Knowledge Foundations of Effective Collaboration*

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Topics

- What collaboration is and how it fits into NCW
- Why teams fail, with some famous examples
- How collaboration works
- What people need to know, and what happens if they don't know
- Applying cognitive focus

A Definition
Expert Leverage Focus

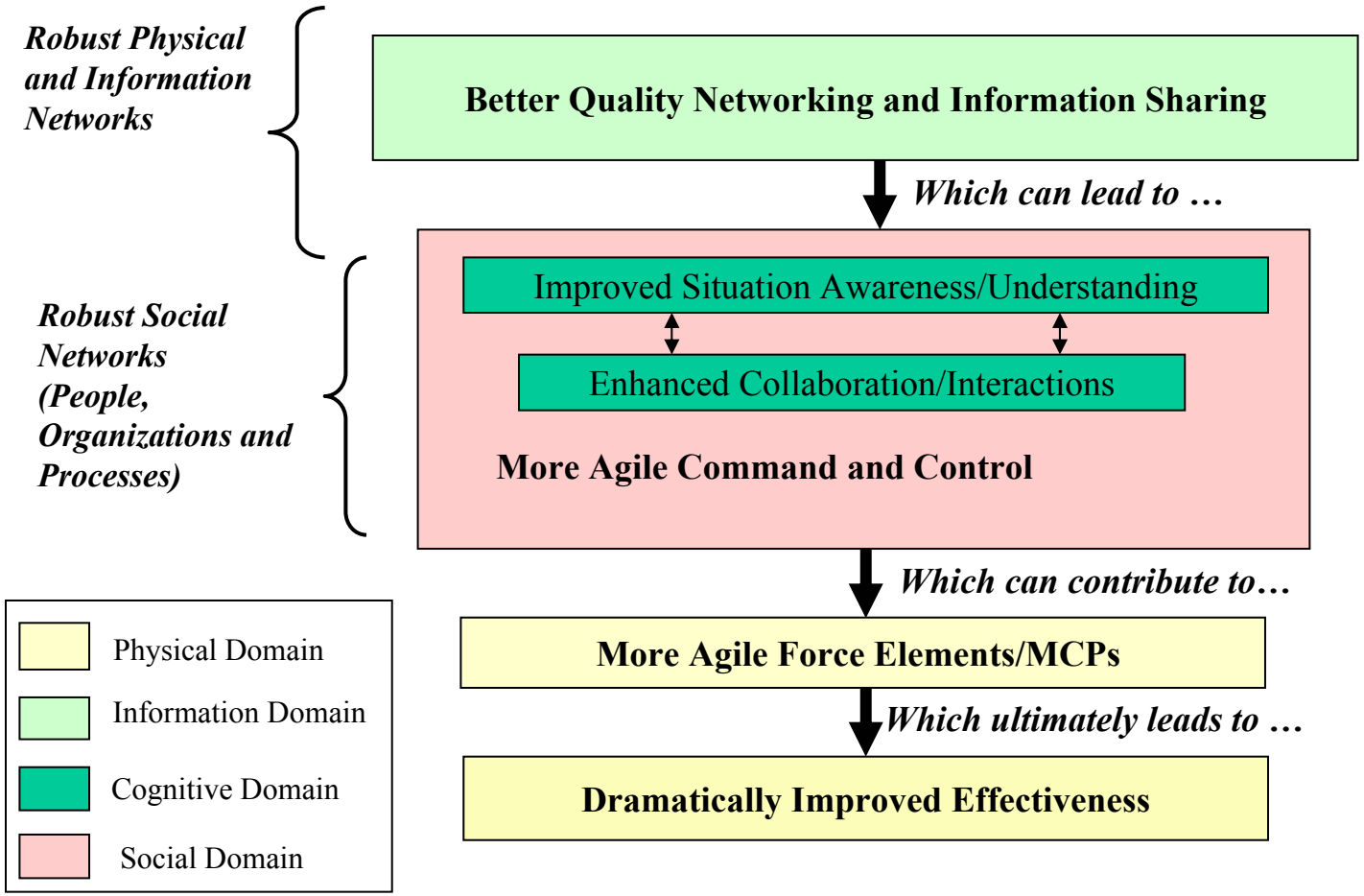
- Experts integrating perspectives to better interpret the situation and problem, identify candidate actions, formulate evaluation criteria, and decide what to do
- By collaborating, the team comes up with a better solution than any one team member could working alone

Group Problem Solving
Sharing of Perspectives

- Collaboration enables teams to "make better lists"
  - Better views on what is happening, the reasons for these occurrences, and their impacts on the team mission
  - Better set of candidate actions to take in response to these impacts
  - Better set of criteria to consider when evaluating the desirability of these actions
  - Better estimates of possible consequences of the alternatives being considered

Collaboration Within the NCO Conceptual Framework

A Robustly Networked Force Enables…



Why Collaboration Fails

- The problem's too hard for our team to succeed
  - EBR decides to form a basketball team, with the goal of beating the Lakers next year
- The team doesn't know how to succeed
  - We'll have a curling team instead, with goal of winning a game in Vienna. But the team doesn't know how to organize and train
- The team members don't care about the goals and don't want to do the work
  - Who wants to do curling anyway. We want to play pinochle instead

Famous Examples of Cognitive Failures

The Bay of Pigs, 1962

A talented and intelligent policy team, but Groupthink doomed the team to an unworkable plan with disastrous results

The Iranian airline shootdown, July 3, 1988

Well trained team on Vincennes, but misunderstandings of each others information and perspectives led to a tragic mistake

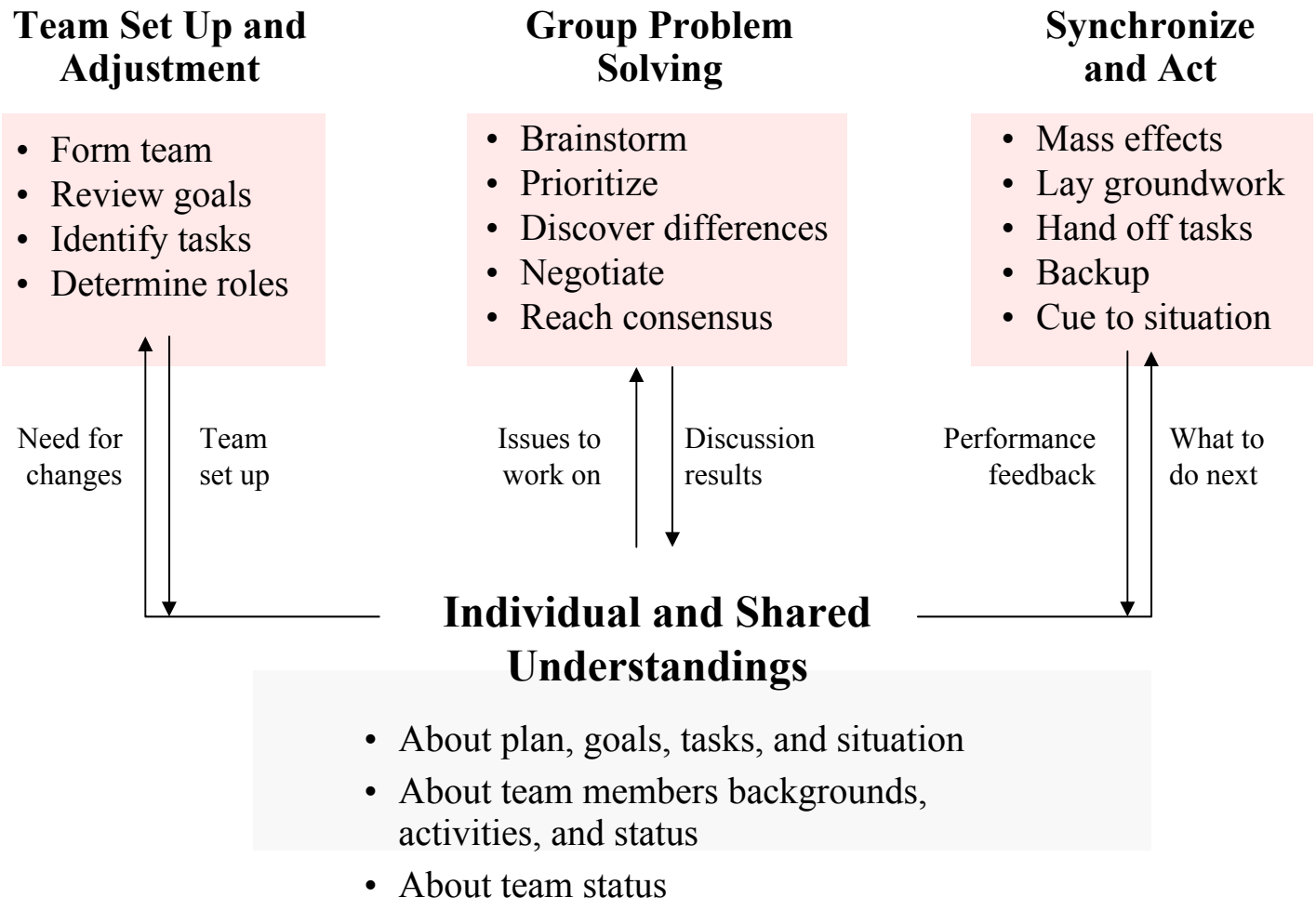
How Collaboration Works
Knowledge-Centered Collaboration Theory

- Theory
  - Specifies the knowledge team members need to interact effectively for the benefit of the team
- Applications
  - Methodology for educating team members on teamwork, tracking team progress, alerting to problems, and recommending solutions
  - Assessing improvements to collaboration and teamwork after introduction of new tools, processes, or organization
  - Selecting collaboration tools
  - Allocating knowledge responsibilities among team members, both human and computers

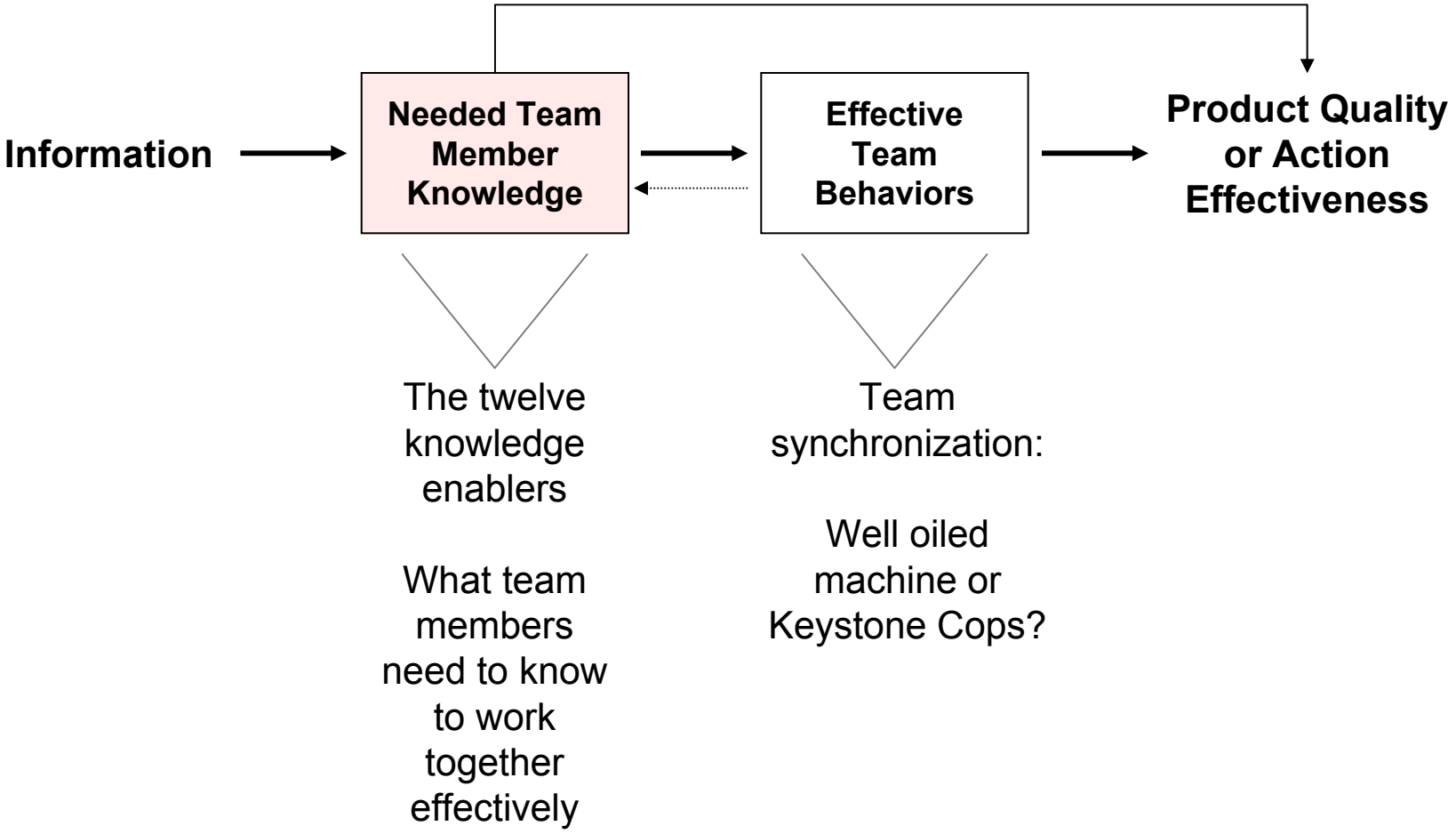
Premises
Knowledge Basis for Collaboration

- Knowledge is central to collaboration and teamwork
  - Teams whose members know what they need to know can work together effectively. Those that do not are prone to various kinds of predictable errors, with the type of error dependent on the type of knowledge deficiency
- Knowledge must be distributed among members of a team
  - Everybody does not need to know everything for a team to be effective. But every team member does need to know how to get the knowledge he or she needs.
- Individuals need to know about both "taskwork" and teamwork
  - Taskwork knowledge is what team members need to carry out their tasks were they acting alone
  - Teamwork knowledge is what team members need to know to work together effectively
- The collaborative dialog helps generate the needed teamwork and taskwork knowledge
  - Team members exchange ideas to clarify issues and reach consensus to put in place the knowledge and understandings that team members must have to achieve the team's mission.

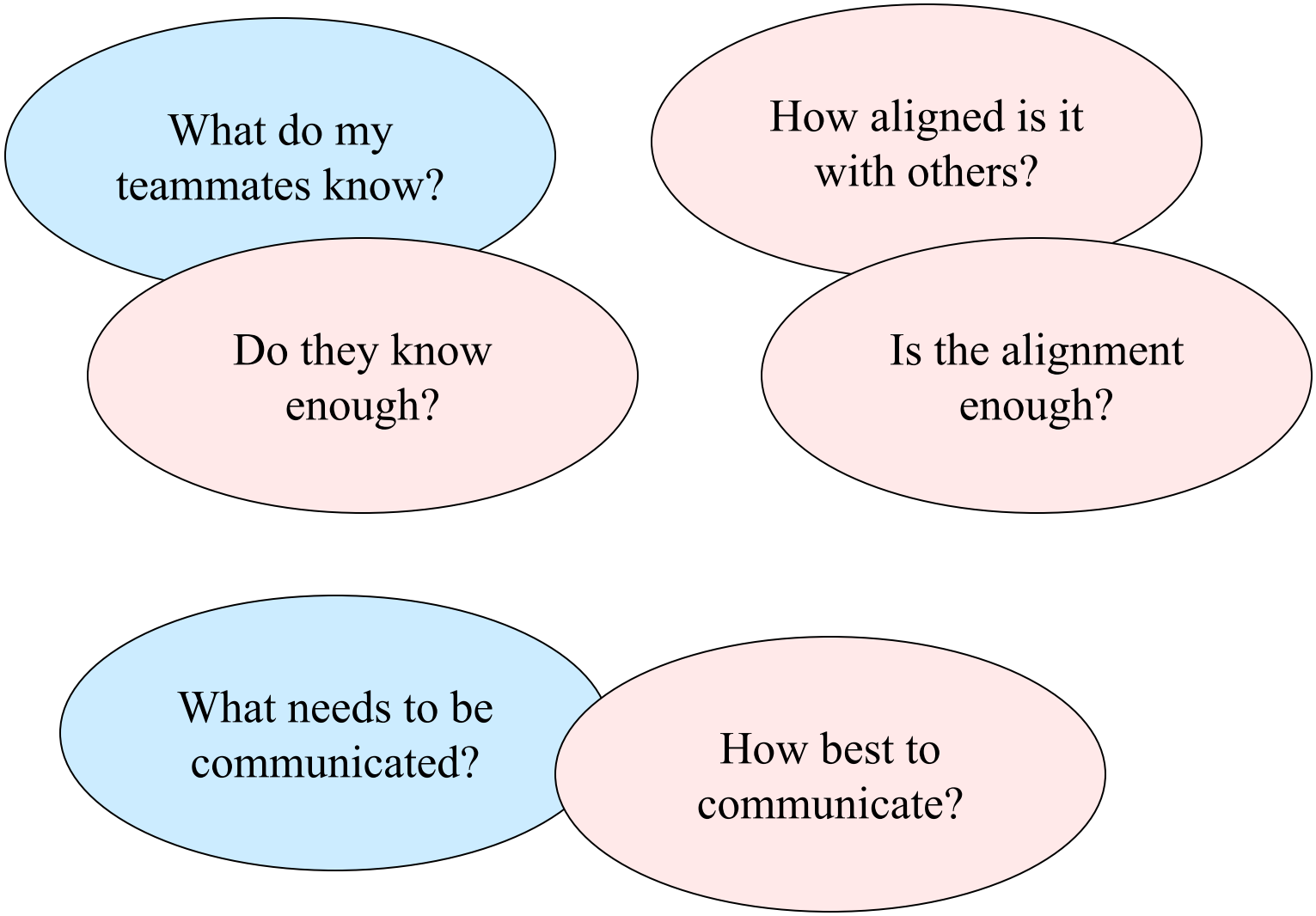
Building Blocks of Collaboration and Teamwork



The Central Role of Knowledge



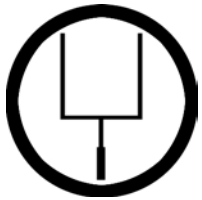
Evaluative Knowledge—the Basis of Team Cognitive Glue



The Twelve Enablers

- Represents basic cognitive foundations for effective collaboration
- At a level useful for diagnosis and recommendations
  - Deficiencies in enablers are the underlying causes of teamwork problems
  - Risks and symptoms map easily to enablers
  - Recommendations follow directly from them
- Generalizes well known critical C2 and decision functions for teams

Knowledge Enablers
Foundational Knowledge



Goals

Others

Plans

Business rules

Dependencies

Task skills

Knowledge Enablers

Real Time Understanding and Assessments

Activity Awareness

Mutual Understanding

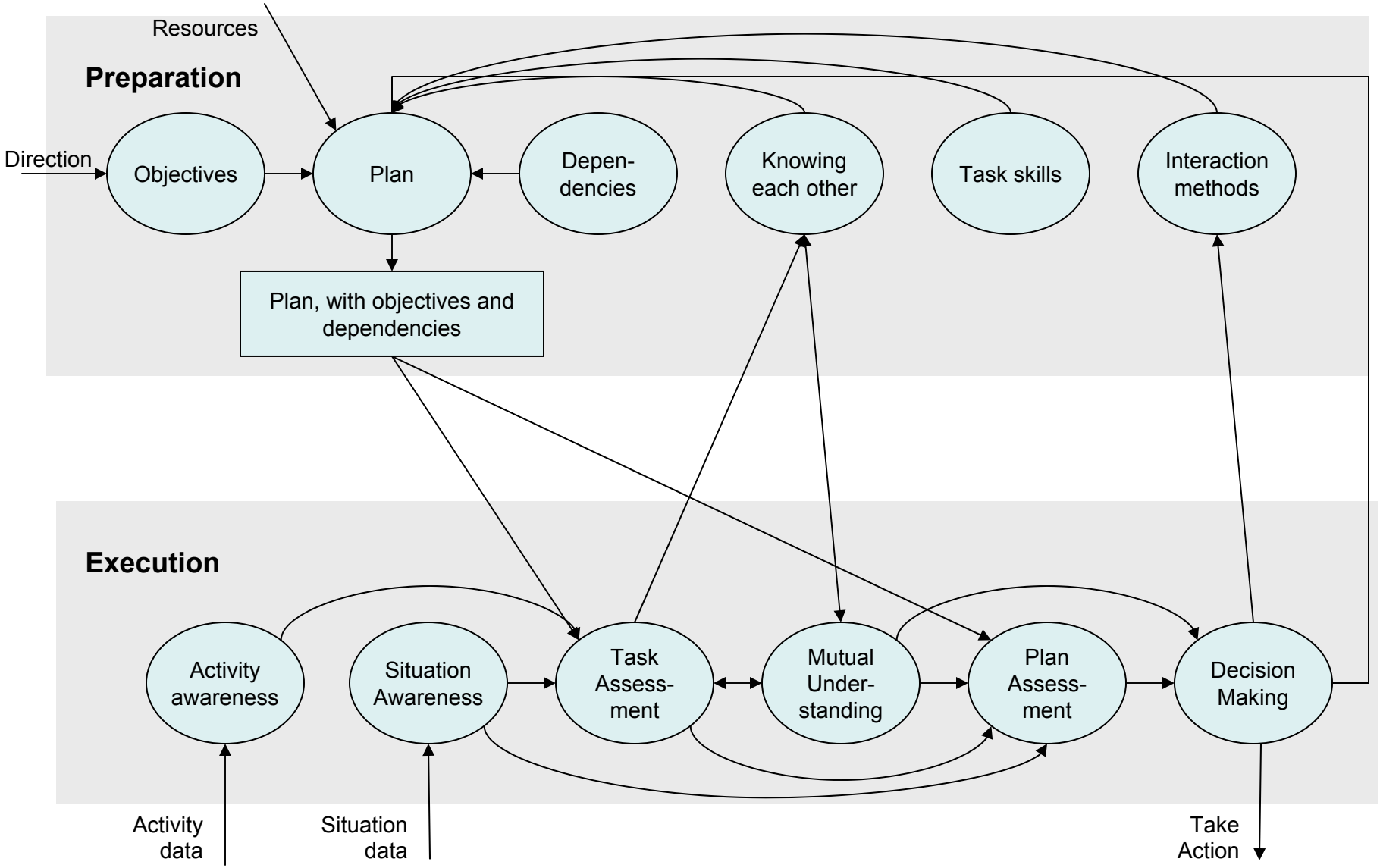
External Situation

Plan Prospects

Task Progress

Decision Factors

Principal Enabler Dependencies



Some Consequences of Knowledge Gaps

A team that doesn't know where it's going may have difficulty getting there

Chaos

Can't prioritize work or predict results of actions

People let them down and lose trust in one another

Fights, hurt feelings, and people quitting the team

Failed tasks

People making mistakes keep making them

Can't react to a changing environment and to the actions of your competitors

Broken tasks don't get fixed

Team members work at cross purposes

Team keeps implementing a bad plan that can't work

Bad decisions, bad outcomes, and a failed mission

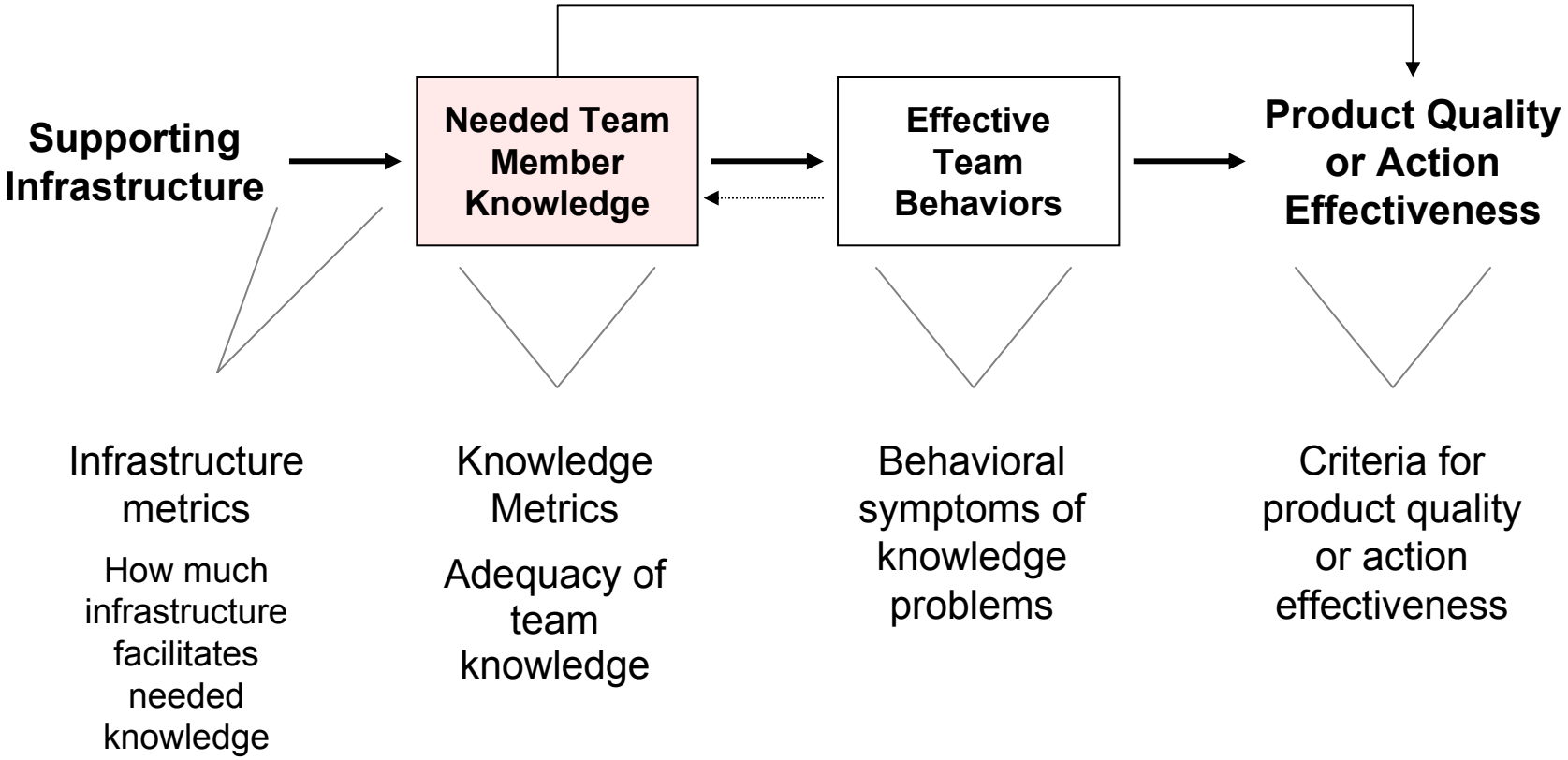
Applications

- Diagnosing and fixing problems
- Metrics
- Tool selection
- Computer/ robot rules

Diagnosing and Fixing Problems
Collaboration Advizor Tool

- Expert system software
  - Alerts to possible knowledge problems
  - Warns of consequences
  - Shows areas of agreement/ disagreement
  - Suggests ways to improve

Metrics*

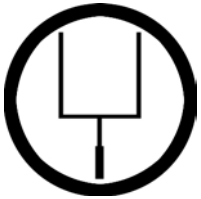


*Most extensively documented in "Command Performance Assessment System" (Kirzl, Noble, Leedom)

Knowledge-Based Tool Selection

- Communication (e.g., e-mail)
  - Common support to all knowledge areas
- Common awareness tools (e.g., COP)
  - Especially important for mutual understanding
- Knowledge and document management (e.g., common document repositories)
  - Task assessment, and indirectly helps gain knowledge of others
- Management support (e.g., project management tools)
  - Plan understanding, task and plan assessment
- Group process support (brainstorming tools)
  - Task assessment and business rules
- Shared development (shared applications)
  - Task assessment and activity awareness

Knowledge-Based Computer-Robot Roles

	Computers	People
 Goals	Explicit goals associated with concrete measurable objectives	Unstated goals implied by cultural norms
 Business rules	Rules for distributing information, accepting edits, enforcing formal permissions	Understanding reasons for rules, so know when to break them
 Mutual Under-standing	Extent of likely agreement/ disagreement based on shared information	Extent of likely agreement/ disagreement based knowledge of person

Summary

- Knowledge is essential to collaboration and teamwork
- Knowledge-Centered Collaboration Theory describes needed team knowledge
- Knowledge perspective supports
  - Diagnosing and fixing team problems
  - Collaboration metrics
  - Tool selection
  - Role allocation