Exploring the Content of Shared Mental Models in Project Teams

Sara McComb, PI
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Overview

- Objectives
- Definitions
- Research Questions
- Conceptualization
- Experimentation
- References
Project Objectives

- To advance the theoretical understanding of shared cognition in project teams by:
  - Integrating existing theory in related fields to establish a model of shared mental model development
  - Validating the model through experimentation
Technical Objectives

- The proposed research has five technical objectives:
  - To establish a model of SMM development
  - To explore the way in which individually-held mental models converge among team members to become shared
  - To examine different means of measuring SMM
  - To distinguish among the multiple mental models working simultaneously within a team
  - To determine how SMM impact team performance
Next Year’s Objectives

- Quasi-experiments
  - Continue data collection

- Controlled experiments
  - Complete specifications for experiments
  - Prepare experimental laboratory
  - Conduct experiments
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Cross-Functional Project Teams

A collection of two or more individuals, representing different functional areas, assembled to work on a time-limited, non-repetitive assignment.

Source: Cohen and Bailey, 1997
Taskwork vs. Teamwork

- **Taskwork**
  The functional job behaviors required to accomplish the assigned task.

- **Teamwork**
  The multitude of processes required to maintain the team such as cooperation, communication, interpersonal relationships.

Source: McIntyre and Salas, 1995
Related Constructs

- Cause maps
- Collective mind
- Schemas
- Shared cognition
- Sociocognition
- Team knowledge
Shared Mental Models (SMM)

“Knowledge [and belief] structures held by members of a team that enable them to form accurate explanations and expectations for the task, and in turn, to coordinate their actions and adapt their behavior to demands of [their unique situation].

Source: Cannon-Bowers, Salas, and Converse, 1993
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Research Questions

- What is the shared mental model development process?
- What is the appropriate shared mental model content for optimal teamwork?
- Do shared mental models impact team performance?
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SMM Development

Teamwork SMM

- Orientation
- Differentiation
- Integration

Taskwork SMM

Changes or adjustments required?

NO

YES
Teamwork → Taskwork and Back

- The Shift
  - Conscious → Unconscious
    - automatic
  - Unconscious → Conscious
    - requires effort

Source: Louis and Sutton, 1991
Unconscious \(\rightarrow\) Conscious

- **The Catalysts**
  - Novel circumstances
  - Discrepancies
  - Deliberate initiatives

- **The Benefits**
  - Overcome “cognitive inertia”
  - Improve overall SMM accuracy
  - Improve performance
SMM Development

- Teamwork SMM
  - Orientation
  - Differentiation
  - Integration

Taskwork SMM

Changes or adjustments required?

YES → Teamwork SMM

NO → Changes or adjustments required?
Conceptualization: Teamwork & Information Processing

- **Orientation**
  - The sharing of information among team members about their unique domain

- **Differentiation**
  - The identification of multiple perspectives

- **Integration**
  - The reconciliation of the various perspectives into functioning mental representations
Integration and Sharing

**To have in common:**

- Compatible
- Overlapping
- Identical

**To divide:**

- Single
- Individual
- Equitably
- Distributed
SMM Development

Teamwork SMM

- Orientation
- Differentiation
- Integration

Taskwork SMM

Changes or adjustments required?

NO

YES
SMM Content Requirements and SMM Development

Models
- Team membership
- Project goals
- Project work allocation
- Project team interaction
- Organizational climate
- Environmental context

Integration
- Compatible
- Identical
- Equitably distributed
- Overlapping
- Compatible
- Compatible
Publication of Conceptualization

- The Emergence of Shared Mental Models: Exploring the Intersection of Their Content and Development in Cross-Functional Project Teams
  - Submitted to the Academy of Management Conference
  - To be submitted to a Top Level Journal
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Experimentation Plan

- Experiment 1: Longitudinal quasi-experiment
- Experiment 2: Laboratory experiment
- Experiment 3: Replication and extension of laboratory experiment
Experiment 1

- A longitudinal quasi-experiment has been designed
  - To test for the convergence of the individually-held mental models and
  - To examine different means of measuring SMM
Experiment 1: Pilot

- 4 teams in Project Management class completing a semester long project
- 4 data collection points: Weeks 1, 2, 7, and 13
- Qualitative data collection
SMM Content Requirements

- Team membership
- Project goals
- Project work allocation
- Project team interaction
- Organizational climate
- Environmental context
Team Membership

- General knowledge about the contributions each team member can make to the team
- Pilot: Contributions of self and team members
- Results: Reported work allocation
Team Membership Example

Team 1

- Time 4
  - Leader, coordinator
  - Leader, coordinator
  - Information processing
  - Information processing

- Represent work allocation among team members
Team Membership

- General knowledge about the contributions each team member can make to the team
- Pilot: Contributions of self and team members
- Results: Reported work allocation
- Revision: Individual contributions
  Assess competencies (e.g., initiative, teamwork and cooperation, flexibility, conceptual thinking)
Project Goals

- Specific knowledge about the scope of, and expectations for, the project
- Pilot: Describe project and sponsor expectations
- Results: Converged at either time 2 or time 3 (dependent upon team cohesion)
Project Goals Example

Team 4

- **Time 1**
  - Strategic planning, recommend
  - Help planning team
  - Insight, evaluate requirements

- **Time 2**
  - Strategic planning, research
  - Future direction
  - What services to offer, budgets, funding, surveys

- **Time 3**
  - Research for strengths and opportunities
  - Survey
  - Data collection, compiling, provide results
Project Goals Example
Team 3

- **Time 1**
  - ??
  - Help UCC
  - Survey, compare UCC, fiscal value
  - Survey, programs, fiscal value

- **Time 2**
  - Survey, fiscal value
  - Survey, 3 programs, fiscal value
  - Survey, 3 programs, place for UCC
  - Fiscal value, survey, compare methods

- **Time 3**
  - Survey; fiscal value; report
  - Survey; fiscal value
  - Survey; fiscal value
  - Survey; fiscal value
**Project Goals**

- **Specific knowledge about the scope of, and expectations for, the project**
- **Pilot:** Describe project and sponsor expectations
- **Results:** Converged at either time 2 or time 3 (dependent upon team cohesion)
- **Revision:** Minor rewording to ensure understanding of term sponsor
Project Goals – Performance

Team 2

- **Time 1**
  - Better ways to sell calendars
  - Marketing plan
  - Help SN
  - Sell more calendars

- **Time 2**
  - Marketing plan
  - Sell more calendars
  - Increase sales
  - Try and increase sales

- **Time 4**
  - Marketing plan
  - Marketing plan, increase sales
  - Increase sales
  - Increase sales, create new contacts
Project Work Allocation

- Detailed knowledge of his/her required tasks and the corresponding interrelations among all team members’ tasks
- Pilot: List tasks and identify who is responsible and who could be responsible
- Results: Varying levels of detail in responses
- Revision: Sentence stems regarding project team organization and work allocation
Project Team Interaction

- Knowledge of how team members plan to collaborate
- Pilot: Describe how team will work together
- Results: Only reported modes of communication used
- Revision: Replace with more specific sentence stems
Organizational Climate

- Beliefs about the way in which the organization values a team’s work

- Pilot: Identify incentives for completing the project

- Results: Responses weren’t common, but were consistent in behavioral implications
Organizational Climate
Example Team 4

- **Time 1**
  - Internship opportunity, test skills
  - Information for library
  - Experience with teamwork, project management, get an A

- **Time 3**
  - grade, experience
  - Help library, get skills
  - Experience, good grade
Organizational Climate

- Beliefs about the way in which the organization values a team’s work
- Pilot: Identify incentives for completing the project
- Results: Didn’t converge, but responses were consistent in behavioral implications
- Revision: Added sentence stems regarding team experience and training
Environmental Context

- Beliefs about the way in which the assigned project will directly impact the organization’s position in its competitive environment

- Pilot: Identification of who would be impacted by the project and how they would be impacted

- Results: Provided four groups because four boxes were given

- Revision: Changed format from one two-part item to two sentence stems
Lessons Learned

- SMM converge at the anticipated point in time
- Complicated questions don’t work
- Data collection timing is adequate
- Less initial information may be desirable
- Easy projects minimize interdependence required
Experiment 1

- Replicate and extend the pilot phase
- Increase sample size (approximately 20 teams currently identified)
- Improve and expand questionnaire
Revised Questionnaire

- Improve qualitative data collection
- Incorporate quantitative scales
- Compare the various means of assessment
  - Qualitative: project goals
  - Quantitative: contributions, interdependence
  - Combination: Beliefs – look for differences in qualitative and similarities in quantitative
- Validate measure accuracy
Experiment 2

- A set of controlled experiments is planned to determine the effects of
  - SMM content
  - SMM development
  - Virtuality

  on team performance.
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