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Modeling Collaboration: A Case Study

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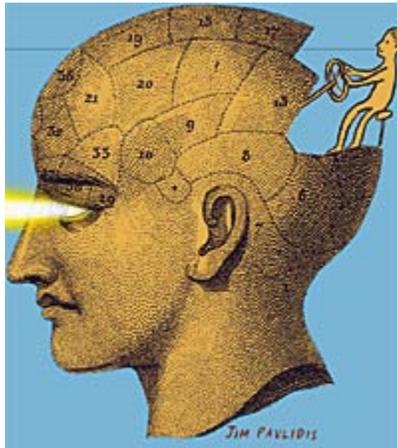
Models Are the Foundation of Good Design

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- **Airplane design is a mature engineering discipline**
 - Early designs were based on observations of birds
 - Today's designs are based on physical and functional models
- **Collaboration technologies are guided by intuition and introspection**
 - We are still at the bird-model stage



Modeling Collaboration

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- **Modeling approaches exist and have proven value**
- **How can models contribute?**
 - Provide better understanding or requirements
 - Provide adaptivity when embedded in technology
- **Performative vs ostensive models (Feldman & Pentland, 2003)**
 - Ostensive models describe how behavior should occur
 - Performative models describe how it does occur

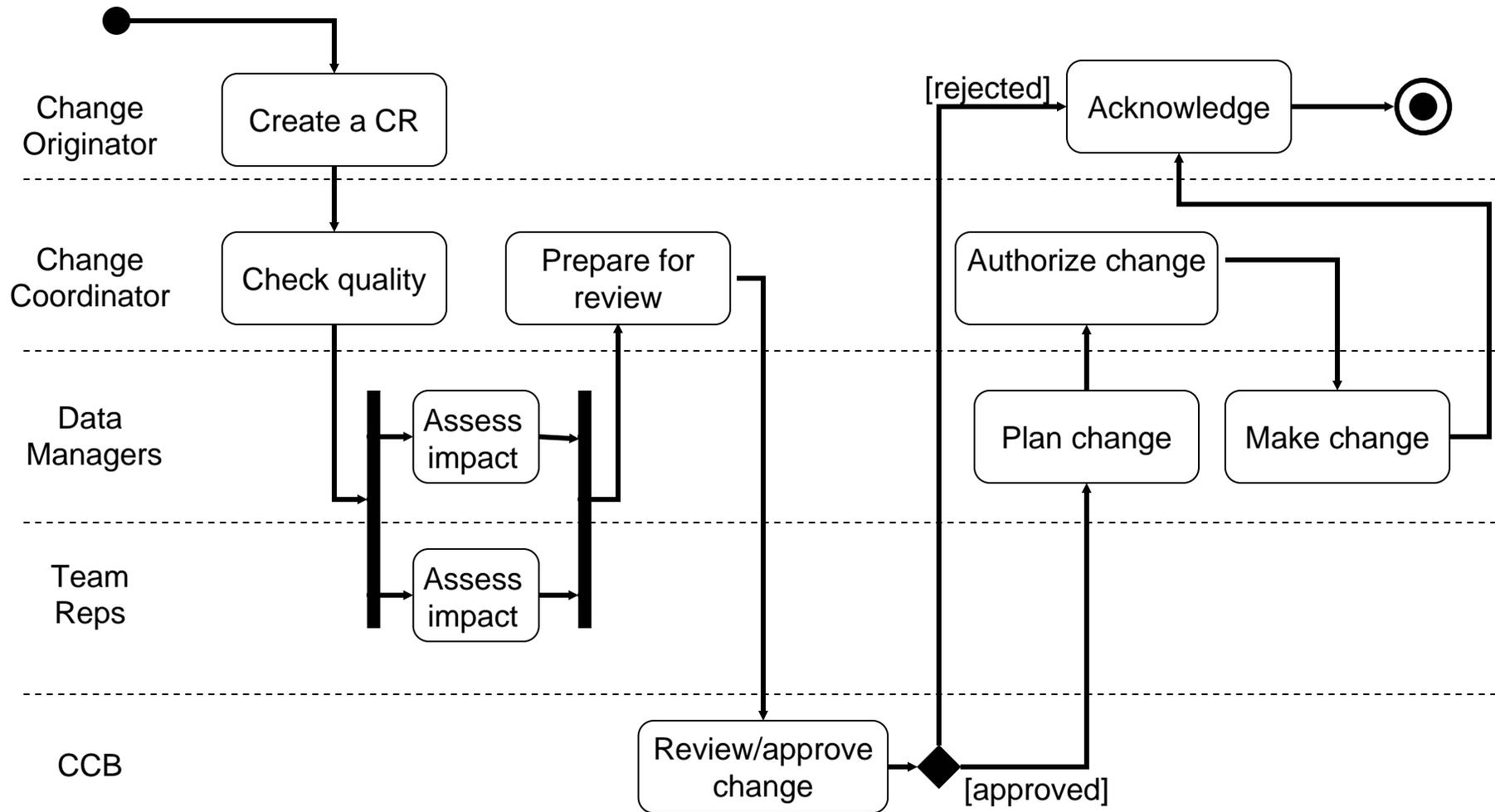
Change Management: A Case Study

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- **Managing change is an essential part of collaborative engineering**
 - **Changes to configuration, schedule, costs, organization structure, technical performance measures**
- **Emerging scientific communities may manage changes to:**
 - **Project plans**
 - **Libraries of data**
 - **Shared computing resources**
 - **Shared lab equipment**
- **How can models of collaboration contribute to effective change management?**

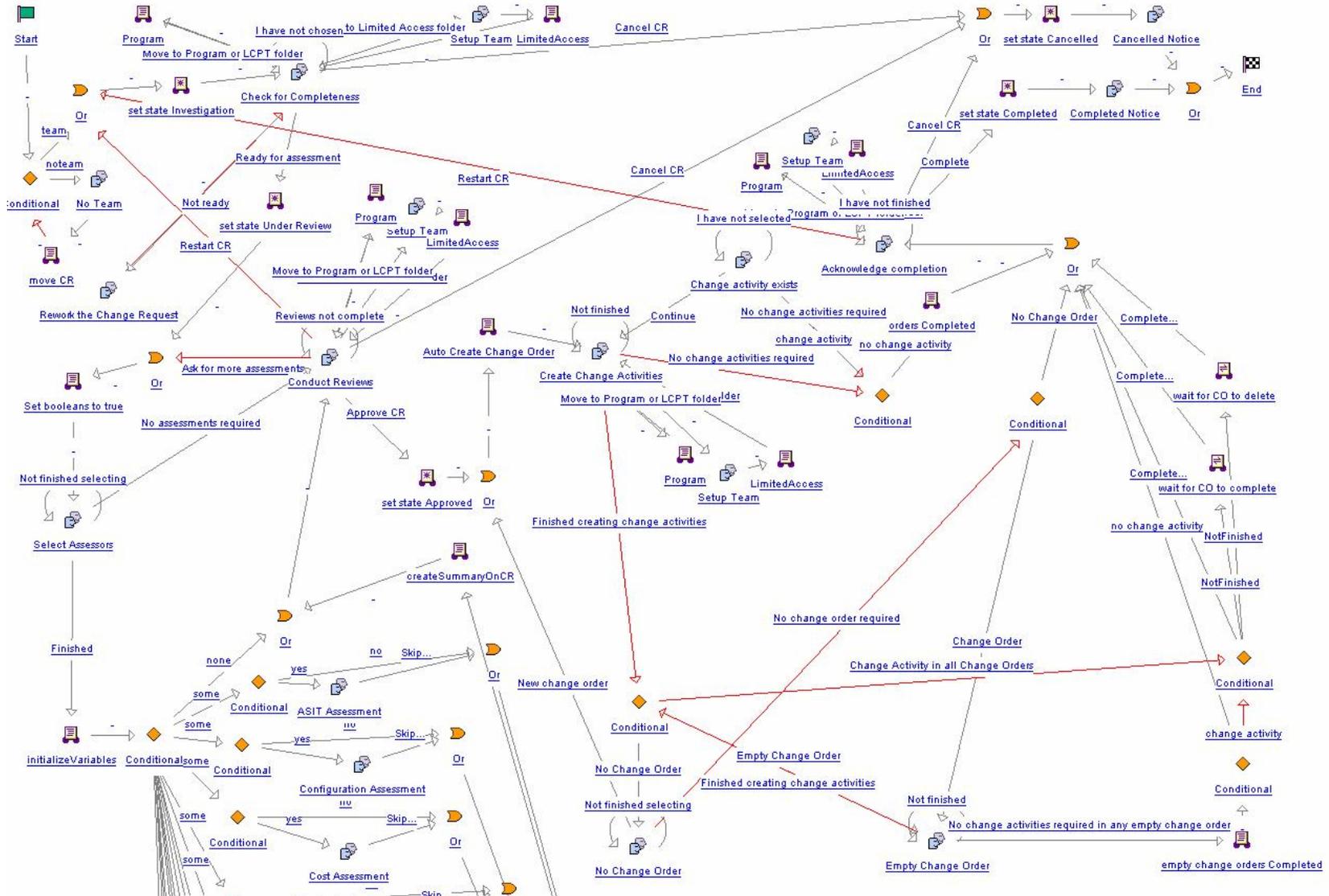
UML Activity Diagrams



Workflow Models

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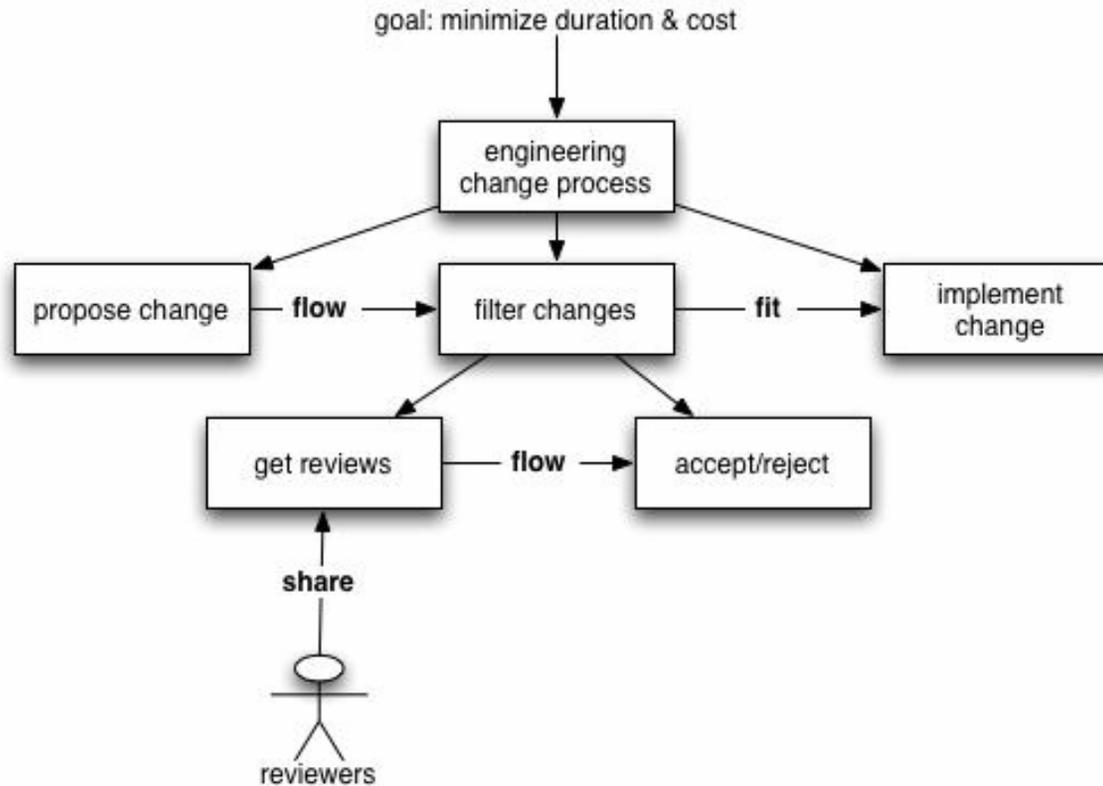
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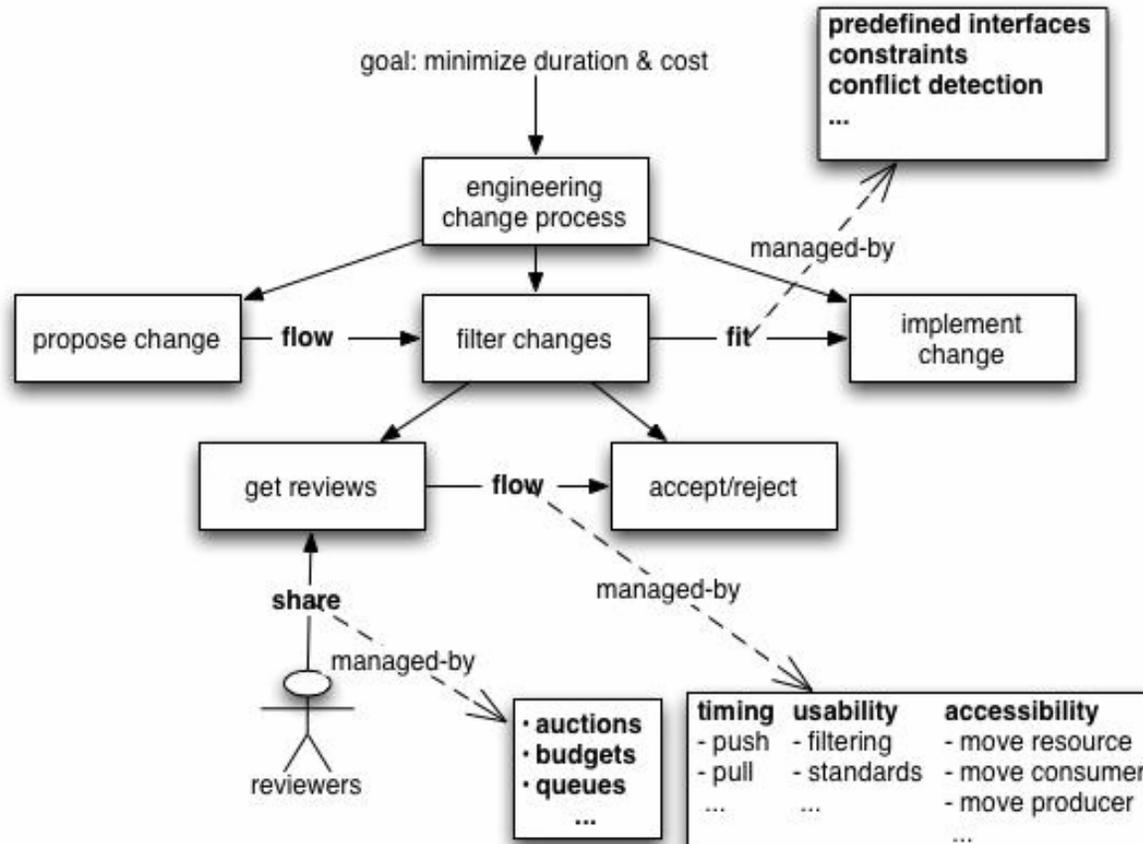
Coordination Theory

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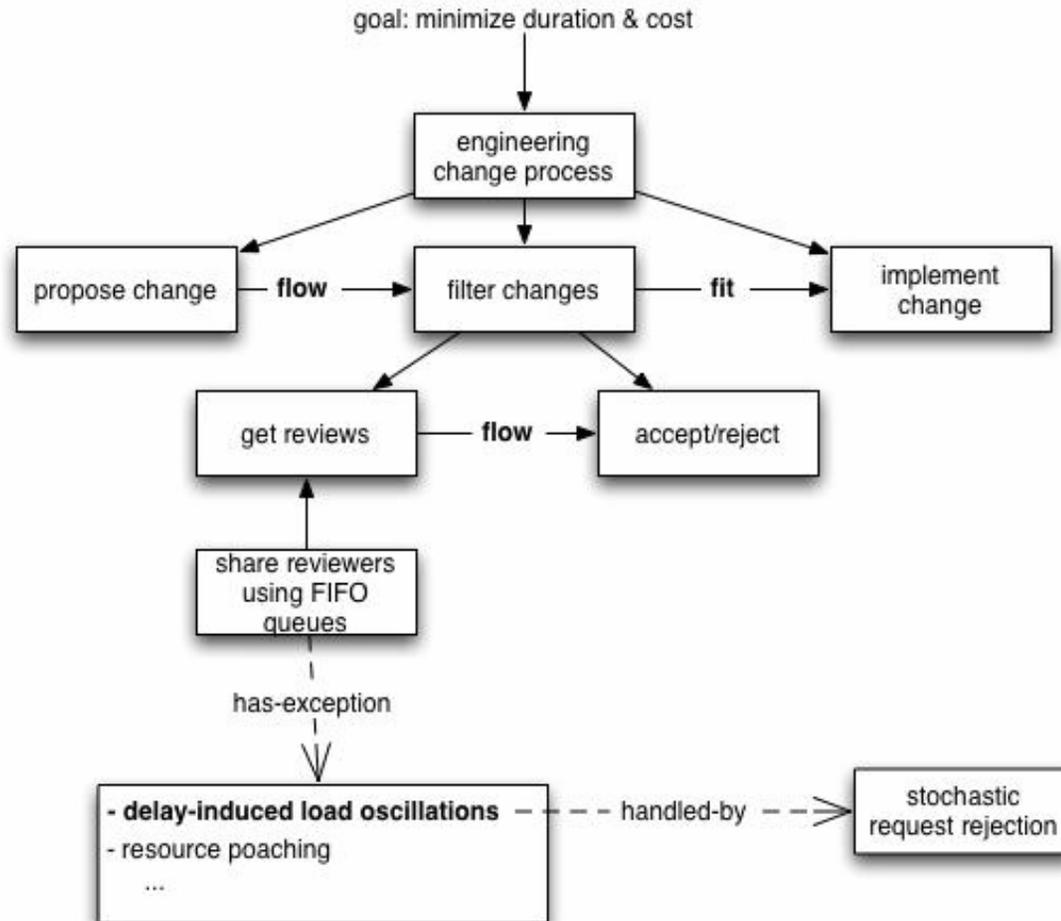
Coordination Theory



Coordination Theory

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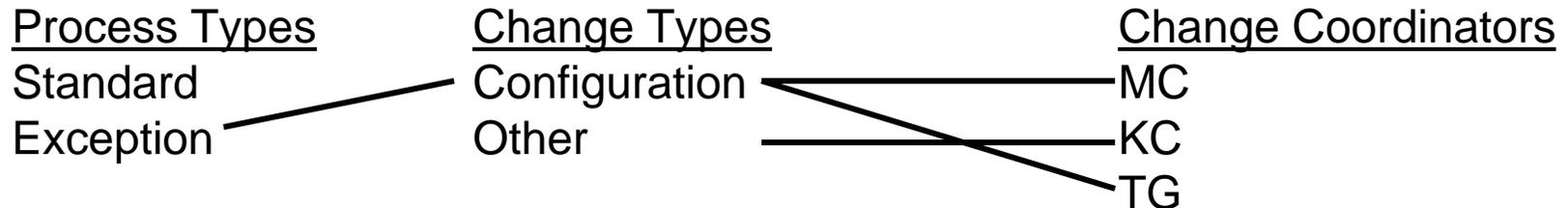


Grounded Theory and Distributed Cognition

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- **Observation, interviews, and artifacts**
 - “Actually, most of our changes these days have been configuration changes, and TG and I are doing all those. KC is doing the rest of them.” [Interview with MC]
 - “Configuration isn’t following the process. We find out about them in the CCB and stick them in the system.” [Interview with KC]
- **Identify categories and relationships**

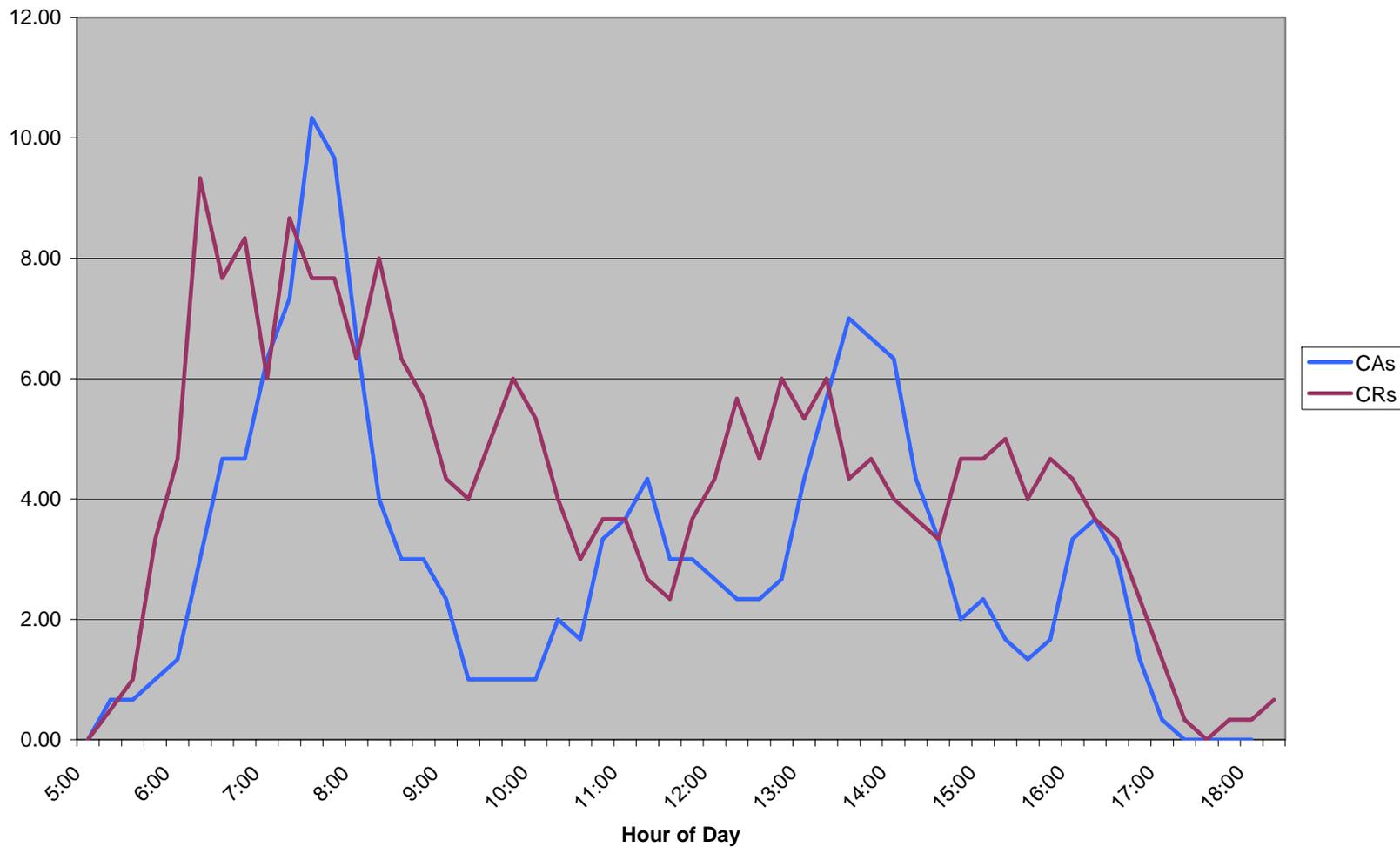


Temporal Models

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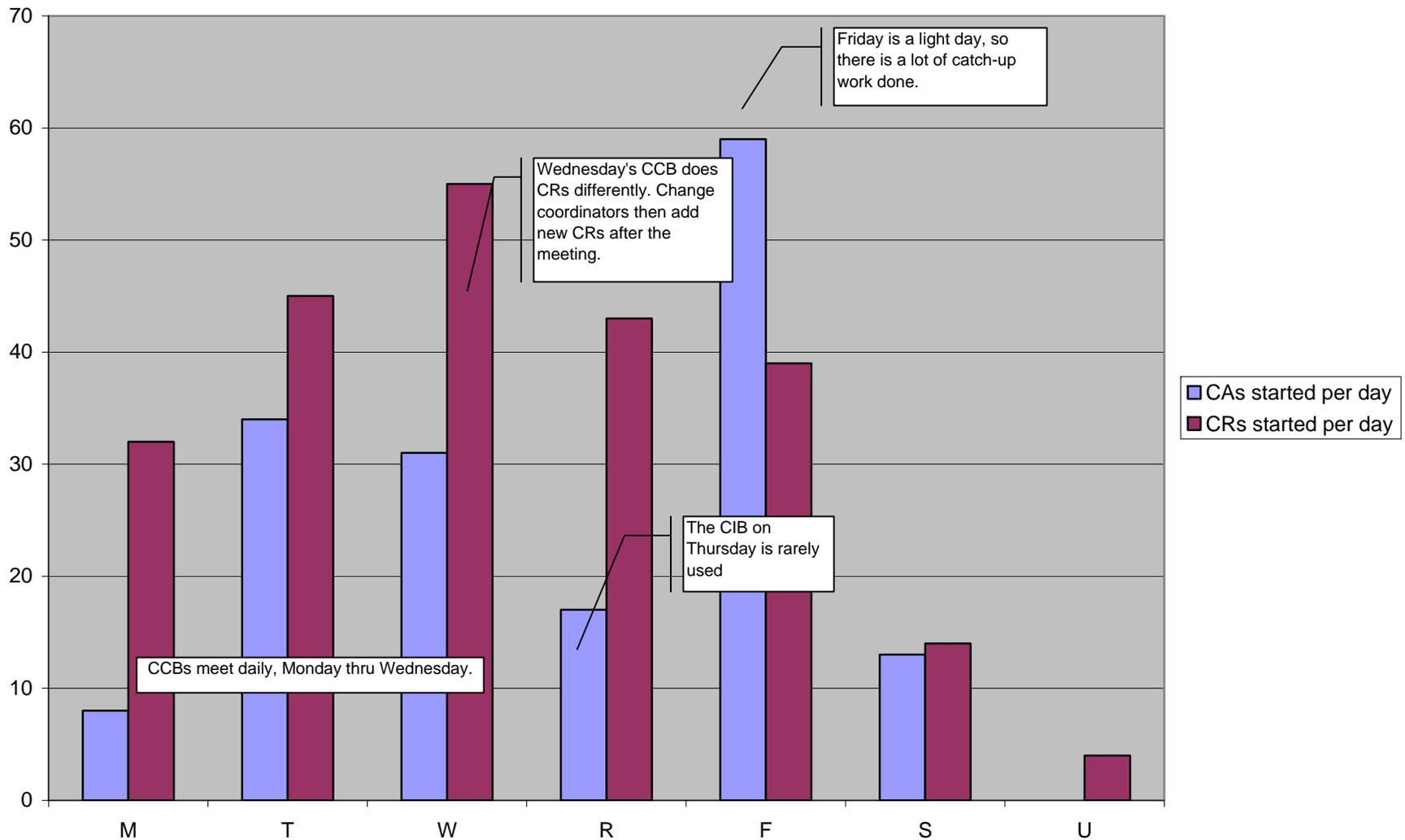
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Hourly CRs/CAs



Temporal Models

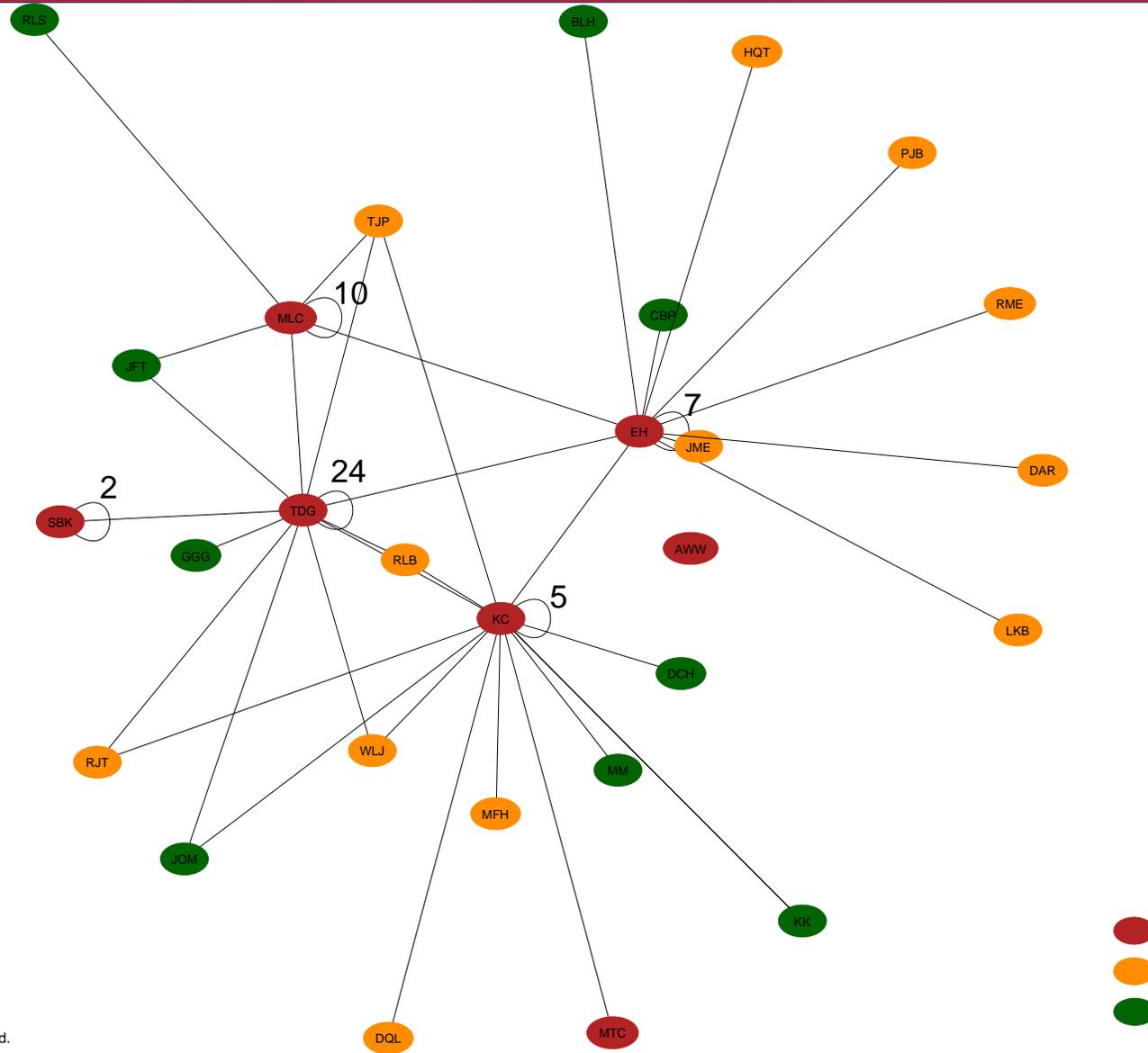
Daily CRs/CAs



Social Network Models

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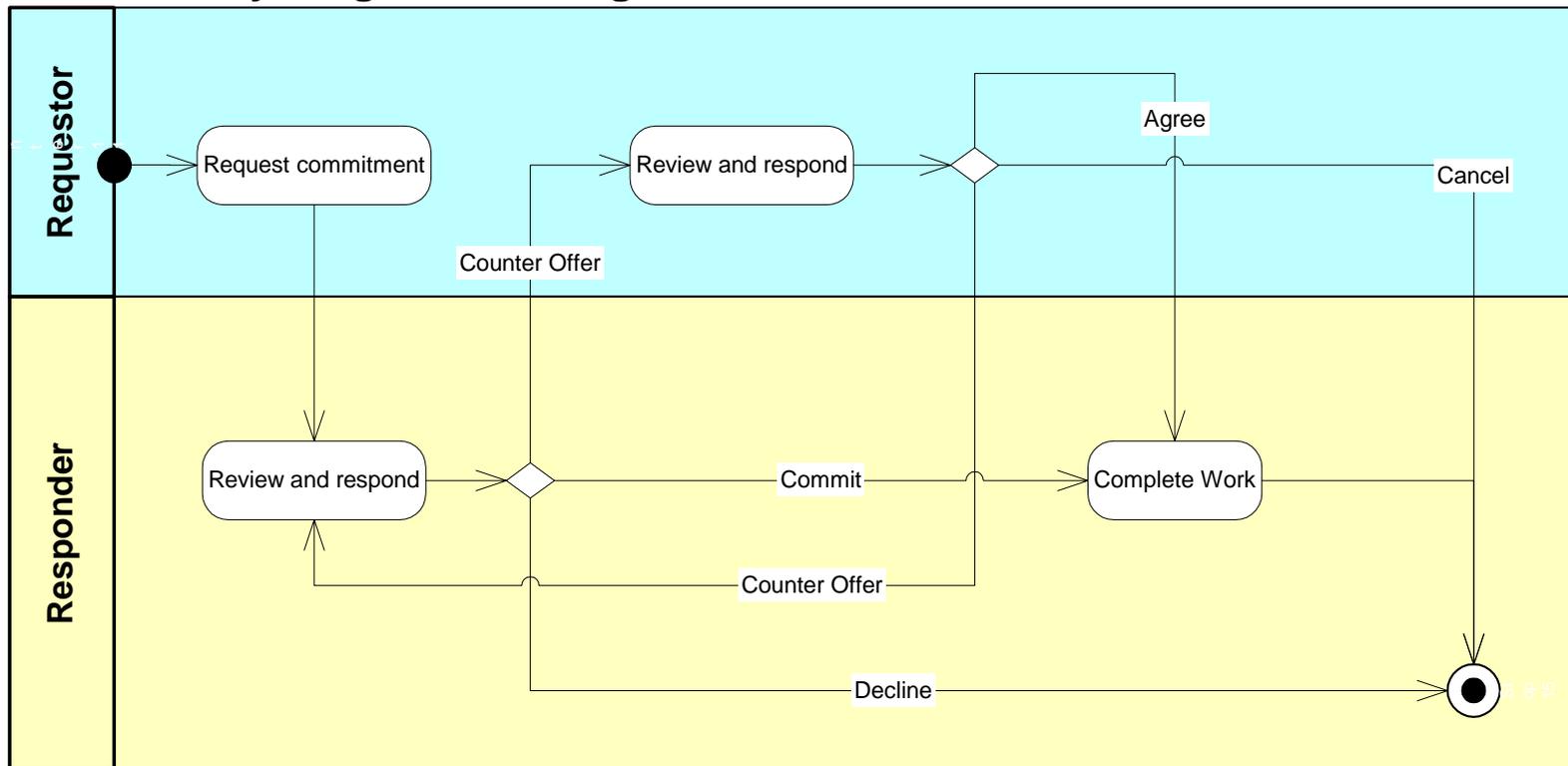


Language Action Perspective

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UML Activity Diagram of a Negotiation Conversation



Formal (GOMS) Models

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- **GOMS = Goals, Operators, Methods, Selection**
- **Simulate teamwork with team of models**
 - **GOMS model for change originator, change coordinator, data managers, team reps, and CCB**
 - **GOMS model of collaboration steps**
- **Possible collaboration examples**
 - **Change Coordinator Goal: Prepare complete package for CCB**
 - **If CR is incomplete, ask change originator to correct it**
 - **If assessments are late, send email to late assessors**
 - **If assessments are incomplete, ask other people for assessments**

Conclusion

- **Models facilitate understanding collaboration**
 - Each modeling method offers a different view and different opportunities
- **Attributes modeled include**
 - Roles, procedures, dependencies, constraints, timing, communication patterns, collaboration artifacts, and goals
- **Models are incomplete**
 - People are a large source of variance and are not modeled
 - No stochastic models of collaboration
- **Potential technology enhancements**
 - Automated adaptation to exception conditions
 - Adaptation to schedule peaks and valleys
 - Visibility of deviation from normative conditions
 - Coaching to achieve high-performance collaboration