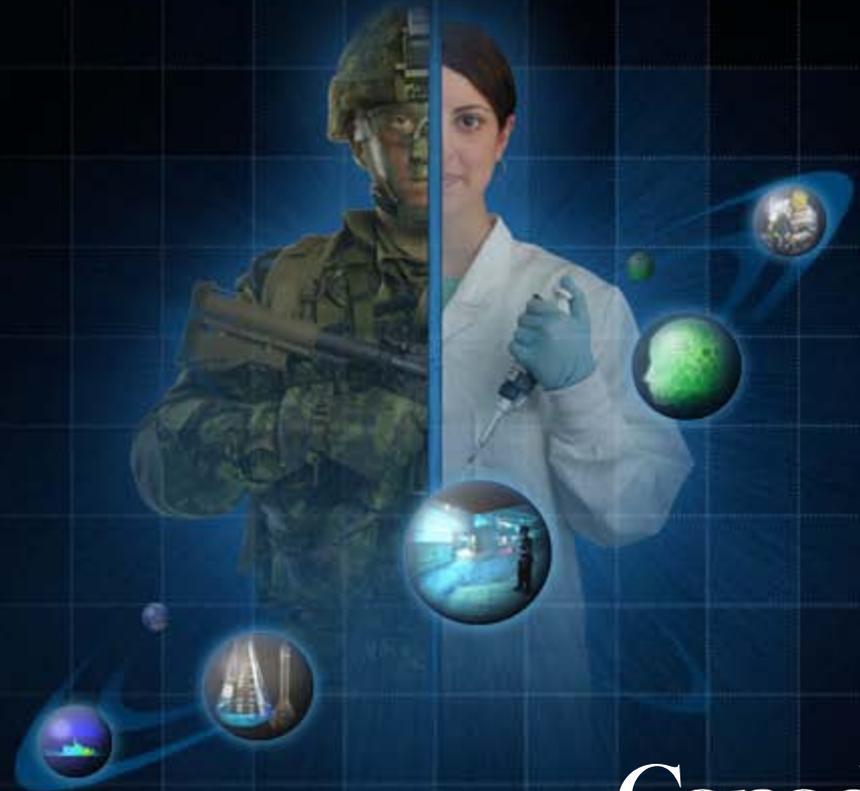


Using Large Group Displays to Support Intensive Team Activities in C2 (Presentation #129)

16th ICCRTS
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Outline

- LGDs and Operation Centers
- Teams and Intense Collaboration
- Benefits of Large Group Displays (LGDs)
- Examples of LGDs use and challenges
- Guidelines
 - Information Content
 - Content and Display Management
 - Integration
 - Interaction

Large Group Displays in an Operation Center



Prince Sultan Air Base
Air Operating Center

Boeing Commercial Airplanes
Operating Center



Lockheed Martin's Center
for Innovation (Lighthouse)

Burlington Northern
Operations Center



Network Line International

CA Regional Joint
Operation Center



Use of LGDs

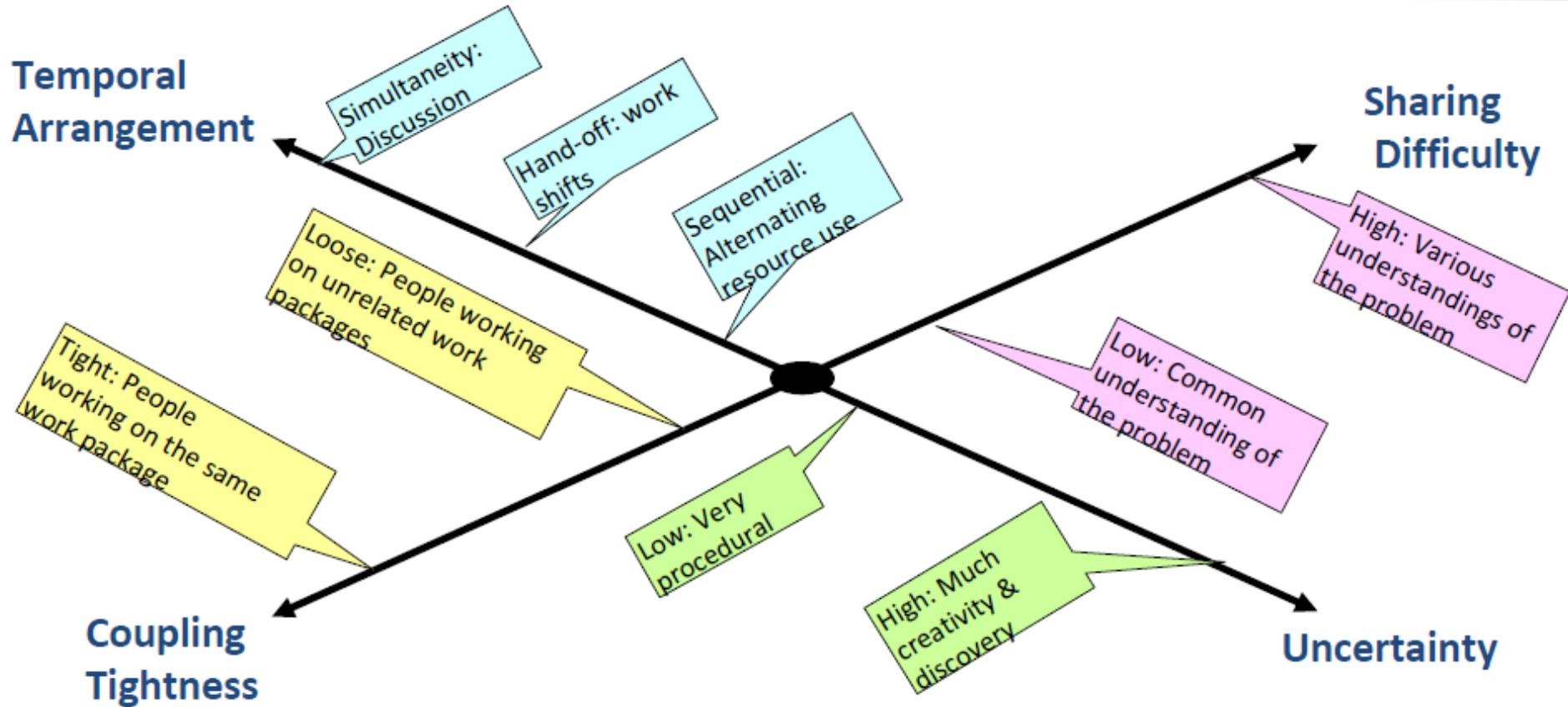
- Often used to
 - Conduct presentations
 - Show multiple new channels
 - Display a static view of the operational environment
- Not used to their full benefit
- Why?
 - Insufficient time is devoted to the broader design considerations
 - Technology often too complex to be used by most users and so only rudimentary features are used
- Unaddressed questions
 - Who are the LGDs intended for ?
 - What information should be displayed ?
 - How is the information shown controlled ?

Teams and Collaborative Working in C2

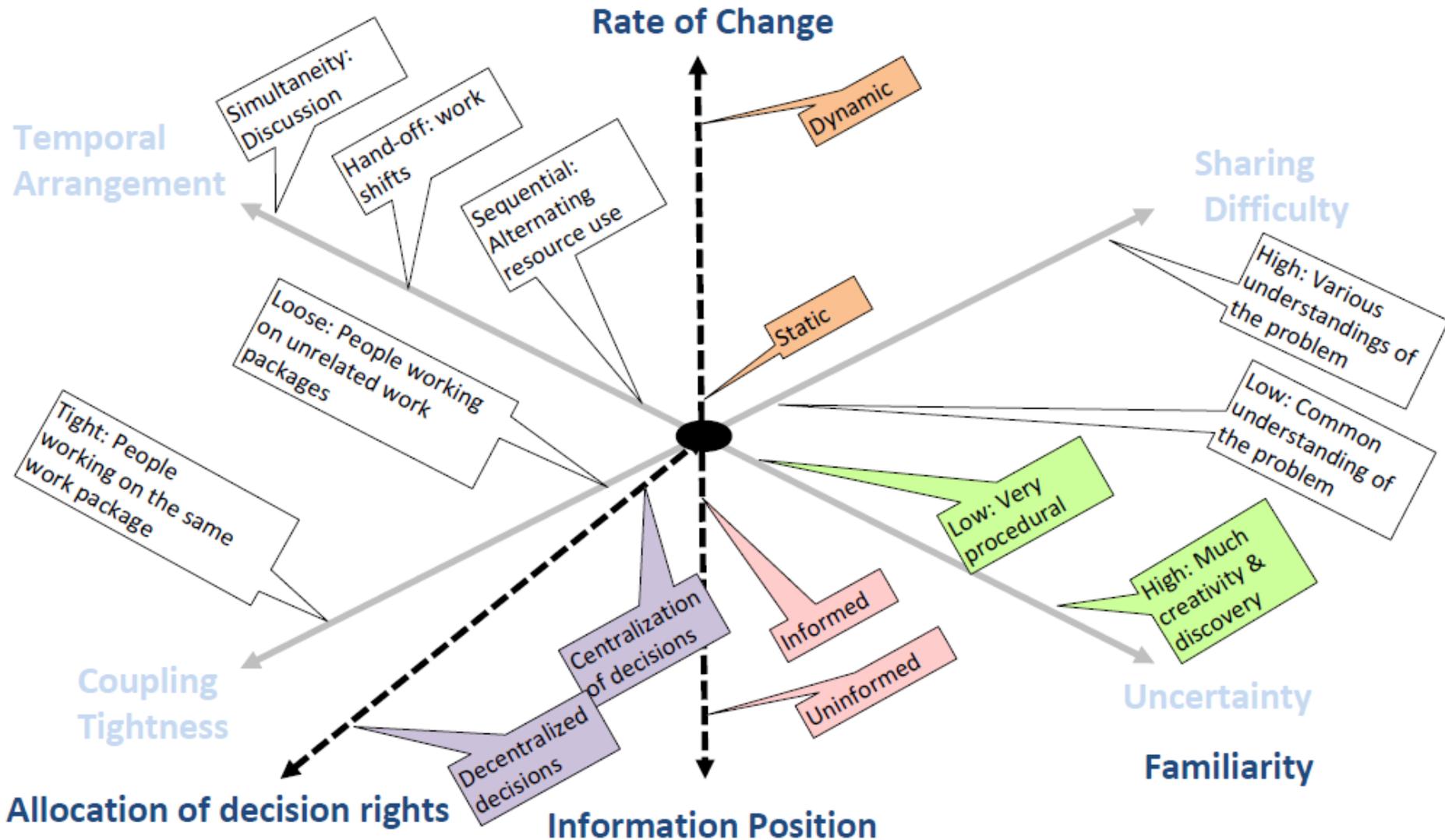
- Team
 - a distinguishable set **of two or more people**
 - who **interact dynamically, interdependently, and adaptively**
 - toward a **common and valued goal/objective/mission**
 - who have each been assigned **specific roles or functions** to perform and
 - who have a **limited life-span membership**

(Salas et al., 1992)

Intense Collaboration



Intense Collaboration and the Information Age



Benefits of LGDs

- Support team working, when
 - Operators require concurrent use of information
 - Operators have common information needs
 - Operators have shared tasks
 - There are non-conflicting task needs
 - Feedback is required to be given to the whole team
 - Tasks require a common frame of reference
 - High-level summary or overview of information needs to be provided

McLeod (1997)

SPAWAR Knowledge Wall



- Information Integration
- Summary Information
- Reducing the briefing cycle
- Information Quality

METOC Last Update: 31 May, 2000 09:42Z

<ul style="list-style-type: none"> ● Today ● Tomorrow ● Long Range 	<div style="border: 1px solid gray; padding: 2px; margin-bottom: 5px;">Alerts</div> <p>Trop. cycl. storm approaching high surf advisory</p> <div style="border: 1px solid gray; padding: 2px; margin-bottom: 5px;">Impacts</div> <p>Small craft advisory in parts of the NORTHERN BAY OF BUNDABERG Threat to navigation in parts of the NORTHERN BAY OF BUNDABERG</p> <div style="border: 1px solid gray; padding: 2px;">Links</div> <p>www.cmc.com www.metoc.com</p>
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Key Knowledge Wall Concepts

- Provision of shared situation awareness
- Multiple displays viewable from a distance
- Information displayed is filtered, synthesized, fused, interpreted and summarized by specialists on the command staff
- Large displays to show the tactical situation
- Small displays used as to show graphically
 - Mission summaries, planned responses, rules of engagement, current and future operational information, alerts, video conf.
- Ability to drill down in html-formatted summaries, via hyperlinks
- Possibility to switch the small displays to the large displays
- Display on the age and reliability of the information
- Use of a briefing tool

MITRE SideView



Operation - Urgent, Unclassified, LIIMDIS, Eyes Only

PRECISION STRIKE

Credible intel indicates that Nodal Nib Amaso will be in one of his command centers for the next two days.

Mission: Primary objective is Nib Amaso. Secondary objective are his entourage and benefactors.

Background: Atrocities against his own people as well as recent terrorist attacks in Southern Texas.

Commander's Intent: Capture or otherwise neutralize Nib Amaso while minimizing collateral damage and forces at risk.

Commander's Guidance: STRATCOM, CENTCOM, and SOCOM to plan multiple options against this target. Deconflict and present options online to NCA at 2300Z today.

Mission Factors	Progress
Av. Vehicles	18 / 25 > 25
Maximum Time to Deploy (hr)	1.8 / 2.2 > 2.2
Weather Capable	Yes / No
Distance Targets Inc	4.5 / 4.2 > 4.2
Number of Ordnance at Risk	440 / 440 / 700 > 700
Collateral Damage (est only)	5 / 1.5 > 5
Estimated Personnel Losses	700 / 700 / 2000 > 2000

STATUS

THREAT CONDITION
 DEFCON: 1
 INFOCON: Bravo
 L-Hour: 091514:22Z APR02
 A-Hour: 091822:44Z APR02

BARKSDALE
 Bombers: 660W
 ICBM: 1002, 111, 131
 ARBRM: ARB1
 WECCO: 20R, 023R

MINOT
 Bombers: 855, 8120,
 9236W, 1628W
 Tankets: 3311, 103T

WHITEMAN
 Bombers: 963BW
 ICBM: 109, 663
 C2 AEBBRV - A31, A667, A15
 C2 MCCC - 77Mc
 SLBM: 556L, 602SL

PATUXENT RIVER
 Bombers: 28, 54BW,
 119BW
 ICBM: 159, 14
 C2 MCCC: 77Mc
 SLBM: 178L, 8, 53

UPDATES
 09:30 Warning order received
 08:00 LCSB down to 28% after incident
 07:30 POTUS arrived in Washington DC
 06:30 POTUS leaving Camp David

POSITION
 Pos: 440719N 1082000W
 EDT: 171020:30 APR 02
 Zulu: 171420:00Z APR 02

WEATHER **BLUE FORCE** **INTEL** **CSISR ASSETS**

Task Timeline (1600Z - 2100Z):

- 1600Z: NCA/CJCS Evaluation
- 1600Z-1700Z: Develop Mission Analysis, Analyze Warning Order
- 1700Z: Situation Update
- 1800Z-2000Z: Develop Force Readiness Estimate
- 2000Z-2100Z: Construct Brief

Target Details
 Target Details
 Target Defenses

Task List:

- Develop Mission Analysis
 - Update Target Intelligence
 - Develop METOC Forecast
 - Determine Forces Available
 - Threat Analysis
 - Develop Blue Force Analysis
- Analyze Warning Order
 - Ascertain C&S Intent
 - Develop Mission Statement
 - Identify / Validate Assumptions
 - Make Notifications

Overview of mission objectives, based on warning order from CJCS

Current state of development of mission analysis components

Task timeline view customized for knowledge wall

FBV-type COP display customized for knowledge wall

FBV drilldowns

Key MITRE SideView Concepts

- Situation awareness: Common Operational Picture display incorporating multiple overlays
 - Mission overview
 - Current status
 - Task timeline with summary information
- Large display area
- Information viewable from a distance
- Team / Task related information
- Publish/subscribe mechanism / Information manager

AFRL Interactive Data Wall

- Large seamless working area
- Multimodal interaction



Key Data Wall Concepts

- Shared situation awareness & collaborative working
- Large seamless display surface
 - 3840 x 1024 pixels across a 12' x 3' screen area
- Multimodal interaction
 - Voice, wireless pointer, mouse, electronic grease pencil
- Multiple concurrent users
- Data display elements include detailed terrain, land route maps, real-time audio/video communications, airborne surveillance and intelligence information, archived geographic database information, and modeling and simulation information

DSTO LiveSpaces



Media Translation

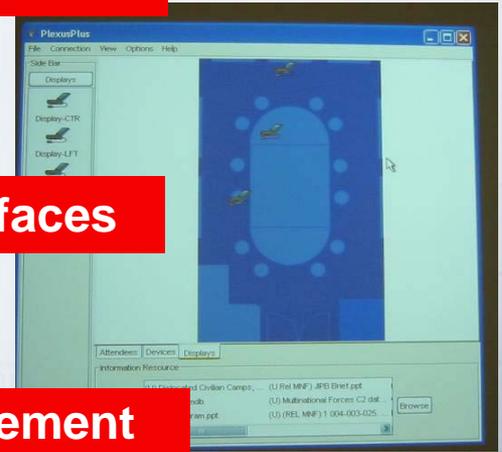


Natural Interaction

Coordination and Orchestration



TeamSpace Interfaces

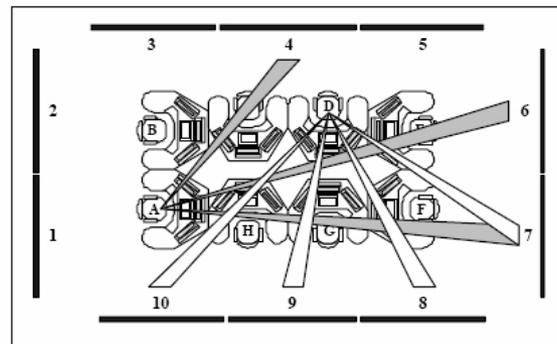
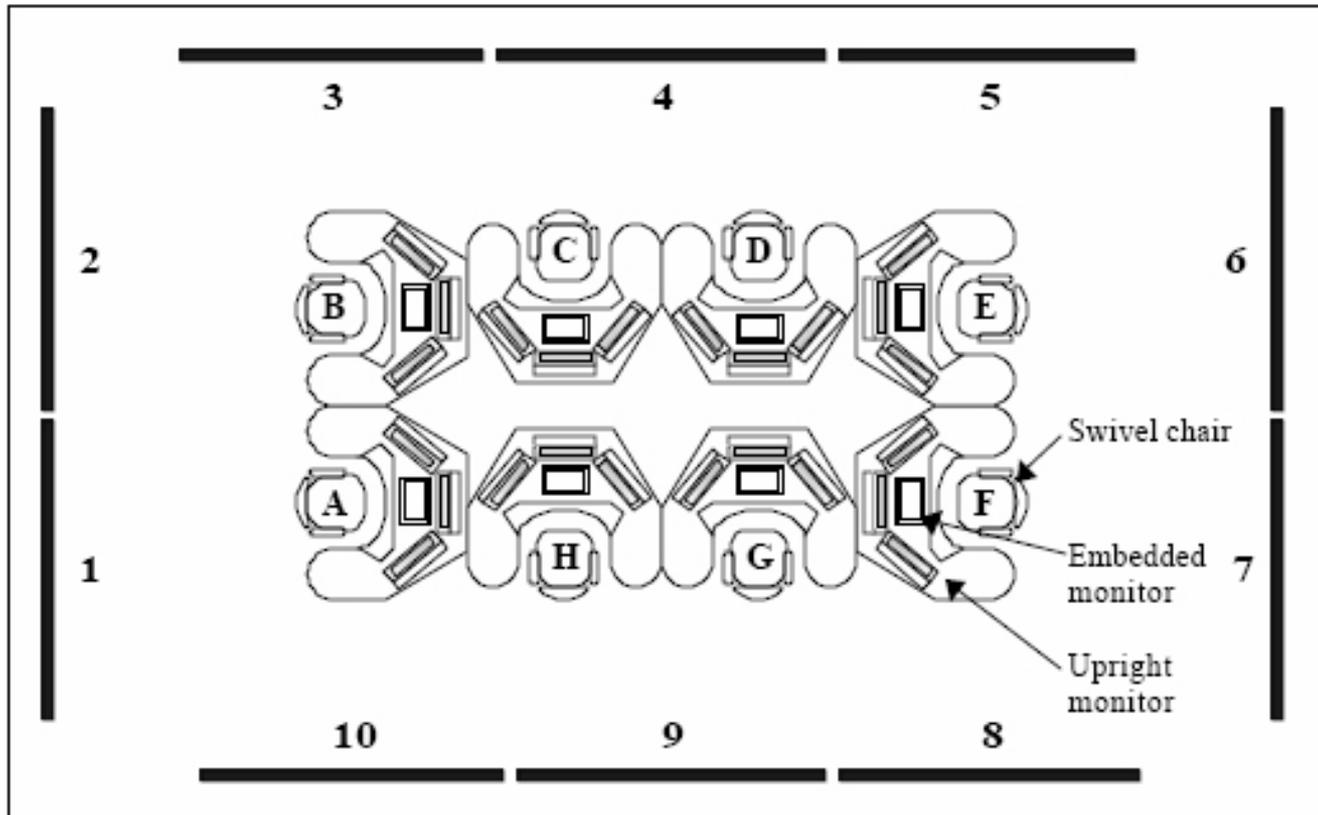


Session & Information Management

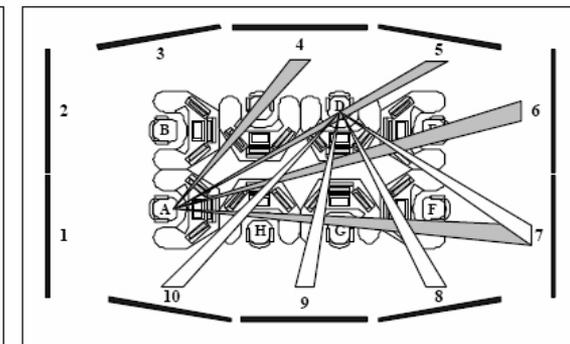
Key LiveSpaces Concepts

- Collaborative working & shared situation awareness
- Integration and collaboration infrastructure
 - Includes displays, smart boards, room facilities (lights, speakers), cameras
- Multiuser and natural interaction
- Collocated and distributed collaboration
- Awareness of
 - Availability of particular facilities and applications
 - Faults that might impact on the team activities

NSWC Integrated Command Environment (ICE) Lab



(a)

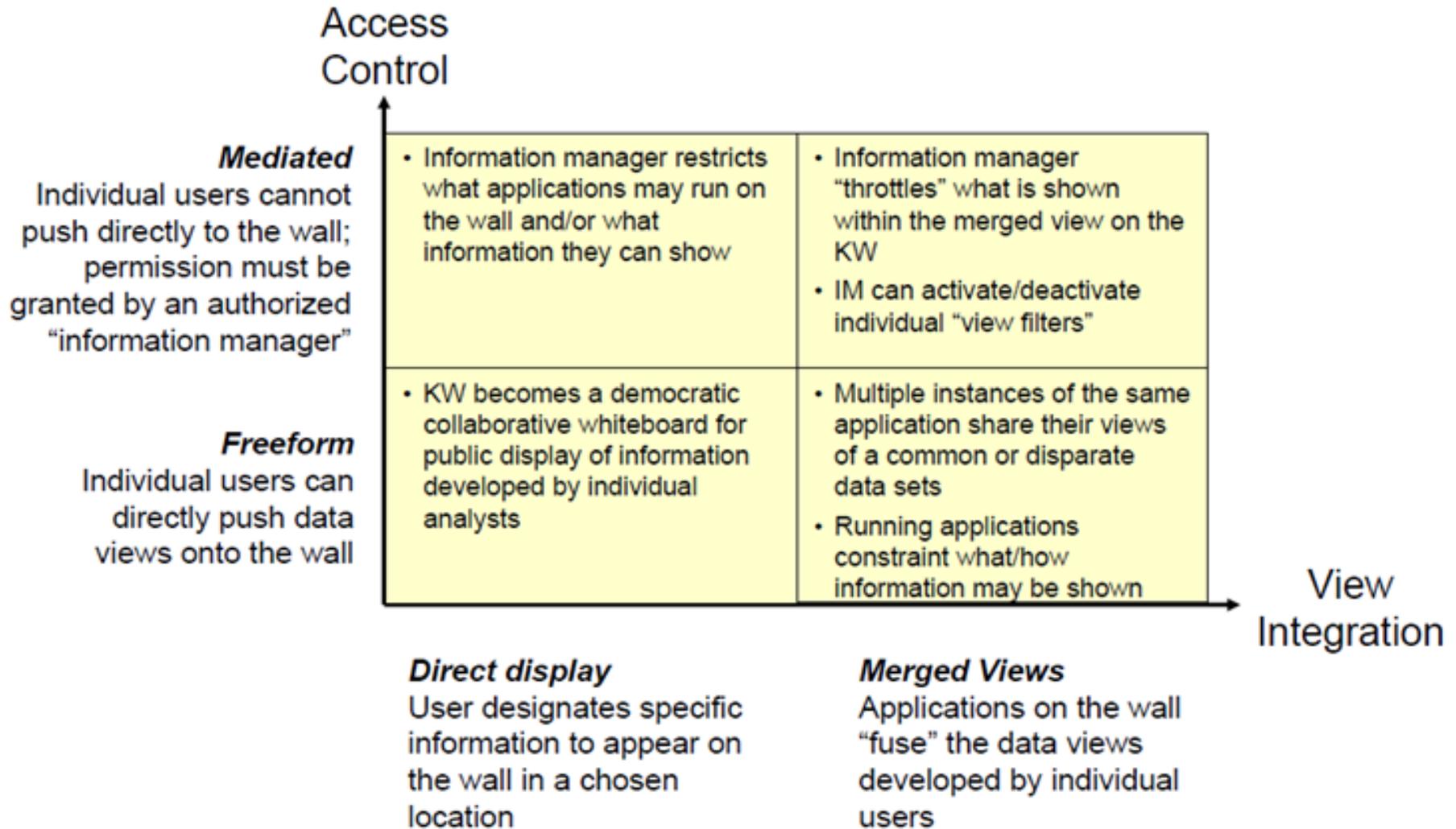


(b)

Key ICE Lab Design Concepts

- Shared situation awareness
- Key analysis of the human engineering factors
 - Legibility
 - Required head rotation and viewing angle
 - Lack of interference from intervening objects, personnel
 - Ambient lighting
- Information on LGDs should assist multiple operators in the completion of their respective tasks
- Use of redundant displays

Content and Display Management



Conclusion - Need proper design

- Information Content
 - What should be displayed?
 - Why is it needed?
 - Shared situation awareness
 - Awareness of the operational situation
 - Awareness of the internal workings of the team
 - Collaborative working
 - When should it be provided?
 - How should the information be provided?
 - Display simplification techniques such as providing summary information, highlighting, grouping and attention management
 - What is the usability (e.g. size, format and legibility)

Conclusion

- Content and Display Management
 - Manual and automated
 - Organization of the information
- Integration
 - Integration with the C2 tasks and processes
 - Redundancy
- Interaction
 - Multi-user and multi-modal
 - Natural
 - Distributed collaboration
 - Drill down

Acknowledgement



TTCP C3I TP2 (Command Information Interfaces)



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