



# Advanced Modeling of Teaming Data to Enable Superior Team Performance

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# Problem and Introduction

Continues work reported at 2009 TSP Symposium

309<sup>th</sup> SMXG (Hill AFB) has had a long-term initiative to improve performance based on CMMI® and TSP®.

## Work Progress

- Multi-year effort with SEI support and internal resource commitments
- Training in the basic SEI technologies plus extensive training in six-sigma methods.

Plan: sustain and improve

**Goal: Improve quality, cost and schedule performance.**

- What can we monitor in-process? How?
- Can we demonstrate that team performance factors contribute to the desired program outcomes?
- Which practices are the most influential?

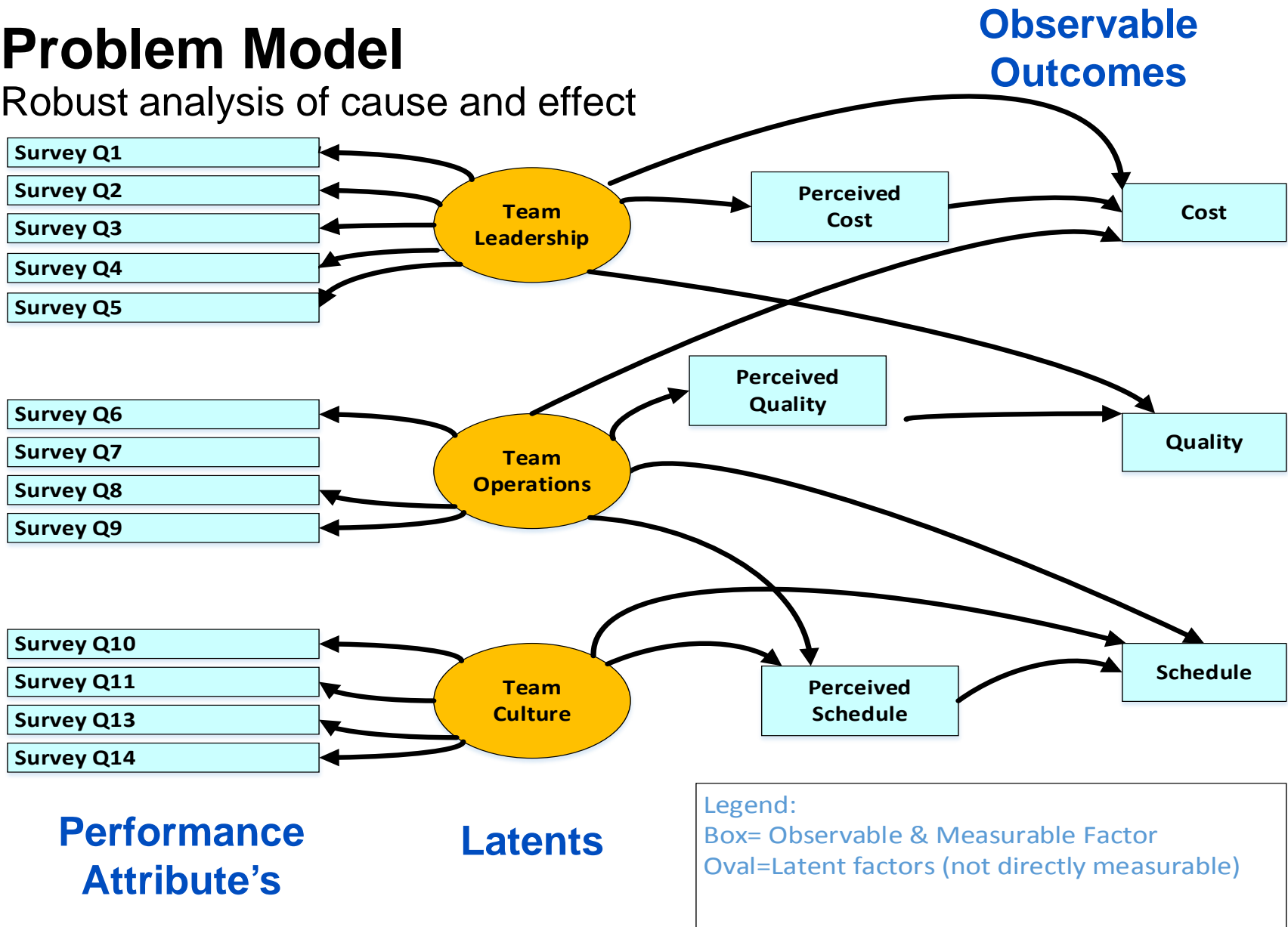


# Team Members

| Name                        | Info   |
|-----------------------------|--|
| Robert Ferguson (Presenter) | Senior MTS, SEI  |
| Robert Stoddard (Lead)      | Principal Researcher, SEI  |
| Dan Bennett                 | Senior Technical Program Manager, 309th Software Maintenance Group |
| Rushby Craig                | Measurement Analysis Team Lead, 309th Software Maintenance Group   |
| Lance Moore                 | Measurement Analysis Team Member, 309th Software Maintenance Group |
| Dave Webb                   | Senior Technical Program Manager, 309th Software Maintenance Group |

# Problem Model

Robust analysis of cause and effect



# Solution Approach

Use team-based surveys to assess activities, attitudes and beliefs.

- Design surveys to reference essential TSP concepts.
- Data collection frequency aligned to frequency of TSP events:
  - launch, weekly meetings, monthly, quarterly and annual reviews
- Minimize cost to team by sampling strategy, limiting questions, limiting list of possible answers.
- Minimize cost to team by using Quatrics, web-based surveys.

Prepare for data analysis.

Report analysis to squadron leaders and group staff on quarterly basis.

**Total number of survey questions = 105!**



# Survey Design and Implementation

Surveys began in January 2014

## Sampling

- Randomly select sample from each team so no individual feels burdened.
- No one should receive more requests than 8/year

## Survey Design

- Five online surveys based on type of activity monitored (e.g. launch).
- Tested and verified questions with staff. (yes/no answers)

## Implementation

- Obtained Qualtrics license to create secure, anonymous survey links.
- Code survey
- Initiate surveys by team schedule (began with weekly and monthly ones)
- Response data analyzed with Excel

## Analysis

- Performed jointly by SEI and 309<sup>th</sup> SMXG

Report at both squadron and group level





# Nature of Team Survey Concerns

## Observations and Assessment of Performance and Behavior

### Leadership

- Clarity of goals, quality suffering, employee role satisfaction, motivation, team member's satisfaction, prioritization of work, measurement of performance, team decisions, change in direction, team conflicts, poor performance from members

### Operational

- Load balancing, not following process, meetings, progress reviews, no impact analysis, consensus on team decisions, ideas for improvement, improvement data collection, stakeholder involvement, number of tasks, ask for help, customer involvement, checklists, problem tracking, collection of data, communication, stress and overtime

### Cultural

- Face time, team cooperation, individual commitment, submit ideas for improvement



# Nature of Survey Questions (the outcomes)

Questions about Perceived Performance (were asked at the end of each survey)

Q13. Describe your team performance at this point in time.

|          | Worse than Plan       | On Plan               | Better than Plan      | Don't Know            |
|----------|-----------------------|-----------------------|-----------------------|-----------------------|
| Quality  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Cost     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Schedule | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

*Intent is to analyze the ability to predict these outcome measures based on the preceding leading indicators*

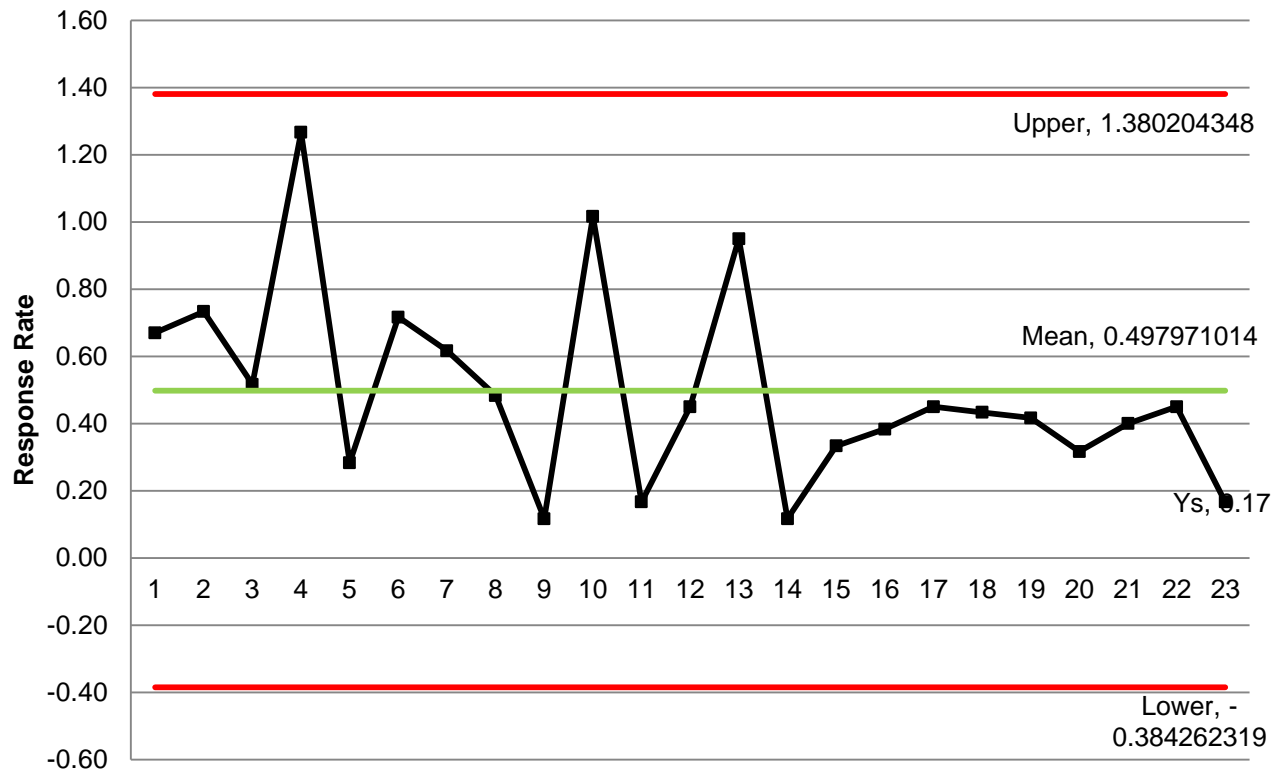


# Response Rates

The Weekly Survey Response Rate has been about 50%

The Monthly Survey Response Rate has been about 43%

The Quarterly Survey Response Rate has been about 40%



# Some Interesting Overall Question Results

|   | Yes        | No         |
|---|------------|------------|
| Did your team leader properly deal with any poor performers on your team? (5)                         | <b>68%</b> | 31%        |
| Were you aware of team conflicts that were not resolved in a timely manner? (6)                       | 14%        | <b>85%</b> |
| Were you aware of team members unhappy with their assigned work? (11)                                 | 33%        | <b>65%</b> |
| Were you aware of important team decisions that were missed or late? (12)                             | 29%        | <b>69%</b> |
| Did your team reach consensus when needed on key team decisions? (5)                                  | <b>85%</b> | 14%        |
| Did you collect your own personal quality data? (28)  | <b>44%</b> | 53%        |
| Did you observe team members under unusual stress or working excessive overtime? (31)                 | 28%        | <b>69%</b> |
| Was there an open climate to submit ideas for improvement? (1)  | <b>87%</b> | 13%        |
| Was open discussion and individual commitment demonstrated within your team? (2)                      | <b>89%</b> | 11%        |
| Were you satisfied with the degree of internal team cooperation? (3)                                  | <b>87%</b> | 12%        |
| Were you satisfied with the degree of one-to-one face time you experienced with your team leader? (4) | <b>85%</b> | 14%        |

*Almost all questions depicted statistically significant differences among squadrons*



# Results - 01

Questions that were most significantly **related to the quality outcome**:

- Were you satisfied with the quality and timeliness of team improvement data collected?
- Were you satisfied with the frequency and nature of team communications?
- Were you satisfied with the degree to which process problems were tracked, handled and resolved in a timely fashion?
- Was there an open climate to submit ideas for improvement?
- Were you aware of quality suffering to meet other goals? (No)
- Were you satisfied with the degree to which process guidance and checklists were used?
- Were you satisfied with the degree of internal team cooperation?
- Were you unclear about any of the primary team goals? (No)
- Were you dissatisfied with the number of recurring issues faced by the team?
- Were you satisfied with the actual versus planned number of quality reviews held within your team?
- Were you satisfied with the action taken based on quality measures collected within your team?



# Results - 02

Question that was most significant **with the schedule outcome**:

- Were you satisfied with how your team prioritized work?
- Were you dissatisfied with the number of recurring issues faced by the team?
- Were you satisfied with the action taken based on quality measures collected within your team?

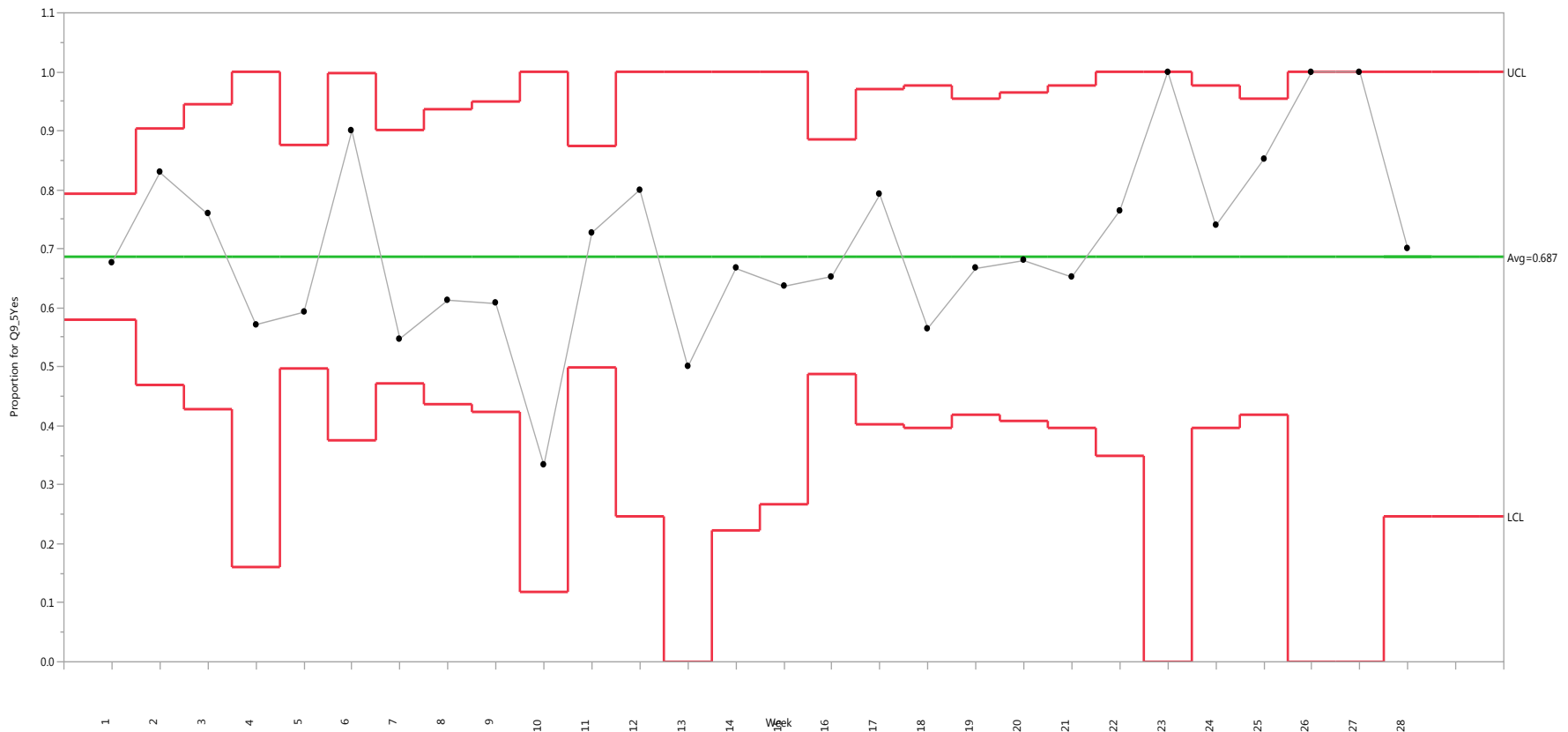
Questions that were significant **with the cost outcome**:

- Were you dissatisfied with the number of recurring issues faced by the team?
- Were you dissatisfied with the team's working conditions or available tools and technology? (No)



# Statistical Process Control Chart (p chart) for Each Survey Question

Enables each question to become an early warning radar!



# Future Work

## Improve decision-making and intervention

- Trim uninteresting or non-value added questions from survey.
- Transition from binary (yes/no) to scaled responses for more robust analysis.
- Implement more robust statistical (structural equation) model for outcomes of perceived cost, schedule and quality
- Collect actual outcome measure data and repeat statistical analysis.

## Develop materials for broader use and more specific questions

- Encourage other teams and organizations to use these survey questions and share data for benefit of community benchmarks and heuristics for superior team performance

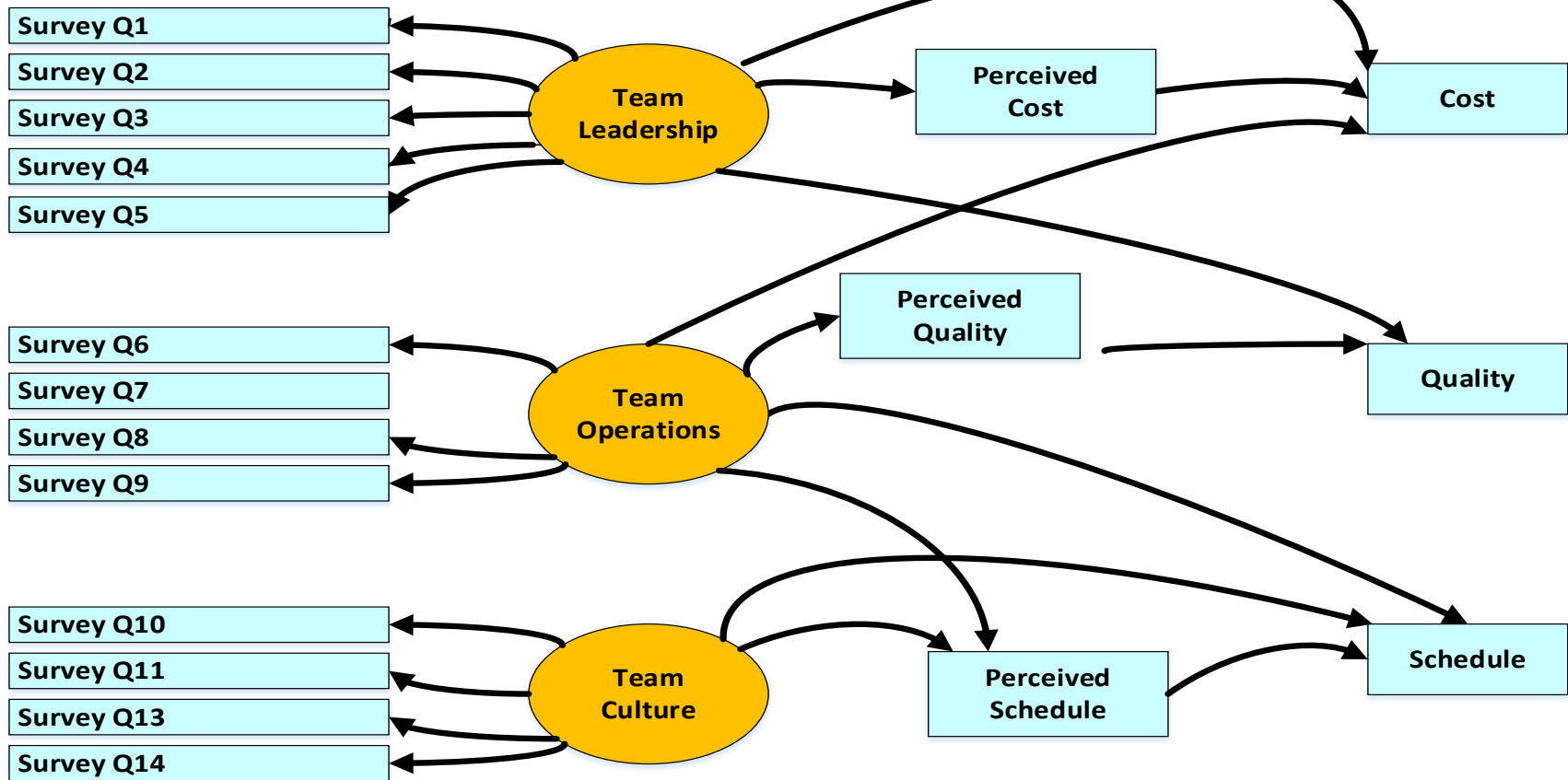




# Structural Equation Model

Robust analysis of cause and effect

Observable  
Outcomes



Performance  
Attribute's

Latents

Legend:  
Box= Observable & Measurable Factor  
Oval=Latent factors (not directly measurable)

# Summary

Survey approach appears to be feasible from both response rates, data collection and value-added results of significant factors

More time needed to demonstrate ability of the control charts to provide valuable early warning on changes in team operations

Other services are showing interest in these survey questions and have begun the journey of implementing the survey questions

Expect cross service benchmarks to share next year!

Over time, results could serve to improve TSP Coach training



# Contact Information

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