THAT PROJECT DIRECTORS, MANAGERS, AND LEADERS CAN USE TO INITIATE AND INCREASE A CULTURE OF COLLABORATION. ADAPTED WITH PERMISSION FROM STOKOLS ET AL. 2008

Sharing skills and building relationships, MAP field day, Costa Rica.
Credit: Anonymous

Small group meetings focused on theory building, planning, data analyses, and specific project tasks increase trust and build reciprocal relationships among team members. Credit: Anonymous

Strategies for sustaining collaboration

An iterative and flexible approach, rather than a fixed plan, will help tailor collaborative strategies to meet team goals and the evolving structure of a project. Paying attention to antecedent and intervening processes in conjunction with leadership of contextual factors and strategies in Figure 3.2 can improve prospects for sustainability. However, maintaining energy and creativity are long-term challenges. Limitations of time and money, along with burnout, can undermine momentum. Jointly produced publications and presentations document collaborative successes in the mid- to long-term. However, enduring organizational change, impacts of innovative research findings, and changes in paradigms and policies will take longer and likely extend beyond the lifetime of project funding.

As a director, you should systematically monitor your team's progress towards a collaborative culture, making adjustments as needed and aligning subgroup efforts with the main project toward a common end. A number of tools can help you evaluate group functioning to assess progress toward a collaborative project. Ongoing communication, in both face-to-face and virtual meetings, are

vital to sustain collaborative relationships. You as project director and/or your leadership team need to intervene when collaboration is weakened by actions of team members or inaction. Intervention is most effective when done early, rather than letting problems or uncertainties reach a crisis stage. External presentations of results and collaborative work on publications can reinforce a shared commitment even in the midst of differences.

Creating Relationships

"Strong" and "weak" ties

Collaborative culture is based in personal relationships and social and professional networks. Project members will bring both strong ties in the form of close relationships and a variety of weaker ties or acquaintance-level relationships to their work in the project. A strong tie is characterized by frequent interactions, high levels of reciprocity, and psychological intensity among people who know each other well and regularly exchange knowledge and information. Within the same discipline individuals often read the same journals, use the same language to talk about theories and data, interact regularly, and may be co-authors on publications

Innovation and Creativity

One of the underlying (and sometimes explicit) expectations from many funders is that a project will innovate and produce groundbreaking new knowledge, products, protocols, and/or paradigm shifts. Innovation and creativity emerge from actions and interactions among a project team and their external networks of influence. A director, then, needs to create opportunities for discovery and invention to occur through strategies that encourage free flow of ideas and tap everyone's imagination. Look for ways the project structure can encourage these exchanges, and explore methods such as scenario building and risk assessment that foster creative discussions.

A project with a strong culture of collaboration encourages out-of-the box thinking rather than rote application of a priori approaches. When trust is high, risks of experimentation are lower, allowing accepted ways of thinking and approaching a problem to be challenged and re-evaluated. Differences are resources for greater creativity, including variances in disciplines, professions, and organizational outlooks as well as gender, cultural backgrounds, and career stages. Moreover, the culture of reward expands when you find ways to count and celebrate innovative work that is not recognized in traditional evaluation metrics for tenure and promotion. Project directors can foster recognition by encouraging shared products (e.g. articles, books, and videos) that document collective innovation, negotiating course buyouts giving individuals time to be creative, and negotiating for graduate research assistantships to help populate the next generation in collaborative science.

Leadership

As leader of a project, the director holds the project's vision and public face. You are the person who team members expect to back them up, keep them informed, and move the project forward. You are the one who funders and administrators will hold responsible for getting reports submitted and insuring expenses do not exceed the funded award. In short, the buck stops with you (see Section 1, Qualities and Skills of a High Functioning Director). A director must exemplify behaviors of collaborating, exchanging information, and sharing data while encouraging the project manager and leadership team to model a culture of cooperation. Although expectations are high, project leaders do not possess all skills, knowledge, and connections necessary to lead. Rest assured you do not need to walk on water to be a successful and good leader. Directors bring different views of what leading means, a diversity of personal resources, and skills to their role of leading.

Yet, being familiar with the defining characteristics of leadership that Barbara Gray (2008) describes is a valuable first step in preparing for requisite tasks, determining your dominant leadership style and its strengths and weakness in accomplishing

Collaboration extends to industry partners in transdisciplinary projects; USDA NIFA-sponsored Northwest Advanced Renewables Alliance (NARA) meeting. Credit: Anonymous

and co-PIs on other projects. These are characterized as strong ties when there are high levels of confidence and trust in these relationships. A weak tie is a more tenuous relationship, based on low levels of interaction and not knowing someone well. Acquaintances may be someone in a social or professional network or a person whose work is known. This relationship is not well-established, is likely to have infrequent levels of communication, and consist of individuals with different interests, social circles, and disciplinary homes.

Both kinds of relationships are valuable for building and sustaining collaboration. Strong ties can help create a well-functioning team because trust has been established and these relationships bring a known work ethic, scientific rigor, and set of known skills. However, weak ties help to find expertise a project needs. In addition, weaker relationships bring together people with different kinds of knowledge and ways of approaching the research and applications to a project. Weak ties are especially useful in expanding the project's reach and connecting with stakeholders and potential partners that could help to achieve project objectives (see Section 8, Partner and Stakeholder Relationships). Some weak ties will become strong ties over the course of the project; if this happens repeatedly across disparate disciplines and institutions it is a strong indicator that the culture of collaboration you developed was a success.

the work of the project in a collaborative manner. Moreover, leadership is not restricted to designated leaders. There are opportunities and good reasons to share the work of leading with other members of the team. Early in project development, while writing a management structure for the proposal or shortly after it is funded, you need to identify individuals who are well suited to sharing leadership. This core group and the leadership team will help build collaborative infrastructure and other tangible practices associated with taskwork and teamwork. (See Section 2, Molding the Team). Sharing leadership will also give the project a big dose of social glue needed for building collaboration. The core leadership team will bring both strong and weak ties and provide opportunities to leverage resources to benefit the project.

Culture of Co-learning

Co-learning is a social process of mutual learning among members of a project (see Section 2, Molding the Team). It occurs on both individual and group levels. As individuals clarify underlying assumptions shaped by their expertise–including methods, concepts, and theories for approaching a particular problem or question– they enable others to expand their own thinking. Communication strategies that foster respectful listening are key and allow time at early stages in the project for individuals to engage in mutual learning situated in particular contexts.

NIFA-USDA sponsored PINEMAP participants learn about soil water sampling protocols.
Credit: Jessica Ireland

Several concrete strategies aid in this process. Identifying points where the work of one person is necessary for others' success can increase effectiveness of exchanges and create a common commitment to overall goals. Differences in disciplines, methods, approaches, and worldviews must also be understood by others on the team in order to build consensus on shared definitions. Joint learning activities are key to this process, these can occur both face-to-face and where applicable in virtual meetings. Communication tools play a valuable role in capturing the learning that is occurring within the team as well, making exchanges available for everyone to review in formal updates and reports as well as ongoing use of wikis and collaboration software.

Integration Strategies and Infrastructure

To elaborate on the role of integration, three major challenges arise in coordinating collaboration and integration: (1) linking different conceptual frameworks to allow cross-disciplinary synthesis throughout the project life cycle, (2) using technology to enable relationship building and collaboration across space and time, and (3) involving stakeholders and partners to ensure project science is actionable (Morton et al. 2015). These challenges require both physical infrastructure and integration strategies with attention to evolving levels of trust among project members and available time and resources. Multi-institutional teams constitute another level of complexity for directors and managers because their spatial dispersion creates challenges to communication and team building. Virtual technologies can aid in exchanging information, managing data, performing small group task assignments, and building trust.

Co-learning and collaboration do not happen automatically. You, as project director, need to use available processes and techniques to create opportunities for exchange and co-learning. Establishing explicit and mutually developed rules of engagement at the beginning of a project will clarify expectations. These rules of engagement should include strategies for negotiating differences and arriving at an agreement, policies and approaches to data management, and allocating credit for contributions to publications and other outputs as well as outcomes. Activities that help team members better understand assumptions, approaches, vernaculars, and methods of different disciplines and stakeholders should be explicit throughout the project's lifecycle. A group environment helps re-contextualize problems as colleagues' questions force others to think about their perspectives on a different scale or level. Planned face-to-face meetings are especially helpful for communicating ideas early, when members do not know each other, or when the group is discussing difficult and complex concepts.

In conclusion, to echo Steven Johnson (2001), "the most productive tool for generating good ideas remains a circle of humans at the table, talking shop." All the insights and strategies in this section affirm the centrality of "the social flow of group conversation." A strong culture of collaboration is essential in enabling all the other elements of project success.

Take Away Messages:

- Develop a culture of collaboration that brings together the "right" people and their knowledge to address system-level complexity.
- The greatest challenge is to create and oversee the space and conditions for working jointly while utilizing tangible and intangible incentives to systematically and intentionally sustain a collaborative culture.
- Model collaborative behaviors in leadership by practicing open dialogue, exchanging information, sharing data, and building trust.

- Build spaces that are conducive to creativity and innovation, allowing time for a shared commitment and language to emerge.
- Allocate resources of money and space so that the team can meet on regular and ad hoc bases to co-create a collaborative environment.
- Use strategic activities that accomplish everyday tasks as well as the big picture vision of a project.

- Celebrate successes routinely within the research process and in formal publications and presentations that reach wider audiences.
- Network across socio-ecological communities of practice to advance broad understanding of the dynamics of leadership and collaboration while continuing to learn from other contexts.
- Design and support forms of education and training that embed collaborative approaches and norms into business-as-usual, not as an elective or peripheral activity.

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