# Creative Cognition:

What happens before and after idea generation

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# About Me

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# What is Creativity?

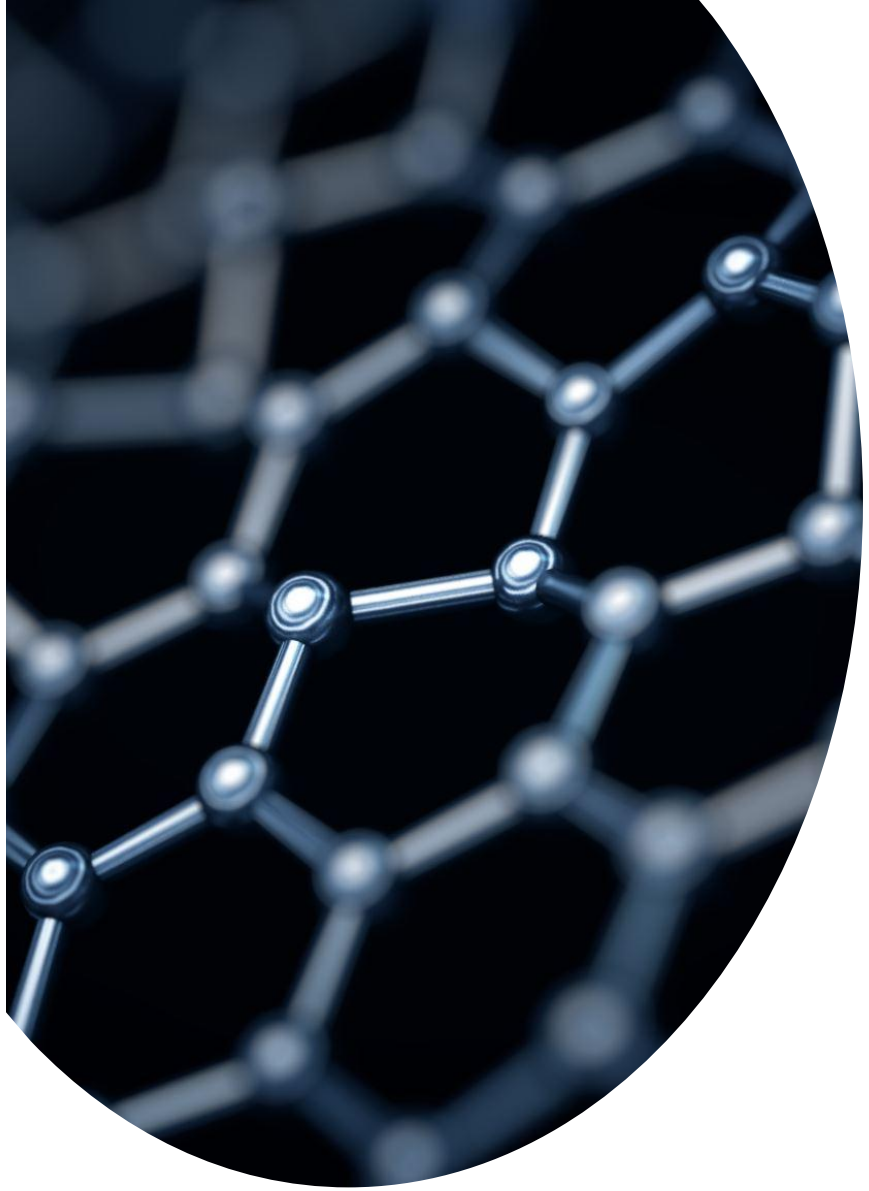
- Creativity is defined as an idea, solution, product, or process that is both original (novel) and useful (appropriate)

- Both need to exist for a solution to be creative
  - Originality without usefulness – cannot be implemented
  - Usefulness without originality - routine

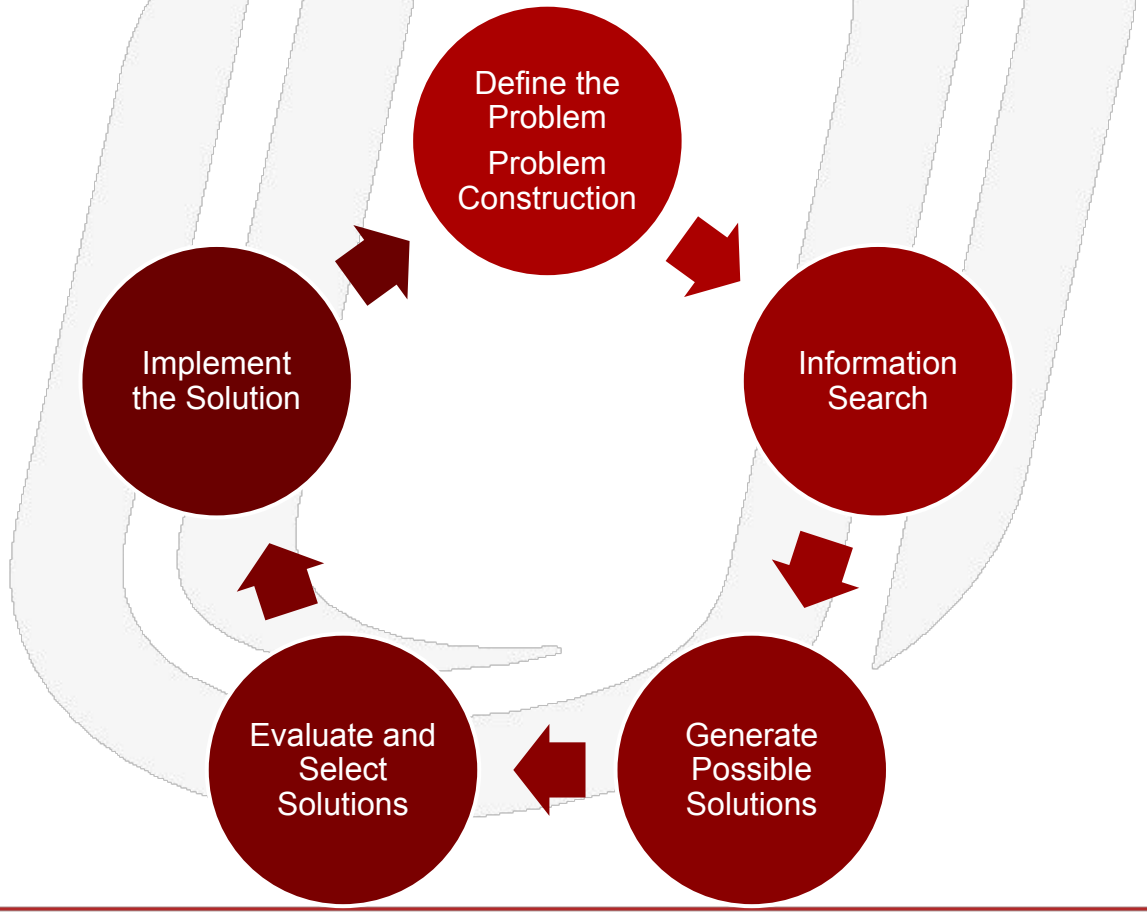
# Cognitive Models of Creativity

How do creative individuals think?

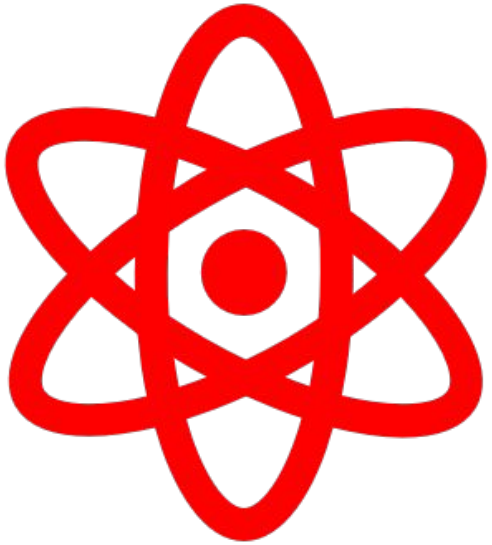
How do creative teams aggregate individual thinking?



# The Creative Process




(Mumford, Mobley, Reiter-Palmon, Uhlman, & Doares, 1991)



The formulation of a problem is often more essential than its solution, which may be merely a matter of skill

Albert Einstein

# Problem Construction

## Most problems in business and science are ill-defined

- Can be viewed in multiple ways
- Have multiple possible solutions
- Have multiple causes

## First step is Problem Definition and Construction

- Provides structure for the problem-solving effort

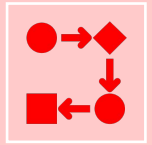
# What is Problem Construction

- During this process the problem to be solved is
  - recognized and identified (Is there indeed a problem?)
  - defined (What is the nature of the problem?)
  - and constructed (What are the parameters of the problem to guide possible solutions?)

(Reiter-Palmon & Robinson, 2009)

# Problem Construction

Typical approach to elicit problem construction



Restate the problem in as many ways as you can starting with “How can I/How can we”

# Problem Construction: Example

- There are mice in my basement
  - How can I catch the mice?
  - How can I prevent the mice from getting into my basement?
  - How can I not be bothered by the mice?
  - How can I make money of the mice?

# Model of Problem Construction

- Attention to environmental cues (Mumford, Reiter-Palmon, & Redmond, 1994)
- Based on problem representations – past experiences (Gick & Holyoak, 1983)
- Includes: Goals, constraints, information and procedures
- For most people, most of the time, PC is automatic

# Model of Problem Construction

If a problem is similar

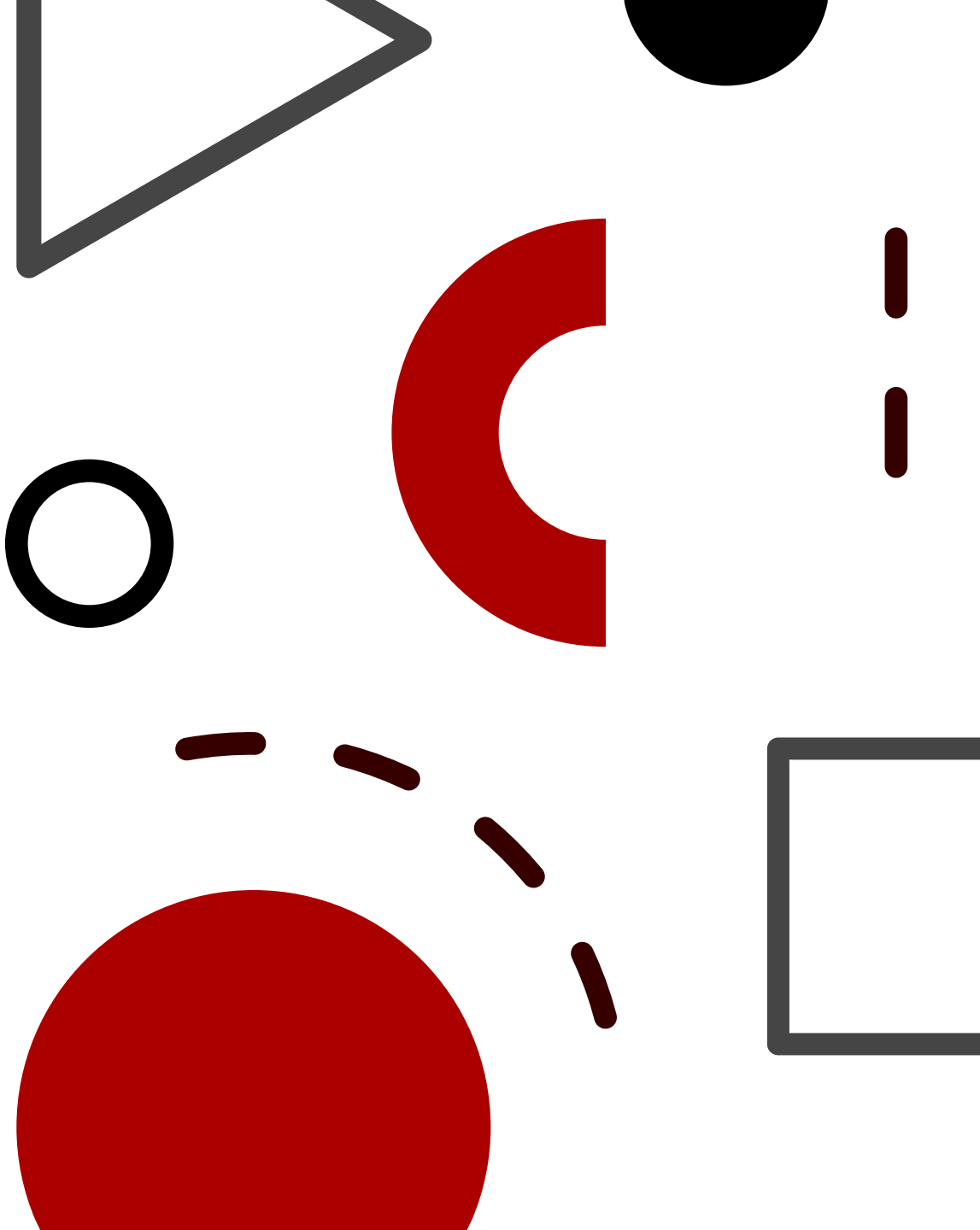
One problem representation – solve the problem the way we solved it before

Novel problems will elicit multiple representations

Must find a way to deal with multiple problem representations

# Multiple Problem Representations

- May choose one
- May find a way to combine these into a coherent whole
  - Resulting in new problem representations (Mumford, Reiter-Palmon, & Redmond, 1994)



# What do we know?

Creative individuals and experts spend more time engaging in PC (Getzels & Csikszentmihalyi, 1975; Rostan, 1994; Voss et al., 1991)

PC ability as an individual difference variable is related to creativity (Okuda, Runco, & Berger, 199; Mumford et al., 1996; Reiter-Palmon et al., 1998)

# What do we know?

Problem construction was found to be the best predictor of creativity in meta-analytic studies (Ma, 2009; Abdullah et al., 2020)

Active engagement and training in PC results in increased creativity (Mumford et al., 1994; Reiter-Palmon et al., 1997; Scott et al., 2004)

# What do we know?

Quality and originality of problem construction predicts solution quality and solution originality (Arreola & Reiter-Palmon, 2016)

Engaging in both divergent and convergent thinking results in more creative ideas (Wigert, Murugavel, & Reiter-Palmon, 2024)

# What do We Know

Paradoxical Frames lead to increase creativity (Miron-Spektor et al., 2018)

Contradictions inherent in the problem must be identified

When the problem is restated in a paradoxical way, AND these restatements are used to solve the problem – creativity increases (Reiter-Palmon et al., 2023)

# Team level PC

Very limited research on team level problem construction

How do teams construct problems?

- Similar individual problem constructions
- Different construction

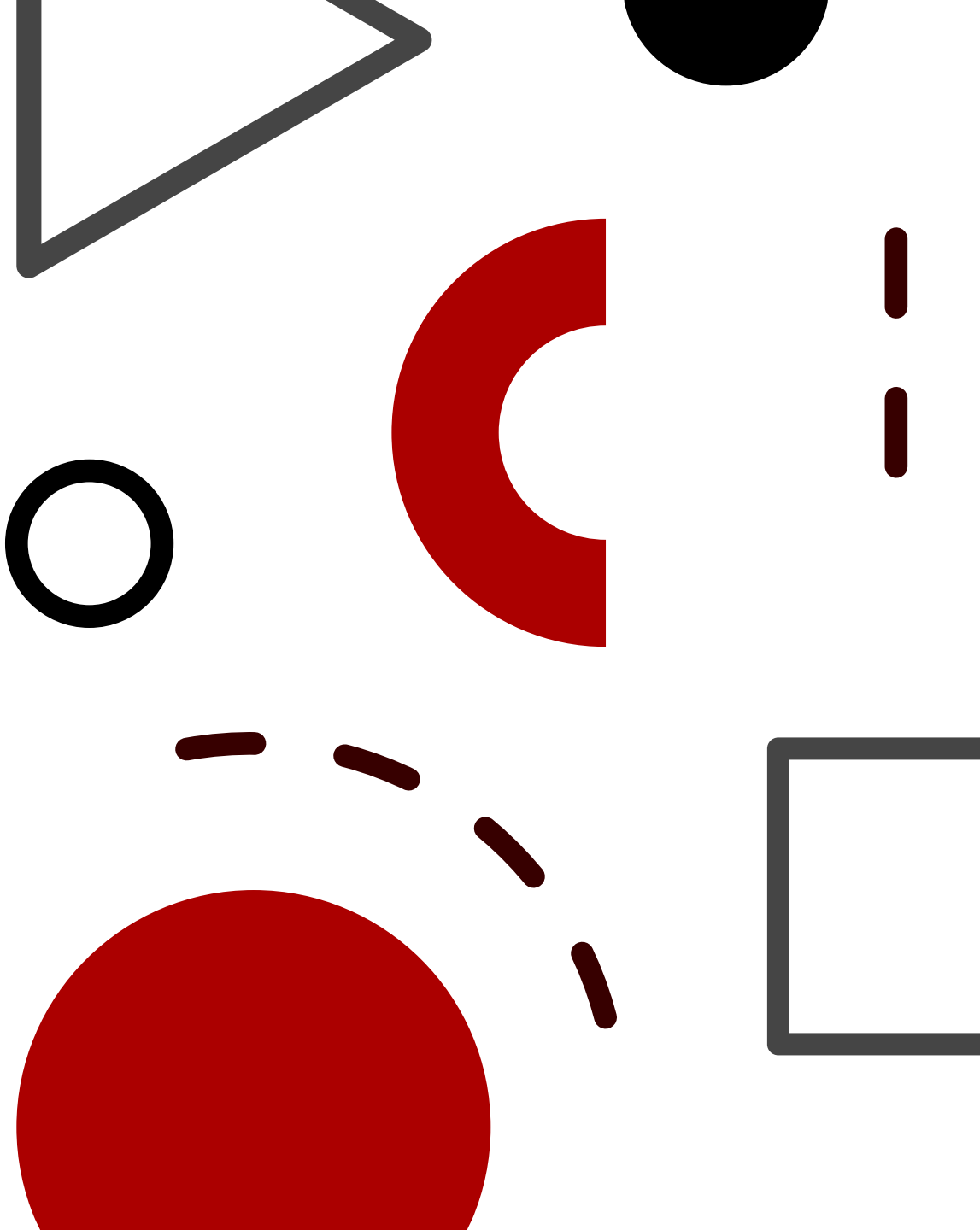
# Differences in team PC

Lead to less integration, increased conflict, and lower creativity (Gish & Clausen, 2013; Weingart, Cronin, Houser, Cagan, & Vogel, 2005)

Lead to increased creativity if differences are discussed (Leonardi, 2011; Weingart, Todorova, & Cronin, 2008)

# Active Engagement

- Active engagement in problem construction
  (Reiter-Palmon & Murugavel, 2018)
  - More original solutions
  - Team members are more satisfied
  - Less conflict



# Natural process in teams

Newly created teams spend the majority of their time in PC

53% of creative cognition were of problem construction (Leone, Japp, & Reiter-Palmon, in press)

# Idea Evaluation and Selection

Ideas are evaluated and choice is made to implement, refine or reject ideas

Creative individuals recognize creativity (Basadur, Runco, & Vega, 2000; Runco & Chand, 1995)

Standards for evaluation likely come from problem-construction stage

# Idea Evaluation and Selection

Instructions to choose creative ideas facilitate original idea selection but lower in quality (Rietzschel, Nijstad, & Stroebe, 2010)

Bias against original and risky ideas (Blair & Mumford, 2007)

- Bias more pronounced when required to make decisions (Muller et al., 2018)

# Team Idea Evaluation and Selectionam Evaluation and Selection

More alternatives are not always better for teams (Mumford, Feldman, Hein, & Nagao, 2001)

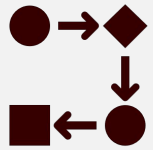
Teams are not very good at selecting creative ideas (Reiter-Palmon, Kennel, de Vreede, & de Vreede, 2018)

Evaluation accuracy leads to selection of more creative ideas (Reiter-Palmon, Kennel, de Vreede, & de Vreede, 2018)

# Team Idea Evaluation and Selection

Teams choose solutions that team members think are high quality (but not always original)

However, team evaluation is not always accurate



25-35% of the time teams choose ideas that are less than optimal

# Social Processes in Teams

- To see benefits from teamwork and team cognition need to look at social process
  - Communication
  - Psychological Safety and Trust
  - Conflict

**Practical Recommendations**

# Make Problem Construction explicit

- Discuss different students think about the problem
- Discuss different opinions and views
- Integrate

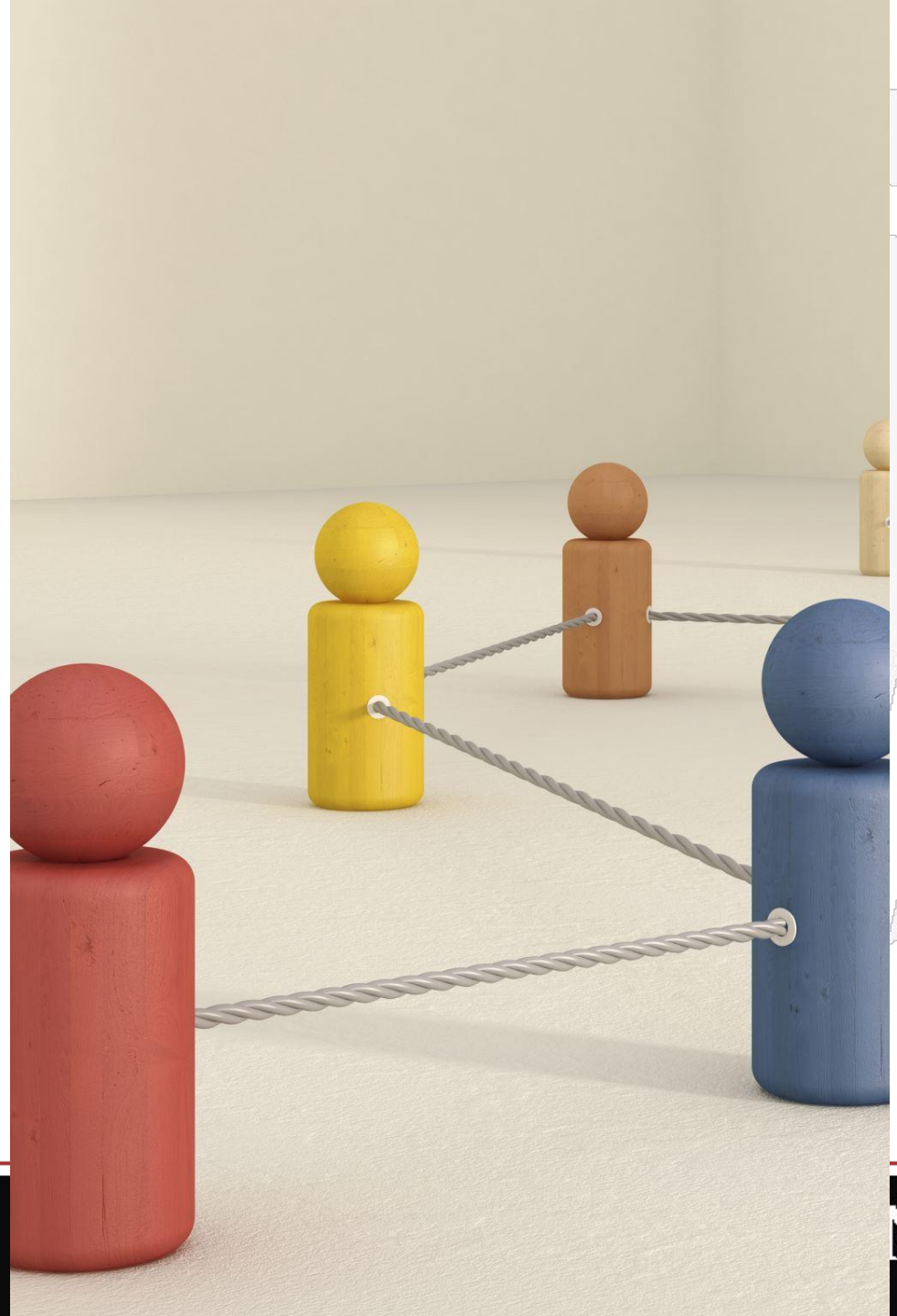
# Practical Recommendations

- Understand the criteria for which ideas or solutions get selected
  - Are these the ones you need?

- Be aware that novel ideas get rejected

# Communication within the team

- Collaborative communication increases creativity (Lovelace, Shapiro, & Weingart, 2001)
- Negative forms of communication hinder creativity (Lovelace, Shapiro, & Weingart, 2001)



# Trust and Psychological Safety

Linked to creativity and innovation (Carmeli & Spreitzer, 2009; West & Anderson, 1996)

Linked to team member willingness to discuss information openly (Burke et al., 2006; Edmondson, 2004; Rank et al., 2004)

# Trust and Psychological Safety

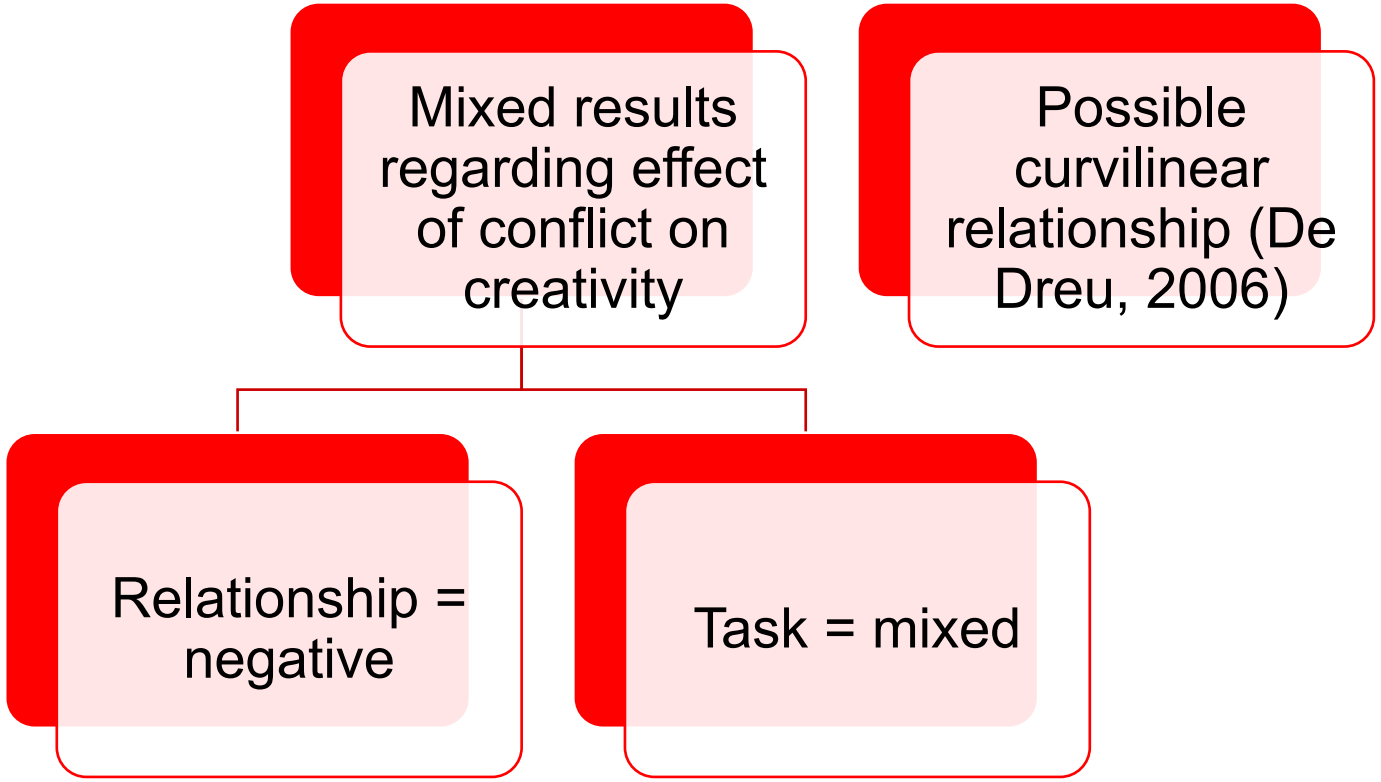
- Low trust causes disagreements and ambiguous information to be interpreted in a negative way (Nicholson & West, 1988; Salas et al., 2005; West & Richter, 2008)

# Conflict

Can be task or relationship based (Jehn, 1997)

Hypothesized that task conflict may be beneficial (Kurtzberg & Amabile, 2001; Mannix & Neale, 2005)

# conflict


Mixed results regarding effect of conflict on creativity
Possible curvilinear relationship (De Dreu, 2006)
Relationship = negative
Task = mixed

# Social Processes

- Social processes are interrelated and may have interactive effects on team creativity and innovation
  - Low trust can lead to more conflict
  - Communication increases trust and psychological safety
  - trust and psychological safety increase communication

# Team Reflexivity

Team members reflect on the objectives and strategies and adapt them to current or anticipated circumstances (West, 1996)

Reflexive teams can change their strategies and learn from past mistakes

# Team Reflexivity

- Important antecedent of team creativity and innovation (Schippers, Den Hartog, & Koopman, 2007; Tjosvold, Tang, & West, 2004)
- Team reflexivity may not occur naturally (Muller, Herbig, & Petrovic, 2009)
- Reflexive debrief manipulation increased reflection and increased solution creativity (paper under review)

# Social and Cognitive Process

1

**When social deficits can be overcome – cognitive benefits facilitate team creativity**

2

**Social deficits can be overcome by effective leadership**

3

**Social deficits can be overcome by time**

- Getting to know the other team members

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