



Using Tracking & Timing as part of a Multi-method Study



Summative Evaluation
Conducted for
Museum of Science, Boston
Carey Tisdal
Tisdal Consulting

Overview of Topics



- Using data sets that including tracking & timing data and an exit survey with the same respondents
- Comparing traveling exhibitions at multiple sites
- Using different T & T measures to answer questions
 - Exhibition wide measures
 - %DV
 - & SWI
 - Exhibit level measures
 - Attraction
 - Holding
- Using in-depth interviews to explore issues more deeply

Attraction & Holding

Attraction and Holding -- Exhibits

- Level of attraction -- percentage of respondents who stopped at an exhibit
- Holding power -- how long respondents stop at an exhibit element

(Bitgood and Shettel, 1994)

The 51% Solution -- Exhibition

- Percentage of Diligent Visitors (%DV) --percentage who stopped at more than half of the exhibit elements
- *Sweep Rate Index (SRI)* --total number of square feet in the exhibition divided by the mean total amount of time in minutes

(Serrell, 1998)

The Exhibition



- Developed by the Museum of Science, Boston and Lucas Film Ltd.
- Funded by National Science Foundation

Traveling
Exhibition

Engineering /
Technology Design

- Create and test technological solutions to problems.
- Recognize the role of imagination and creativity in technology design.
- Assess the implications of futuristic technologies.
- Recognize topics of current research and follow their ongoing development. (adults)
- See role as future scientists, engineers, workers, consumers and citizens (children)

- Using popular culture theme to make connections to science and technology
- Themed Areas
 - Transportation
 - Robotics
- Artifacts, physical interactives, virtual interactives, videos

Strategies

Types of Exhibits



Artifact
Cases



Demonstration
& Exploration
(Videos &
Timed
Experiences)



Simple
Design



Engineering
Design Labs
(EDLs)



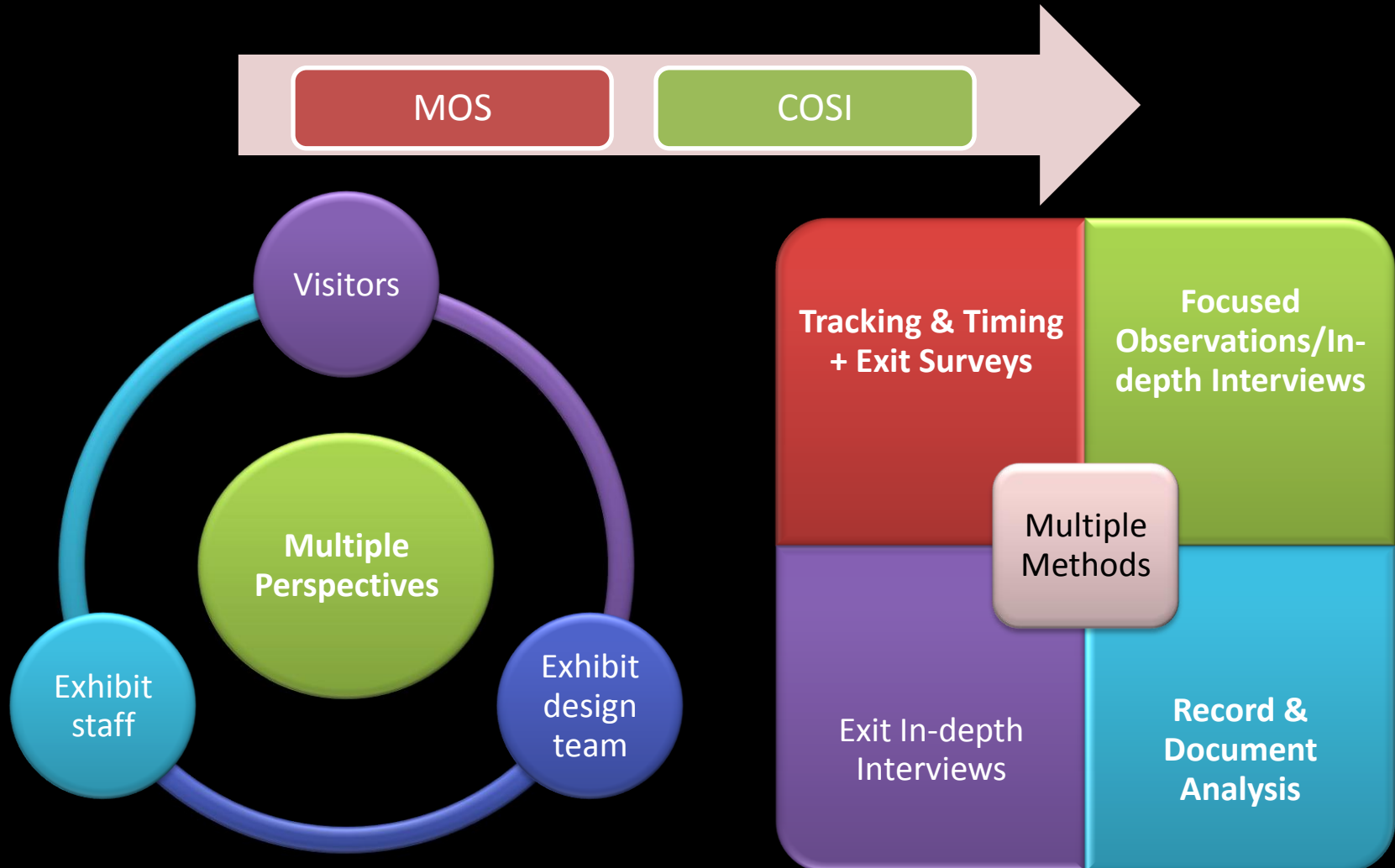
Selected Questions

Did the exhibition perform reliably at different sites?

Did waiting time (lines) affect satisfaction?

How did visitors use the Engineering Design Labs?

Naturalistic Methodology



MOS – Tracking Instrument

Star Wars Tracking Form

Notes (write additional notes on back):

Tracking # _____ Data Collector _____ Time Entered _____ Time Exited _____ TOTAL TIME _____

Exhibit List

Notes:

Exhibit List

OGEN Gender
(Circle one.)

1) male

2) female

OPD (Circle one.)

A 0) no

1) yes

CAGE CHILD
Ages Write in Observed Ages

#	Observed Age
A	
B	
C	
D	
E	

Total Number of Children in Group: _____

GROUP Group Type
(Circle one.)

1) Group with children under 18

2) Adults on group (all 18+)

3) Alone

4) School field trip

5) Other, please describe _____

AGE Age
(Circle one.)

1) 18-24

2) 25-29

3) 30-34

4) 35-44

5) 45-54

6) 55-64

7) 65-74

8) 75-84

9) 85 or older

Key

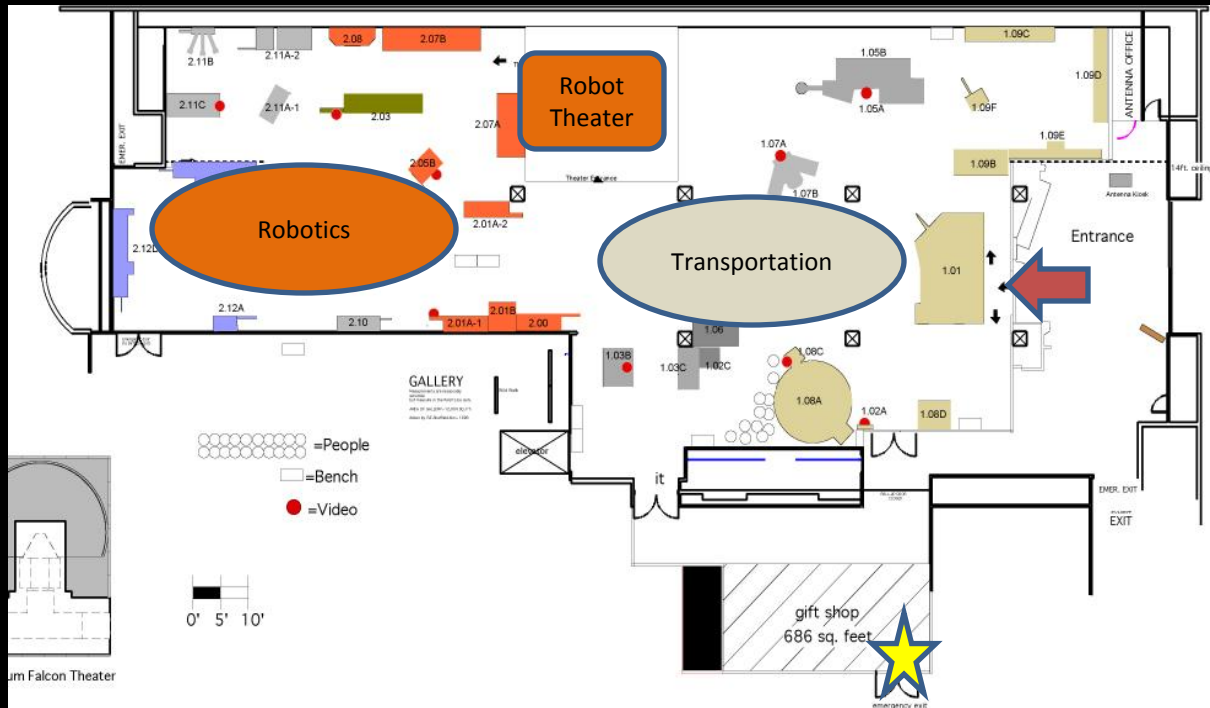
Key	Symbol	Super
Exhibit Stop	O	none
Non-Exhibit Stop	O	X
Cart	O	none
Seated Stop	O	S
Waiting in Line	O	W

Cart Name

C.11	Float like me, can you?
C.12	Pass the Jedi Trials, can you?
C.21	Sense you, the robots can
C.22	Man or machine?

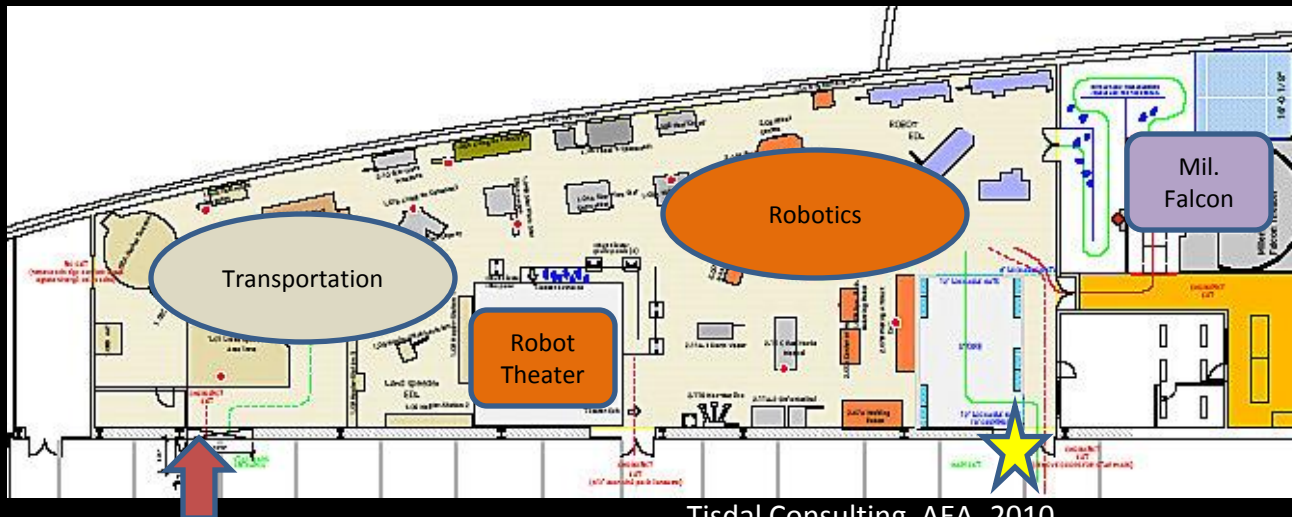
Exhibit List

- 1.01 Luke's Landspeeder
- 1.02A Ride on a Magnetic Field - video
- 1.02B Real World Speeders
- 1.02C Electrostatic Lifter
- 1.03B Jumbo Millennium Falcon
- 1.03C Chewy-Han case
- 1.04A SW Star Ships - Rebel side
- 1.04B SW Star Ships - Empire side
- 1.05A Living on Tatooine
- 1.05B Building Communities
- 1.06 Today's Spacecraft
- 1.07A Living on Coruscant
- 1.07B Moving down the Skyway
- 1.08A Ride on a cushion of air (chair)
- 1.08C Float on a cushion of air (seat)
- 1.08D Armored Attack Tank
- 1.08E Sebulba's podrace
- 1.08C MagLev EDL - Station 1
- 1.08D MagLev EDL - Station 2
- 1.08E MagLev EDL - Station 3
- 1.08F MagLev EDL - Parts Bin + Intro
- 2.00 Robots and People
- 2.01A-1 SW Robots
- 2.01A-2 RW Robots
- 2.01B Ordokeo
- 2.02 Robot Theater
- 2.03 Living on Kashyyyk
- 2.05A Static Stability
- 2.05B Dynamic Stability
- 2.05A Living on Hoth - Star Wars side
- 2.05B Living on Hoth - Real World side
- 2.07A Walking Robot interactive
- 2.07B Walking Robot artifact cases
- 2.08 Robot Vision
- 2.09 Expressive Robot
- 2.10 Star Wars Weapons
- 2.11A-1 Darth Vader
- 2.11A-2 Star Wars Medical
- 2.11B Human or Machine?
- 2.11C Prosthetics and implants
- 2.12A Robot EDL Intro/Padme costume
- 2.12B Robot EDL Station 1
- 2.12C Robot EDL Station 2
- 2.12D Robot EDL Station 3
- 2.12E Robot EDL Station 4



MOS

- 37 exhibit elements
- 12,000 square feet
- 2 timed experiences
- Remedial changes not completed
- April data collection



COSI

- 38 exhibit elements
- 11,500 square feet
- 3 timed experiences
- Costumed characters
- Remedial changes completed
- July data collection

Data Source Table

Method	Site	Data Sets	Unit of Analysis	Unique Respondents
Tracking & Timing	MOS	70	Individual	70
	COSI	55	Individual	55
Exit Surveys	MOS	44	Individual	0
	COSI	25	Individual	0
In-depth Interviews	MOS	16	Group	48
	COSI	17	Group	60

Did the exhibition perform reliably at different sites?

Site

Size

Exhibits

Mean Total Time

%DVI

SRI

Satisfaction

MOS

12,000 sq. feet

37

57.6 minutes

51%

208

3.6 ($SD = .5$)

COSI

11,500 sq. feet

38

62.3 minutes

50%

168

3.4 ($SD = .9$)

Did waiting time (lines) affect satisfaction?

Lines for Timed Experiences



Wait time and satisfaction

- Mean wait time ($p < .05$)
 - MOS 6.9 m ($SD = 7.3$)
 - COSI 18.9 m ($SD = 21.7$)
- Satisfaction (nsd)
 - MOS -3.6 ($SD = .5$)
 - COSI -3.4 ($SD = .9$)
- Correlation .23 (nsd)

Did waiting time (lines) affect satisfaction?



Wait time at timed experiences

- Robot Theater
 - MOS -- 7.9 m ($N = X$, $SD = .9$ m)
 - COSI -- 5.2 m ($N = Y$, $SD = 2.7$ m)
- Millennium Falcon at COSI
 - Wait Time: 25.3 m ($SD = 20.0$ m)
 - Satisfaction: ($p < .05$)
 - Viewed: 3.9 ($N = 10$, $SD = .3$)
 - Did not: 3.1 ($N = 15$, $SD = 1.0$)



Engineering Design Labs



- Design Challenge
- Multiple Stations
- Learning outcomes
 - Process: create, test, refine
 - Real world analogies



How did visitors engage with Engineering Design Labs?

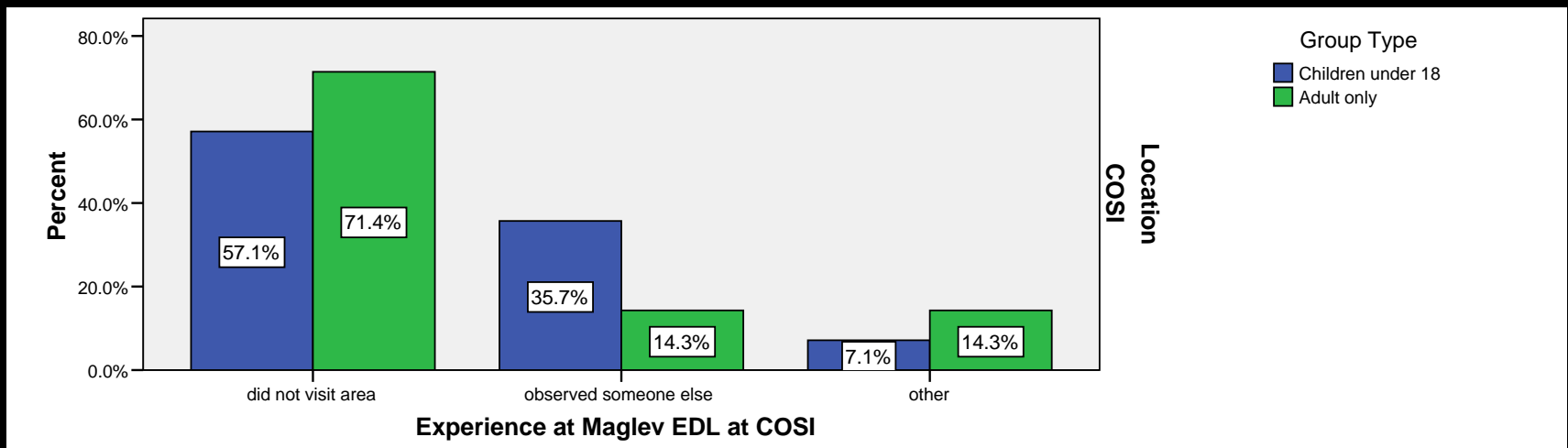
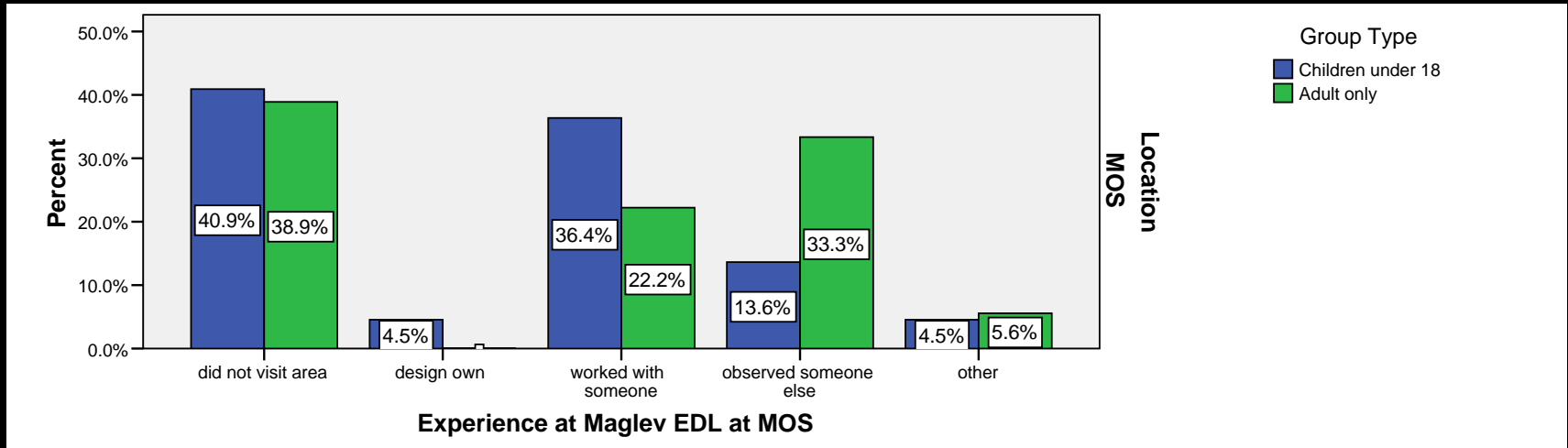
Tracking Data (N = 125)

- *Maglev EDL*
 - ranked 4th in level of attraction 70.0% of respondents stopping
 - Holding -- 146 seconds, ranking 3rd overall.
- *Robot EDL*
 - Ranked 9th in level of attraction 65.0% of respondents stopping
 - Median holding time of 133 seconds.



How did visitors engage with Engineering Design Labs?

Exit Survey Responses – MOS (N = 44) and COSI (N = 25)



How did visitors engage with Engineering Design Labs?

In-depth Interview Data

Question: Did you the exhibit where you built your own levitated train?

Female: I felt like all the activities were being taken over. Like there was never any availability for like anybody else to like have a turn. . . . Yeah, because families would come and there would be eight people in their family, and all eight would have to try it. And you know, you could never get in. (20 year old Ohio State early childhood major)

Male: No, I didn't do it here. So that was kind of the reason I didn't do it is because you know, I'd--and plus again, you know, the kids, I wanted to let the kids do it. And it seemed like there was lines for that. So I didn't want to jump in the line when the kids, you know, and not give the kids a chance to try it out. (21 year old Ohio State physics major)

Affect on Learning – Exit Survey

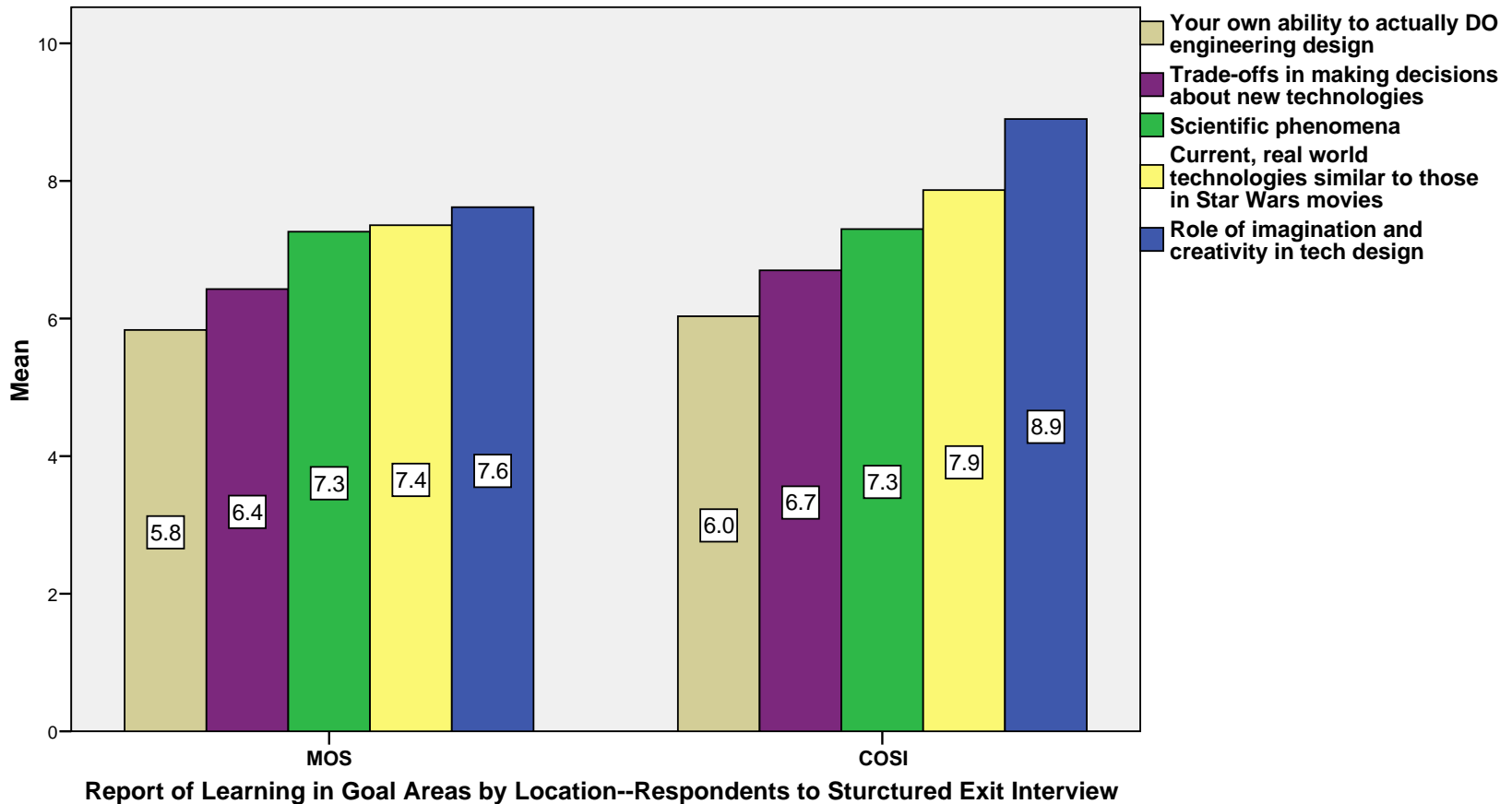


Figure 13. Report of Learning in Goal Areas by Location—Respondents to Structured Exit Survey (N = 77) 1 = low to 10 = high

Summary

- Tracking & timing data can be productively used in multi – method studies to extend understanding of engagement and outcomes.
- Data sets with both tracking & timing and exit survey data allow the connection of observed behavior to perceptions and outcomes.
- Clearly reporting data from multi-methods can be challenging.

References

- Bitgood, S. & Shettel, H. (1994). The classification of exhibition evaluation: a rational for remedial evaluation. In M. Borun, R. Korn, & R. Adams (Eds.) Introduction to museum evaluation (pp. 69-74). Washington, D.C.: American Association of Museums Technological Information Service.
- Serrell, B. (1998). Paying attention: visitors and museum exhibitions. Washington, DC: American Association of Museums, Technical Information Service.
- Tisdal, C. E. (2007). **Star Wars: Where Science Meets Imagination**
- **Boston: Museum of Science.** Retrieved November 3, 2010 from http://www.exhibitfiles.org/star_wars_where_science_meets_imagination.