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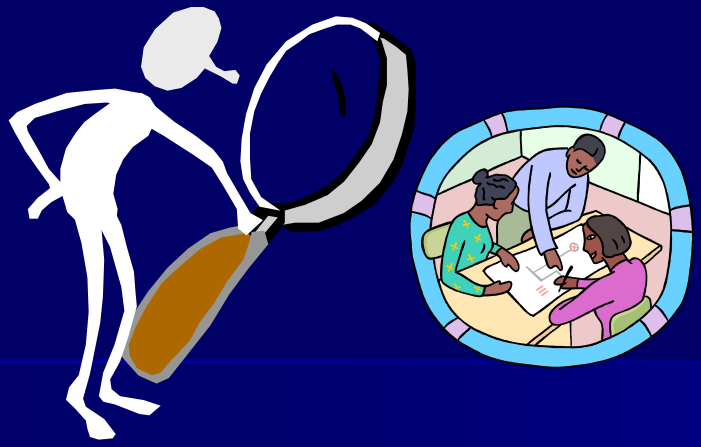

The Ecology of Team Science: Understanding Contextual Influences on Transdisciplinary Collaboration

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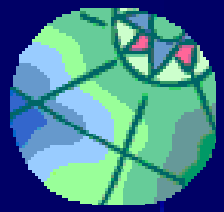


Mapping the Ecology of Team Science

- *Demands for evidence that TD science initiatives are cost-effective and justifiable*
- *Varying levels of effectiveness have been achieved by transdisciplinary (TD) teams and research centers within the health sciences*
- *Investments in team science are not uniformly cost effective*
- *Need to better understand the contextual determinants of collaborative success as a basis for strategic investments in large-scale team science initiatives*

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

- Analysis of team work in a variety of institutional and community settings
- 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 group goal setting and decision making
- Team development strategies such as experiential learning to encourage members' active participation
- Regular and effective communication and feedback among members to foster trust
- 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
- '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

Cyber-Infrastructures 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
- 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

Cyber-Infrastructures 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
- 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
- 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 TD Research Centers and Training Programs

Facilitating factors

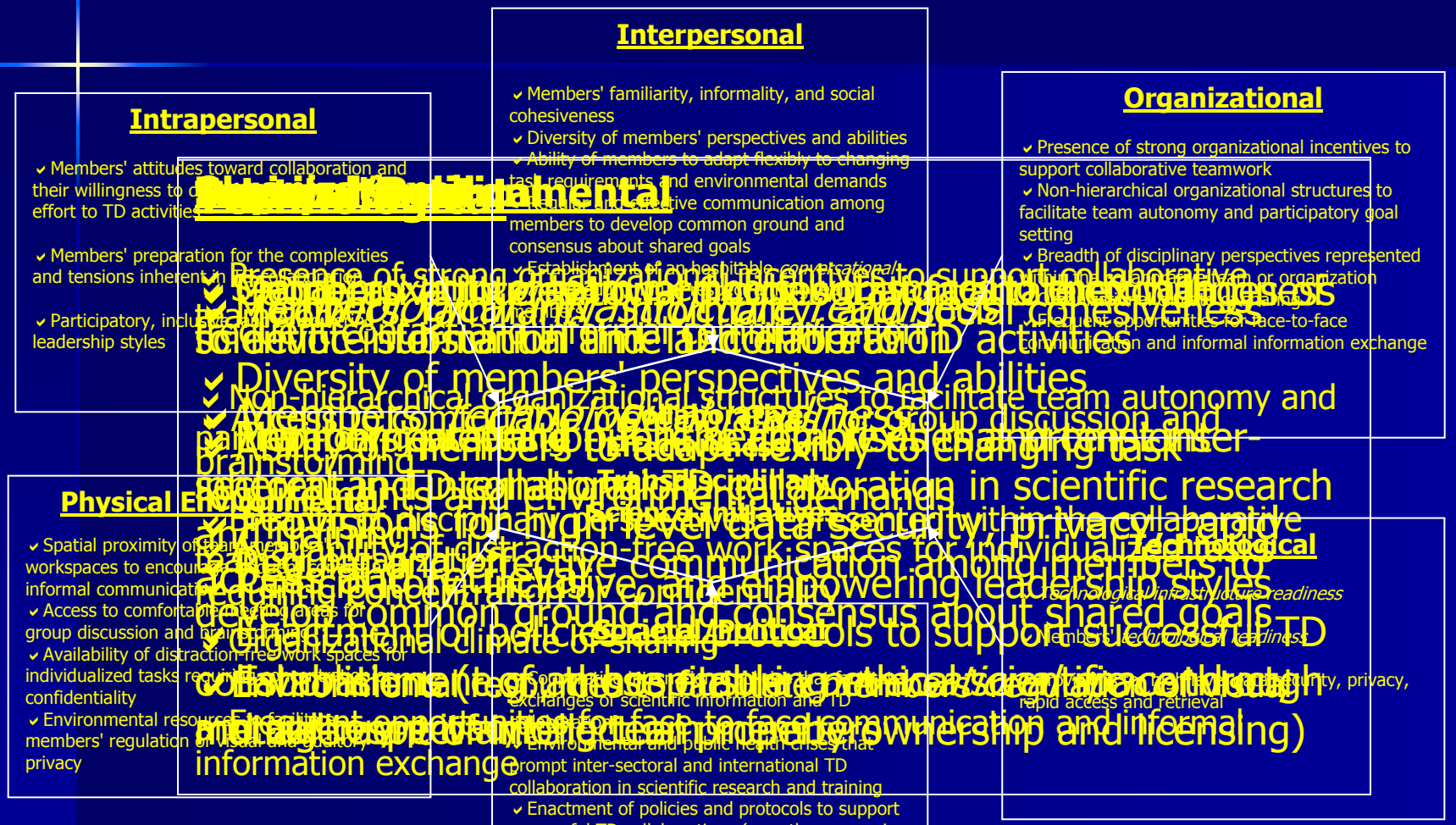
- Prior experience of positive collaboration
- Presence of a strong shared vision, agreement on highest priority goals and the timelines for achieving them
- Exemplary leadership skills of center directors
- Prolonged and regular exchange of ideas to encourage the development of positive and informal interpersonal relationships
- Presence of electronic systems to facilitate regular communication among center members
- 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 TD research and training initiatives

Evaluative Studies of TD Research Centers and Training Programs

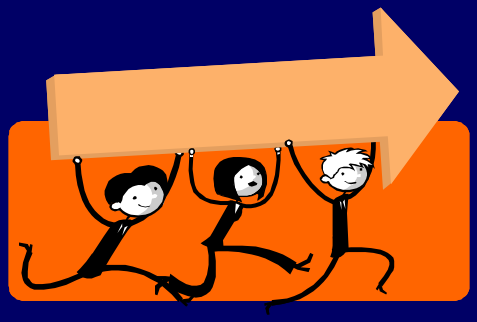
Constraining factors

- 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
- 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

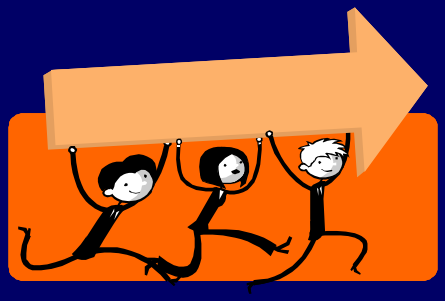


Implications



- Matching the particular goals and structure of a TD research program with targeted investments in those contextual resources that are specific to the project at hand
- Distinguishing between project specific requirements and generic requirements for effectiveness
  - Ensuring minimum project-specific requirements are present at the outset
- For more complex TD science programs
  - Choosing leaders with interpersonal styles that promote effective collaboration and experience with TD teams
  - Training programs for participants to prepare them for the challenges of TD collaborations

Implications (cont)



- Funding should be tailored to match the *degree of complexity* in the TD science initiative through
  - Project-specific audits to ascertain which contextual factors should receive highest priority and investment before program launch
- Long-term funding should be reserved for teams that have demonstrated high levels of collaborative readiness

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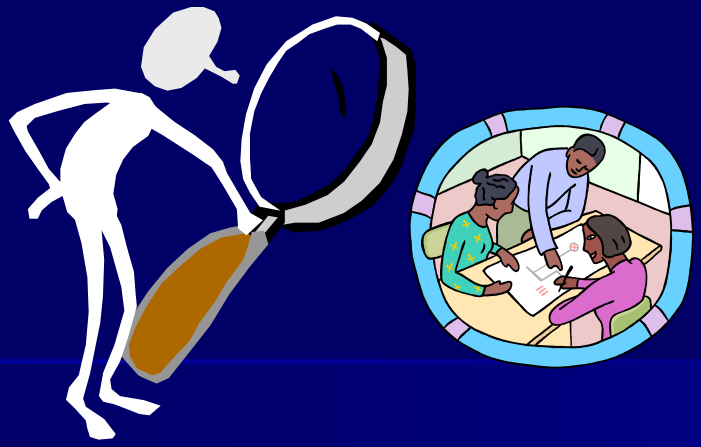

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