Understanding Process Differences:

Agreeing Upon a Single Way to Skin a Cat

Steven Poltrock and Mark Handel, Boeing Phantom Works
Mark Klein, MIT

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Coalition members must work together

- **Working together requires common or integrated processes**
  - Organizations follow different processes to accomplish the same goals
  - Coalition members also differ in language, culture, policies, and objectives
- **What would help coalition members achieve common or integrated processes?**
  - Hypothesis: A method for analyzing processes that identifies the root causes of their differences
  - May help eliminate, reconcile, or at least understand differences

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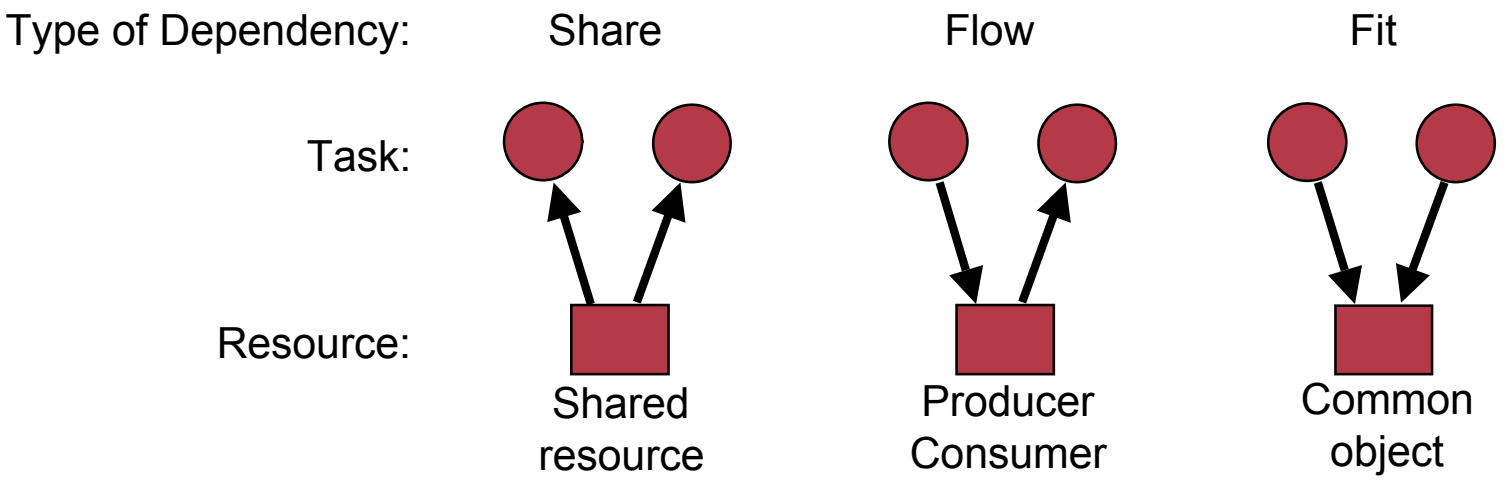
Coordination theory describes why people collaborate

- **Coordination theory describes how people or software agents coordinate their activities**
- **Collaboration occurs in order to manage dependencies between tasks**



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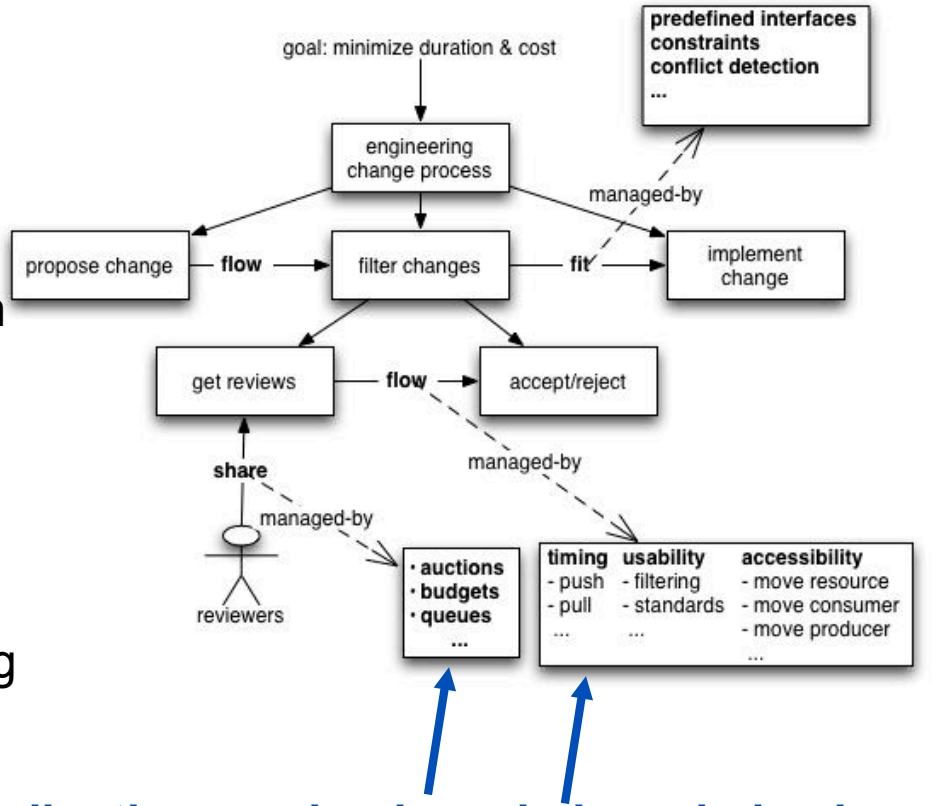
Top-down modeling approach

- **Top-down approach instead of the typical bottom-up analysis**
- **Iteratively:**
  - Define primary process steps
  - Identify fit, flow, and share constraints
  - Select a coordination mechanism from a knowledge base – the Process Handbook
  - Add exception handlers
- **Benefits:**
  - Compare, analyze, and integrate different processes for performing the same work
  - Reduce process diversity
  - Identify process similarities



Coordination mechanisms in knowledge base

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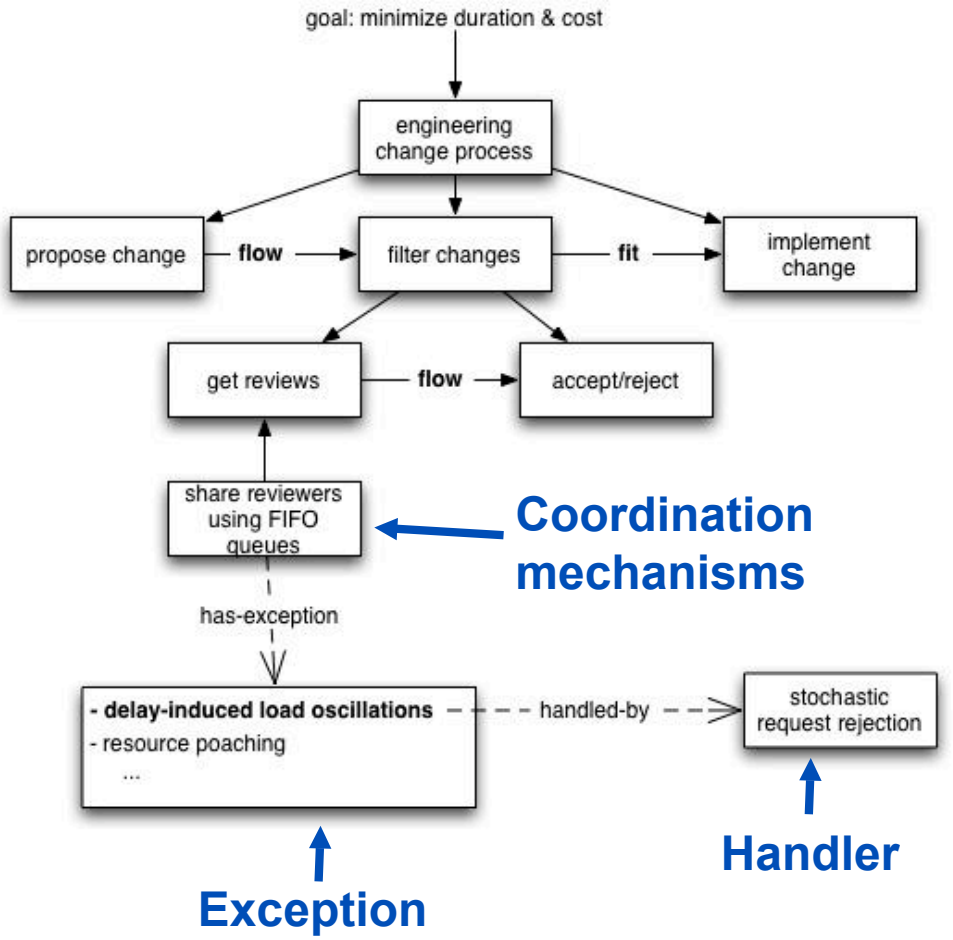
Coordination mechanisms encounter exceptions

- **Processes are fragile because of unexpected exception conditions**
- **The knowledgebase includes exceptions and methods for handling those exceptions**
- **Potential for real-time detection of exceptions and automated process repair**



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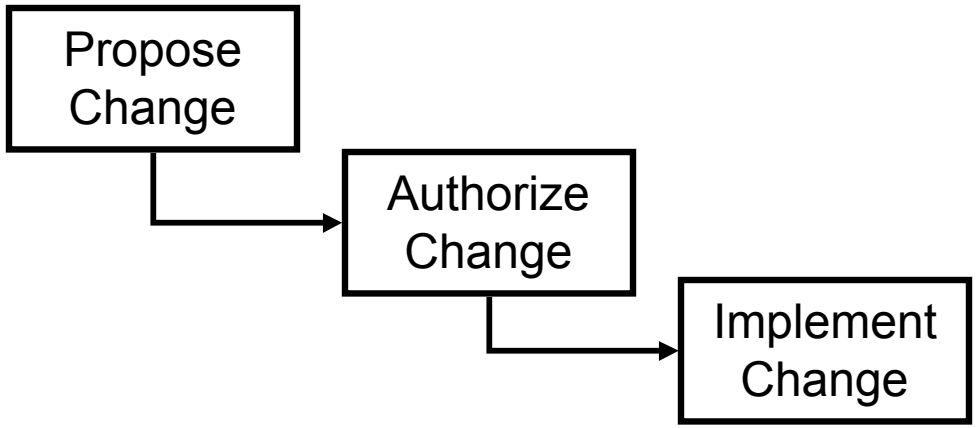
Change management is mission critical in industry

- **A single program may have hundreds of change management processes**
  - Everyone uses different tools and processes
  - Everyone agrees on the basic process



- **We modeled and compared three change management processes in the same program**

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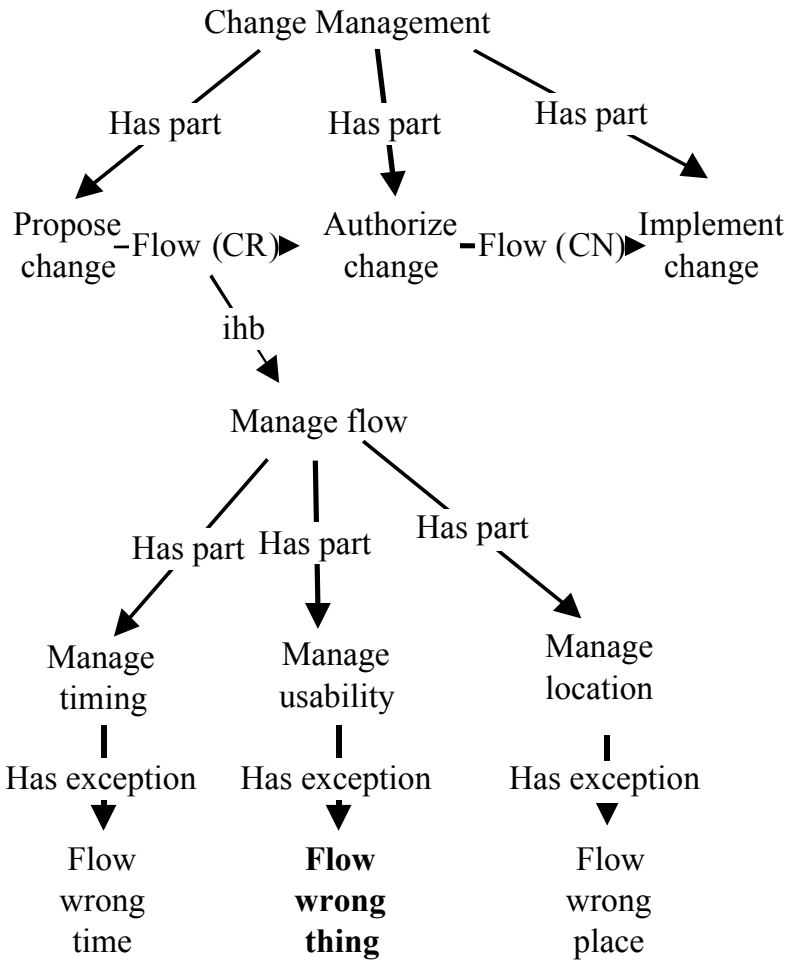
Top level of the change management process

- **The coordination theory approach:**
  - Identify primary process steps
  - Identify fit, flow, and share dependencies
  - Select a coordination mechanism
  - Decide how to address anticipated exceptions by adding exception handlers
  - Iterate



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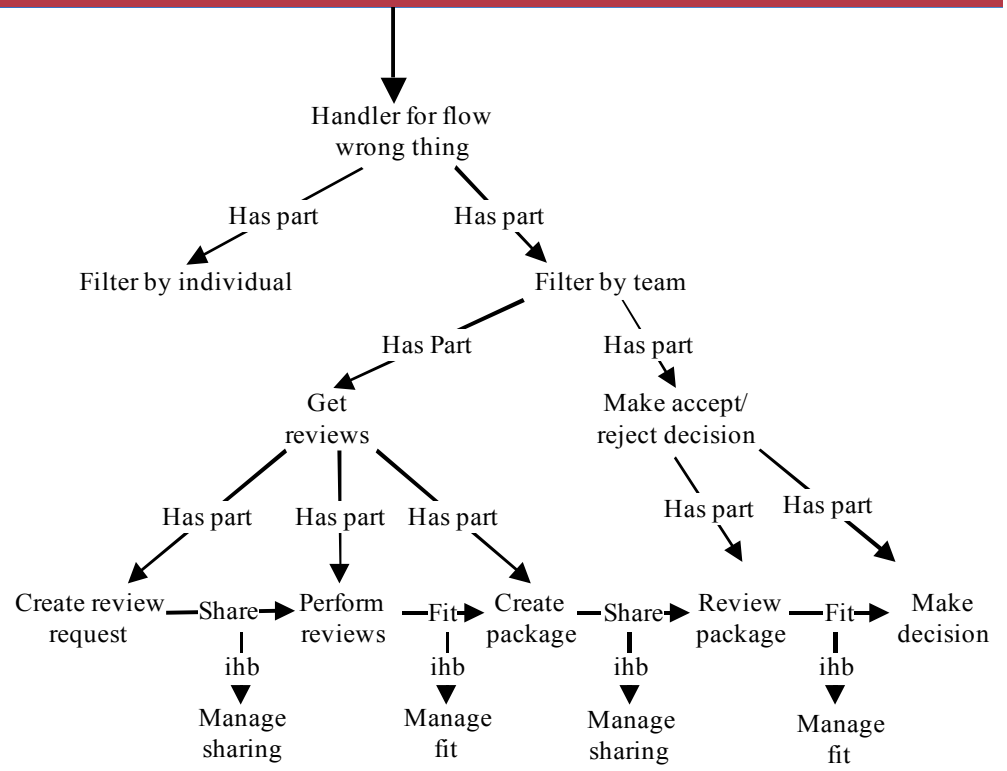
Avoid implementing wrong change requests

Exceptions and their handlers

Avoided by	Filter out unwanted elements (by individual or team judgment)
Resolved by	Filter out bad agents
Detected by	Monitor agents for commitment violations
Anticipated by	Track reputation information
Avoided by	Provide incentives



Tradeoffs for specializations of filtering out unwanted elements

Alternative	Best for	Cost	Quality	Speed
Filter by individual	Initial pruning of easy-to-find problems, such as missing data	Low	Low	Fast
Filter by team	Careful evaluation of resource from multiple perspectives	High	High	Slow

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We modeled three change management processes

- **Compared three change management processes**
  - Cost and schedule
  - Product configuration
  - Processes and tools
- **Most steps involve coordination (41 of 48 tasks in one process)**
  - Sending change requests to reviewers
  - Collecting and consolidating reviews
  - Distributing reviews
  - Holding review meetings
  - Notifying requestor of outcome

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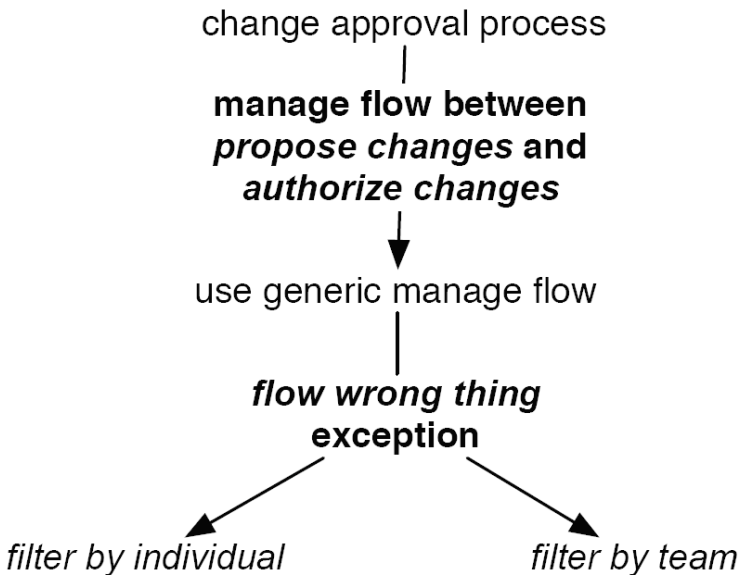
Modeling process variation

- **Process differences were due to selecting different coordination mechanisms and exception handlers**
- **A derivation tree captures the process refinements**
  - Bold text defines the aspect of the model to be refined
  - Targets of the arrows describe the selected coordination or exception handling process



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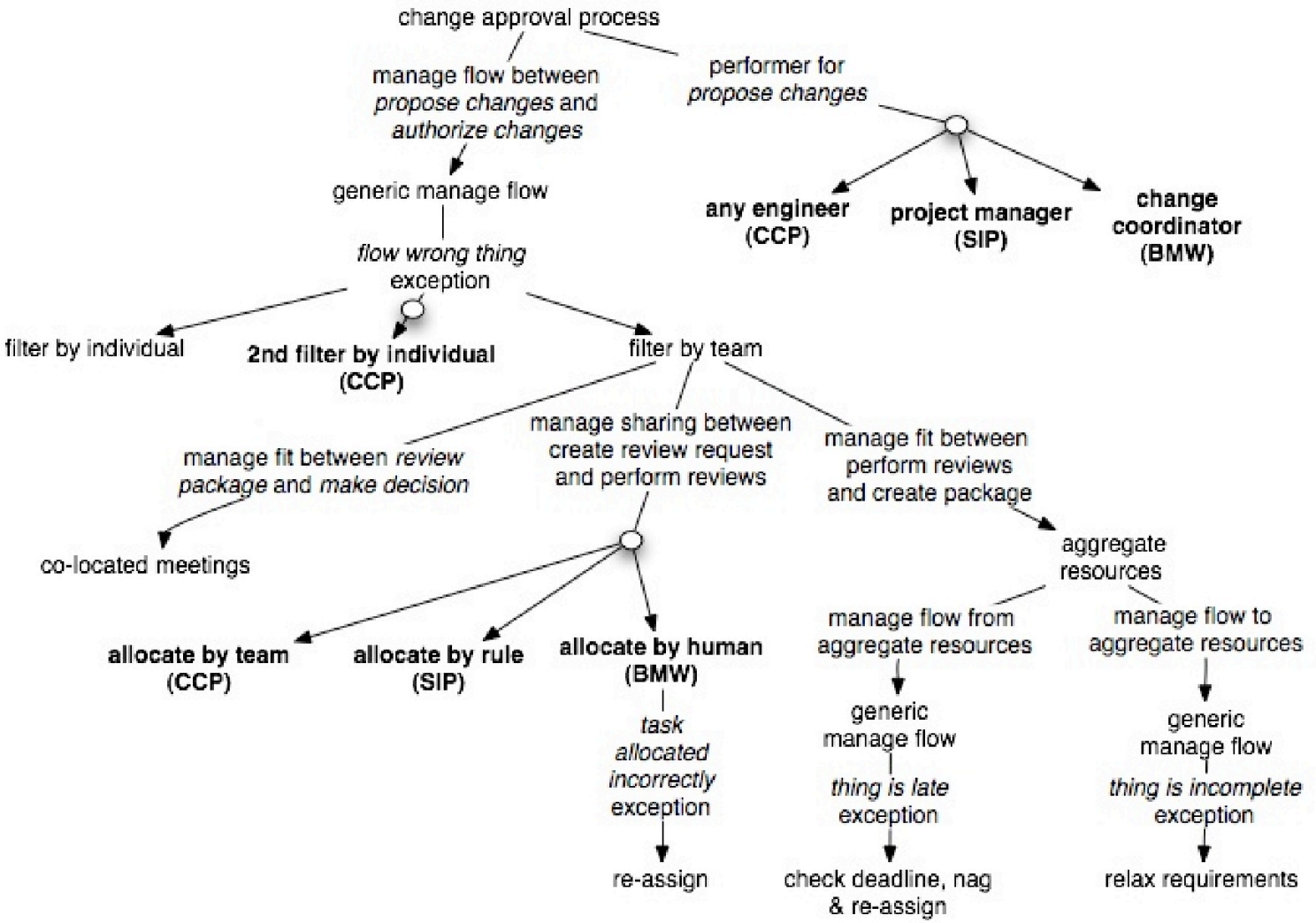
Derivation trees can show similarities and differences



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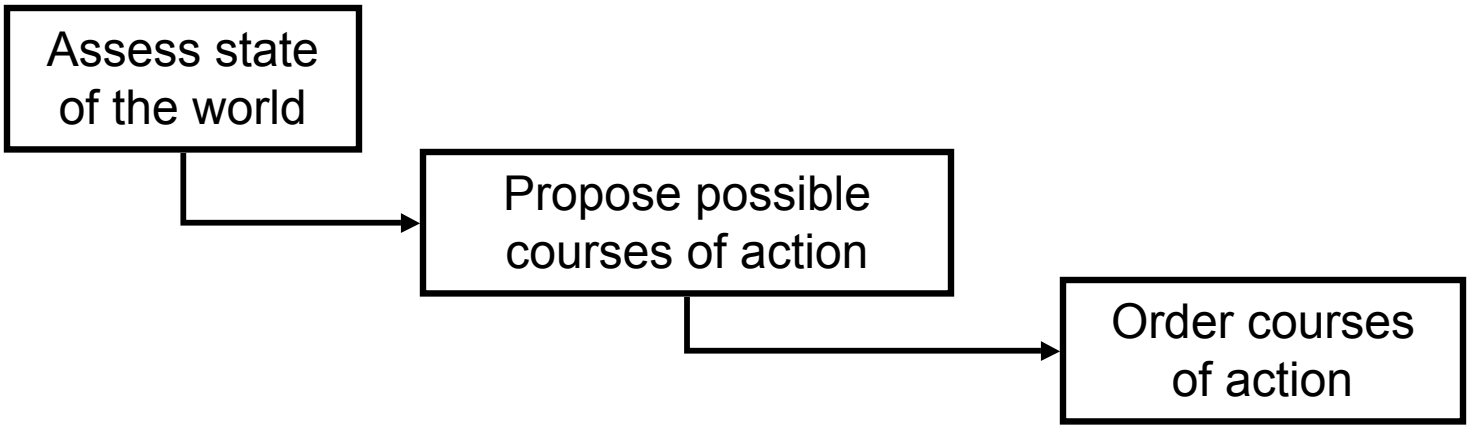
Coalition mission planning

- **Can this approach help coalition members (or different forces) integrate their mission planning processes?**
  - Construct a coordination theory of mission planning
  - Identify alternative coordination mechanisms and exception handlers and their tradeoffs
- **Modeling the military decision making process described in FM 101-5**



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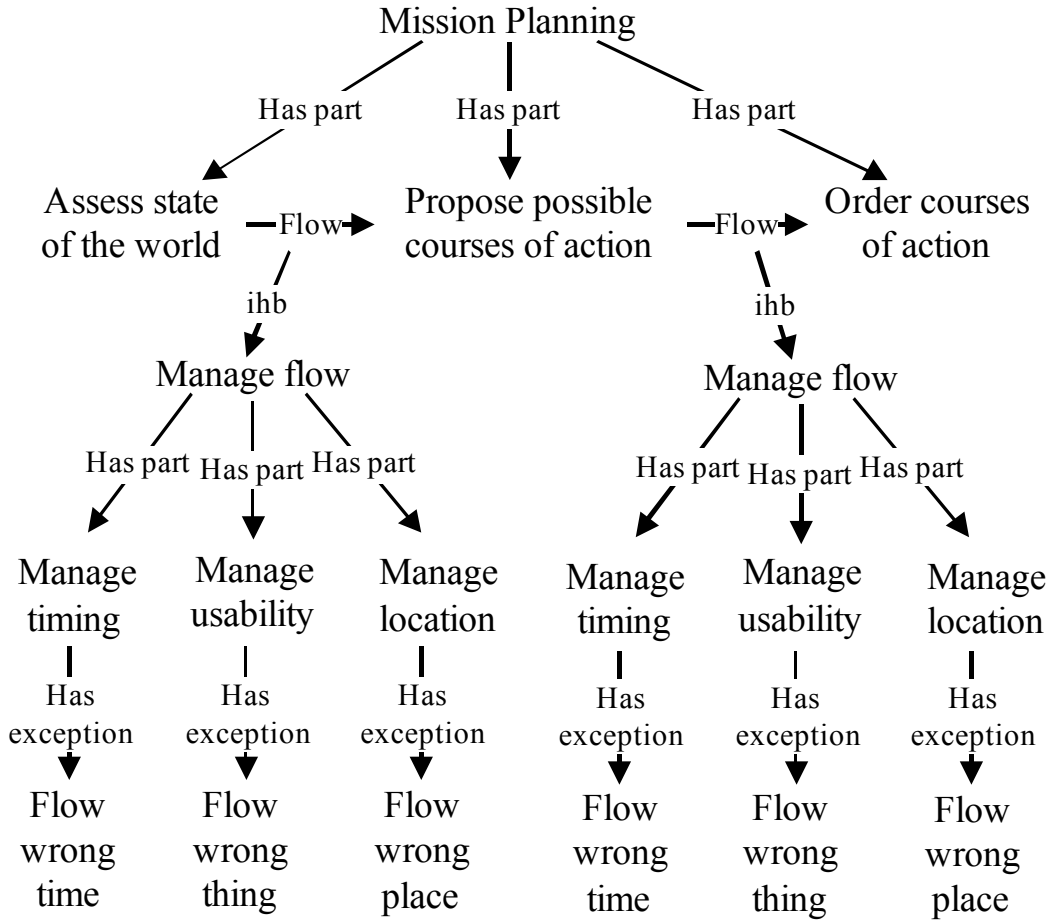
Top level model of mission planning

- **Manage flow of assessment information**
  - Timing: deploy reconnaissance early
  - Usability: Provide guidance about needed information
  - Location: Collocate staff
- **Manage flow of COAs**
  - Timing: Initial guidance and warning order
  - Usability: War games
  - Location: Collocate staff



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Conclusion

- **Coalition members must work together**
  - Each member will have established processes
  - Other members' processes may appear inferior
- **Process integration requires understanding why processes differ**
  - When different processes accomplish the same goals, the differences are generally in how work is coordinated
  - Coordination theory provides a top-down approach to model how work is coordinated
  - MIT Process Handbook provides a knowledgebase of coordination mechanisms and exception handlers
  - Derivation trees summarize process similarities and differences
  - Tradeoff matrices describe the costs and benefits of alternatives

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