What Do We Know About Teamwork and Team Training?: Helping Promote Safety in High Risk Environments

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I.   Why the need to understand teams and teamwork?

II.   What are high-performance teams?

III.   What do we know about teams and teamwork?

IV.   What do we know about team training?

V.   What does it take to create a safe environment through teamwork?

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- Complexity of Tasks Increasing

  - Distributed Information & Resources

  - High Workload

  - Technological Sophistication

  - Pace of Change

- Human Performance Errors

  - 60-80% Mishaps & Accidents

  - Persian Gulf Incidents

    - USS Vincennes

  - Medical Settings

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- Keep Competitive Advantage

  – Team-Based Organizations

  – Self-Managed Work Teams

  – Teams are "In"...

- Many Crucial Tasks Require Coordination

  – Aircrews/Military Teams

  – Surgical/Emergency Medical Teams

  – Law Enforcement Teams

  – Work Teams

Defining Characteristics...

•Two or more individuals

•Multiple information sources

•Meaningful task interdependencies

•Coordination among members

•Common, valued goals

•Specialized member roles and responsibilities

•Task-relevant knowledge

•Intensive communication

•Adaptive mechanisms

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•Complex, Multi-Component Decisions

•Rapidly evolving, ambiguous situations

•Information overload

•Severe Time Pressure

•Severe Consequences of Error

•Adverse Physical Conditions

•Performance/Command Pressure

•Distributed, Multi-Operator Problems

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How Do We Turn a Team of Experts into an Expert Team?

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- Shared Mental Models Theory
    - Cognitive Psychology
    - Explanatory Mechanism
    - Implicit Coordination
- Models of Team Effectiveness
    - Group Dynamics/Organizational Psychology
    - Framework
    - Content of Training/Competencies
- Naturalistic Decision Making Movement
    - Studying Teams in Context
    - Acquisition of Expertise
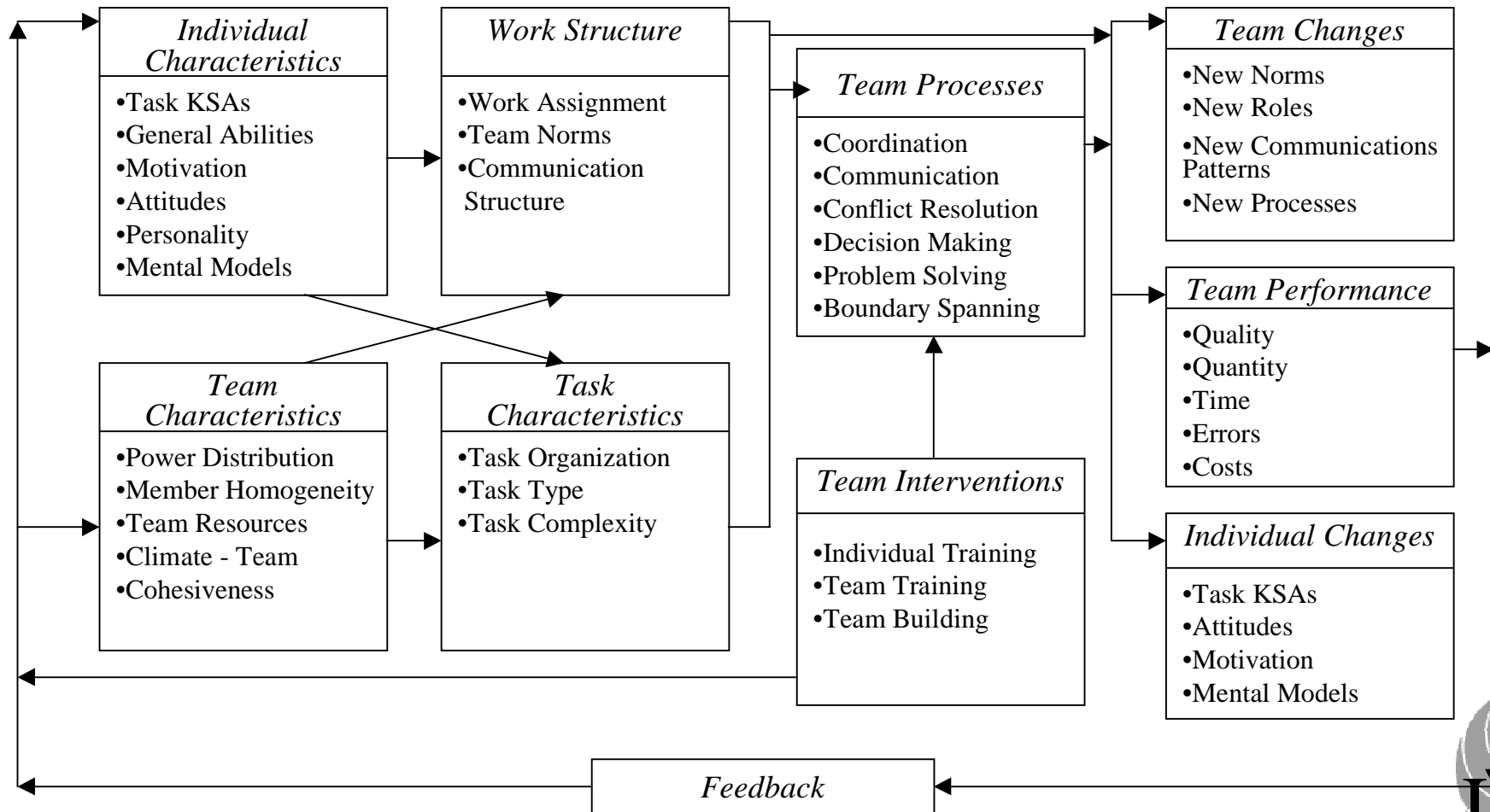   - Pattern Recognition

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Organization & Situational Characteristics

Reward Systems *Management Control* *Organizational Climate* *Intergroup Relations*
Resource Scarcity *Levels of Stress* *Competition* *Environment Uncertainty*

Input *Throughput* *Output*

Individual Characteristics
•Task KSAs
•General Abilities
•Motivation
•Attitudes
•Personality
•Mental Models

Work Structure
•Work Assignment
•Team Norms
•Communication Structure

Team Processes
•Coordination
•Communication
•Conflict Resolution
•Decision Making
•Problem Solving
•Boundary Spanning

Team Changes
•New Norms
•New Roles
•New Communications Patterns
•New Processes

Team Characteristics
•Power Distribution
•Member Homogeneity
•Team Resources
•Climate - Team
•Cohesiveness

Task Characteristics
•Task Organization
•Task Type
•Task Complexity

Team Interventions
•Individual Training
•Team Training
•Team Building

Team Performance
•Quality
•Quantity
•Time
•Errors
•Costs

Individual Changes
•Task KSAs
•Attitudes
•Motivation
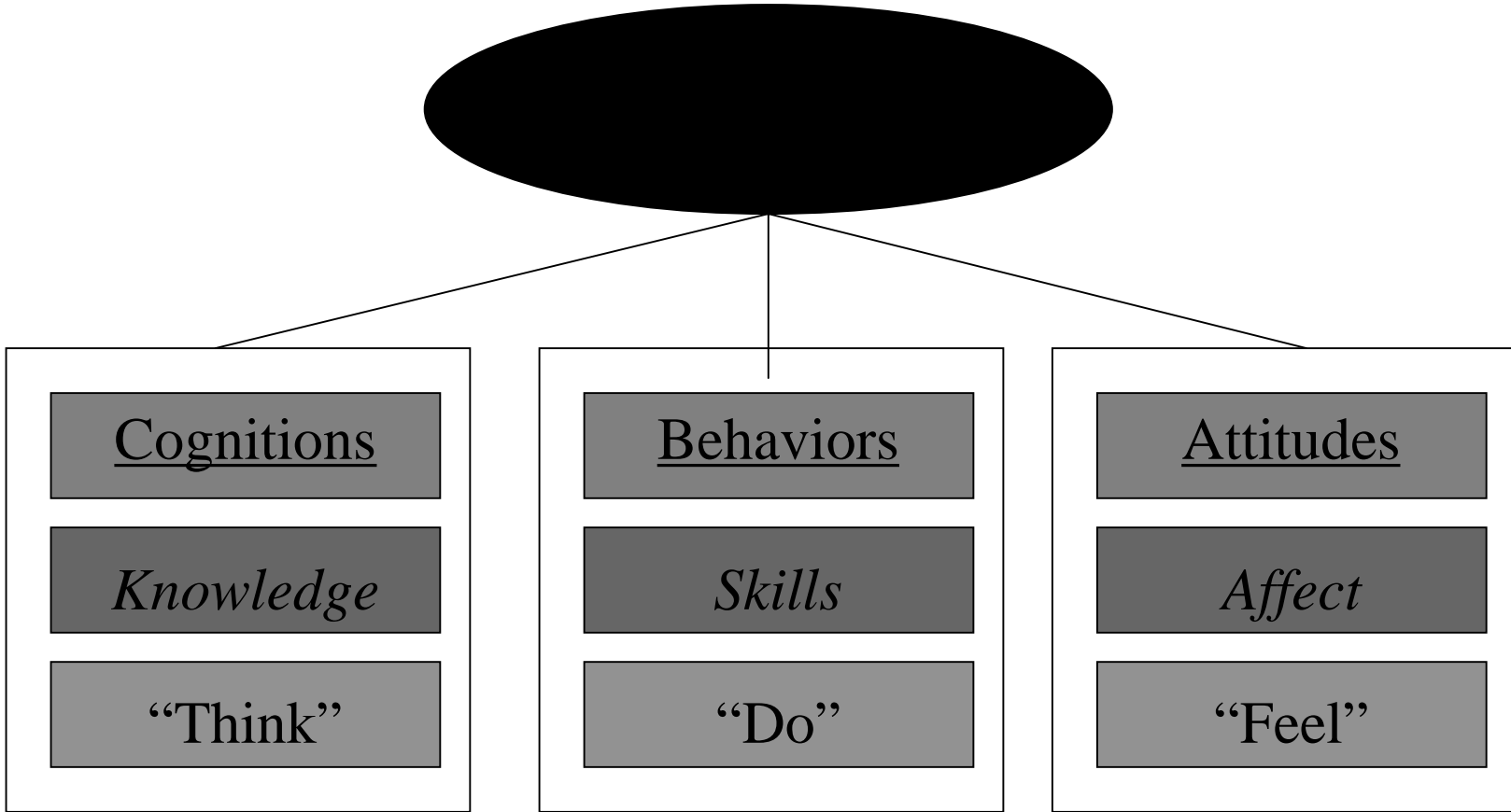•Mental Models

Feedback

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- Theoretically-Driven
- Study Teams in Natural Settings
- Experts as Participants
- Laboratory Experiments When Appropriate
- Balance Science & Practice
- Product-Oriented

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- Over 200 Teams in Natural Settings
- Over 600 Teams in Laboratory
- Over 1500 Aviators
- Over 800 CIC Personnel
- Over 300 ATC & Others

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We Know…

- The Required Team Competencies

- How to Assess Teamwork

- What is Effective Teamwork

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Cognitions	Behaviors	Attitudes
Knowledge	*Skills*	*Affect*
"Think"	"Do"	"Feel"

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- Cue/Strategy Associations

- Shared Task Models

- Teammate Characteristics

- Knowledge of Team Mission; Objectives; Norms; Resources

- Task-Specific Role Responsibilities

- Mutual Performance Monitoring

- Flexibility

- Supporting Behavior

- Leadership

- Assertiveness

- Conflict Resolution

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- Team Orientation (Morale)

- Collective Efficacy

- Shared Vision

- Team Cohesion

- Interpersonal Relations

- Mutual Trust

- Collective Orientation

- Importance of Teamwork

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•Enhances the Practice of:

  •Selection and Placement

  •Career Development

  •Training

•Provides Evidence of Organizational Effectiveness

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Requirements of a Team Performance Measurement System:

- • Must Be Theoretically-Based
  - - Models of Team Performance
  - - Cognition, Behavior and Affective Factors
- • Must Consider Multiple Levels of Measurement
  - - Individual/Team
  - - Process/Outcome
- • Must Be Able to Describe, Evaluate and Diagnose Performance
  - - Moment-to-Moment Changes
  - - Create Standards
  - - Determine Causes

- Must Provide Basis for Remediation
    - Feedback
    - Knowledge of Results
    - Driving Subsequent Instruction
- Must Support Ease of Use
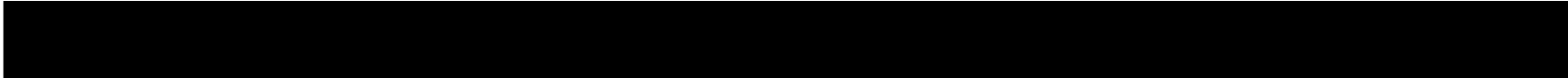
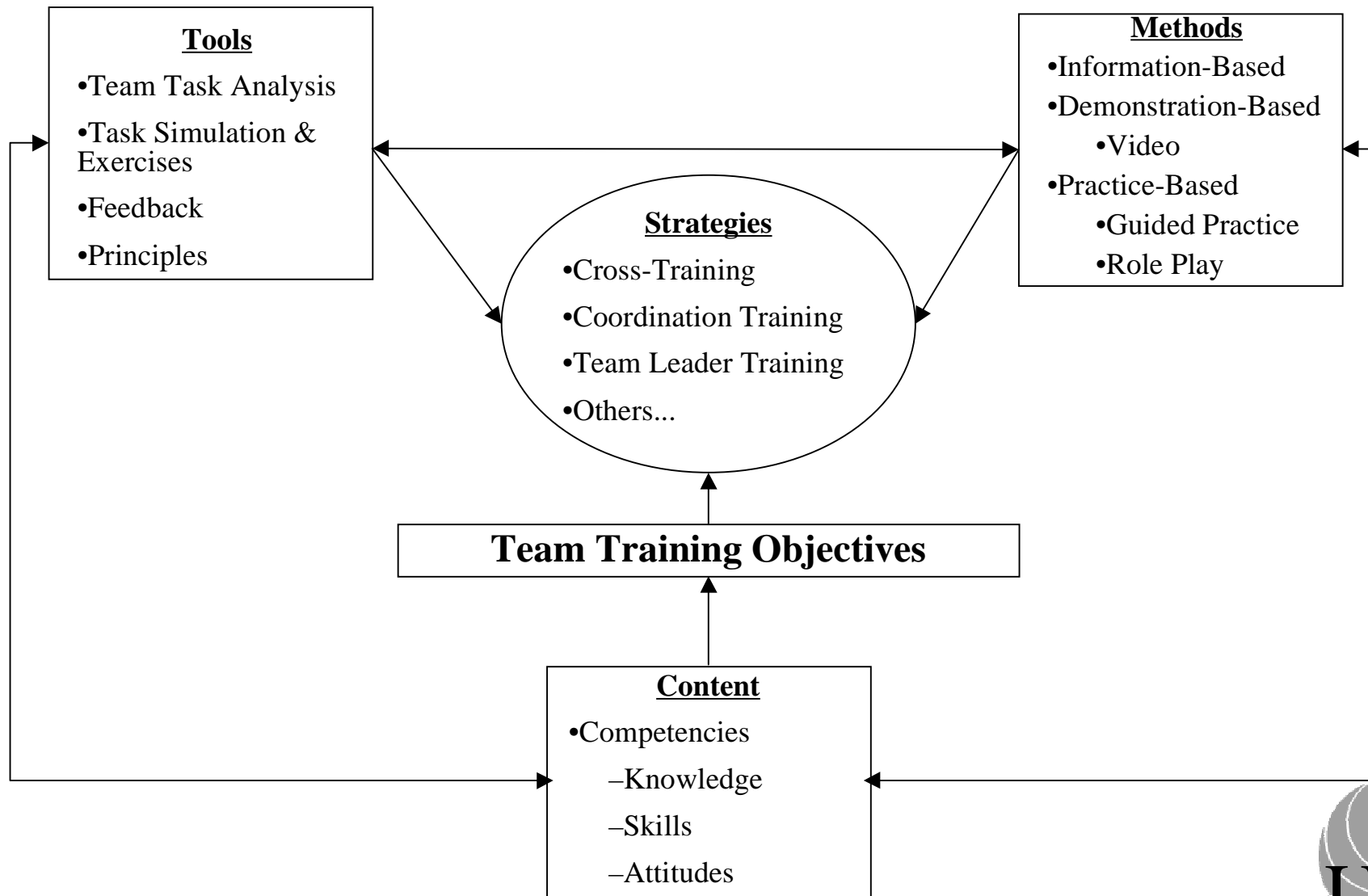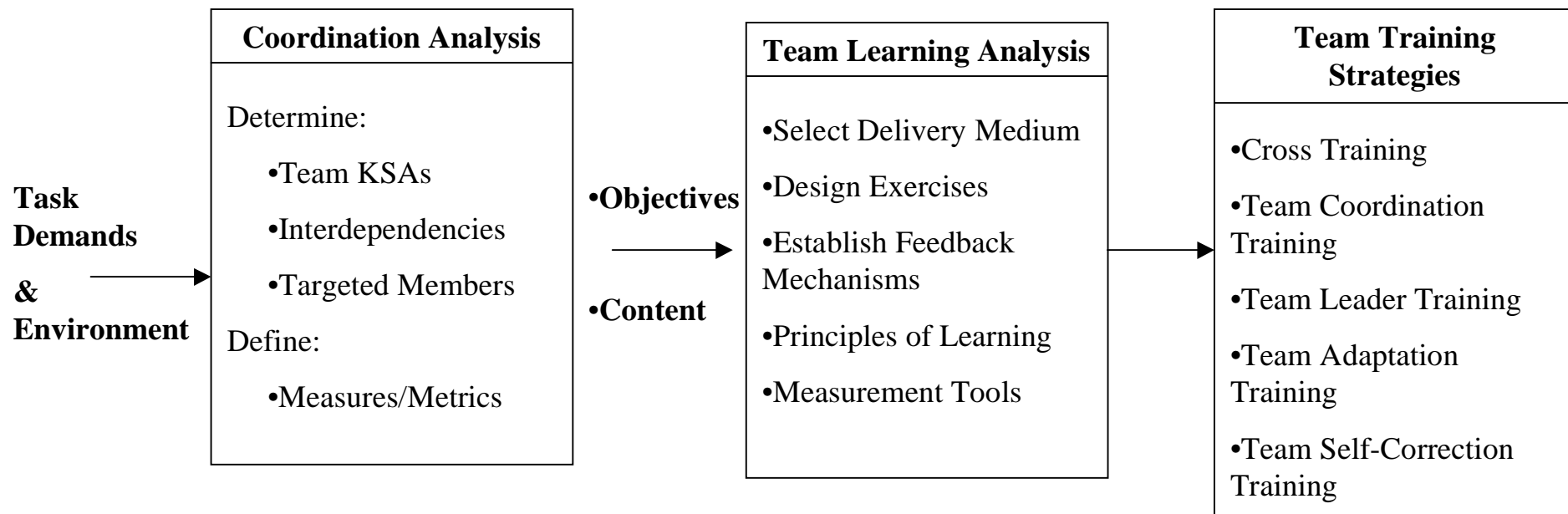|	**Individual**	**Team**
P R O C E S S	–Decision Flow Analysis –Performance Diary –Observation Analysis	–Observational Scales –Content Analysis –Critical Incidents
O U T C O M E	–Critical Incidents & Latency –Automated Performance Recording –Expert Opinion	–Rating Scales –Team Error Analysis –Archival Data

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- Teamwork Skills are Distinct from Taskwork Skills

- Effective Teams have members who Anticipate each Others' Needs

- Effective Teams can Coordinate without the Need to Communicate overtly

- Effective Teams Develop Collective Efficacy

- Effective Teams Optimize Resources

    - Are Self-Correcting

    - Compensate for Each Other

    - Reallocate Functions

- Effective Teams have a Strong Sense of "Teamness"

- Effective Teams can Recognize and Adjust their Strategy under Stress

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Team Training is NOT….

- A Program

- A Place

- A Simulator

- A Collection of Individuals Being Trained Together

- A Computer Network

- The Same as Team Building

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Tools

•Team Task Analysis

•Task Simulation & Exercises

•Feedback

•Principles

Methods

•Information-Based

•Demonstration-Based

   •Video

•Practice-Based

   •Guided Practice

   •Role Play

Strategies

•Cross-Training

•Coordination Training

•Team Leader Training

•Others...

Team Training Objectives

Content

•Competencies

   –Knowledge

   –Skills

   –Attitudes

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A (Simple) Model of Team Training

Task Demands & Environment →

Coordination Analysis

Determine:

- Team KSAs
- Interdependencies
- Targeted Members

Define:

- Measures/Metrics

→ •**Objectives**

•**Content** →

Team Learning Analysis

- Select Delivery Medium
- Design Exercises
- Establish Feedback Mechanisms
- Principles of Learning
- Measurement Tools

→

Team Training Strategies

- Cross Training
- Team Coordination Training
- Team Leader Training
- Team Adaptation Training
- Team Self-Correction Training

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Implications of the Model

- Model Describes a Fairly Typical "Training Development" Model

- We Will Focus Only on Aspects that are Unique to TEAMS:

  - Competencies

  - Coordination Demands

  - Performance Measures

  - Exercises Design

  - Specific Instructional Strategies

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Team KSAs

•Based on Task Analysis Results

•Determine Tasks that have Coordination Demand (Qualitative or Quantitative)

•Rate Tasks using Coordination Demand Index

•Obtain Descriptors, Incidents for Tasks with High Coordination Demand

•Determine Competencies Required and Establish Training Objectives

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- Determines What to Train
  - KSAs
- Determines Who to Train
  - Targeted Members
- Assesses What are the Coordination Demands
  - Interdependencies
- Uncovers Metrics/Criteria
  - Measures
- Products:
  - 1. Training Objectives
  - 2. Content

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- How to Deliver the Training
  - Information-Based Methods
    - Lectures
  - Demonstration-Based
    - Videos
  - Practice-Based
    - Role-Plays
    - Exercises
    - Simulations
- How to Design Exercises for Learning
  - Links Between Objectives, KSAs and Exercises/Curriculum
  - Links Between Exercises, Measures and Feedback
- Incorporated Principles of Learning
  - Motivation
- Develop Measurement Tools
- Develop Supporting Materials
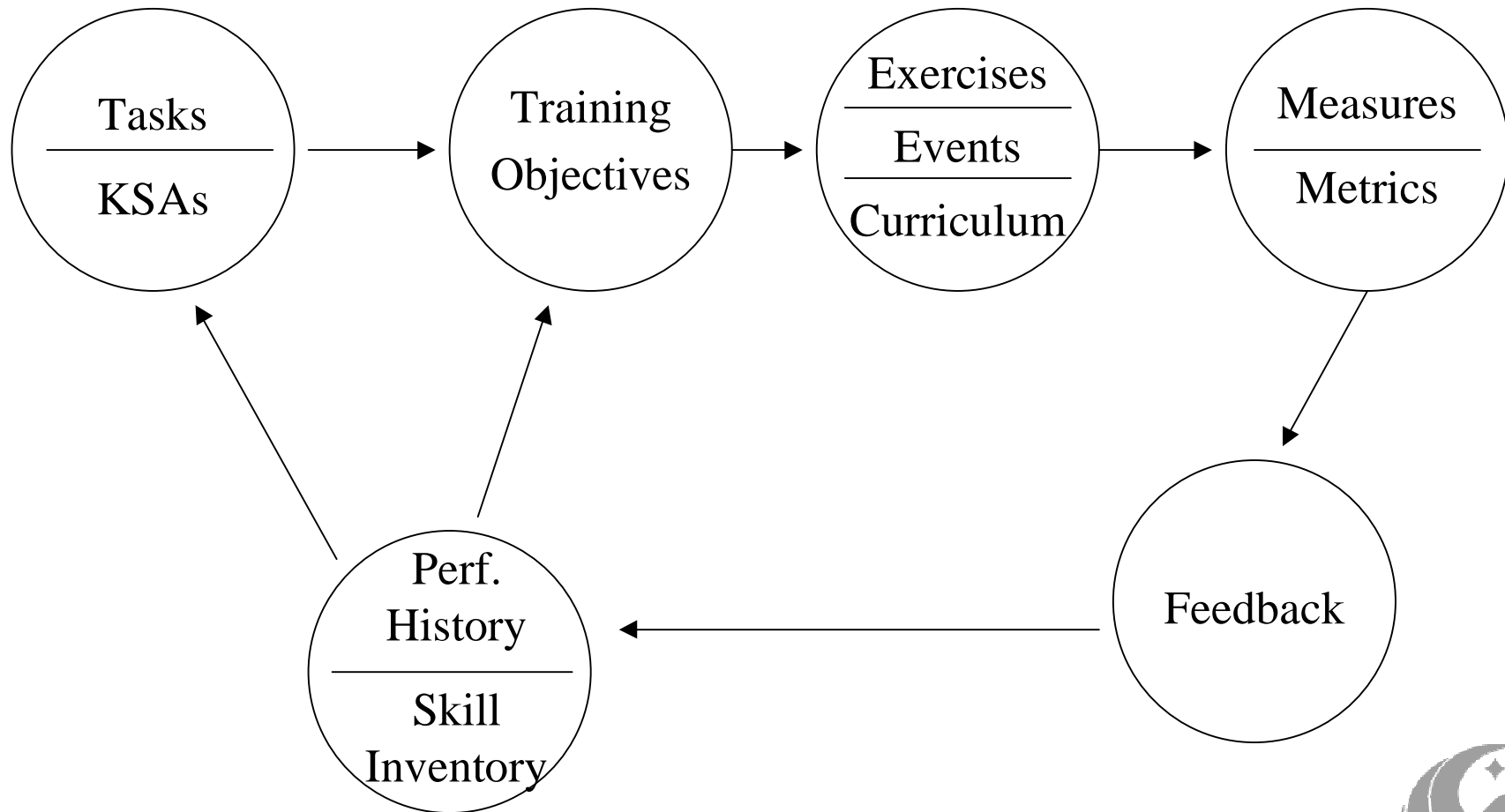 - Curricula
  - Lesson Plans
  - Exercises

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•Compared With Current Training, Enhanced Training Resulted in (see Cannon-Bowers & Salas, 1998):

–45% Improvement in Mission Performance

–33% Improvement in Tactical Decision Making Performance

–25% Improvement in Communication Efficiency

–10-34% Improvement in Team Coordination

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Training Strategies

- Cross Training

  – Walking in each other's shoes…

- Team Coordination Training

  – He ain't heavy…

- Team Leader Training

  – The blind pass…

- Team Self-Correction:

  – Replay in the bar...

Cross Training

- Targeted KSAs
    - Shared Task Models
    - Task-Specific Role Responsibilities
    - Knowledge of Team Mission & Objectives
- Description of Strategy
    - Information-Based
    - Simulation
- Validation Efforts
    - Three Studies
    - 12-40% Team Performance Improvements

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Team Coordination Training

- Targeted KSAs
  - Mutual Performance Monitoring
  - Compensatory Behavior
  - Understanding of Teamwork Skills
- Description of Strategy
  - Information
  - Practice & Feedback
  - Demonstration
- Validation Efforts
  - Four Studies
  - 12-15% Team Performance Improvements

Team Leader Training

- Targeted KSAs

  - Motivating Others

  - Shared Task Models

  - Task Structuring

- Description of Strategy

- Validation Efforts

  - Significant Improvements in Team's Performance

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Guided Self-Correction Training

• Targeted KSAs

   – Mutual Performance Monitoring

   – Initiative/Leadership

   – Communication

• Description of Strategy

   – Driven by Team Itself

• Validation Efforts

   – High User Acceptance

   – Evidence of Performance Improvements

Team Training is (Should be)….

- Based on Team/Task KSA Requirements

- A Context in which Team Skills can be Practiced, Assessed and Learned

- A set of Tested Methods and Tools

- More than a "Feel Good" Intervention

- On-going...

- Over 50 Year History…

- Vast Literature… and Growing
  - Thousands of Articles and Chapters!!
  - Journals, Books and Handbooks.
  - Empirical Work and Testing

- Now a Multidisciplinary Field…
  - Industrial/Organizational, Human Factors, Cognitive, Military Psychology

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- Moved Out of the Lab to the Field...
  - Studying Teams in Context
  - Use Experts as Participants
- Resources to Study Teams...
  - Military R&D
  - FAA
  - NASA
- Pockets of Knowledge...
  - UCF/Navy
  - UT/UNT
  - GMU/MSU
  - Others

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- Shift to Practical Products
  - Tools, Techniques & Procedures
  - Guidelines

- Debates Continue...
  - Theories
  - Measurement
  - Team Effectiveness

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•Understanding of the Team Competencies Required…

•Assessing Performance…

•Establishing Mechanisms to Foster Safety & Teamwork…

•Creating an Organizational Climate for Safety & Teamwork...

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- The Science and Practice of Team Performance and Training is Alive and Well…

- Progress has been Made…

- More to be Done…

- Don't try this at Home!!!

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