Modeling Interaction Processes in Multicultural Teams through Relational Event Models

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* Process in teams
* Challenges in modeling process
* Intro to relational events
* Examples of sequential structural signatures (SSS’s)
* Brief and simple example of a longitudinal analysis
**process = interaction**

In order to understand “team process”, we need to look at how and when team members *interact* and how this unfolds *over time*.

This, we rarely do in the team literature.
Challenges along the way

Having to rely on theories that are underveloped with regard to time

- The higher X, the higher Y
- But: how quickly?
  - for how long?
  - does it happen linearly?

We generally don’t force ourselves to explicitly think about these questions and find it very difficult to think in time-sensitive terms.
Processes as relational events

Event = \{sender, receiver, time\}

Event = \{sender, receiver, time, weight, type, modality, …\}

Events are recorded in an event list.
We model event rates, parameterized as:

$$\lambda_{(\text{sender, receiver, time})} = \exp(\sum \beta X_t)$$

$X_t$ can be time-dependent, both endogenously and exogenously.

For example, the rate by which A asks B for help at time $t$ loglinearly increases with how much B has favorably responded to A’s requests in the past.
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Advantages of modeling rates

* They are a natural building block for time-based theorizing.

* They stimulate thinking in terms of speed, pacing, rhythm, cycles, duration, lag, frequency, et cetera.

* There is a huge body of statistical work on rates, especially in event history modeling and survival analysis, which we can directly make use of.

* The formulation of a model for event rates is straightforward and can be made extremely rich.
The general approach

possible events, SSS’s

possible events, SSS’s

possible events, SSS’s

possible events, SSS’s

actual event

actual event

actual event

actual event
The general approach

Possible events, SSS’s

Possible events, SSS’s

Possible events, SSS’s

Possible events, SSS’s

Actual event

Actual event

Actual event

Actual event

Theory

Observations
Statistically speaking (for those who are into Greek)

We assume inter-event times to be exponentially distributed (with rate $\lambda_t$) and that rates ($\lambda_t$) and covariates ($X_t$) are constant between events (but can vary otherwise).

The conditional likelihood of an event sequence, is then straightforward and parameter estimates are obtained by maximizing a likelihood function: $\max_{\theta} p(A_t | \theta)$

or Bayesian: posit $p(\theta)$, work with $p(\theta | A_t) \propto p(\theta)$
SSS’s: distance/co-location
Hypothesis:
Reciprocity may occur at different speeds for different cultures
Hypothesis:
Members of cultures in which status (difference) is important, may communicate more frequently with the team manager than members from more egalitarian cultures.
SSS’s: habitual inertia
Hypothesis:
Team members from cultures where formal rules are highly valued, will less frequently skip the intermediary than team members with a looser appreciations of formality.
Hypothesis:
Team members who are new to the team will tend to initially mimic (culturally) similar others, until they establish their own way of working and interacting.
SSS’s: participation shifts

Classify actors into senders, receivers, and bystanders. When roles change, a participation shift ("P-shift") is said to occur. Gibson (2003, 2005) distinguishes 13 kinds of shift, including:

**AB-BY**: John talks to Mary, then Mary turns to Peter (turn receiving)

**A0-XA**: John addresses the group, of whom Frank responds to John (turn claiming)

**AB-XA**: John talks to Mary, then Frank talks to John (turn usurping)

**Hypothesis**: Cultures can differ in their conversational norms (as hence, parameters for P-shifts will be different), this can lead to communicational disarray.
An example

Butts (2008): study of the radio communication by responders immediately after the 9/11 WTC disaster

Findings: local reciprocity + handing-off (AB-BY)
Hypothesis:
Team members from outgoing cultures will engage in more frequent outgoing communication (at higher rates) than those who are more contemplative.
Hypothesis:
Differences in temporal styles create heterogeneous interaction rates across the team, but with overall low rates of communication between early actors and deadline actors.
Thinking in terms of time: simple example
Thinking in terms of time: example

REM with shared group membership as explanatory variable
Thinking in terms of time: example

REM with shared group membership as explanatory variable
Thinking in terms of time: example

REM with shared group membership as explanatory variable
Typical model

The rate of communication from one team member (A) to another (B):

* increases with shared communicational history ("inertia")
* increases with an increasing history of messages from B to A ("reciprocity")
* is higher the more similar B is culturally to A ("dyadic similarity")
* if B is the team leader, A will have a higher rate of interacting with A if A is culturally more accepting of status hierarchy ("fixed effect for A")
* for modest/shy cultures: is higher when A is previously addressed individually, rather than as a member of a group (negative "turn claiming")
* is lower the more contemplative A is ("fixed effect for A")
Taking Team Dynamics a Step Further: From Snapshots to the Movie

* Increasingly we have access to (full) event data (e.g., sensor data, server logs, videotaped interaction, document analysis, sociometric badges)

* Temporally binning is a waste of beautiful data

* There is much variance to be explained in team performance, modeling the movie allows us to open the box for many new explanations and more detailed analysis

* Without ample time-sensitive theory to study (multicultural) teams, approaches like REM can help inform theory by providing opportunities for fine-grained temporal analysis.
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