Faculty of Design

2019

Collaborative foresight for long-range problem discovery in complex R&D

Weigand, Kirk and Jones, Peter

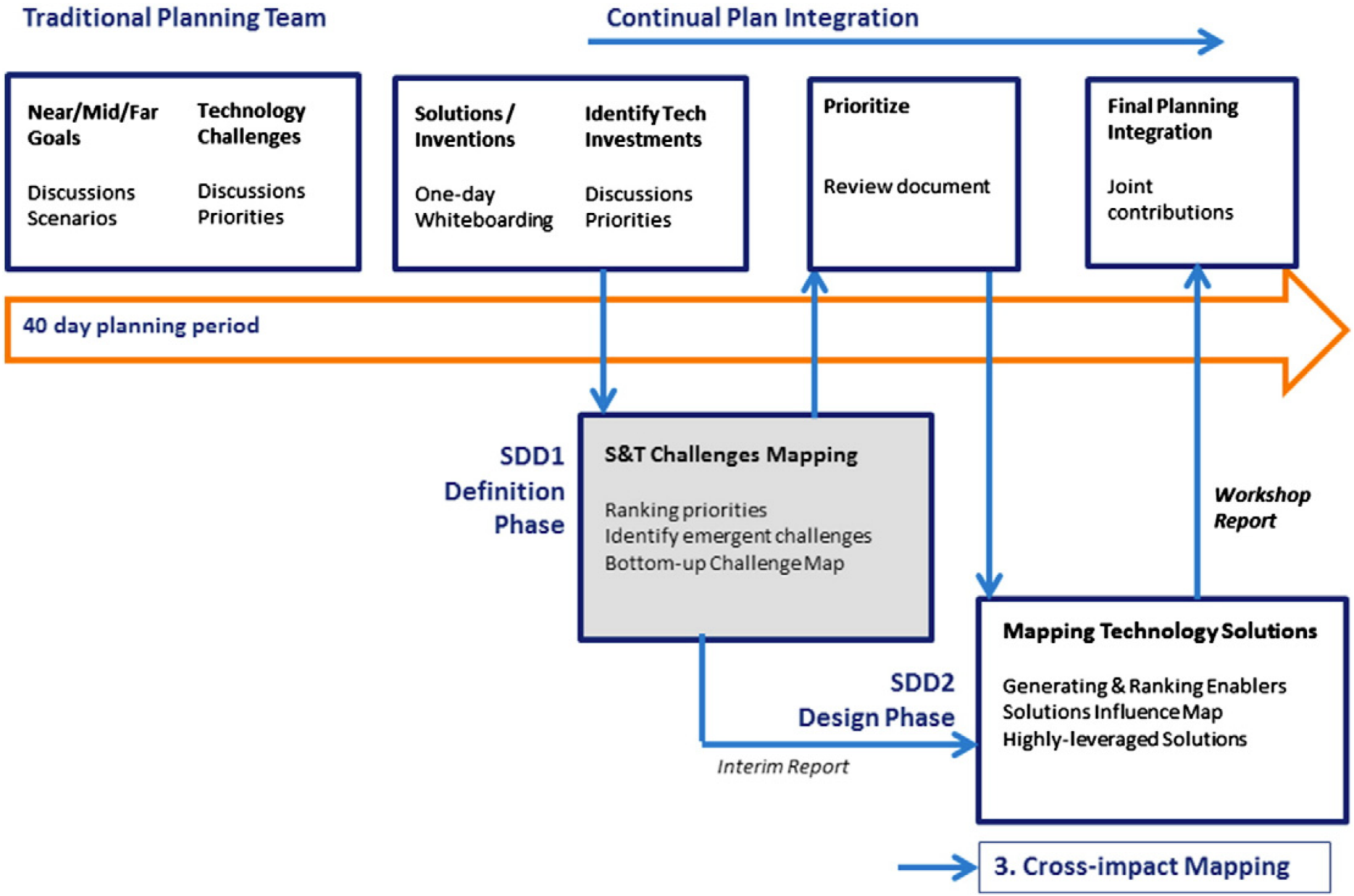
Collaborative Foresight for Long-Range Problem Discovery in Complex R&D

Kirk Weigand, United States Air Force Research Laboratory

&

Peter Jones, OCAD University

Public Release by the United States Air Force, Approved date: 2012-08-03, PA Approval Number: 88ABW-2012-4261


Traditional Planning Team
Continual Plan Integration
Near/Mid/Far Goals
Technology Challenges
Discussions Scenarios
Discussions Priorities
Solutions / Inventions
Identify Tech Investments
One-day Whiteboarding
Discussions Priorities
Prioritize
Review document
Final Planning Integration
Joint contributions
40 day planning period
SDD1 Definition Phase
S&T Challenges Mapping
Ranking priorities
Identify emergent challenges
Bottom-up Challenge Map
Workshop Report
SDD2 Design Phase
Interim Report
Mapping Technology Solutions
Generating & Ranking Enablers
Solutions Influence Map
Highly-leveraged Solutions
3. Cross-impact Mapping

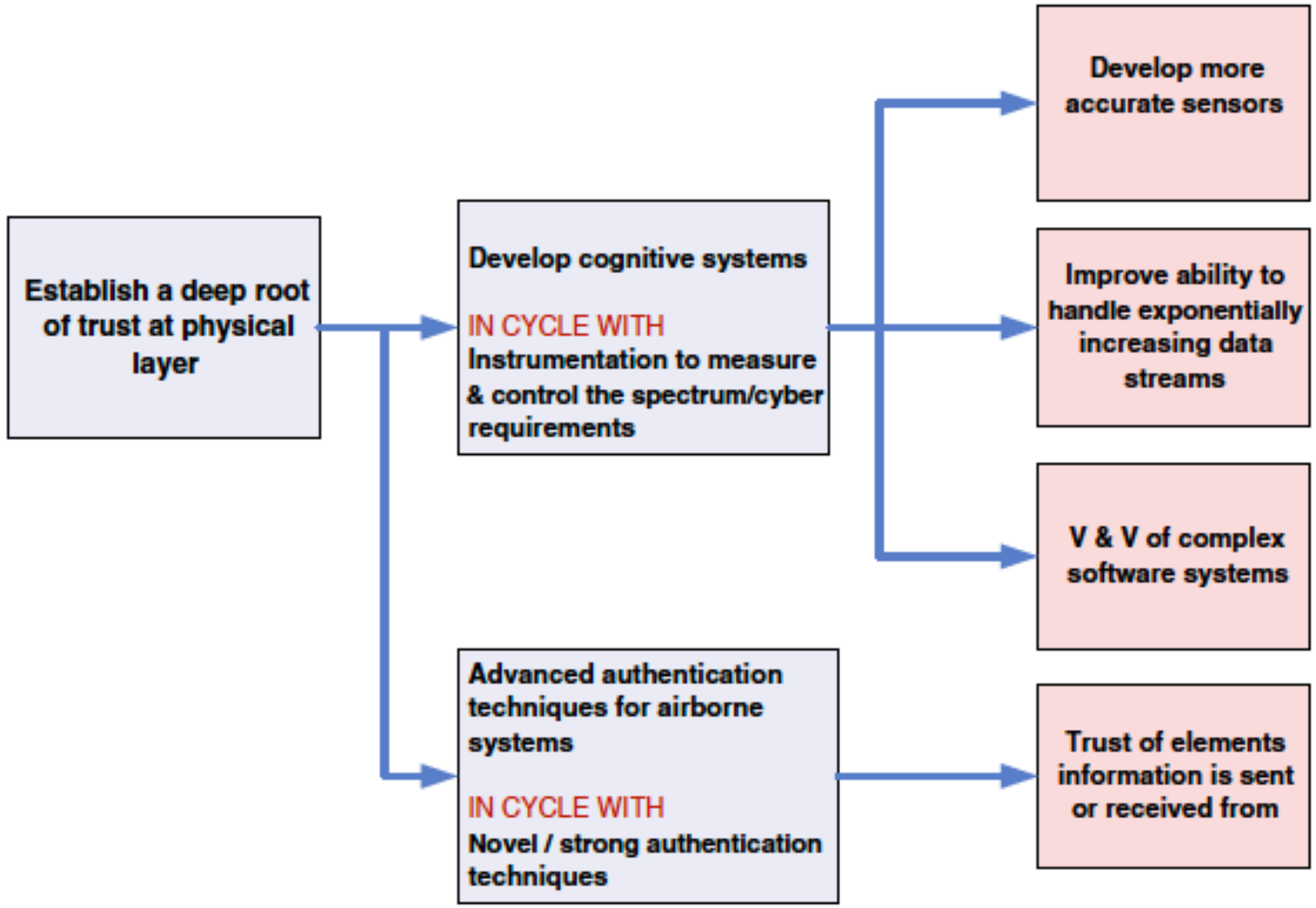


Fig. 6. Strategic pathway 3: Cognitive systems research to enable trusted systems.

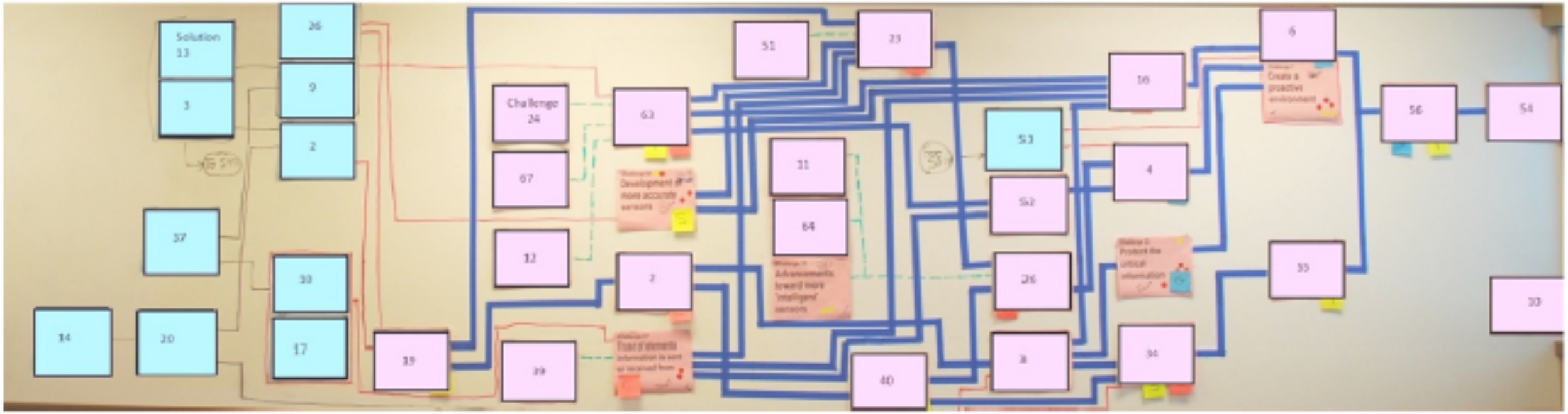
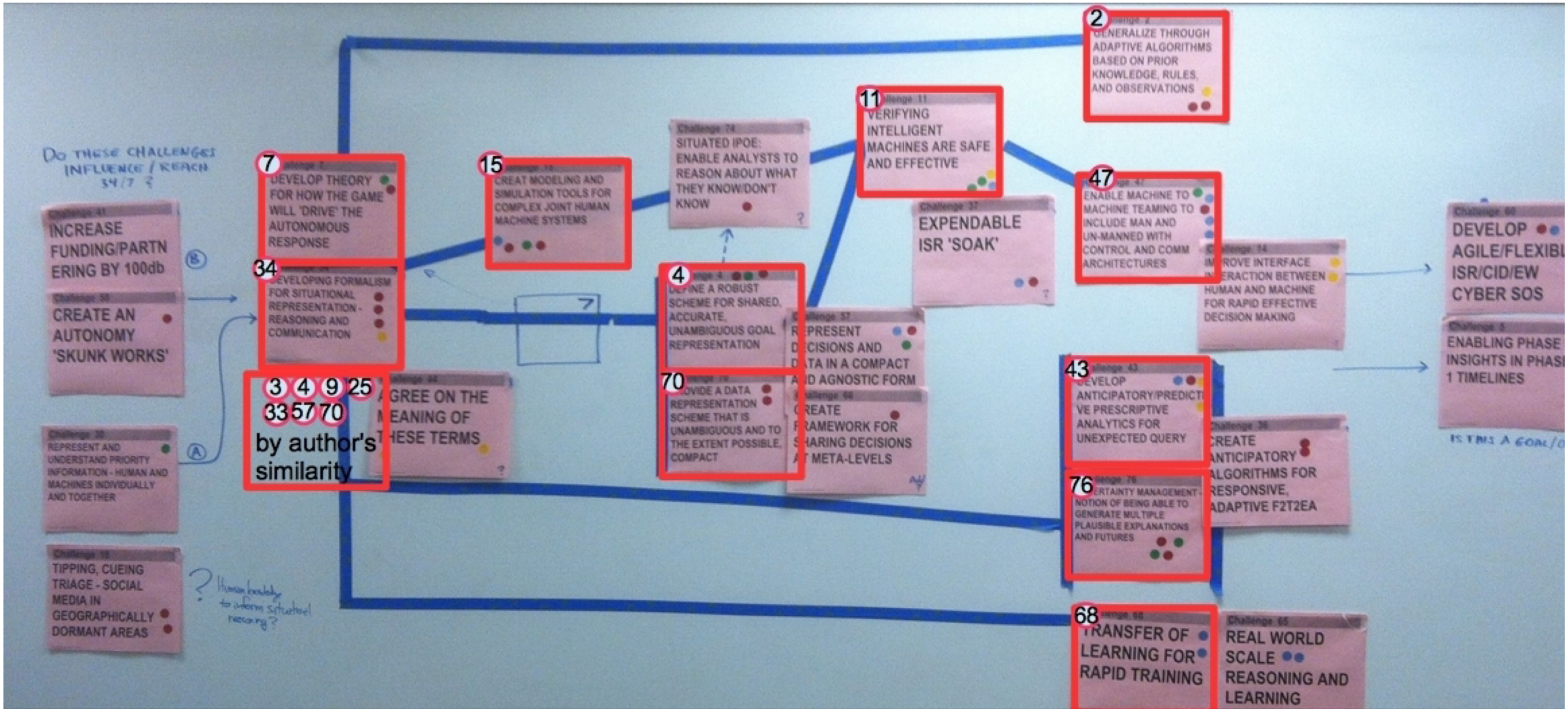


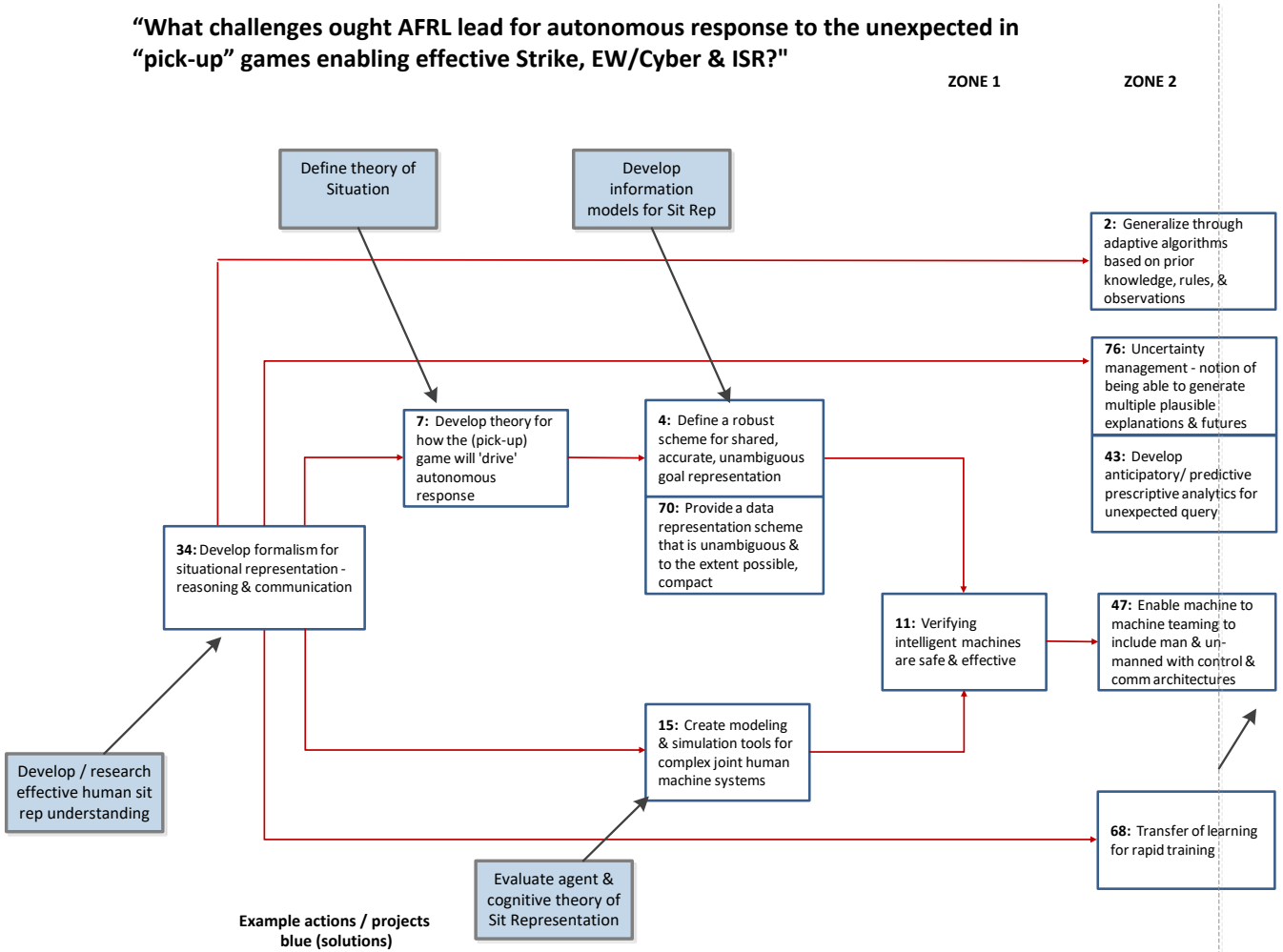
Fig. 4. Cross-impact mapping of technology enablers to S&T challenges.

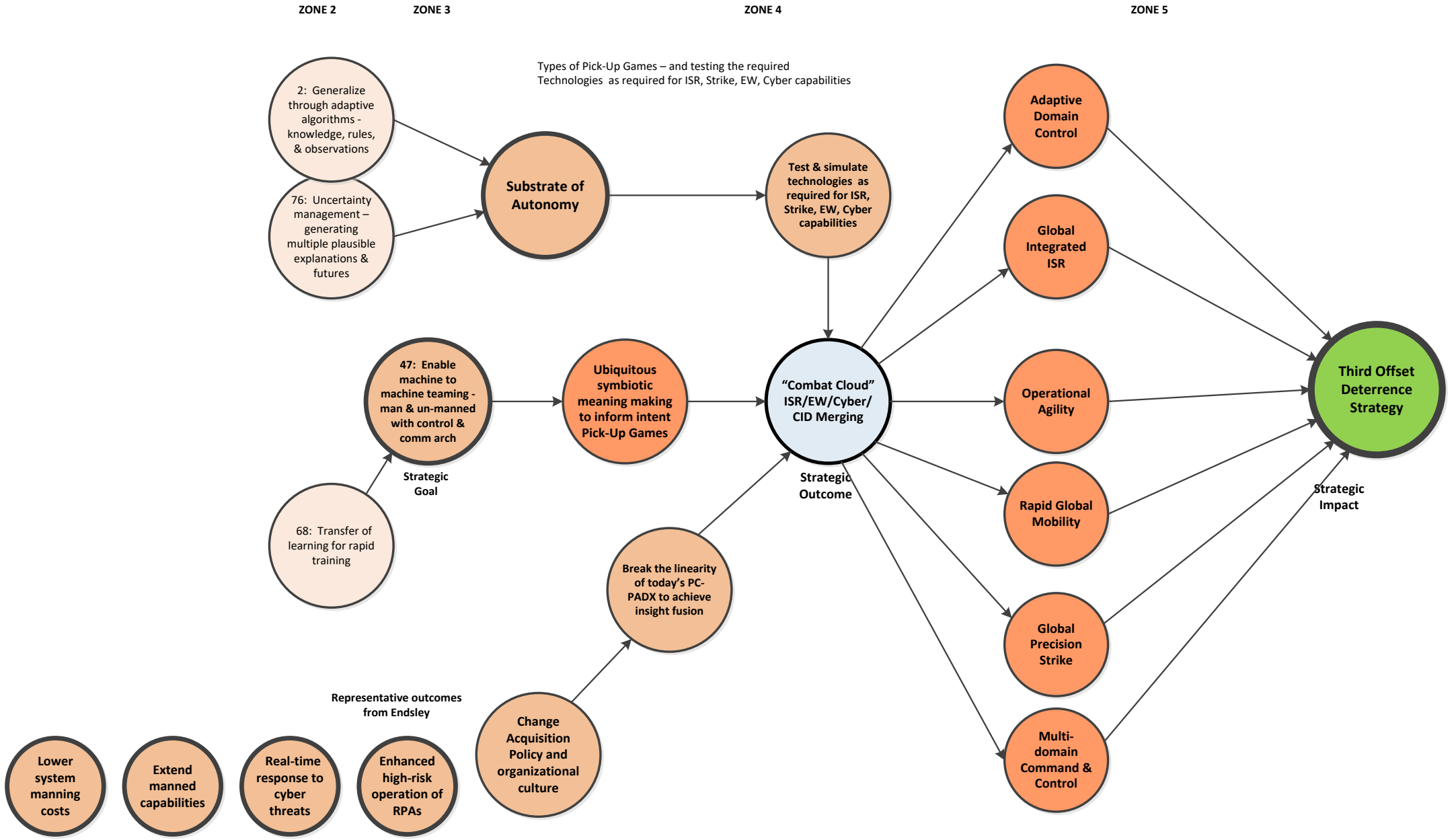
A Figurative, tangible representation in a sand tray

Visual Narrative Summary

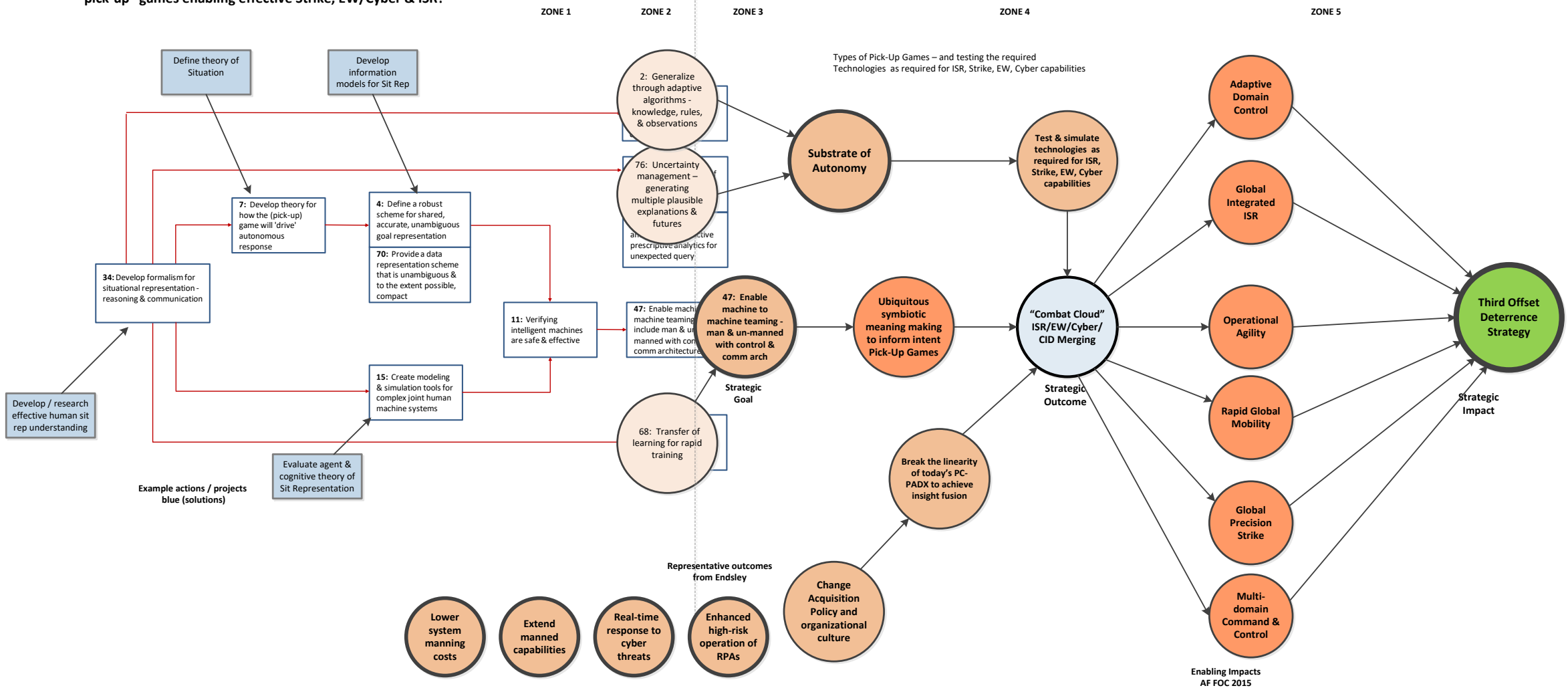

DO THESE CHALLENGES INFLUENCE / REACH 34/7 ?
INCREASE FUNDING/PARTNERING BY 100db
CREATE AN AUTONOMY 'SKUNK WORKS'
REPRESENT AND UNDERSTAND PRIORITY INFORMATION - HUMAN AND MACHINES INDIVIDUALLY AND TOGETHER
TIPPING, CUEING TRIAGE - SOCIAL MEDIA IN GEOGRAPHICALLY DORMANT AREAS
7
DEVELOP THEORY FOR HOW THE GAME WILL 'DRIVE' THE AUTONOMOUS RESPONSE
34
DEVELOPING FORMALISM FOR SITUATIONAL REPRESENTATION - REASONING AND COMMUNICATION
3 4 9 25 33 57 70
by author's similarity
AGREE ON THE MEANING OF THESE TERMS
15
CREAT MODELING AND SIMULATION TOOLS FOR COMPLEX JOINT HUMAN MACHINE SYSTEMS
SITUATED IPOE: ENABLE ANALYSTS TO REASON ABOUT WHAT THEY KNOW/DON'T KNOW
4
DEFINE A ROBUST SCHEME FOR SHARED, ACCURATE, UNAMBIGUOUS GOAL REPRESENTATION
70
PROVIDE A DATA REPRESENTATION SCHEME THAT IS UNAMBIGUOUS AND TO THE EXTENT POSSIBLE, COMPACT
REPRESENT DECISIONS AND DATA IN A COMPACT AND AGNOSTIC FORM
CREATE FRAMEWORK FOR SHARING DECISIONS AT META-LEVELS
11
VERIFYING INTELLIGENT MACHINES ARE SAFE AND EFFECTIVE
EXPENDABLE ISR 'SOAK'
2
GENERALIZE THROUGH ADAPTIVE ALGORITHMS BASED ON PRIOR KNOWLEDGE, RULES, AND OBSERVATIONS
47
ENABLE MACHINE TO MACHINE TEAMING TO INCLUDE MAN AND UN-MANNED WITH CONTROL AND COMM ARCHITECTURES
IMPROVE INTERFACE INTERACTION BETWEEN HUMAN AND MACHINE FOR RAPID EFFECTIVE DECISION MAKING
43
DEVELOP ANTICIPATORY/PREDICTIVE PRESCRIPTIVE ANALYTICS FOR UNEXPECTED QUERY
76
CERTAINTY MANAGEMENT - NOTION OF BEING ABLE TO GENERATE MULTIPLE PLAUSIBLE EXPLANATIONS AND FUTURES
CREATE ANTICIPATORY ALGORITHMS FOR RESPONSIVE, ADAPTIVE F2T2EA
68
TRANSFER OF LEARNING FOR RAPID TRAINING
REAL WORLD SCALE REASONING AND LEARNING
DEVELOP AGILE/FLEXIBLE ISR/CID/EW CYBER SOS
ENABLING PHASE INSIGHTS IN PHASE 1 TIMELINES
IS THIS A GOAL/

"What challenges ought AFRL lead for autonomous response to the unexpected in "pick-up" games enabling effective Strike, EW/Cyber & ISR?"




ZONE 2
ZONE 3
ZONE 4
ZONE 5
Types of Pick-Up Games – and testing the required Technologies as required for ISR, Strike, EW, Cyber capabilities
2: Generalize through adaptive algorithms - knowledge, rules, & observations
76: Uncertainty management – generating multiple plausible explanations & futures
Substrate of Autonomy
Test & simulate technologies as required for ISR, Strike, EW, Cyber capabilities
Adaptive Domain Control
Global Integrated ISR
47: Enable machine to machine teaming - man & un-manned with control & comm arch
Ubiquitous symbiotic meaning making to inform intent Pick-Up Games
"Combat Cloud" ISR/EW/Cyber/ CID Merging
Operational Agility
Third Offset Deterrence Strategy
Strategic Goal
Strategic Outcome
Strategic Impact
68: Transfer of learning for rapid training
Rapid Global Mobility
Break the linearity of today's PC-PADX to achieve insight fusion
Global Precision Strike
Representative outcomes from Endsley
Change Acquisition Policy and organizational culture
Multi-domain Command & Control
Lower system manning costs
Extend manned capabilities
Real-time response to cyber threats
Enhanced high-risk operation of RPAs

"What challenges ought AFRL lead for autonomous response to the unexpected in "pick-up" games enabling effective Strike, EW/Cyber & ISR?"



START

Marie Byrd Land

Louise shepherds drones from Nevada.

Laurel & Melko test their AIs:"What is the situation?""

Alan: Sit Rep dynamic neural network process

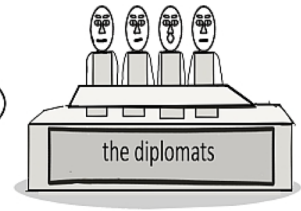
Ada: Sit Rep through big data category comparrisons

The Pickup Game

General Nidjinski

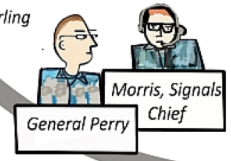
Admiral DiPaola

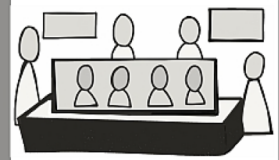
I SR



The Serling

Wallace Carter, Treaty Expert





Perry activates the PIE

Soles sees smoke on the horizon

The Situation

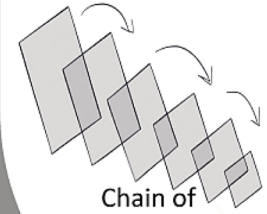
Soles, Laurel, & Melko at the site

Laurel & Melko ride drones to investigate

AIs command drones arriving on the scene

The Reporters Arrive

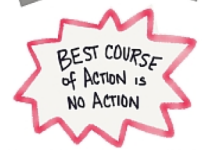
Soles speaks with Latore



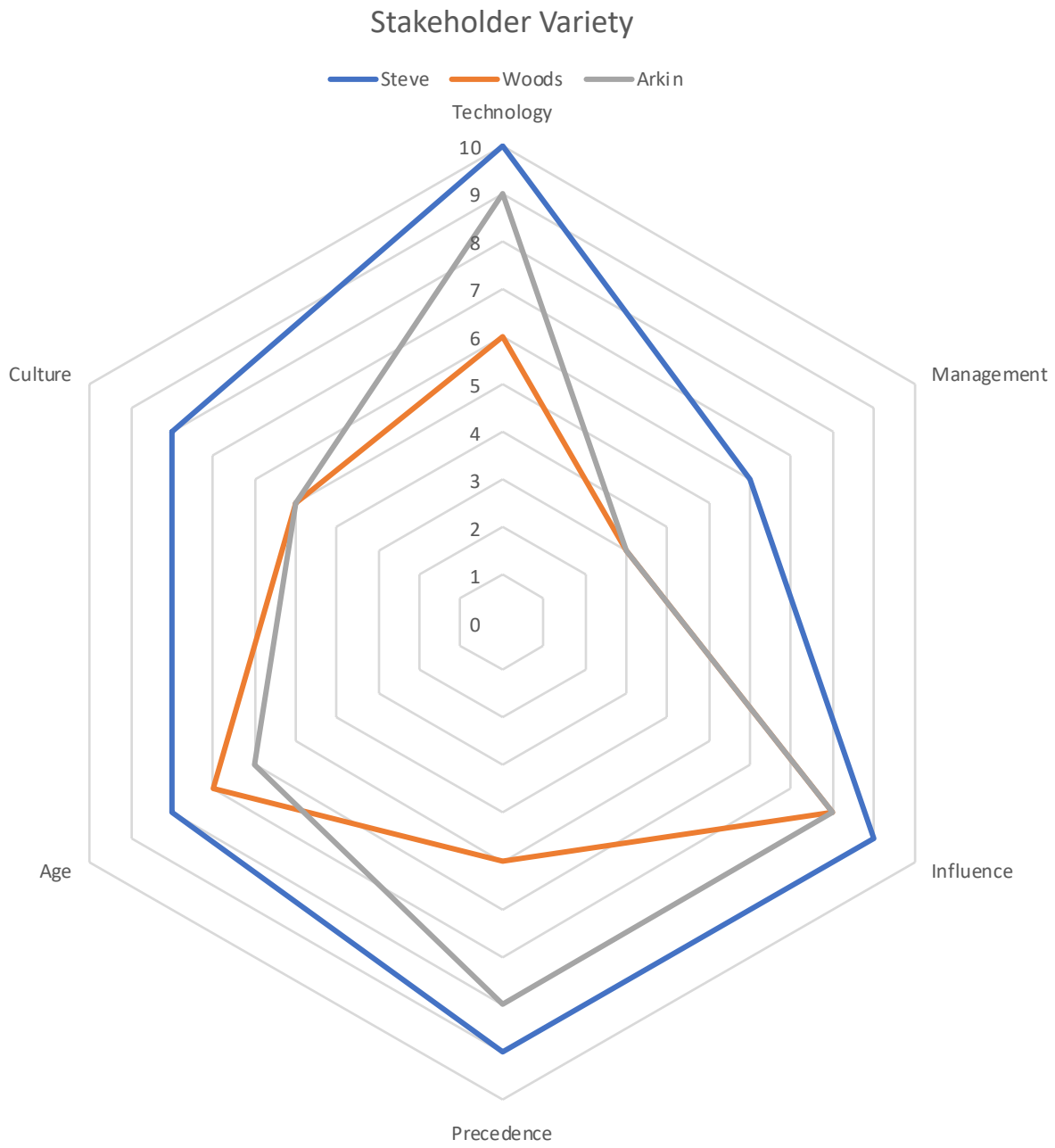
Chain of Attestation

The A.I.s merge

Situation Over



Perry talks to the situation


Stakeholder Variety
Steve
Woods
Arkin
Technology
10
9
8
7
6
5
4
3
2
1
0
Management
Influence
Precedence
Age
Culture