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Using Crowdsourcing to Set Resource Levels for Deployed Repairables and Maintainers

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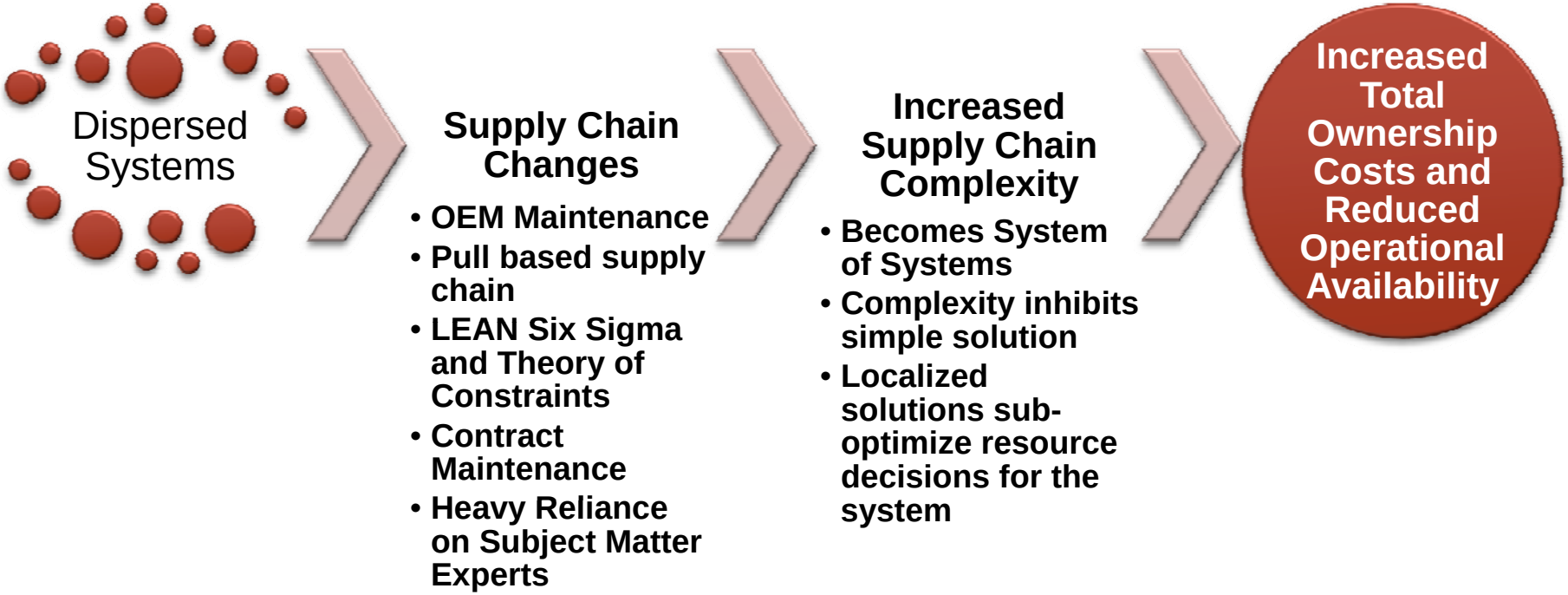
Agenda

Discuss doctoral research work to introduce crowdsourcing as a solution to set supply chain resource levels.

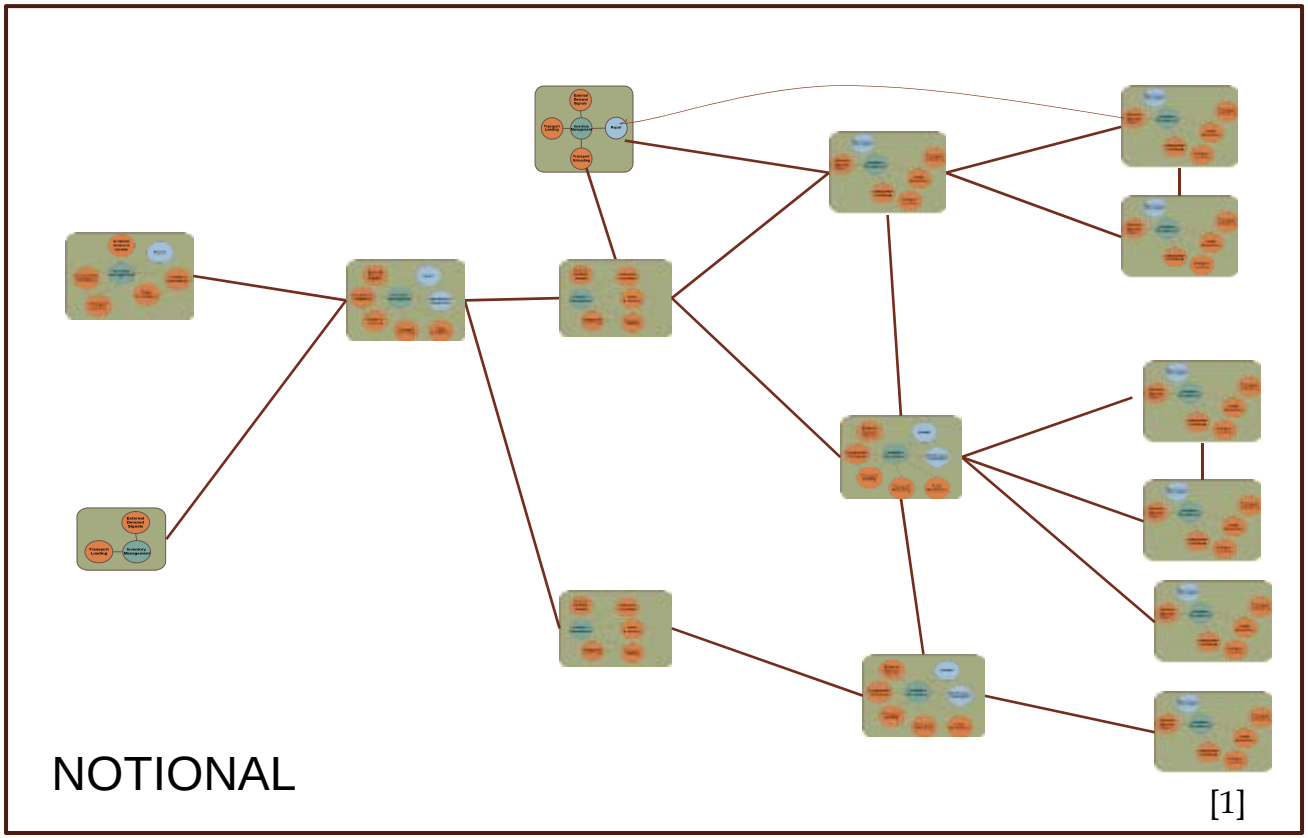
- Remotely Dispersed Supply Chain Problem
- Focus
- Solution Gap & Evolution
- Expected Outcomes and Applications

Problem



Organizations with dispersed systems have implemented supply chain adjustments yet costs have escalated to over 60% of Total Ownership Cost while availability is 30% below threshold.

Remotely Dispersed Supply Chains



- **Each node acts as an independent system.**
- **Consideration of whole system is needed for resource assignment**
- **Problem is NP hard for the entire system**

Dispersed Supply Chain Complexity

System Complexity Influenced by:

- Random resource demands
- Common repairables and repair resources
- Scarce or limited resource distribution priority among nodes
- Forward and retrograde transportation between nodes

DoD Supply Chain Complexity

Supply chain includes world wide logistics chain [2]

- Must consider:
  - Global Sourcing Concept
  - End to End Synchronization
  - Nodal Footprint
  - OEM and Contractor Repair of Components
- Supply chain is dynamic
- Anticipate new weapon system logistics

Focus on Resource Allocation

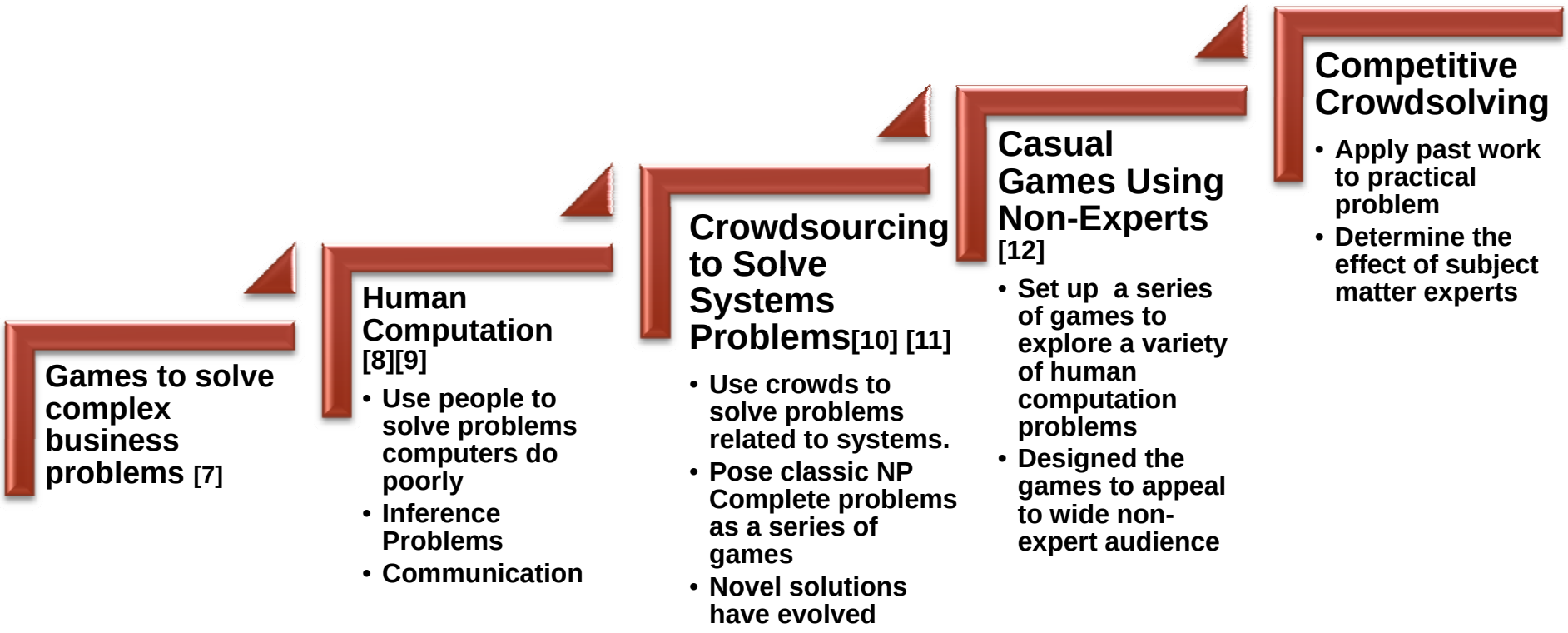
- Resources account for the majority of costs associated with operating supply chains.
- Stochastic nature of demand for maintenance and parts makes quantification difficult.
- Maintenance is 15% of Airline Annual Revenue. [3]
- Maintenance is 12% of DoD Annual Budget ($83.7B of $691.8B). [4]
- Operations and Maintenance 67% of Total Ownership Cost for DoD Systems. [5]

Solution Gap

In 2003 INFORMS performed Supply Chain Management Software Review[5]

	Optimization	Simulation	Decision Support
Responses	24	21	29
Retail	✓	✓	✓
Manufacturing	✓	✓	✓
Localized Optimization	✓		
ERP Software Solution	✓		✓
Remotely Dispersed Supply Network			
Manpower Resource Estimation			

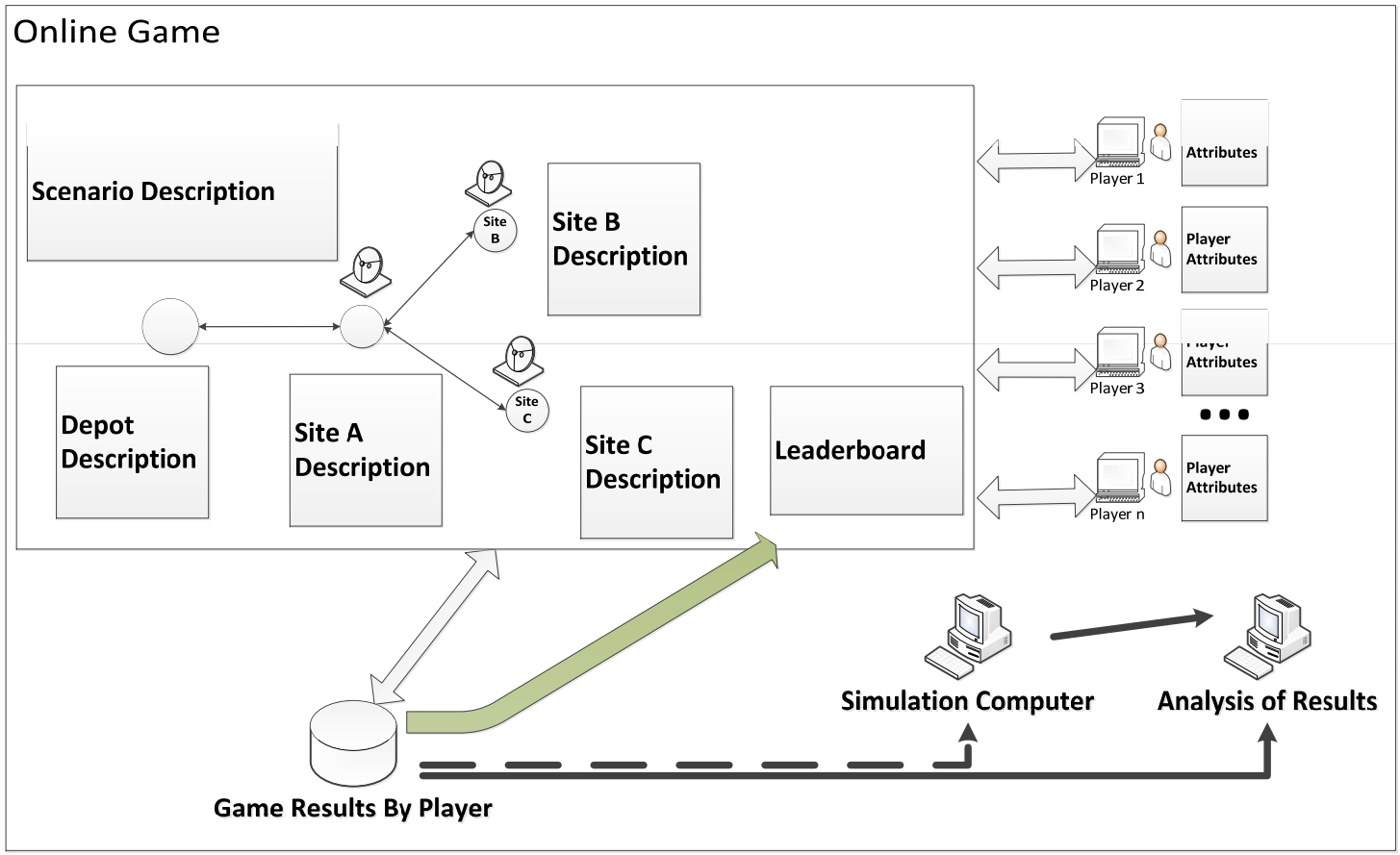
Evolution to Competitive Crowdsolving



Research Goals

1. Determine the influence on solutions of:
   - Experts and Non-Experts
   - Posing the problem in a non-acrimonious way
   - Prestige based competition between solution providers
2. Determine the efficiency of competitive crowdsourcing in terms of cost and time to solution
3. Determine obstacles to practically apply competitive crowdsourcing to dispersed supply chain resources and similar NP Hard problems

Research Method



Scenario Based Game

Player Attributes

Expectations and Applications

- Expectations
  - Establish a technique for systems based supply chain resource design
  - Demonstrate crowdsourcing practicality for real world NP-Hard Problems
- Applications
  - Transportation Network Design
  - Supply networks with random demand
  - Emergency planning

DoD Specific Considerations

To practically apply crowdsourcing to DoD applications:

- Security issues need to be addressed
  - Scenarios may give away critical information
  - Player control
- Limiting players may restrict solutions
- Solution acceptance and trust
- May not be dynamic enough to suit needs for time critical issues

Feedback?
Questions?

Interested in playing…
speak to me or email at
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