



Spontaneous Role Adoption and Self-synchronization in Edge Organizations Using the ELICIT Platform

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Overview

- Self-synchronization
 - Conceptual
 - Empirical
- Role adoption
- ELICIT experiment
- Results
- Conclusions



Conceptual Characteristics

- Core characteristics of self-synchronization:
 - Common intent
 - Shared awareness
 - Competence
 - Trust
- Features? Enablers? Precursors? Factors?
- What actually happens when people self-synchronize?



What Do They Do?

- Doing the right thing at the right time for the right reason without top-down direction (Araki, 1999).
- Shared time, coordination of units, effects-based outcome (Van Bezooijen et al., 2006).
- *Spontaneous (undirected) coordination of effort*
- *Enhanced effectiveness*



The Role of Roles

- Strong link between team roles and organizational structures
- One's knowledge of their role and of other team members' roles contributes to effective team performance
- Role assignment seems to have an impact on team performance (e.g., role overlap in high-workload situation)
- “Planned” assignment vs. spontaneous adoption of roles
- Role assignment/adoption has received limited attention in team research



ELICIT Architecture

- Goal for the team:
 - To answer a 4-part question about the impending attack - *Who? What? When? Where?*
- All information is defined in a set of discrete intelligence bits called “factoids”, only some of which are relevant
- No one is given enough to answer any of the questions
 - Answering the questions requires sharing factoids



ELICIT Client Screen

The screenshot shows the ELICIT Client application window. The title bar reads "ELICIT Client". Below the title bar, the status bar shows "Subject name: undefined" and menu options "Actions" and "View". A secondary menu bar contains "Add to MyFactoids", "Share...", "Post...", "Refresh", "Identify...", and "Ready".

The main content area is divided into two sections:

- InBox:** A table with two columns: "From" and "Message". The table is currently empty.
- My Factoids:** A table with columns: "From", "Duplicated", and "Factoid". Above this table is a row of filter tabs: "My Factoids", "Who Site", "Where Site", "When Site", "What Site", "How I'm Seen", and "What I See". The "My Factoids" tab is selected. The table below is empty.

The Windows taskbar at the bottom shows the Start button, several application icons, and the system tray with the time "2:28 PM".



ELICIT Architecture

- Players share information
 - P2P
 - By posting to global websites
- 2 configurations:
 - **C2**: 4 teams of 4 (leader + 3 members) and team coordinator with each team responsible for 1 question
 - **Edge**: 1 homogenous team answer all 4 questions



Experiment Design

- **C2:** Subjects given explicit direction for what each role requires
 - **Cross-team Coordinator:** The role of the Cross-team Coordinator is to coordinate the flow of information between the 4 teams that is relevant to the question the team is responsible for answering. In addition, the Cross-team Coordinator has the responsibility to answer all 4 questions about the adversary attack.
 - **Team Leader:** The Team Leader receives special information about the adversary attack and is responsible for making sure all team members are provided with all relevant information for the question the team has to answer, as well as trying to figure out the answer to the question assigned to your team.
 - **Team Member:** The role of the Team Member is to send information you receive about the adversary attack to the Team Leader, and to figure out the answer to the question assigned to your team.
- **Edge:** Subjects not given explicit direction



Experiment Design

- C2 group acts as reference for comparison to Edge group.
- Self-synchronization in the Edge condition should lead to
 - Adoption of meaningful roles by Edge subjects in the absence of direction
 - Enhanced effectiveness and performance of Edge subjects



Results: Operationally Defining Roles

- What people do in ELICIT is defined by the actions they engage in... hence the frequencies with which they commit those actions are telling
- *Unconditional action frequencies*: May not represent contingencies of complex meta-actions
- *Action pair frequencies*: Could more meaningfully represent a complicated construct like role
 - E.g., *Pull-Pull* different from *Pull-Share* or *Pull-Post*.



Paired-Response Frequency Matrix

0177 - pull IamB3n6
 0177 - post IamKpES
 0179 - **pull** Iamph64
 0182 - pull IamKpES
 0182 - identify Iama0UY
 0183 - pull IamKpES
 0184 - **how_seen** Iamph64
 0185 - **what_see** Iamph64
 0185 - pull IamB3n6
 0186 - how_seen IammoN_
 0187 - pull IamFIdN
 0188 - **pull** Iamph64
 0188 - what_see IammoN_
 0188 - pull IamMqs7
 0188 - pull IamfaIv
 0188 - what_see IamFIdN
 0189 - pull IamFIdN
 0191 - **share** Iamph64
 0191 - **pull** Iamph64
 0191 - pull Iam8r9k
 0191 - **pull** Iamph64

	Push	Pull	Share	Receive	Identify	What_see	How_seen
Push	3	6	3	2	0	1	0
Pull	7	107	12	18	4	6	4
Share	1	17	7	2	0	2	0
Receive	4	11	4	13	3	1	0
Identify	0	7	0	0	1	0	0
What_see	0	11	0	0	0	0	1
How_seen	0	0	0	0	0	4	0

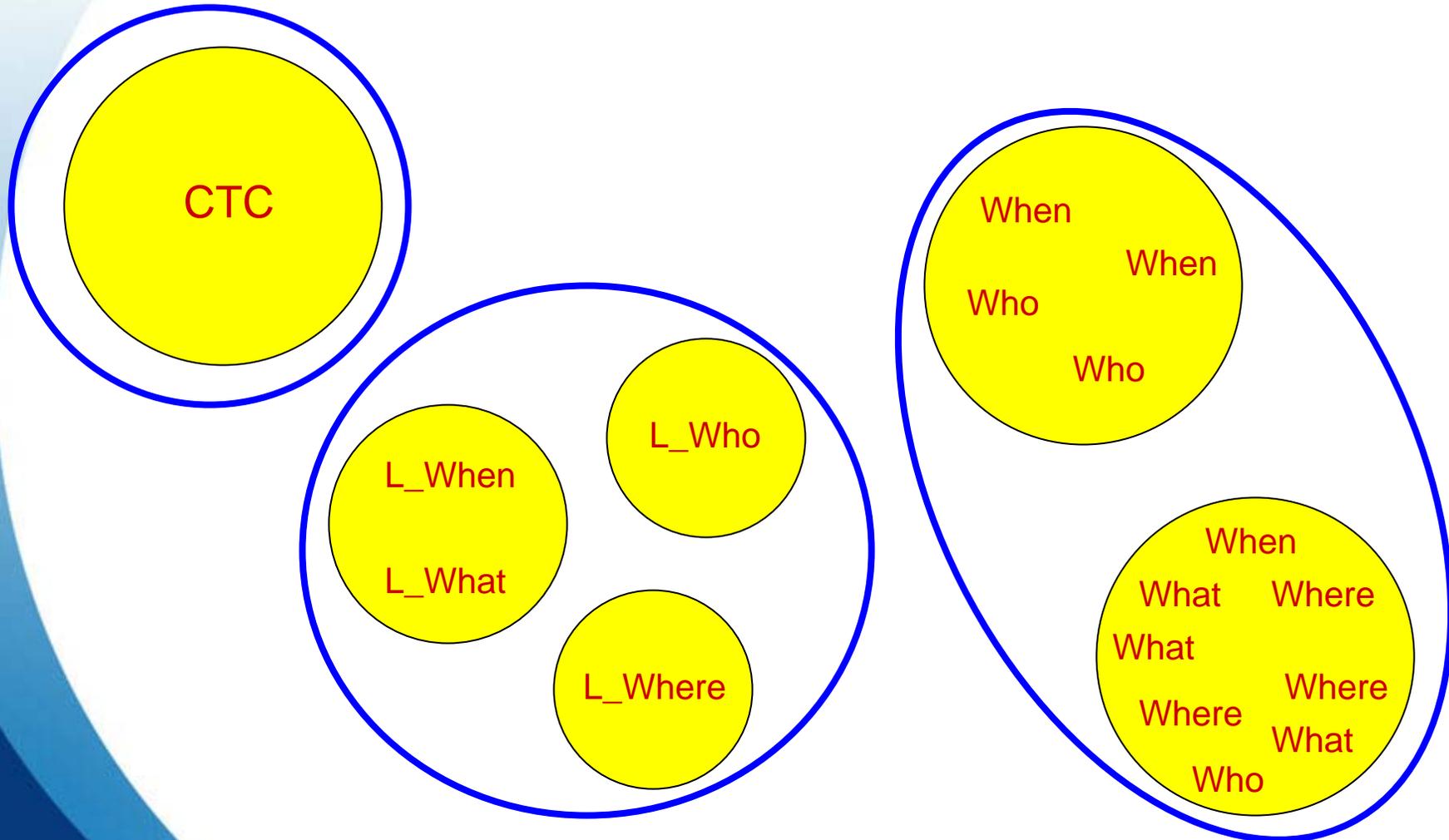


Cluster Analysis

- Individual cells from the paired-response matrix were entered as variables into a cluster analysis
- Maximized between subjects Chi-square proximity metric
- Clustering started at 2
- Number of clusters incremented until all 3 role classes (CTC, Leader, Member) occupied unique clusters with no overlap between them

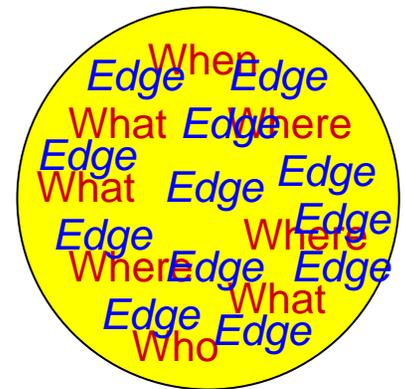
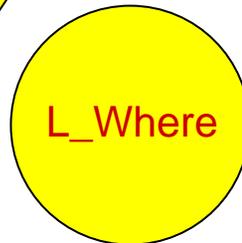
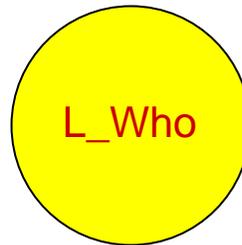
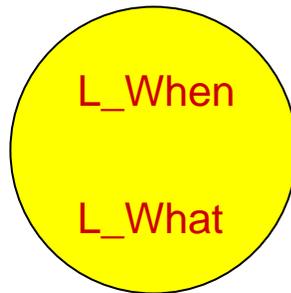
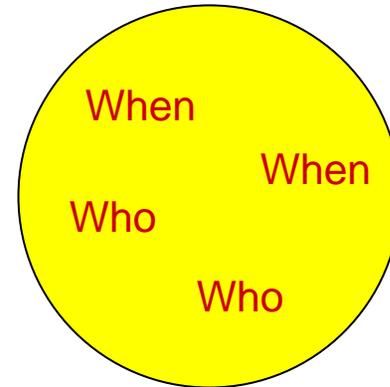
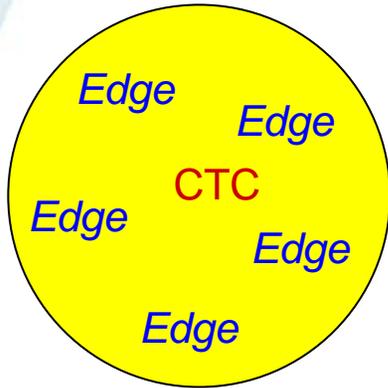


C2 Group Clusters





Clustering with Edge Group Members





Support for Role Clustering Results

- 2 behavioural indicators used to confirm role clusters observed:
 - Proportion of reciprocated shares
 - Proportion of each type of actions
- Analyzed by role, whether predefined in C2 or spontaneously adopted in Edge



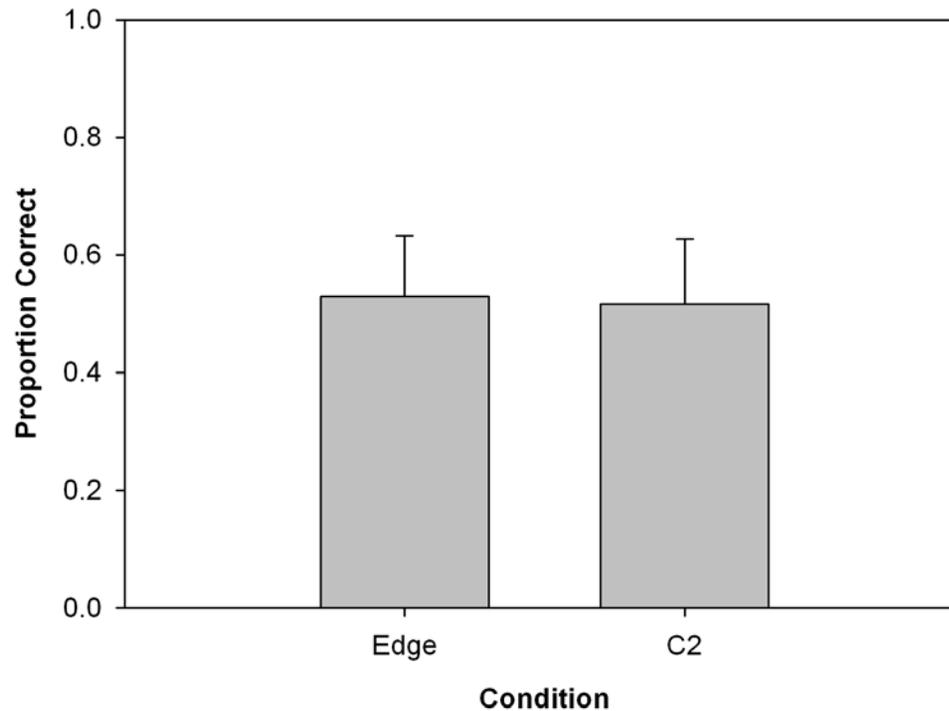
Support for Role Clustering Results

- Reciprocated shares
 - More reciprocated shares when sender had a leadership role in C2, but no difference in Edge
 - More reciprocated shares when receiver had leadership role both in C2 and Edge
- Type of actions
 - Spontaneous leaders in Edge acted as their C2 counterparts (e.g., more shares than Team Members)
 - Spontaneous team members in Edge acted as assigned team members in C2 (e.g., more pulls)



Measure of Effectiveness

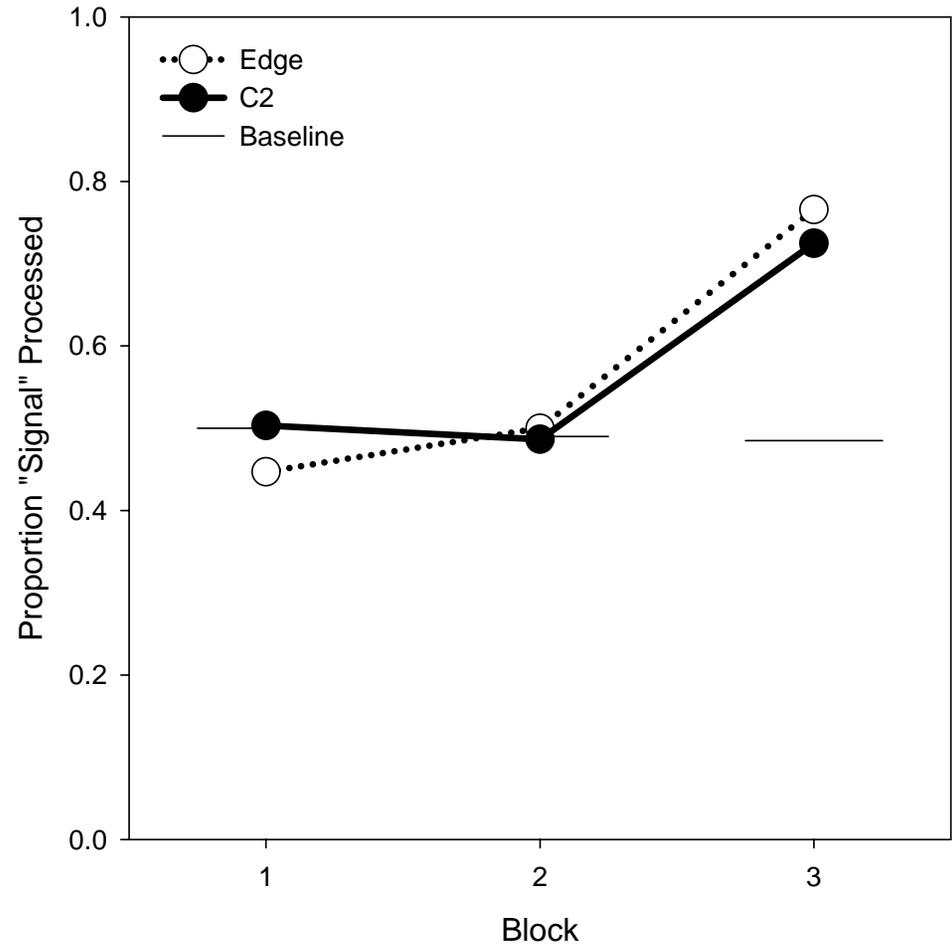
- Effectiveness is the proportion of correct Identify responses submitted by subjects in each group





Measure of Performance

- Factoids divided into “signal” and “noise”
 - **Signal:** Key, Expert, Supportive
 - **Noise:** Noise
- Computed proportion of each class used in actions across blocks





Conclusions

- Some support for self-synchronization: Subjects in Edge spontaneously adopted some of the defined roles of C2 but did not adopt novel roles
 - Behavioural indicators suggest corresponding roles were similar
- Both groups were equally effective in identifying details of the terrorist attack and in learning to select signal vs. noise factoids
- Results could be explained in part by:
 - Self-synchronization
 - Organizational differences
 - Nature of the ELICIT platform

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