The Ecology of Team Science: Understanding Contextual Influences on Transdisciplinary Collaboration

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Goals

• Examine the complex web of intrapersonal, interpersonal, organizational, institutional, physical environmental, technological, and other societal/political factors that influence the effectiveness of TD collaboration

• Present an evidence-based typology of contextual influences on TD collaboration as a basis for deriving practical guidelines for designing and managing successful team science initiatives
Criteria for Gauging Team Effectiveness

• Generic Criteria
  • Intended to apply to broad categories of similarly organized initiatives and programs

• Project-Specific Criteria
  • Assignment of different priorities among the multiple potential outcomes of TD collaboration depending on diverse, project specific goals
Contextual Factors Influencing the Success of TD Collaborations

• Review of empirical literature in four domains of research
  • Social psychological and management research in organizational and institutional settings
  • Studies of cyber (computer-based) infrastructures designed to support TD collaboration across multiple research sites
  • Field investigations of community-based coalitions for health promotion
  • Studies focusing on the antecedents, processes, and outcomes of scientific collaboration within TD research centers and training programs
Caveats

• Diversity of conceptual and methodological approaches
• Different criteria used to assess collaborative effectiveness
• Variations in integrative scope of the collaboration
  • Organizational (intra-organizational, inter-organizational, intersectoral)
  • Geographic (narrow or broad)
  • Analytic (molecular to molar levels of analysis)
Social Psychology and Management Research

• **Facilitating factors**
  • Social cohesiveness and familiarity among team members
  • Flexibility in adapting to changing task requirements and environmental conditions
  • Transformational and empowering leadership
  • Participatory goal setting and decision making
  • Regular and effective communication and feedback among members to foster trust
• Facilitating factors
  • Organizational support for members’ diversity and heterogeneity, especially in intellectual and scientific endeavors
  • Opportunities for face-to-face contact and relationship building
  • Access to physical environment resources that support collaboration
  • Members sharing egalitarian values and mutual respect among team members throughout all stages of collaboration
Social Psychology and Management Research

• Constraining factors
  • Group-think and social loafing, sometimes arising from prolonged familiarity and rigid operating procedures
  • Inflexibility in the face of changing task demands and environmental conditions
  • Lack of adequate and regular communication and feedback, resulting in low levels of trust among members and social fragmentation
  • Leaders who are non-collaborative and exclusionary
Social Psychology and Management Research

• Constraining factors
  • ‘Hybrid’ task and reward structures
  • Insufficient opportunities for face-to-face contact among members
  • Failure to identify and utilize the resources of all group members
  • Work environments that inhibit communication among team members, hinder privacy regulation, or are too distracting
  • Non-collaborative rather than collaborative attitudes and values among team members
Cyberinfrastructures for Remote Collaboration

• Facilitating factors
  • Technological infrastructure readiness
  • Collaboration readiness of team members and organizations:
    • Having incentives to participate in and sustain collaboration,
    • Broad based institutional, organizational, and administrative support
  • Technology readiness of users
    • Familiarity with tools
    • Habit of making information accessible to others
    • Providing regular and prompt feedback
Cyberinfrastructures for Remote Collaboration

• Facilitating factors
  • Regular face-to-face meetings and socialization among remote team members
    • To increase trust and strengthen group identity
    • To establish common ground and reduce task uncertainties
  • Enthusiastic leaders strongly committed to effective remote collaboration
  • New roles and communication patterns that enhance distance collaboration
Cyberinfrastructures for Remote Collaboration

• Constraining factors
  • Lack of adequate technical infrastructure
  • Technological concerns
  • Constrained audio and visual choices and use of media that are inappropriate for the task at hand
  • Financial costs and expenditures of time and effort to establish requisite infrastructure for distance collaboration
  • Lack of experience and familiarity with the use of distance collaboration tools
  • Communication challenges in establishing team identity and trust
  • Absence of a culture of sharing information and non-alignment of reward structures to encourage collaboration and use of collaboration tools
Community Coalitions among Scientists and Practitioners

- Facilitating factors
  - Identification of common and clear goals, objectives, outcomes
  - Shared statement of principles among coalition members including mutual benefits and responsibilities
  - Continuity of collaboration throughout all phases of the coalition
  - Shared norms that encourage open communication, inclusiveness, and shared decision-making
  - Prior positive experiences of collaboration with participating community organizations and their members
Community Coalitions among Scientists and Practitioners

- **Facilitating factors**
  - Supportive, democratic, and empowering leaders
  - Members’ readiness for collaboration
    - Cooperative orientation and commitment to collaboration
    - Interpersonal communication skills and training
  - Presence of suitable electronic communication systems
  - Strong incentives to participate and remain involved
  - Sustained support by funding agencies
Community Coalitions among Scientists and Practitioners

- **Constraining factors**
  - Disagreement and conflicts due to divergent understandings of the coalition’s goals and timelines among community practitioners and academic researchers
  - Conflicts arising from different scientific worldviews, disciplinary perspectives, and decision-making styles
  - Inequitable distribution of decision-making power, information, time, resources, and control
  - Perception of status differences between scientists and community practitioners
Community Coalitions among Scientists and Practitioners

- **Constraining factors**
  - Lack of trust arising from negative experiences in prior collaborative projects
  - Leaders who encourage secrecy, in-group exclusiveness, and interpersonal competition and confrontation
  - Absence of adequate and regular communication among members
  - Decline in participation of members in coalition activities
  - Uncertainties about and absence of sustained funding to support the coalition’s long-term goals and activities
Evaluative Studies of ID Research Centers and Training Programs

- Facilitating factors
  - Prior experience of positive collaboration
  - Presence of a strong shared vision, agreement on highest priority goals and the timelines for achieving them
  - Exemplary leadership skills of center directors
  - Prolonged and regular exchange of ideas to encourage the development of positive and informal interpersonal relationships
  - Presence of electronic systems to facilitate regular communication among center members
Evaluative Studies of ID Research Centers and Training Programs

• Facilitating factors
  • Spatial proximity of scientists’ office and laboratories
  • Physical environments that afford opportunities for face-to-face contact among center members
  • Members’ awareness of and preparation for the collaborative constraints, disagreements, and conflicts they are likely to encounter over the course of their collaboration
  • Availability of training resources and negotiation strategies for resolving the tensions inherent in ID research and training initiatives
Evaluative Studies of TD Research Centers and Training Programs

• Constraining factors
  • Lack of experience working together on prior TD research and training programs among team members
  • Lack of a shared vision among members about highest priority goals and the timelines for achieving them
  • Conflicts and tensions stemming from alternative disciplinary perspectives, multiple departmental affiliations, and contrasting interpersonal styles
  • Lack of collaborative skills and management experience among available leaders
Evaluative Studies of TD Research Centers and Training Programs

- **Constraining factors**
  - Lack of regular communication among team members and adequate cyber-infrastructure to support frequent and effective exchanges of information
  - Absence of institutional supports and organizational incentives to sustain inter-departmental and inter-university collaboration
  - Lack of physical environments that encourage face-to-face contact among members
  - Lack of training programs to enhance team members’ readiness for collaboration
  - Unrealistic expectations for complete cooperation and harmony among team members
Typology of Contextual Factors Influencing TD Scientific Collaboration at Each Level of Analysis

Intrapersonal

- Members' attitudes toward collaboration and their willingness to devote substantial time and effort to TD activities
- Members' preparation for the complexities and tensions inherent in TD collaboration
- Participatory, inclusive, and empowering leadership styles

Interpersonal

- Members' familiarity, informality, and social cohesiveness
- Diversity of members' perspectives and abilities
- Members' ability to adapt flexibly to changing task requirements and environmental demands
- Establishment of an hospitable conversational space for group discussion and brainstorming
- Ability of members to develop common ground and consensus about shared goals

Organizational

- Presence of strong organizational incentives to support collaborative teamwork
- Non-hierarchical organizational structures to facilitate team autonomy and participatory goal setting
- Breadth of disciplinary perspectives represented in the collaborative team or organization
- Technological infrastructure readiness to support collaborative teamwork
- Ability of members to adapt flexibly to changing task demands

Physical Environmental

- Spatial proximity of team members' workspaces to encourage frequent contact and informal communication
- Access to comfortable meeting areas for group discussion and brainstorming
- Availability of distraction-free workspaces to support collaborative teamwork
- Environmental and public health crises that prompt inter-sectoral and international TD collaboration in scientific research and training

Societal/Political

- Diversity of members' perspectives and abilities
- Members' familiarity, informality, and social cohesiveness
- nailed and imperial to changing task demands

Transdisciplinary

- Effectiveness of participatory goal setting, including the development of common ground and consensus about shared goals
- Establishment of an hospitable conversational space for group discussion and brainstorming
- Ability of members to develop common ground and consensus about shared goals
- Regular and effective communication among members to support collaborative teamwork
- Participation, inclusive, and empowering leadership styles
Selected References


