



Intense Collaboration: Human and Technical Requirements for Agile C2



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Acknowledgements

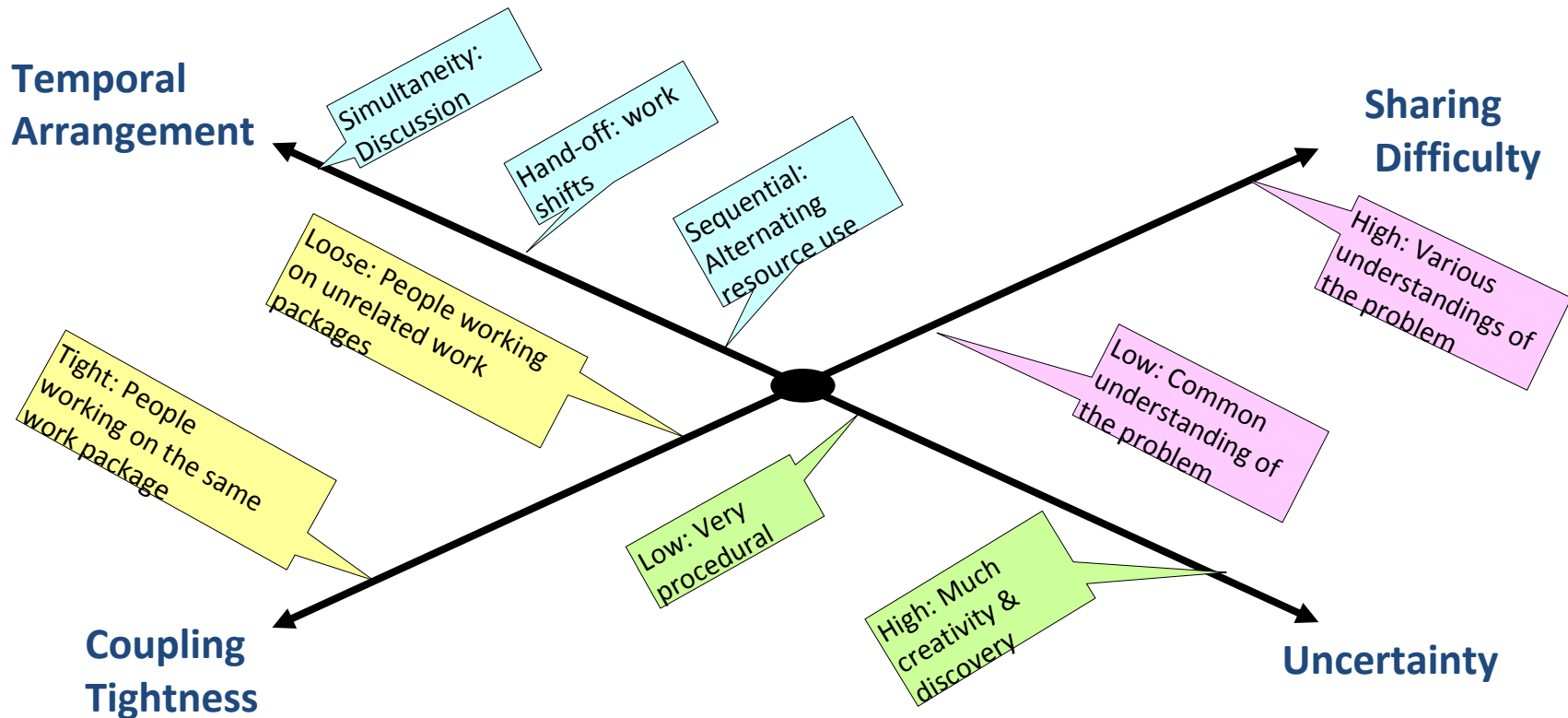


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Why Intense Collaboration?

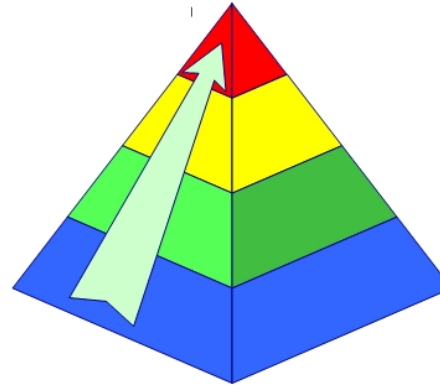
- Increasing complexity of problems facing military and civilian leaders
- Burgeoning communications technologies that allow networked collaboration, drive expectations, and also enables enemy activities.
- Need to adapt human aspects of IC to technological capabilities and affordances.

Intense Collaboration Defined (1)



“The required level and frequency of interactions needed for initiating and sustaining joint action and mutual awareness of the members of a team, the flux of activities in teamwork, the evolving work object, and the context of the collaborative situation (Kumar, Fenema & VonGlinow, 2004, p 131).

Collaboration Intensity Dimensions



**Time and Space
of Collaboration**

**Maturity levels
of Collaboration**

Nature of Collaboration

<p>Time and Space Collaboration is taking place in both time and space dimensions. Each of these aspects provide distinctive characteristics that details further such collaboration and influence how collaboration takes place and is executed amongst participants;</p>	<ul style="list-style-type: none"> ▪ Same time / Same place ▪ Same time / Different place ▪ Different time / Same Place ▪ Different Time / Different place
<p>Nature Participants' particular relationships amongst each others is another key characteristic that has influence on the collaboration process;</p>	<ul style="list-style-type: none"> ▪ Symmetry of Knowledge Relationship ▪ Functional Relationship of Organization ▪ Number of Participants
<p>Maturity Levels The purpose of collaboration is another aspect that qualifies further the collaboration process. Specific criteria are associated in maturity assesment of the collaboration process</p>	<ul style="list-style-type: none"> ▪ Shared objectives/end-state among participants and sense of urgency. ▪ Formal communication processes (protocols). ▪ Commitment and sense of belonging. ▪ Open communication, interoperability among participants, mutual trust and respect. ▪ Complementary, diverse skills and knowledge, intellectual agility and autonomy of thinking:

Examples of Intense Collaboration



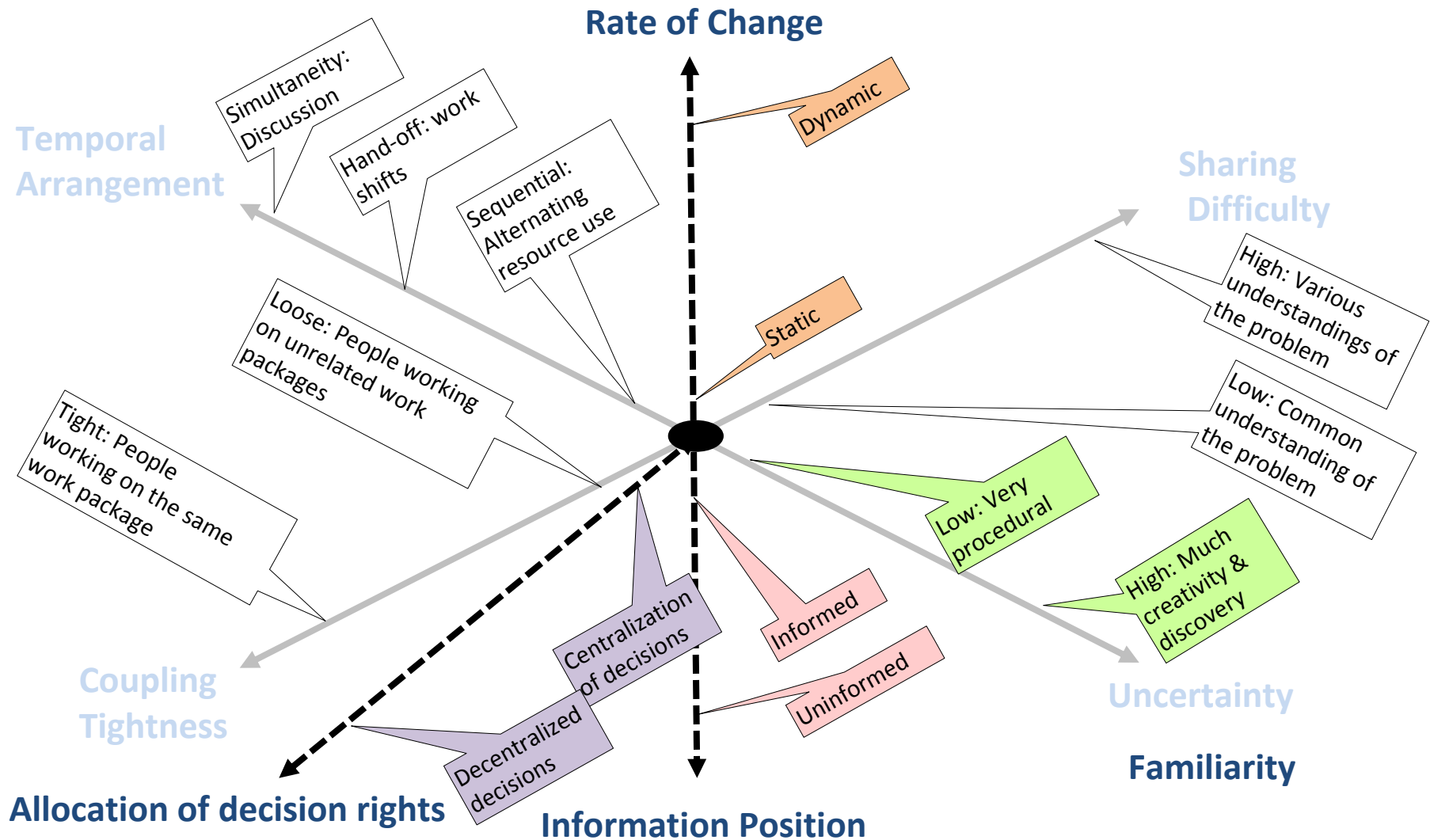
cursors

remote collaborators

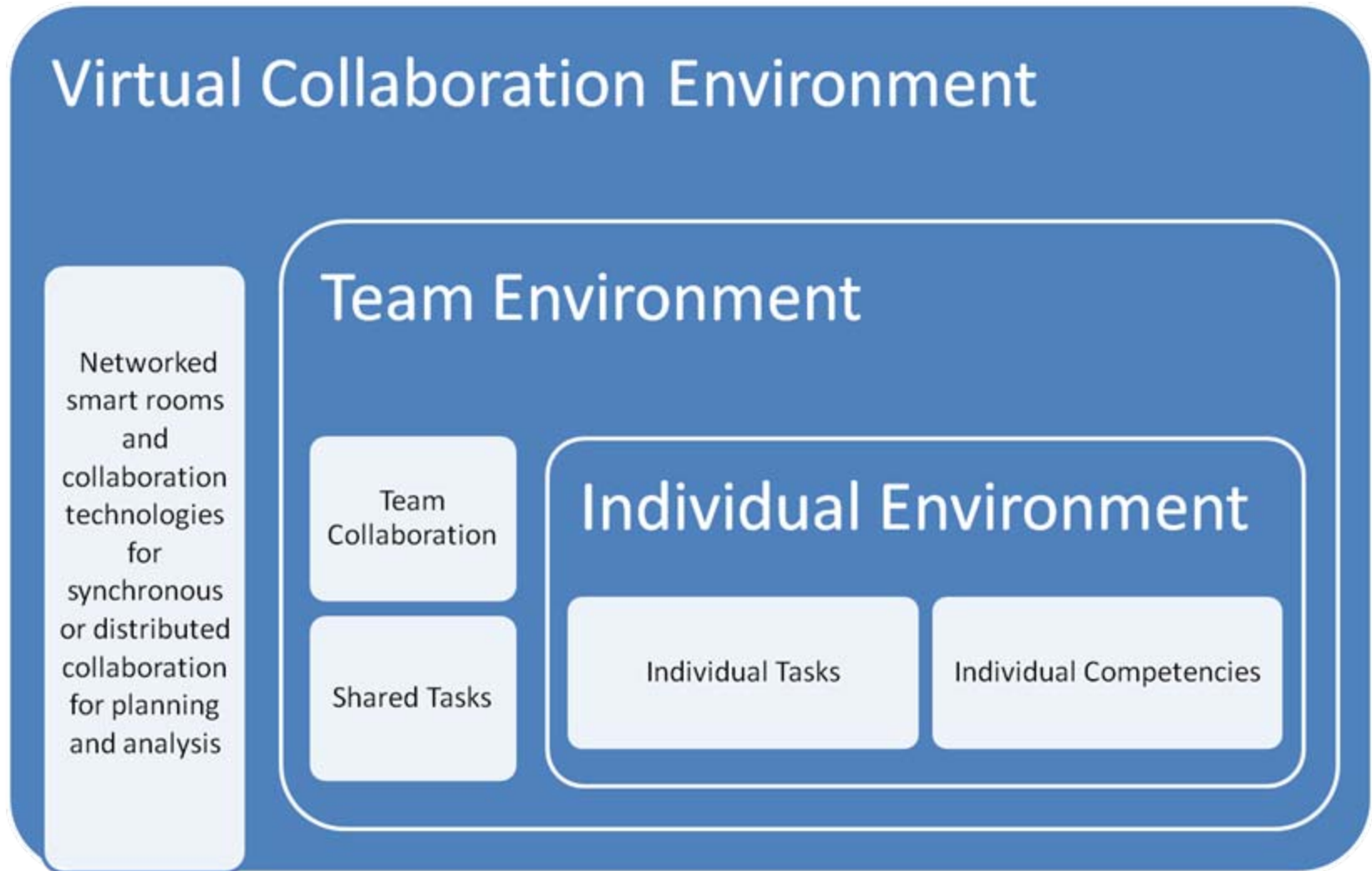


InFusion Collaboration Wall

Intense Collaboration and Information Age C2



Intense Collaboration and Agility



IC: Tasks

- Task Types: planning, execution, negotiation
- Time available
- Nature of problem at hand
- Emerging asymmetric problems pose high-stake decisions requiring access to remote experts, large data sets that are difficult to procure/analyze, and choices between less than optimal courses of action.
- Difficulty in reaching consensus among divergent stakeholders; consensus may not be feasible.

IC: Individual Factors

- Flexibility:
 - Respond to a variety of conditions and unfamiliar/shifting team partners
 - Create meaningful/coherent knowledge representations over time
 - Understand cues and patterns in novel environment
 - Understand interactions among cues to build causal relationships
- Resilience:
 - Rebound from failures that will occur in novel situations
 - Form problem templates to coordinate with new members
- Innovation/adaptability:
 - Think creatively in unanticipated/unexpected scenarios
 - Link new information with existing knowledge
 - Use a variety of thinking/reasoning strategies to achieve goals
 - Track individual, team, and system performance

IC: Team Factors

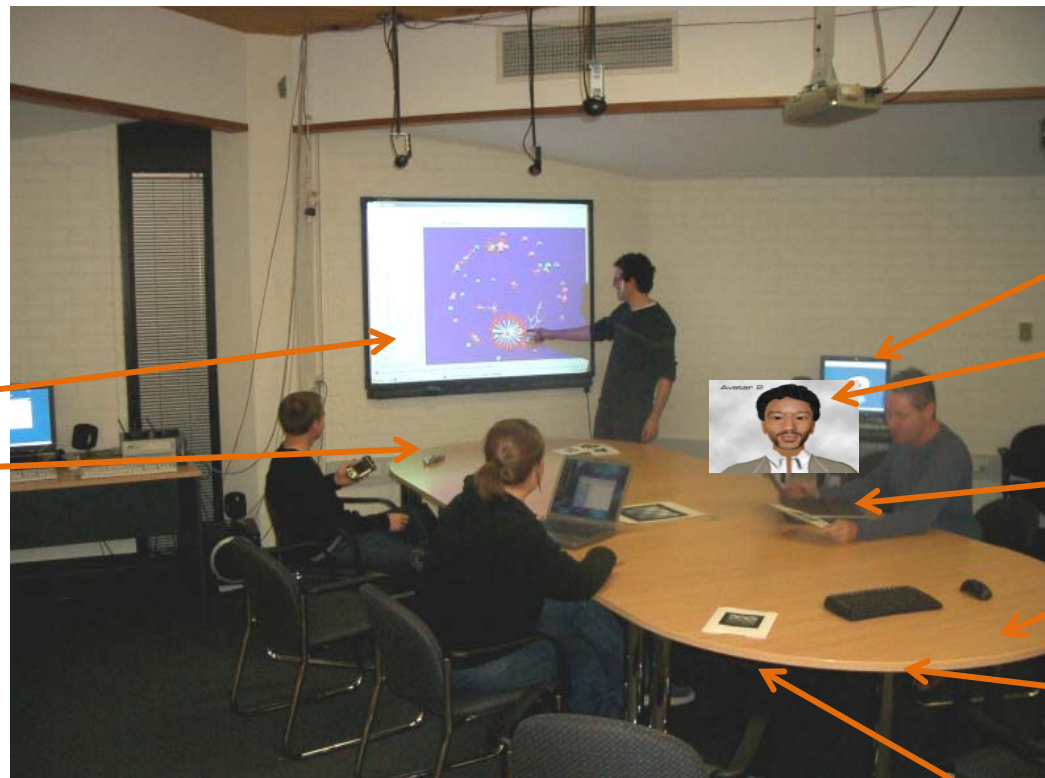
- Experience working together
- Mutual Trust
- Common Purpose
- Shared/complimentary skill sets
- Leadership
- Collective sense of efficacy
- Flexibility to adjust resource allocations and work strategies
- Active monitoring of self and team performance

IC: Internal/External Environments

- External:
 - Strategic goals: mission type, stakeholders
 - Resources available: time pressure, unpredictability of events and consequences, rapidity of change
 - Common Purpose: will impact stress level
- Internal:
 - Real time remote interaction (VTC, TC, groupware)
 - Use individuals as boundary spanning agents to connect various groups in the team

Technology for Intense Collaboration

How should technology support collaboration?



Camera Array

Interactive
Smart Board
Displays

X10 Controllers

Wireless Network

Workspace
Software
Infrastructure

Projectors

Virtual Avatars

Ambient
Displays
Pointing
Instruments

Wireless Devices

Augmented
Reality
Fiducial Cards

Livespaces: AU Intense Collaboration



Affordances

- **Convert text to graphics**
 - Create geo or conceptual views that help us come to a shared understanding
- **Visualisations of concept maps of things that are being discussed can help people "see" the issues more clearly and therefore may help prompt further discussions**
- **Create systems that mix narrative and graphics to explain things?**
- **Create a system which records keywords and concepts that have been discussed and links them back to the audio of the meeting that referred to these things**
- **Need to support people joining meetings part way through**
 - Find a way of summarizing what has been said so far
- **Use wordnet to explore different meanings of words to expand and contract on what people are referring to**
- **Need ability to disagree**
 - Need technology to support alternatives - need to hold disagreements and not prune branches too early - allow people to explore braches perhaps as separate subgroups
- **Support for electronic water cooler – allowing teams to share information informally**
 - could just ping a few people separately using current Livespaces sticker functionality
- **The IT is critical to organize, archive, collaborate and share in a workspace environment**

Hindrances

- Individual workspaces tend to individualize work
- Some people will just choose not to use the technology - and these can be a real hindrance for a team trying to use collaboration technology
- Latency can be a real concern and disturbs collaboration
- Variation in latency may be a worse problem - because of variability in response
- Amount of bandwidth consumed to support collaborative technology
- There will be different technical support to different parties - some are disadvantaged and this will cause significant discontinuities in the collaboration - are there alternatives to having high quality video?
- Tendency to feel that you can trust more if you can see people
- Value of the human cues – collaboration software can eliminate many of them or not convey them – the closer you approach high end VTC the more comfortable people are
 - Discrepancies between body language and what is being said

Intense Collaboration and Agility

	Intense Collaboration Dimensions		
	Team Factors	Leadership Factors	Technology Factors
Agility Attribute			
Robustness	Task-sharing among team members ; institutional memory would be developed over time and with technology support	Leadership may need to be shared among team members; more than one leader may be needed	Redundant technologies to provide back-up capabilities for information sharing and data management; quick recall of past actions to aid new problems
Resilience	Development of shared knowledge and trust would allow members to shift/share workload as needed to address unexpected issues	Leader efforts to make explicit knowledge implicit over time would lead to continuity in performance	Diagnosis and repair of inoperable technologies; tools that provide updates to members joining an ongoing process
Responsiveness	Timely responses can be effected by 24-7 operations across time zones; diverse expertise would allow the team to address a wide range of issues	Leader should monitor external and internal environments for early detection of cues that would impact team operations	Tools that alert team members to threshold conditions

Intense Collaboration and Agility

Flexibility	Diverse expertise would provide a variety of approaches in responding to issues and needs	Leader should actively work to achieve consensus among stakeholders while avoiding 'group think' among team members	Employment of visual, audio, textual forms of communication with a variety of display capabilities (white boards, knowledge walls, etc.)
Innovation	Team members with diverse cultural, political, and educational backgrounds can design new approaches to team problems/issues	Leader should span organizational and cultural boundaries	The presence of networked communication technologies may stimulate the operators to use the tools in novel ways; the presence of an IT expert will aid this process (people innovate, not tools)
Adaptation	Team member diversity would lead to a variety of responses to situations	The Leader may have to 'satisfice' among goals and be creative in determining courses of action	See above comment