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# Computer Mediated Social Network Approach to Software Support and Maintenance

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# What we will share

- Definitions
- Background
  - Social Networks
  - Expert Service
  - Metrics
- Phenomenon
- The research
- Findings
- Next Step



# hypotheses

- $H_1$ : The ad hoc emergent decision support system will result in faster responses to maintenance problems than the traditional maintenance processes.
- $H_2$ : The ad hoc emergent decision support system will result in higher (quantity) transfer of knowledge (actionable information that is accurate and has utility) than the traditional maintenance processes.
- $H_3$ : The ad hoc emergent decision support system and infrastructure requires less effort (more efficient) compared to published support and maintenance process.

# Definitions

- Virtual organization – a group of people who interact through interdependent tasks guided by common purpose that works across space, time and organizational boundaries (Lipnack and Stamps, 1997)
- Community of Practice – groups of people who share a common concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interaction on an ongoing basis (Wenger, 1998, 2002)

## Definitions cont.

- Virtual community – participation in computer-mediated social groups (Rheingold, 1994)
- Social Networks - the personal or professional set of relationships between individuals and the organizations they represent. Social networks represent both a collection of ties between people and the strength of those ties (Granovetter, 1973; 1983; Milgram, 1967; Vega-Redondo, 2007)
- Electronic Network of Practice – a self organizing , open activity system focused on a shared practice that exists through computer-mediated communications (Wasko and Tiegland, 2004)

# Social Networks

- Social
  - The personal or professional set of relationships between individuals and the organizations they represent.
- Social networks
  - The collection of ties between people and the strength of those ties

# Expert Services

- An Expert -
  - Someone who has special skills, talent, knowledge or know-how in a domain
- Expert Service
  - Ability to convey the knowledge of experts to others,
  - Conveyed in a fashion that is consumable and actionable by the recipient, and
  - A mechanism for discovery.



# Phenomenon

- ~ 1000 sustained members in a virtual network
- > 10 years of history
- Focus is on Army automation
- Informal correspondence
- All done by email (Listserve)

# Characteristics

- Self organized (other than the technological enablers)
- Socially constructed
- Emergent roles
- Emergent behavior



# Performance Metrics

- Quality of Information
  - Richness of the information
- Quality of Awareness
  - Relevance to the situation and environment
- Collaboration
  - Purpose for collaboration
- Interoperability
  - Issues related to working together
- Time
- Return on investment

# The Data



# Data Collection

## Archival analysis

- Four months worth of dialogue were examined

Summary of database analyzed (4 months of Data)	
New Threads	536
Response to thread	1903
Total threads analyzed	2439

## Surveys

- Survey #1 Demographics
- Survey #2 Usage patterns and quality of dialogue

## Discussion

- Interviews with informants

# Validation

## Case Studies

- Exploring the critical cases
  - The dialogue that focuses on problem and their resolution or understanding
- Exhaustive
  - Using a large enough data set to identify patterns of behavior (repeatable)

## Subject matter experts in the domain

- Verify that observable behavior is consistent with data / findings

# Other sources of quantified data

Service Innovation.org (Gregg Oxtan)

- Collaborative methods to resolve tier 0 and 1 problems

U.S. Army PM Command Posts (Eileen Weinstein)

- Incident reporting procedures for large scale systems of system

Army Knowledge Online (James Lindsey)

- Reporting statistics and procedures

# Survey #1

## Demographic of the community of informants

- Self reporting (and partial verification by researcher)
- Stratification of informants
- Education and training
- Role in the Software and system lifecycle
- Industry
- Position (senior executive to junior technician)
- Motivation



# Survey #2

## Usage patterns

- Time to read and respond
- Level of effort to respond
- Quality of information
  - Information requestors
  - Information providers
- Complexity of the problems addressed
- Satisfaction rates from responses

# The Findings



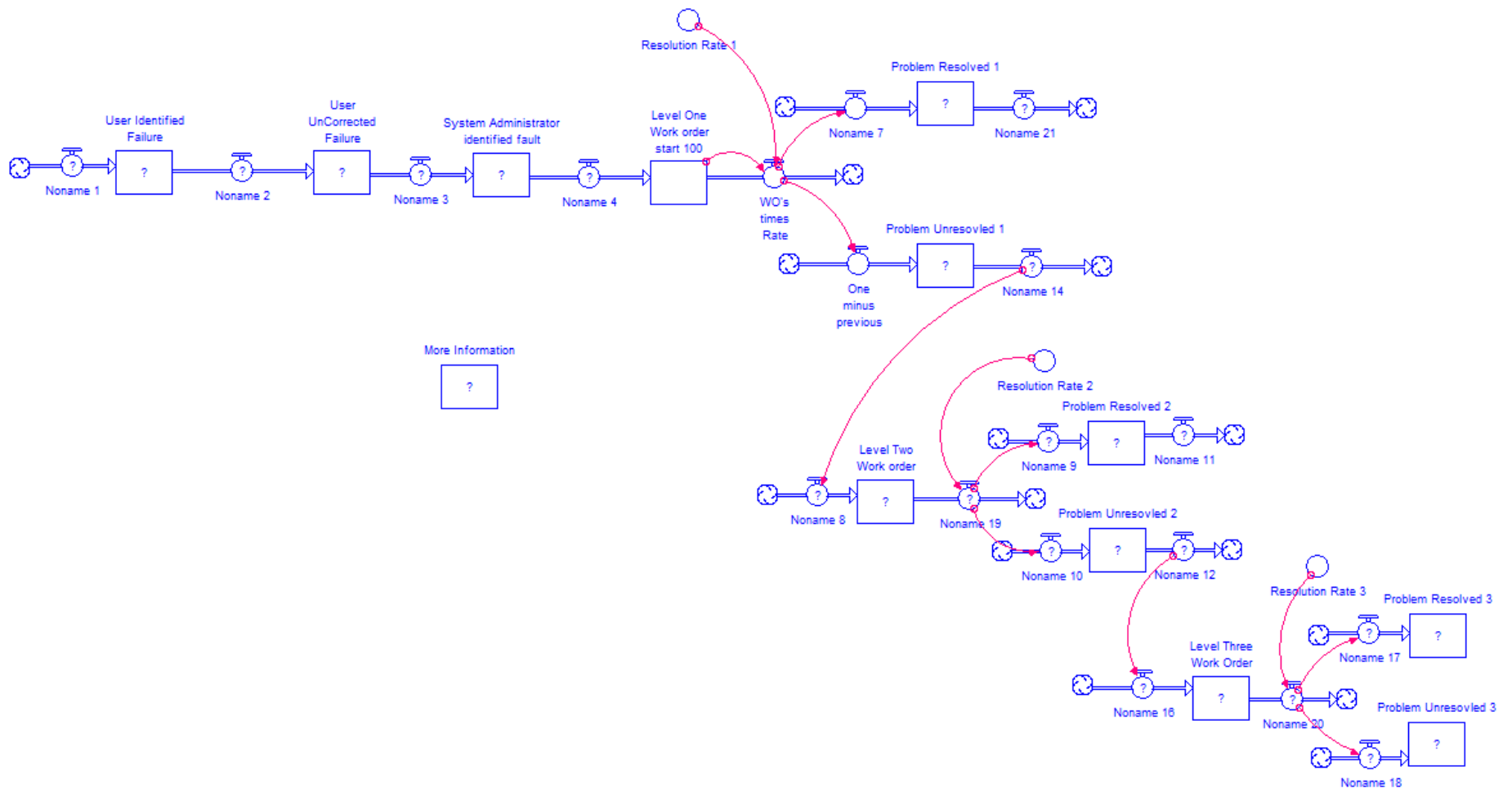
# Current State

- Hierarchical
  - Stepped approach
- Query a static database
- Ask an officemate
- Ask a peer



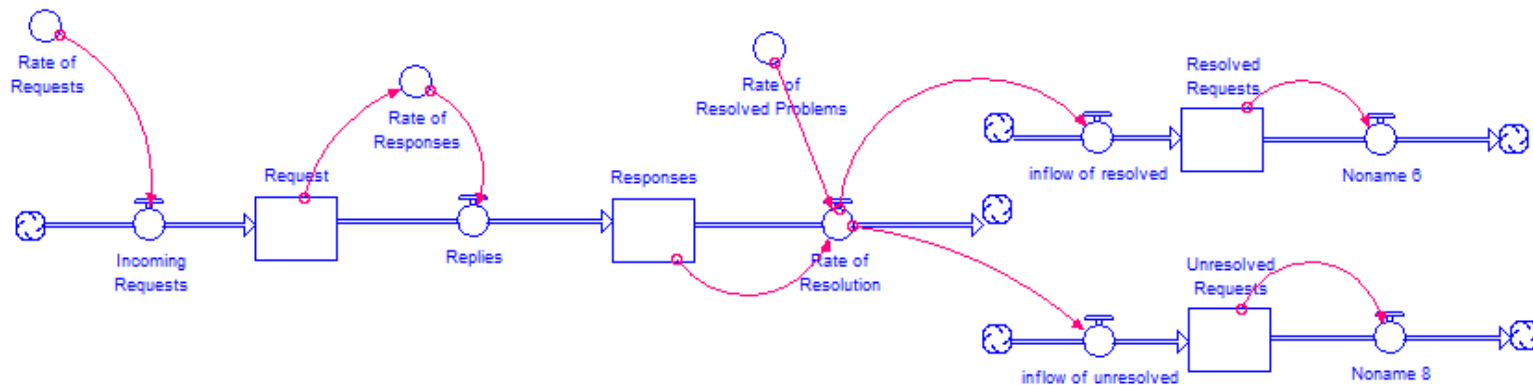
# Hierarchal Example

Knowledge and know how is needed outside of an organizations internal capability

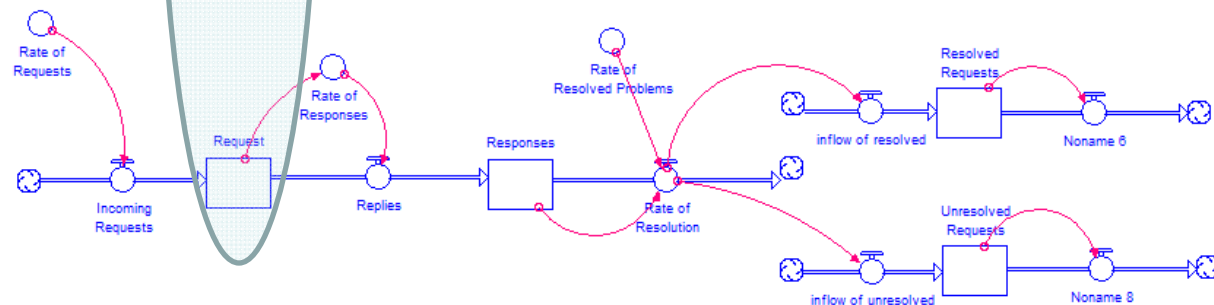
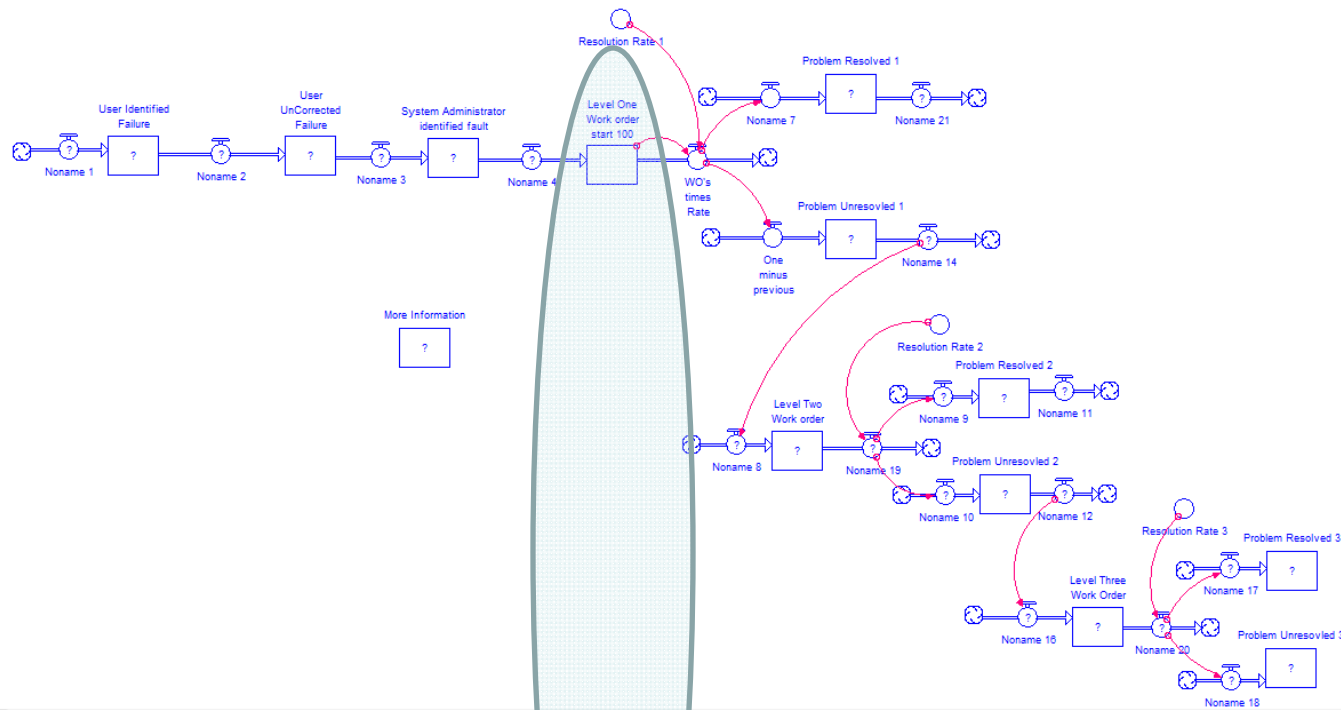


# Social Network Approach

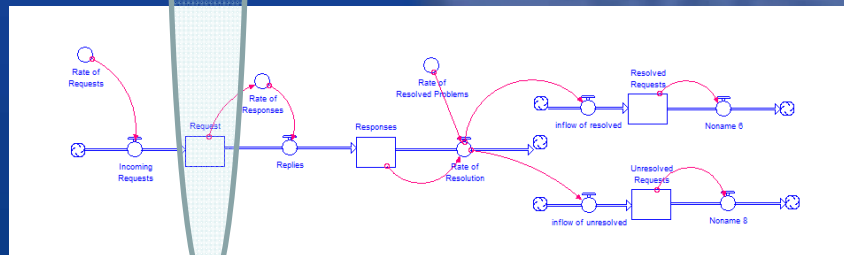
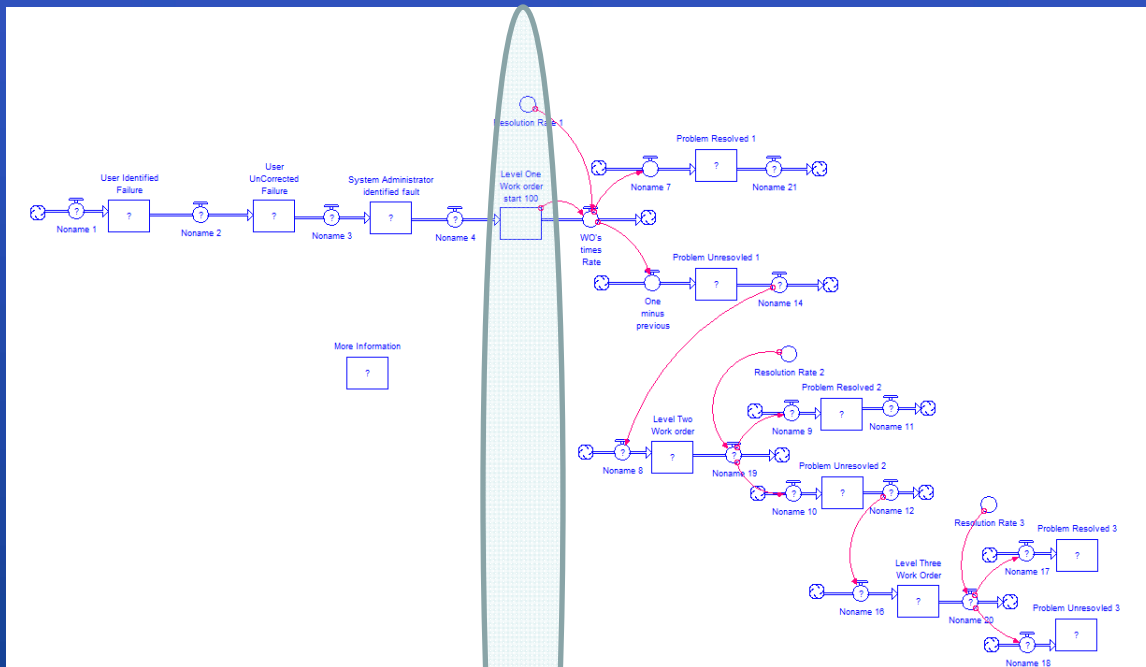
## Broadcast or net-call to all subscribers



# Where the Models Meet



# Where the Models Meet

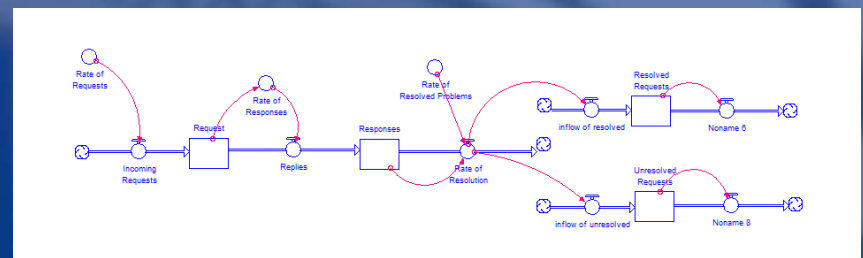
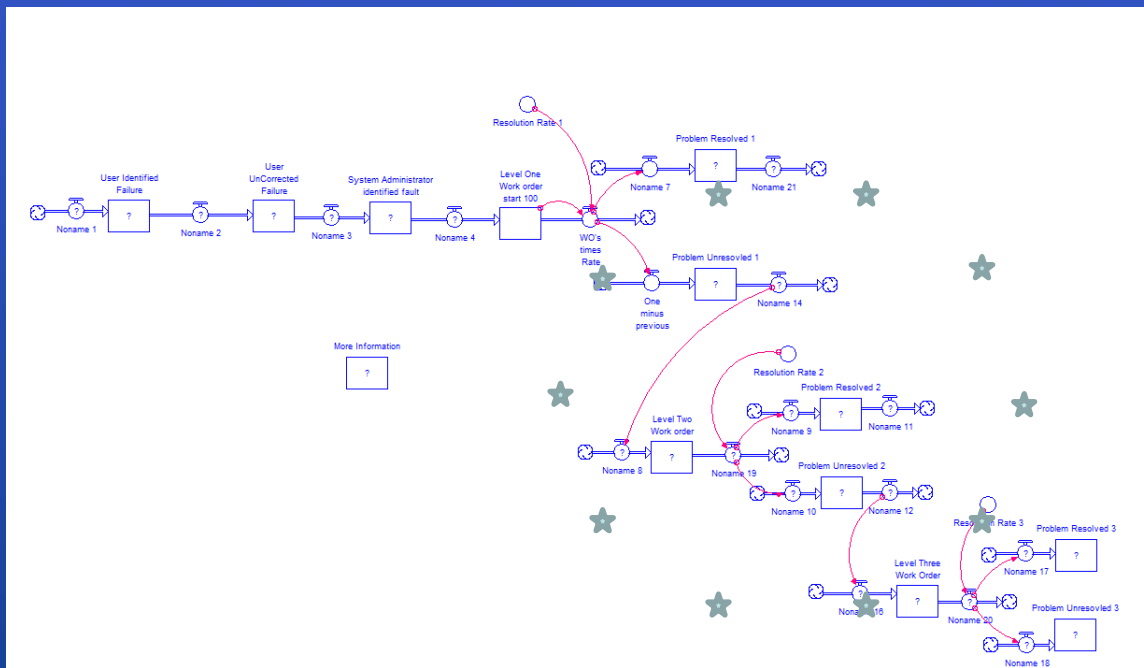


Organizational Support (OS)

Sw Engineering Center (SEC)

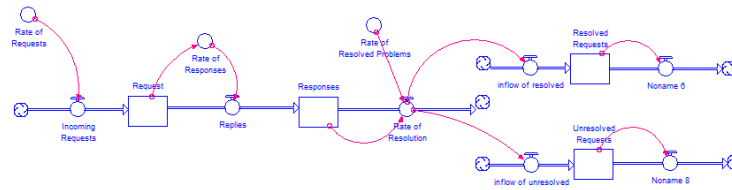
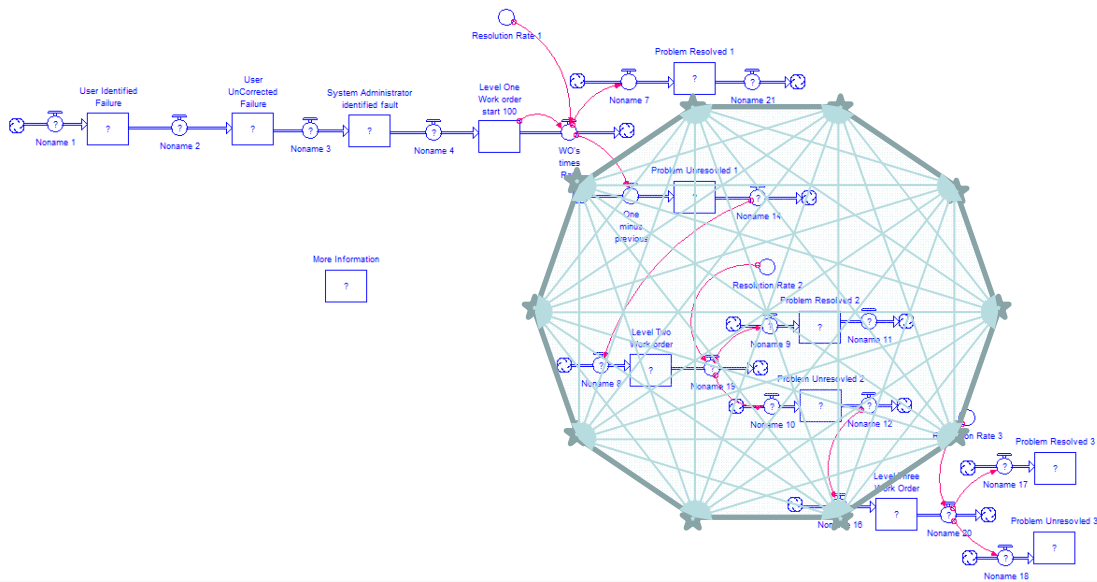
Program Manager (PM)

# Where the People Overlap





# Where the People Overlap



# Findings

The minority members led the expert system.  
Less than 2% of the community submitted more than 5 threads.

Discussions with impunity

Significant amount of social activity

22% of discussions were non-IT or work related activities

Lurkers – Contribute and benefit from the group discussions

# Findings

## Temporal responses

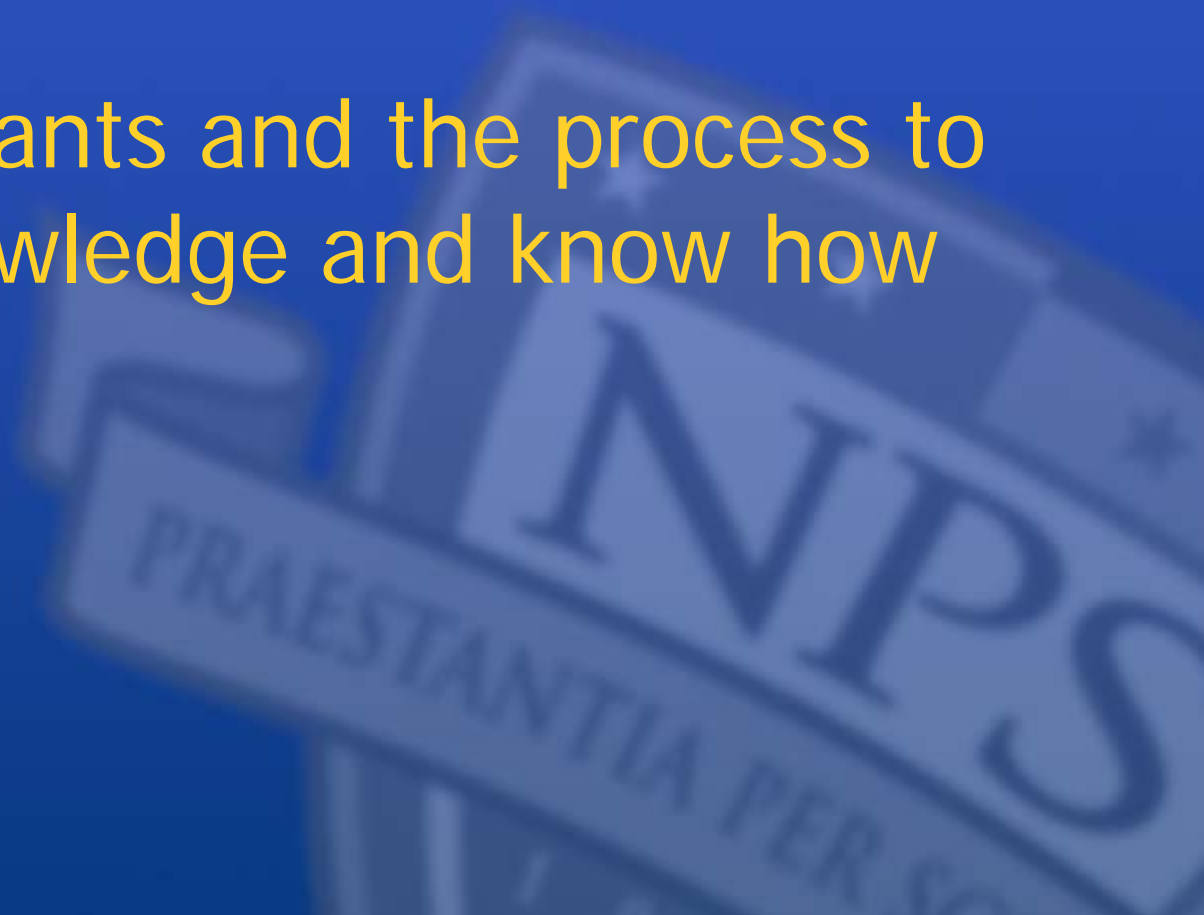
- 50% response rate within 1 hour
- 99% response rate within 48 hours

## Format fits well in a dynamic environment

## Learning

members changed their perceptions through the interactions

The informants and the process to share knowledge and know how

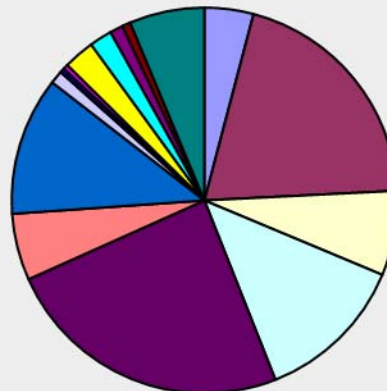


# Who are the informants?

~ one thousand members of a computer mediated community of practice

ns	Response Percent	Response Count
	4.1%	11
Supervisor, Manager . . .	20.1%	54
Professional/Analytical. . .	7.1%	19
Scientific, Engineering . . .	12.7%	34
Supervisor, Manager. . .	24.3%	65
Professional/Analytical. . .	5.6%	15
Scientific, Engineering,	11.6%	31
Supervisor, Manager . . .	1.1%	3
Scientific, Engineering. . .	0.4%	1
ative staff	0.4%	1
aff	2.6%	7
aff	1.9%	5
	1.1%	3
	0.7%	2
	6.3%	17

**Which of the following best describes your role in your current position? The examples provided are approximations based on the type of responsibility, level of responsibility, and supervisory vs. non-supervisory roles. Select one**



# What do they do

They mash up problems with solution

Reduce the complexity of problems

- Type III to type II or I
- Type II to type I

Categorization of problems	Known Solution	Unknown Solution
Known Problem	Type I	Type II
Unknown Problem	Type III	Type IV

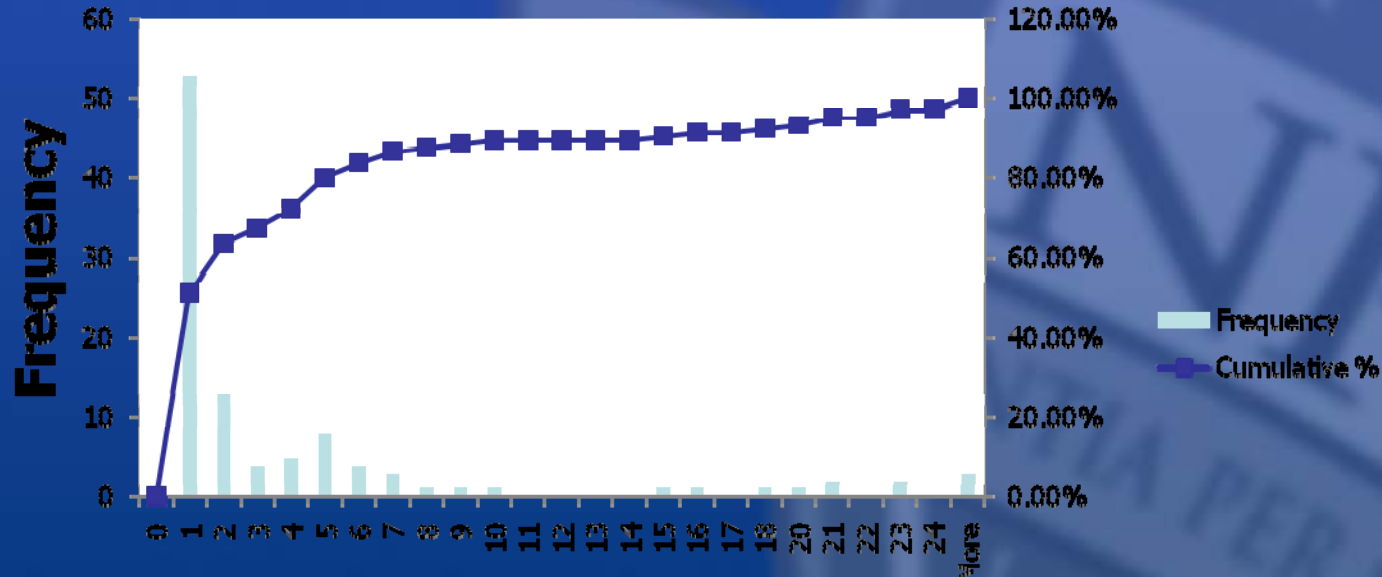
# They do it really Fast

51% of the responses are within 1 Hour

99% of the responses are within 48 Hour

Known Solution

Time to Respond



# Statistics on Information Requests (IR)

From a period of Jun to Sep 2009

145 New threads (IR only)

109 Received at least 1 response

Mean	Median	Mode
6	3.5	1

36 No response

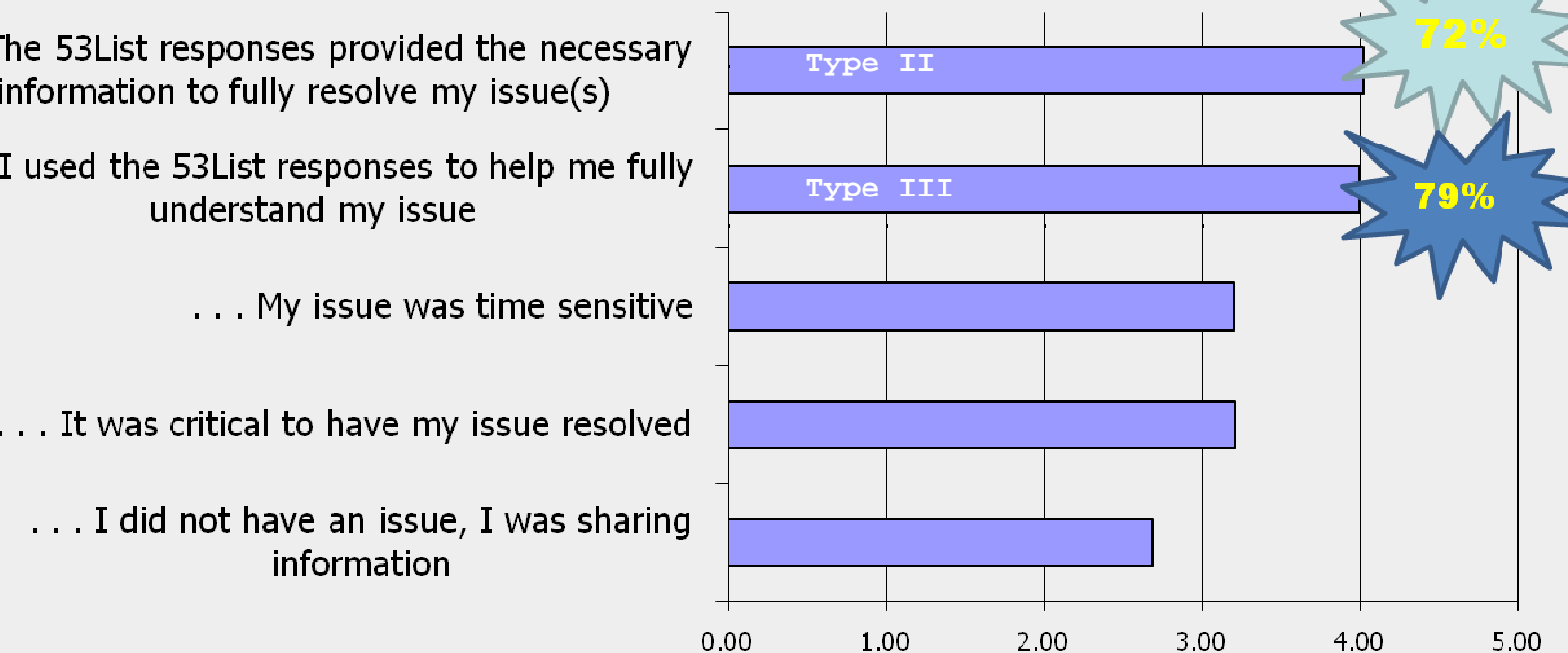
51% (53) of the 104\* answered within 1 hour

\* Adjusted for outliers (weekends and  
listserve downtime)



# They satisfy those seeking assistance

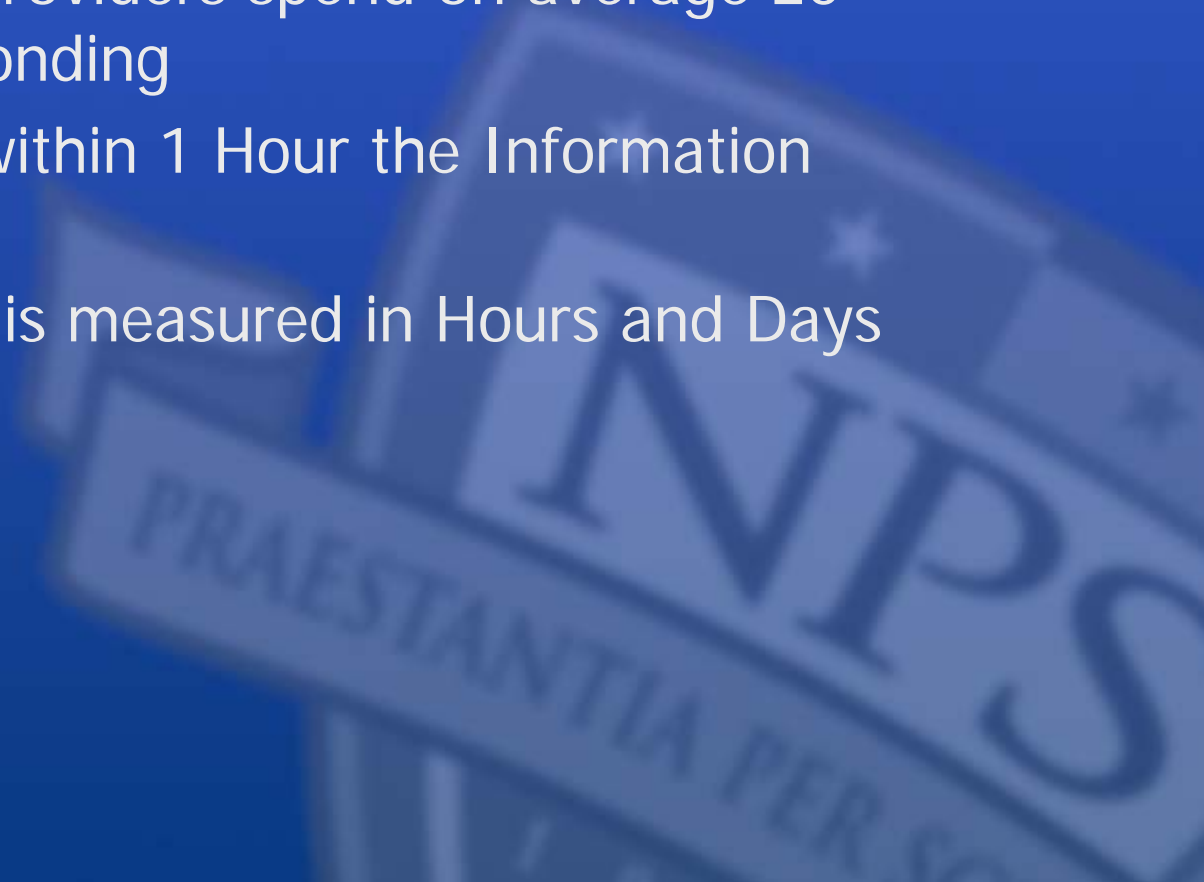
Using your most recent posting (or the one you best recollect) on the 53List as your guide, please answer the following questions. To what extent do you agree with the following statements.



# The method is very efficient

## Near real time response

- Information providers spend on average 20 minutes responding
- Response is within 1 Hour the Information Request
- Time savings is measured in Hours and Days



# Real time savings

member time savings.

- Rate of return on time invested

Question: How much time would you estimate you saved from by posting a question and receiving an answer from the 53List?

Answer Options	0 (none)	Less than 1	Between 1 and 2	Between 2 and 4	Between 4 and 6	More than 6	Response Count
hours (less than a day)	5	4	6	13	4	6	38
days (took longer than a day)	9	1	10	2	0	1	23
Other (please specify or add comment)							3
<b><i>answered question</i></b>							<b>44</b>

Time saved measured in hour or days

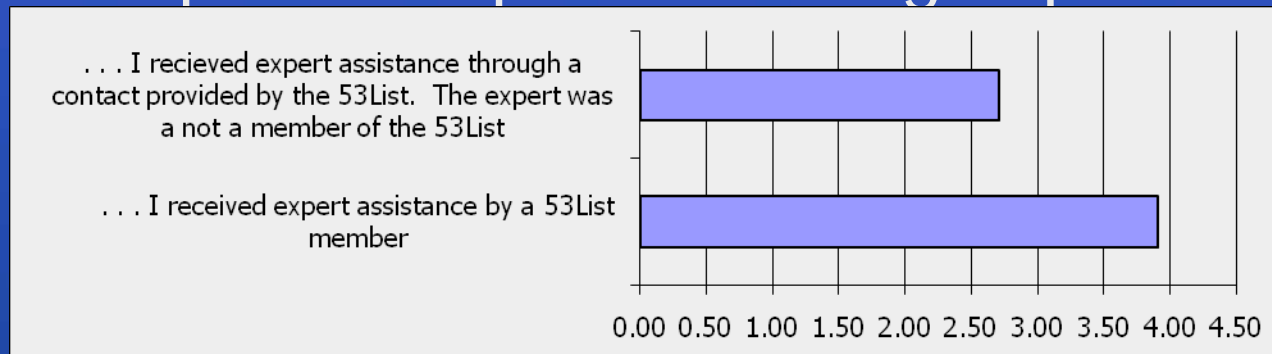
# Changing knowledge search patterns

BL is the primary source for problem resolutions

Percentage listed as 1st option	Sources (Respondents had up to 5 choices)
39%	53 Lists (message threads, archives, or contacts)
21%	Search Engines (e.g. the Internet, Google, Bing)
13%	Co-worker
7%	Books or other printed material
5%	Internal organizational support (e.g. help desk)
5%	Vendor provided resource
5%	External organizational support (regional help desk, program manager)

# Quality of assistance

Information requestor report receiving expert service



Information providers report giving expert advice

**If you already knew the solution or partial solution to the post/question, how many other readers of the question posted on the 53List do you think or believe also knew a solution?**

## Answer Options

## Response Percent Response Count

Many, this information is common knowledge.	4.2%	4
Some, this information may be known to some people, but not most.	55.2%	53
Few, only people with good general experience in the domain.	17.7%	17
Few, only people who had encountered similar problem.	6.3%	6
Few, only experts in this domain.	4.2%	4

# Preliminary findings validate hypotheses

$H_1$ : The ad hoc emergent decision support system will result in faster responses to maintenance problems than the traditional maintenance processes.

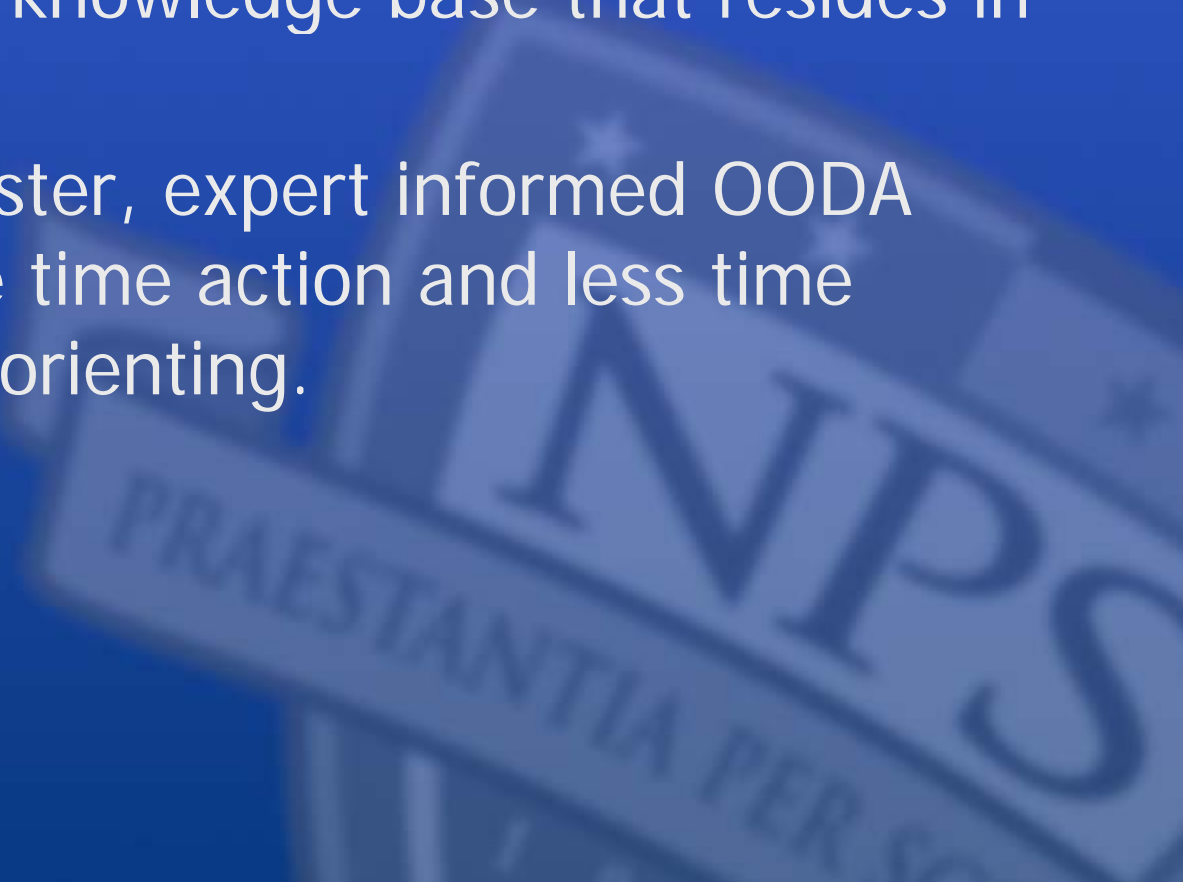
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# Summary

Create an infostructure that is people centric  
Capitalize on the knowledge base that resides in  
the people

The result is a faster, expert informed OODA  
loop with more time action and less time  
observing and orienting.



# Discussion and Questions

