Developing a Model for Improving Safety Performance in the Fire Service

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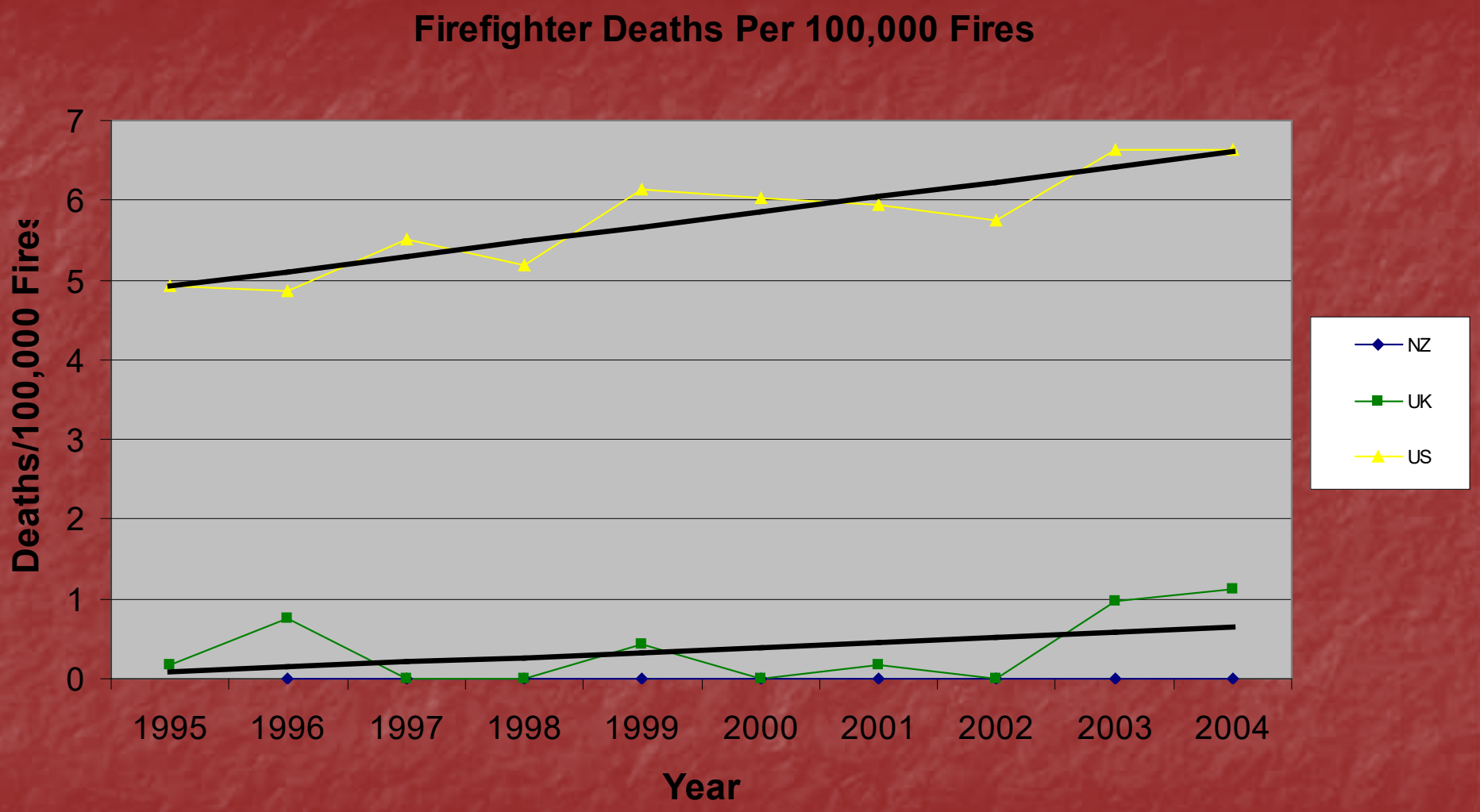
Outline

- Problem
- Individual and Organizational Dynamics
- Theoretical Background for an Effective Solution
- Safety Culture
- Changing Safety Culture
- Safety Performance Improvement
- Research Results

Problem

- Firefighter deaths
- Firefighter injuries
- Economic impact


Firefighter Deaths Per 100,000 Fires
Deaths/100,000 Fires
7
6
5
4
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1
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1995
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1997
1998
1999
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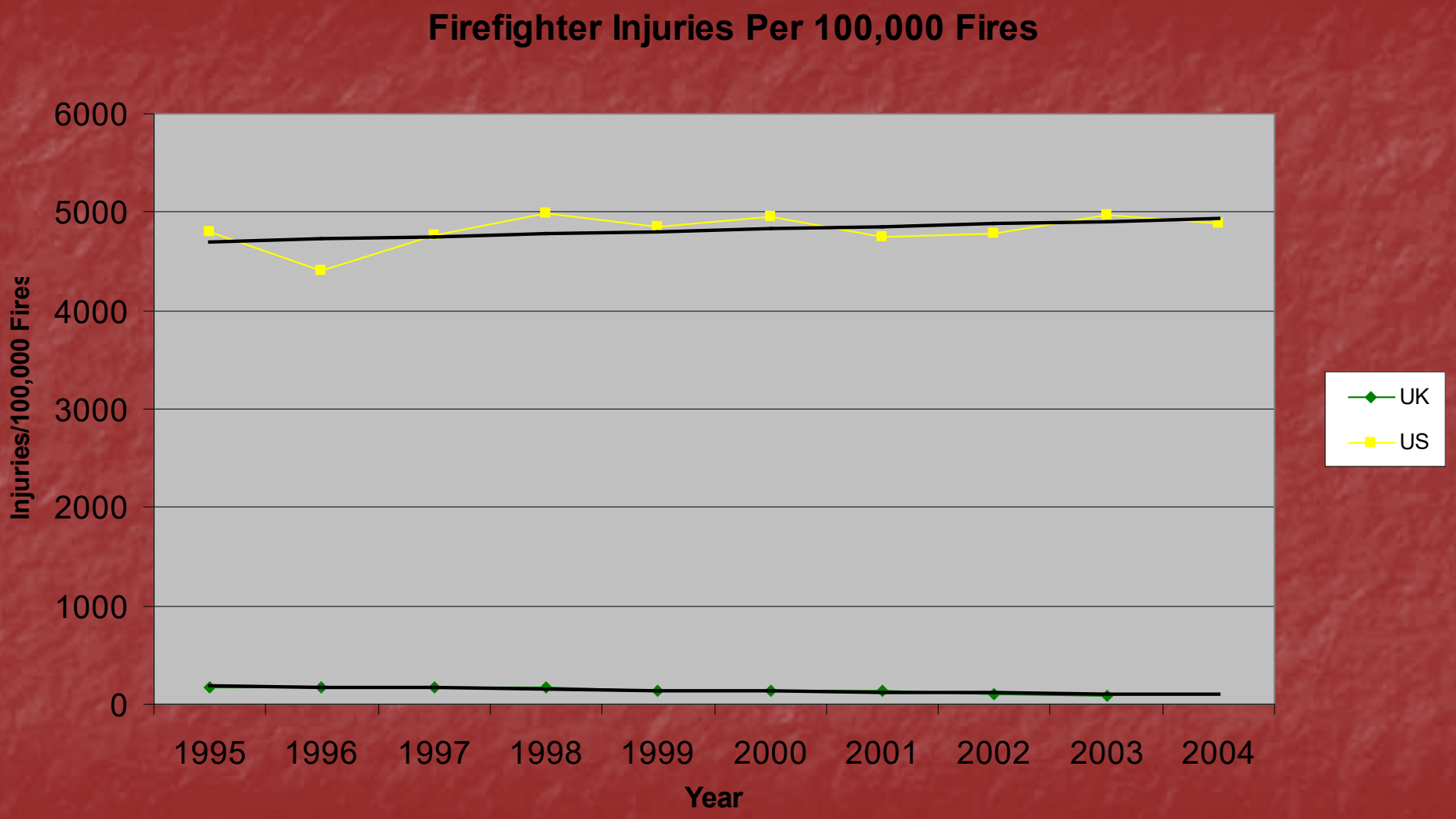
2001
2002
2003
2004
Year
NZ
UK
US


Firefighter Injuries Per 100,000 Fires
Injuries/100,000 Fires
6000
5000
4000
3000
2000
1000
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
Year
UK
US

Economic Impact (2005)

- Injuries
  - Cost per injury $50,187
  - 80,100 injuries
  - Total economic impact of injuries $4,019,978,700
- Deaths
  - Cost per death to $7,169,604
  - 115 deaths
  - Total economic impact of deaths is $824,504,405
- Total Direct and Indirect Economic Impact
  - $4,844,483,105

Performance Impact: Lives Lost

- Civilian Lives Lost
  - US: 1.32 per 100,000 population
  - UK: 1.05 per 100,000 population
  - NZ: 0.95 per 100,000 population

Performance Impact: Cost of Fire

- Total Fire Loss (2005)
  - US: 130 to 250 billion dollars annually
- Direct Fire Loss: Percent of GDP (2002)
  - US: 0.022
  - UK: 0.014
  - NZ: 0.017

Sustaining High Risk Behaviors: Individual and Organizational Dynamics

- Melioration Bias
- Rare Event Bias
- Optimism Bias
- Cost of Safety
- Normalization of Risk
- Identity and Values: Individual/Social
- Recognizing the Need for Change

Effective Safety Management

- Structured method for managing risk
  - Risk Control Systems
  - Preventive Action Plans
  - Corrective Action Plans
- Specifically targeted critical behaviors

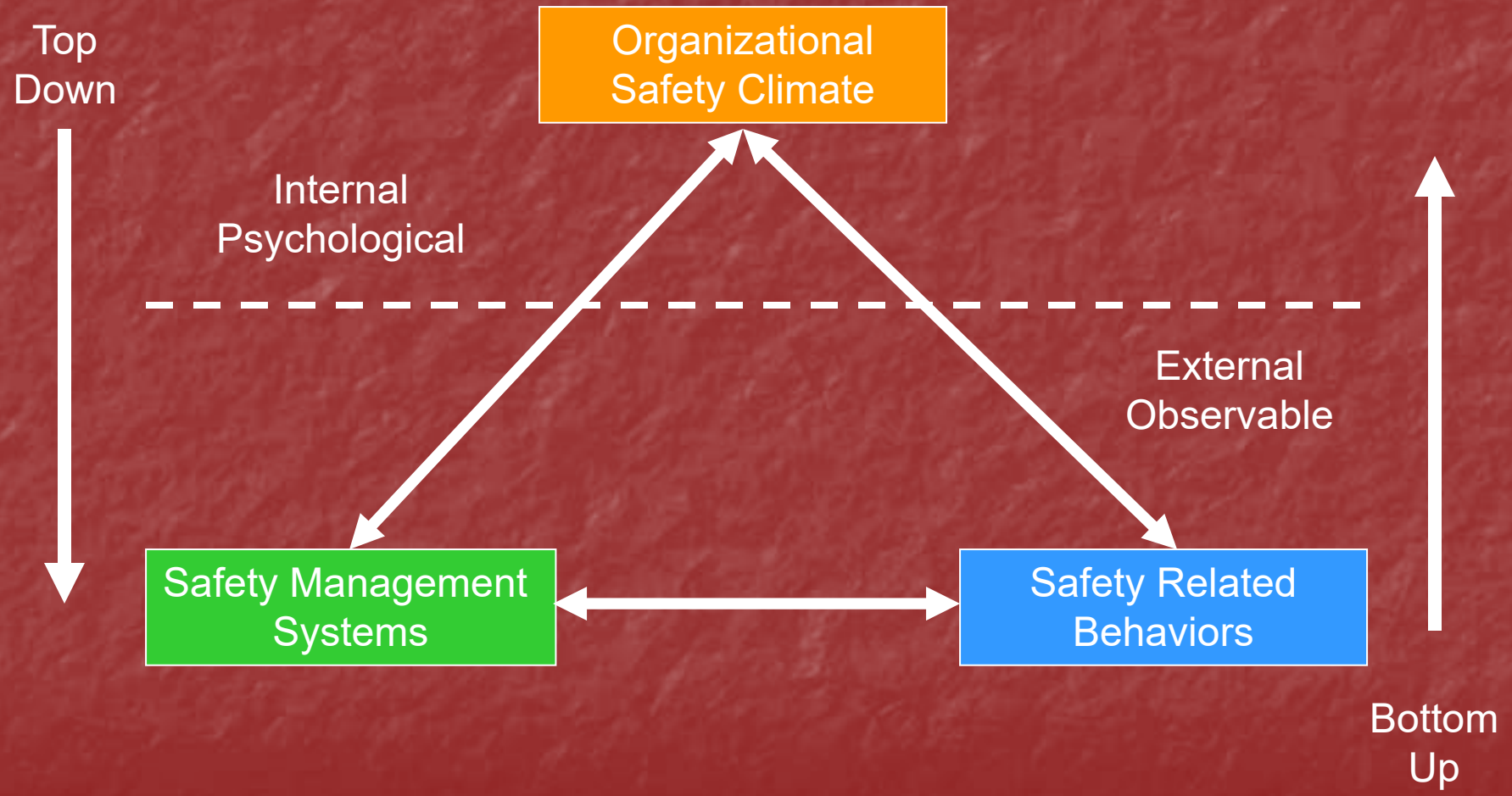
Theory

- Safety Culture
- Quality Improvement
- Innovation Implementation

Safety Culture

- Definition of safety
  - Deal with risk, achieve goals
- Safety culture
  - Underlying Assumptions
  - Values, Beliefs and Attitudes
  - Behaviors

Model of Safety Culture



Safety Management Systems

- Policy
  - Intentions, Approach, Objectives, Principles, Priorities, upon which action is based
- Organization
  - Structure, Cooperation, Communication, Competence, Responsibilities, Relationships
- Planning and Implementing
  - Performance Standards, Risk Assessment, Hazard Identification, Planning aimed at eliminating or controlling risk
- Measuring and Reviewing Performance
  - Active Monitoring, Reactive Monitoring, Remedial Action, Reviewing Performance, Continuous Improvement

Safety Related Behaviors

- Health/Wellness/Fitness (Cardiac) 44%
  - Fitness Program, Medical Evaluation
- Fireground Operations 37%
  - C3, Accountability, Operational Risk Mgmt
- Respond/Return 23%
  - Seat Belts, Response, Training, Supervision
- Training 14%
  - Instructors, Planning, Facilities, Safety Req's

Organizational Safety Climate

- Organizational Context
  - Management Commitment, Communications, Priority of Safety, Safety Rules and Procedures
- Social Environment
  - Supportive Environment, Involvement
- Individual Acceptance
  - Personal Priority and Need for Safety, Personal Acceptance of Risk
- Work Environment

Safety Intervention Research

- Approaches to changing Safety Culture
  - Engineering
  - Administrative
  - Behavioral
- Focus on front line supervisors and workers

- Intervention
  - Attempt to change the way that critical safety behaviors are managed in order to improve safety performance
- Implementation
  - Use of management practices
  - Higher rates of safety behaviors

Quality Improvement

- Quality improvement as planned change
- Improve quality by changing systems and practices
- Compatibility of quality initiative and organizational values
- Employee involvement critical for success

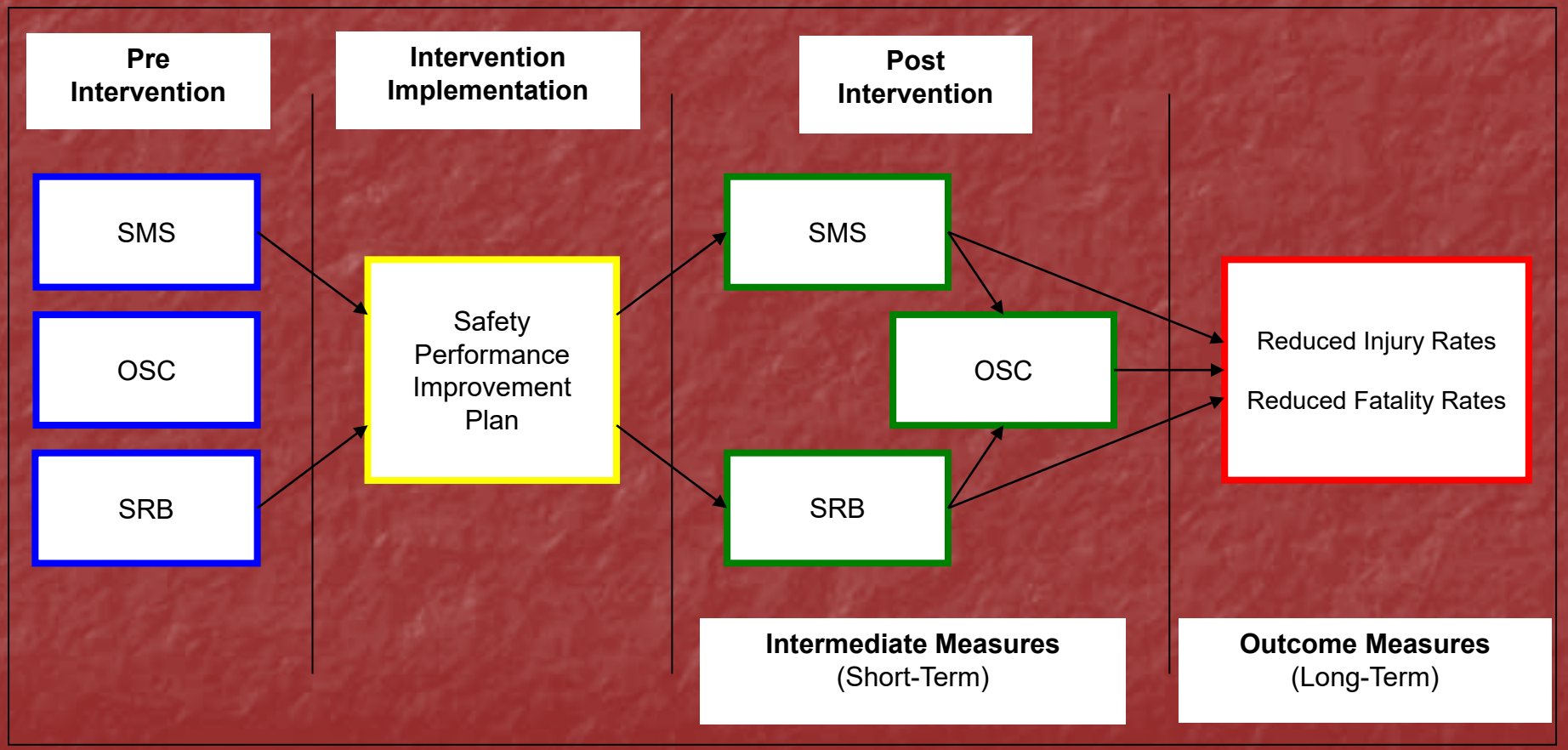
Innovation Implementation

- Implementation success = use
- Climate for implementation
  - Knowledge/Incentives/Concerns/Review
- Remove obstacles/barriers
  - Bias/Costs/Benefits/Values/Need
- Fit between innovation and values

Logic Model

- Key elements of intervention
  - Process/Content
- Essential aspects of implementation
  - Climate/Obstacles
- Important characteristics of target persons
  - Control variables
- Outcome variables
  - Intermediate: SMS, SRB, OSC
  - Outcome: injury rates, death rates

Safety Performance Improvement



Improving Safety Performance

- Intervention Development
  - Review baseline results
  - Develop a Safety Performance Improvement Plan
    - Process
      - Participation, commitment, communication, participation, resources
    - Content
      - SMS and SRB

- Implementation Strategy Development
  - Process
    - Participation
    - Plan
  - Content
    - Positive climate for implementation
    - Remove obstacles and barriers
    - Plan for implementation

- Implementation of SPIP
  - Monitor management activities and interactions
    - Duration
    - Frequency
    - Intensity
    - Content
    - Method

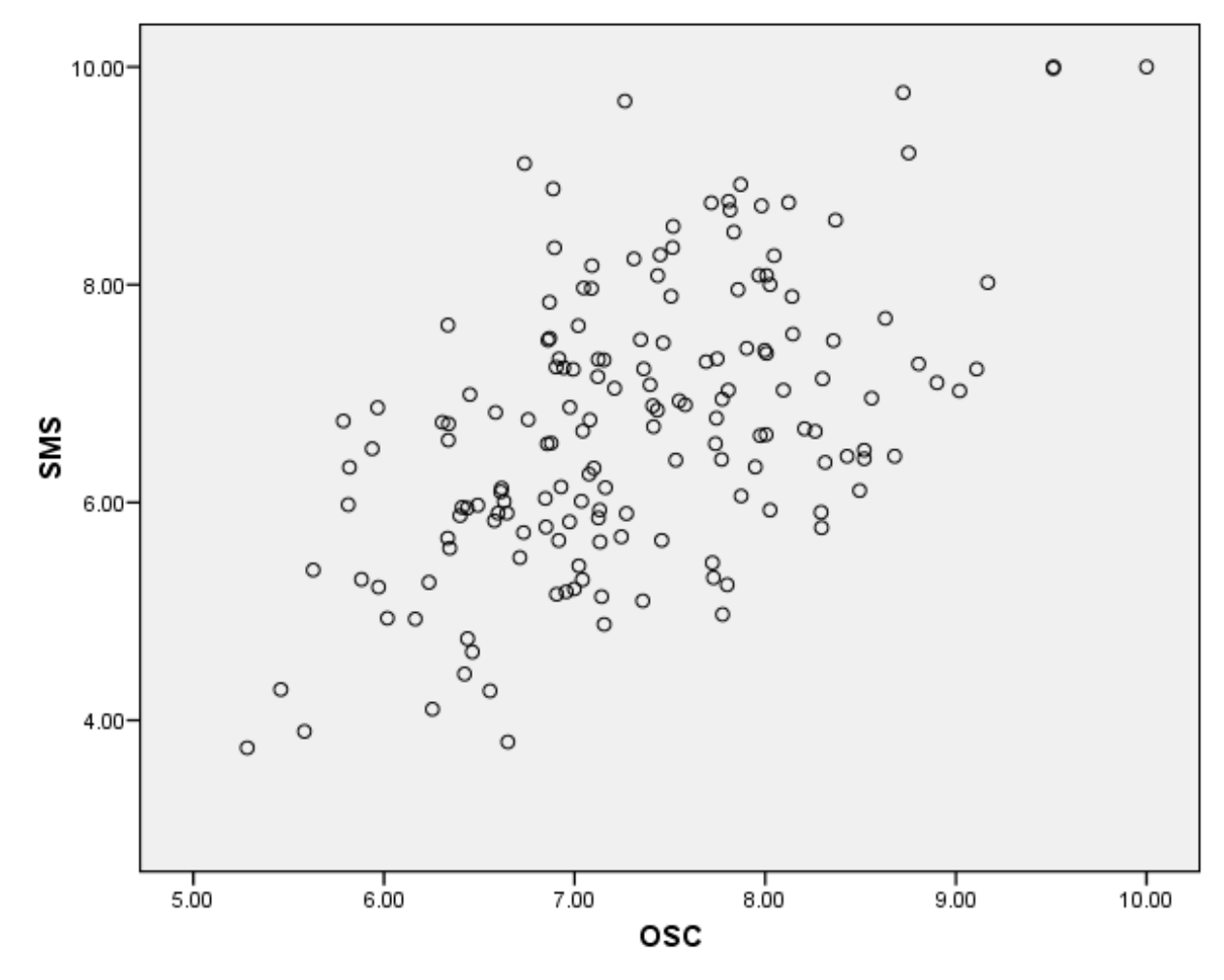
- Evaluation of Implementation
  - Which elements
  - How much use
  - Context of implementation
    - Relationships
    - Trust
    - Response
    - Legitimacy

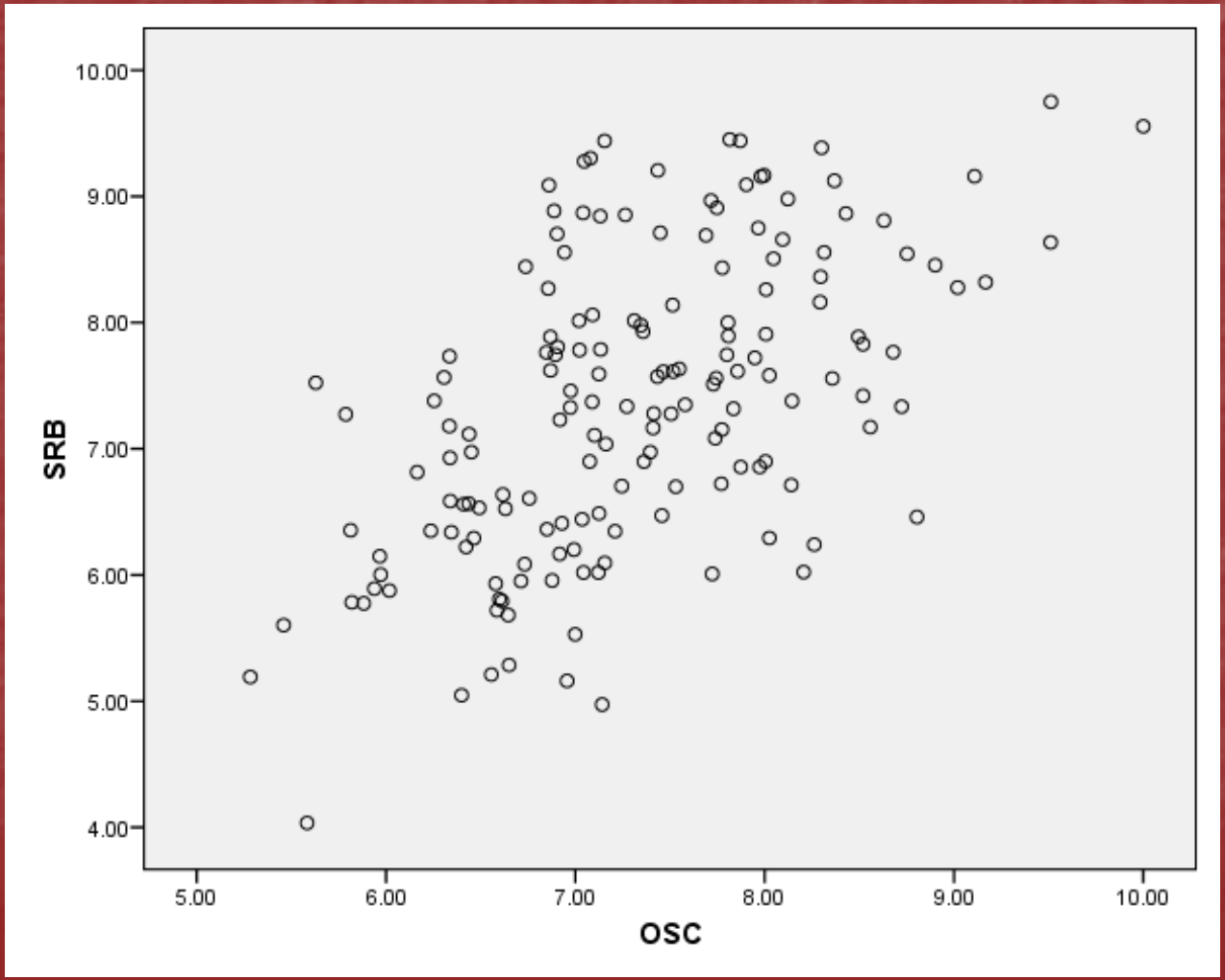
- Evaluation of Safety Performance Improvement Plan
  - Intermediate Measures
    - SMS, SRB, OSC
  - Outcome Measures
    - Injury Rates
    - Death Rates
  - Unanticipated/Unintended consequences

Data Collection Phase I

- Site Visit Locations
  - Bellevue, WA
  - Aurora, CO
  - Tempe, AZ
- Data Collection Methods
  - Surveys
  - Interviews
  - Document Review

Analysis




SRB
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OSC

Correlations

		OSC	SMS	SRB
Pearson Correlation	OSC	1.000	.547	.558
	SMS	.547	1.000	.641
	SRB	.558	.641	1.000
Sig. (1-tailed)	OSC	.	.000	.000
	SMS	.000	.	.000
	SRB	.000	.000	.
N	OSC	163	163	163
	SMS	163	163	163
	SRB	163	163	163

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.610[a]	.372	.364	.69015

a. Predictors: (Constant), SRB, SMS

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.636[a]	.405	.372	.67059

a. Predictors: (Constant), SRB4, SMS3, SRB1, SRB2, SMS2, SRB3, SMS4, SMS1

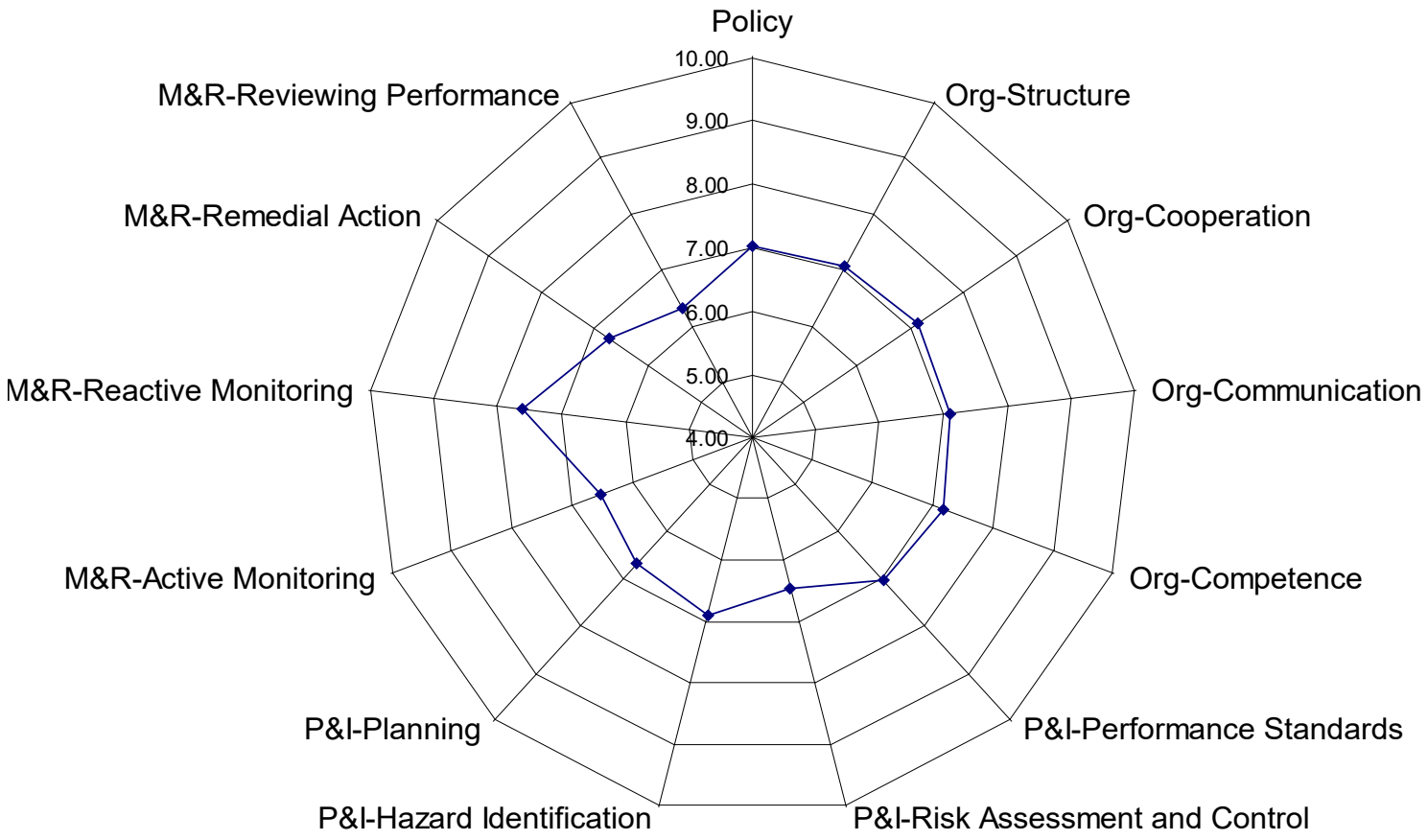
Findings from Interviews: SMS

- Policy
  - Not well defined or understood
  - Barriers: culture, complacency, resistance to change, arrogance, competitiveness
  - Every policy has a name attached
- Roles and Responsibilities
  - No clear definition or understanding
- Priorities (Safety vs. Performance)
  - Different between staff and line

Findings from Interviews: SRB

- General
  - Conflict between safety and performance
- Health/Wellness/Fitness
  - Fear factor
- Operations
  - Lack of consistency between Company Officers
  - Lack of understanding of latent risk, operational risk management
  - Performance = Speed

Group 1 SMS


Policy
Org-Structure
Org-Cooperation
Org-Communication
Org-Competence
P&I-Performance Standards
P&I-Risk Assessment and Control
P&I-Hazard Identification
P&I-Planning
M&R-Active Monitoring
M&R-Reactive Monitoring
M&R-Remedial Action
M&R-Reviewing Performance
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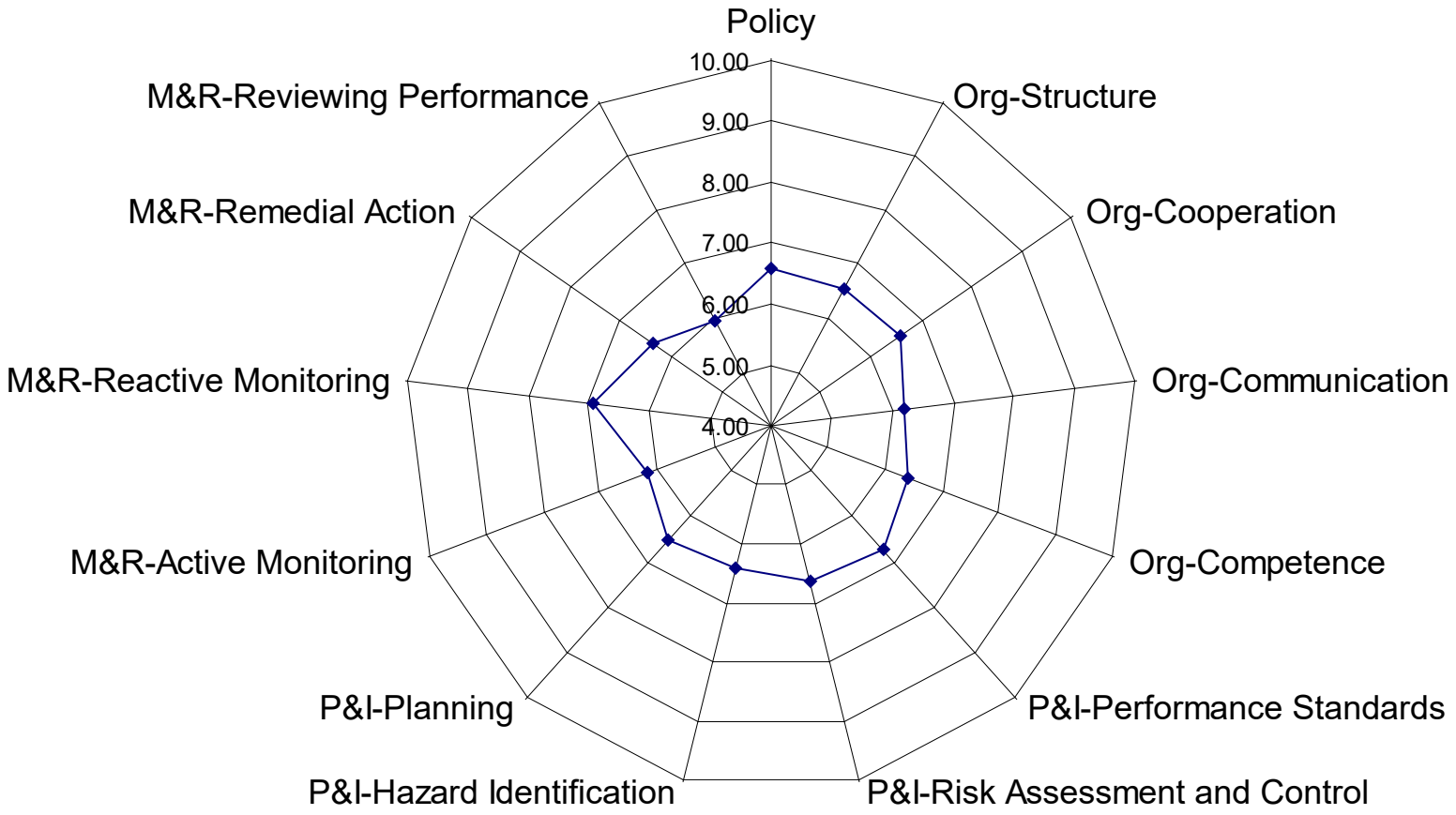
Group 2 SMS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M&R-Reactive Monitoring
M&R-Remedial Action
M&R-Reviewing Performance
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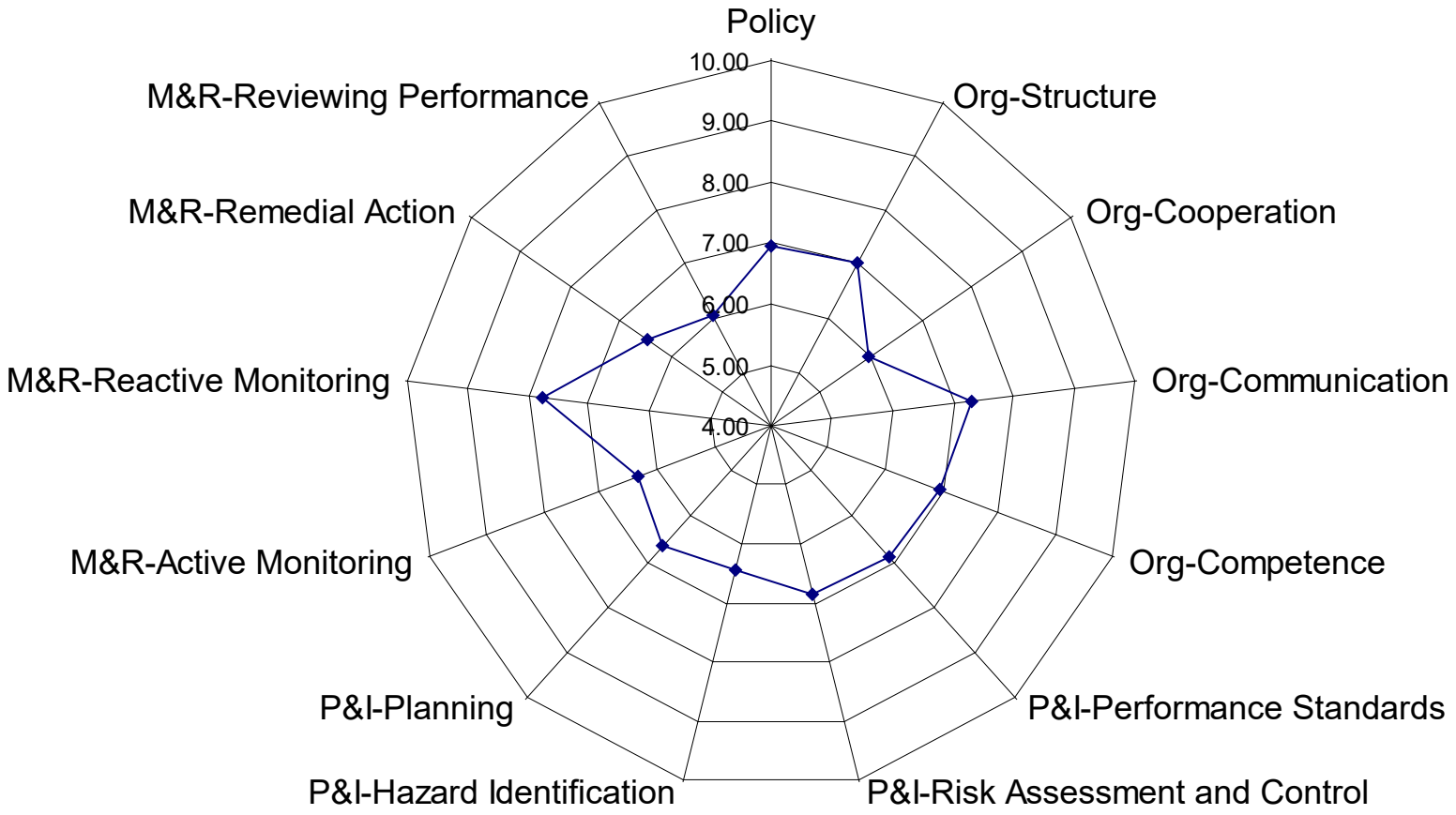
Group 3 SMS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M&R-Reviewing Performance
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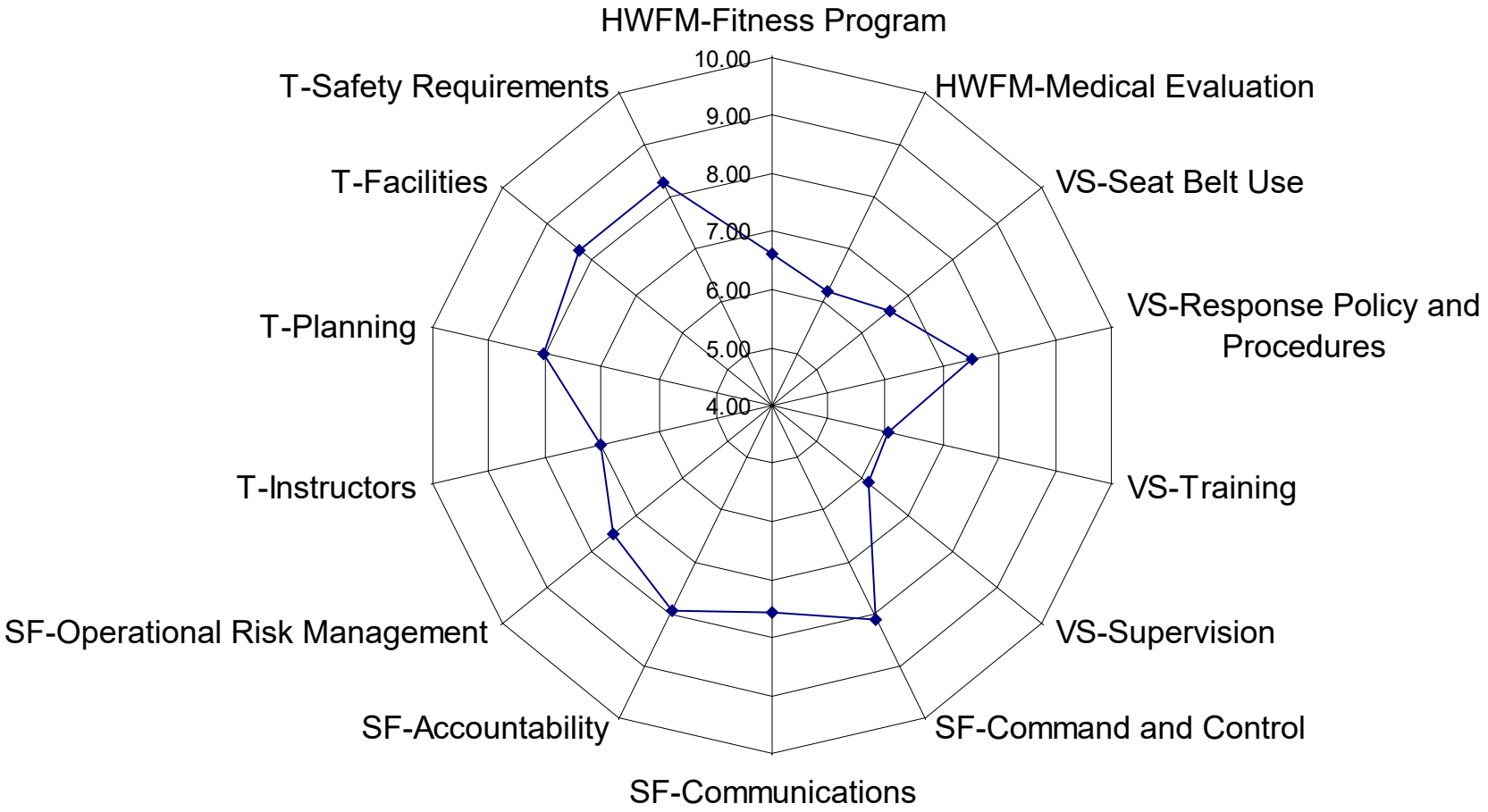
Group 1 SRB


HWFM-Fitness Program
HWFM-Medical Evaluation
VS-Seat Belt Use
VS-Response Policy and Procedures
VS-Training
VS-Supervision
SF-Command and Control
SF-Communications
SF-Accountability
SF-Operational Risk Management
T-Instructors
T-Planning
T-Facilities
T-Safety Requirements
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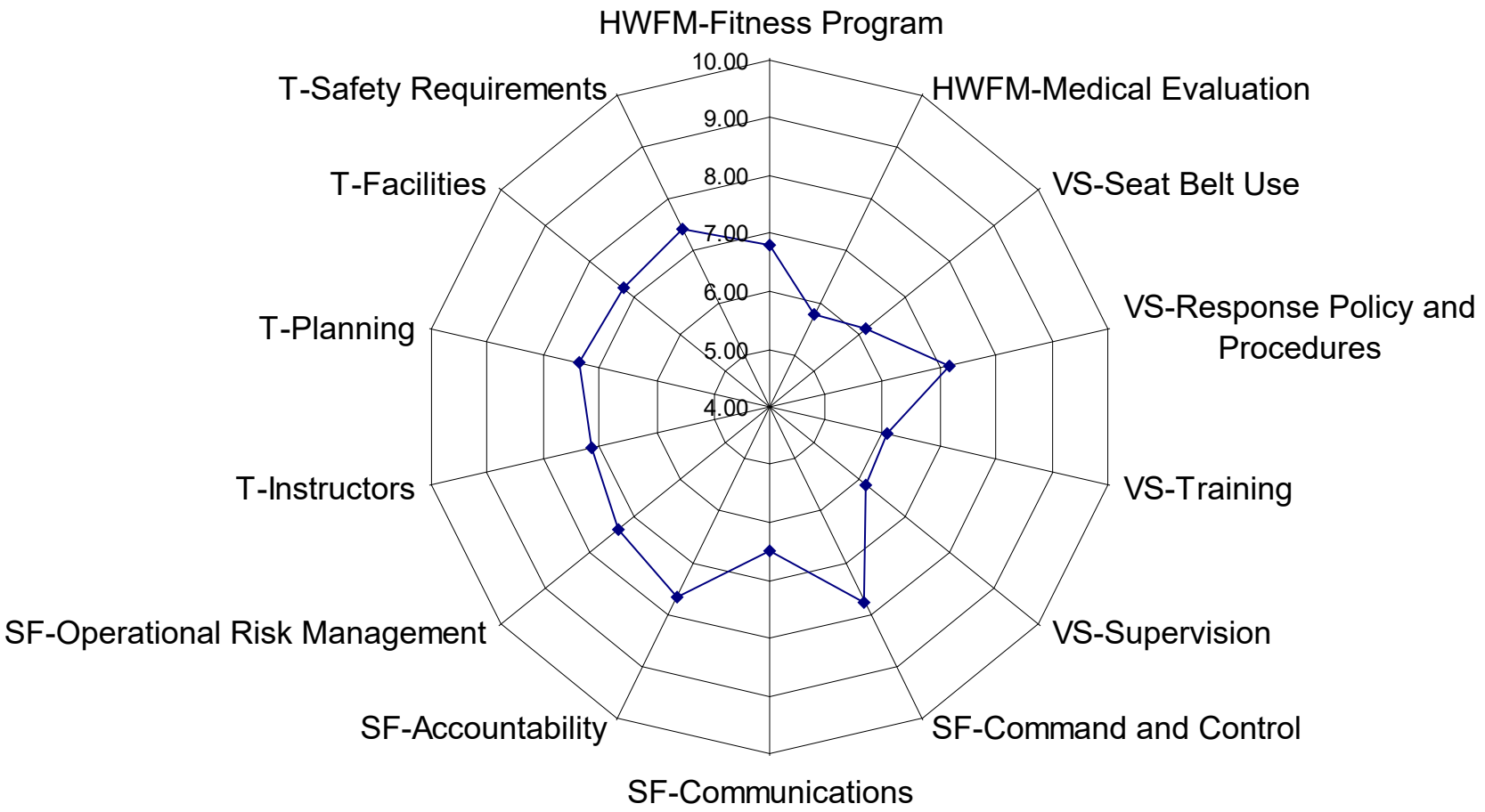
Group 2 SRB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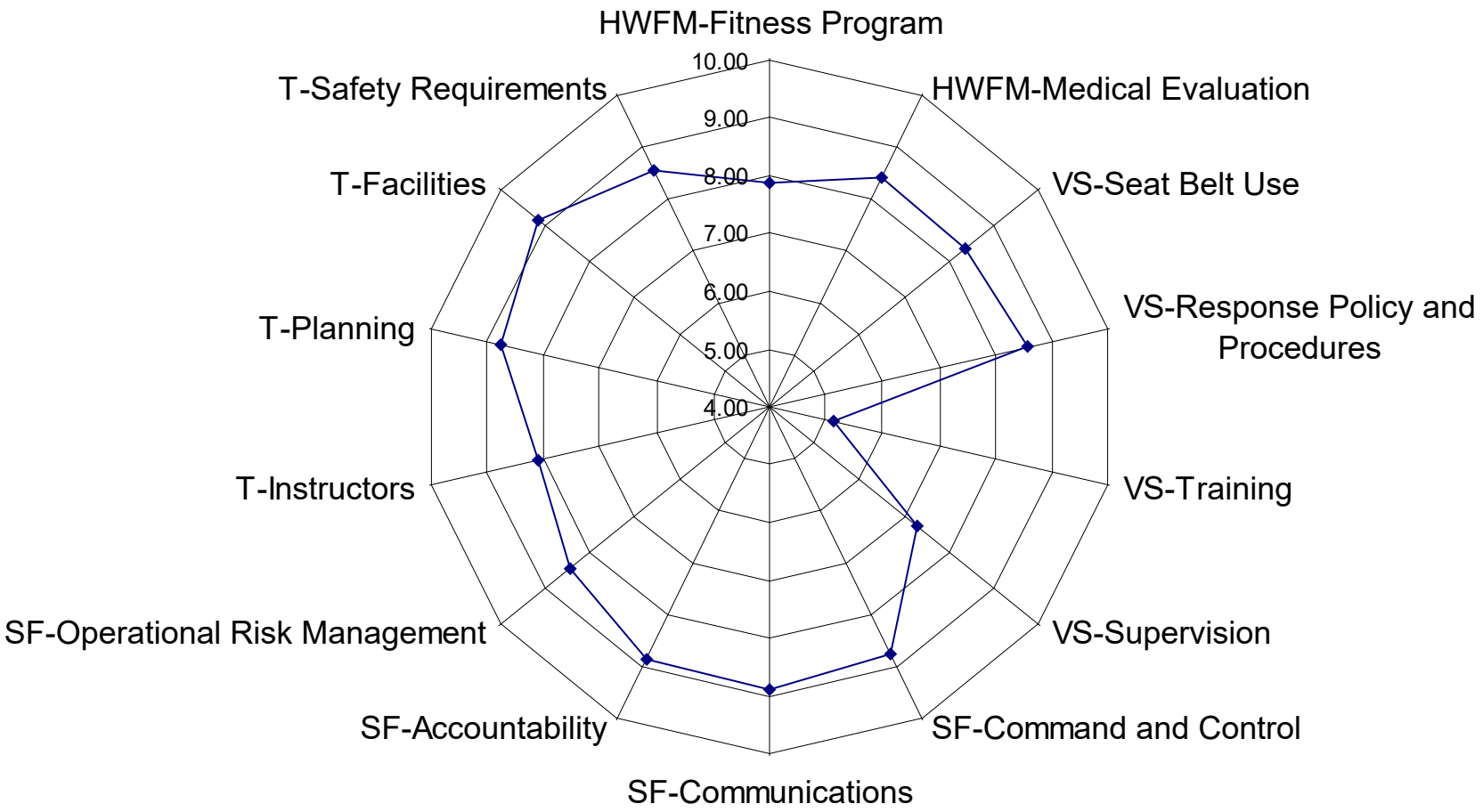
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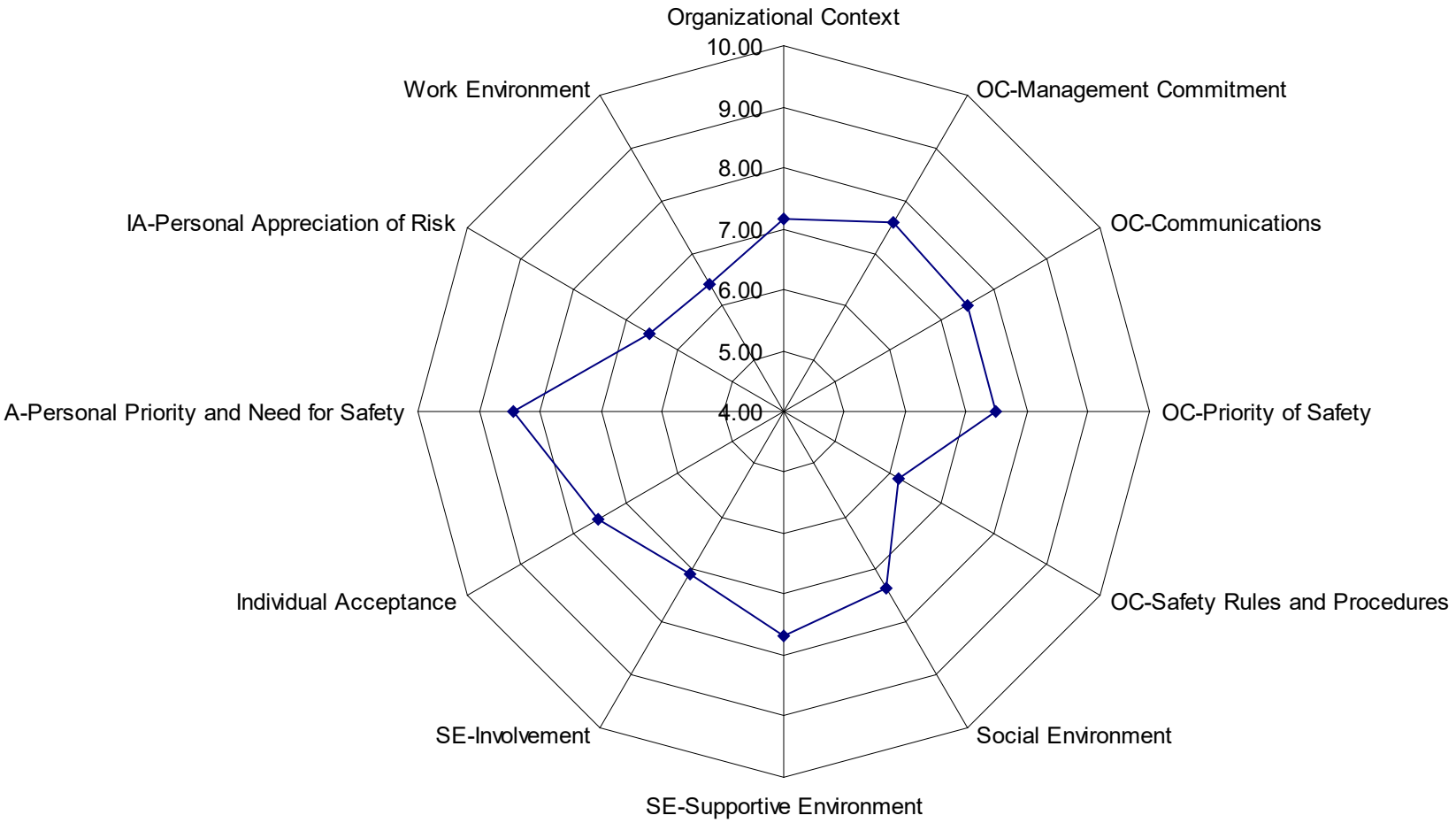
Group 1 OSC


Organizational Context
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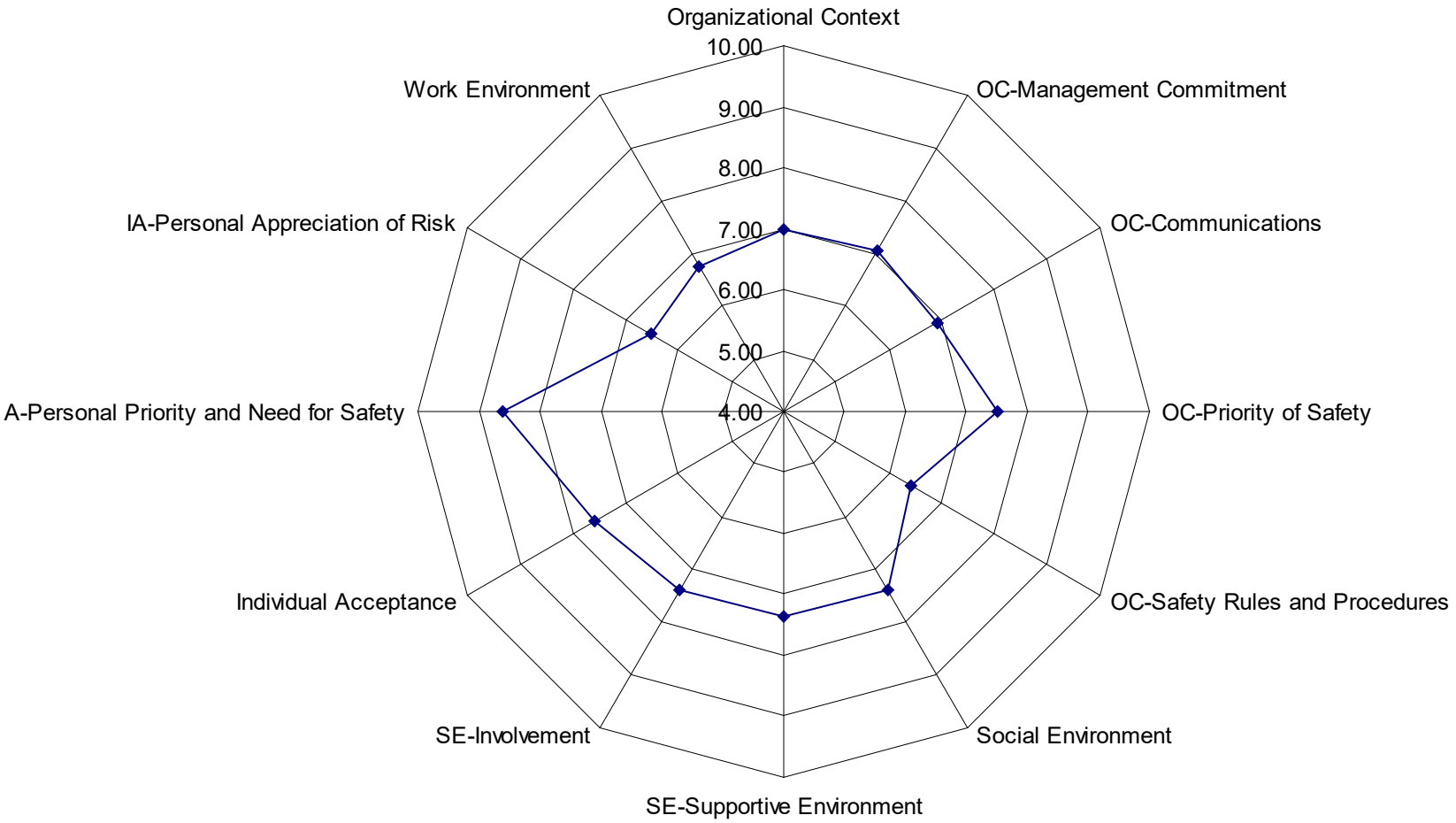
OC-Management Commitment
OC-Communications
OC-Priority of Safety
OC-Safety Rules and Procedures
Social Environment
SE-Supportive Environment
SE-Involvement
Individual Acceptance
A-Personal Priority and Need for Safety
IA-Personal Appreciation of Risk
Work Environment

Group 2 OSC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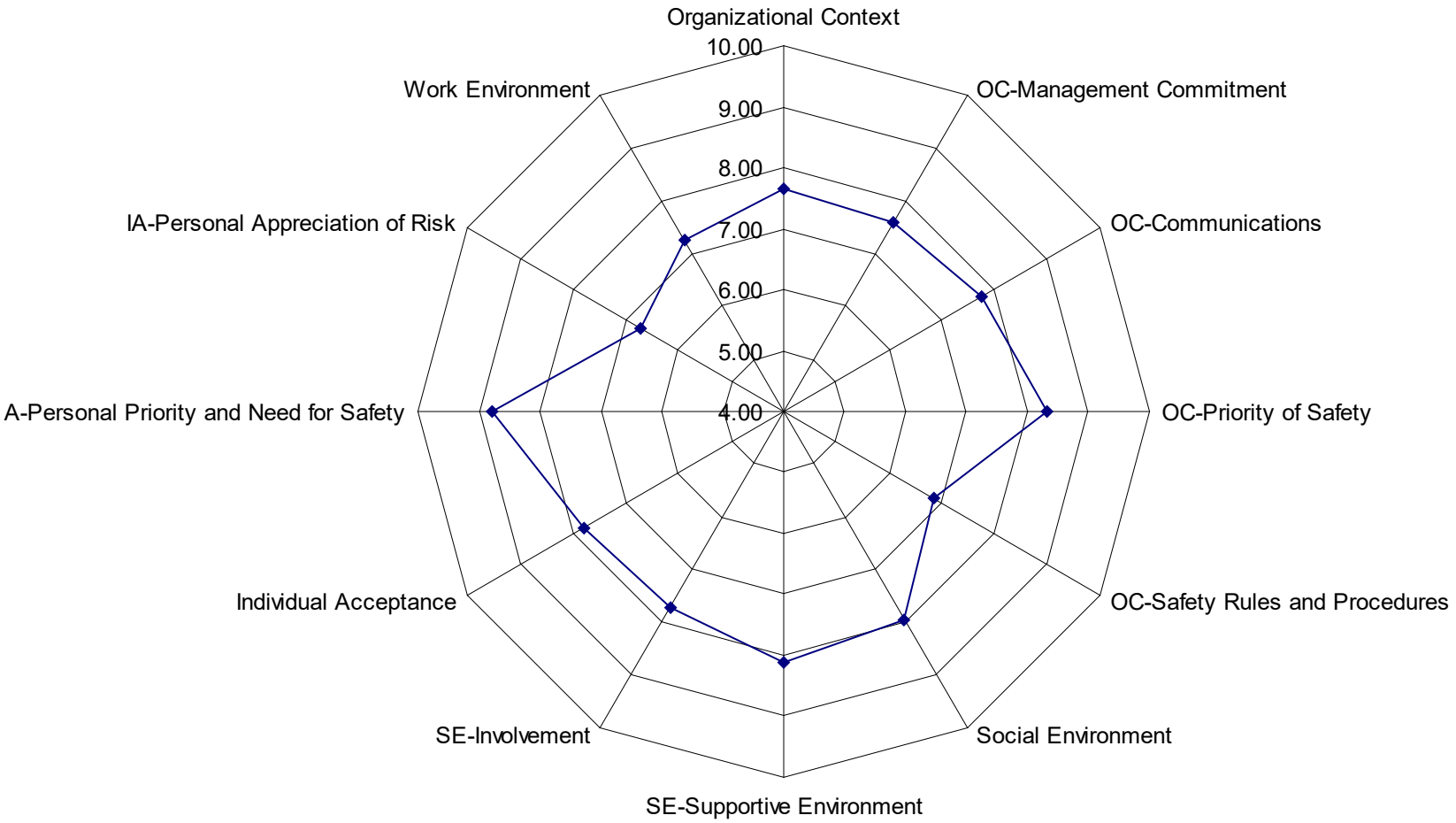
Group 3 OSC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Implications

- Relationship between the variables in the context of the fire service
- Useful model for evaluating safety culture in the fire service
- Selection bias: participating organizations believe they have a high level of safety performance