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2014

Budapest, Hungary

# Addressing Security Concerns through Rapid Republishing and Psychometrics

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- CompTIA is a non-profit trade association advancing the global interests of ICT professionals and companies.
- Leading provider of technology neutral and vendor neutral ICT certifications.
- Offering 17 certification programs in the ICT space.



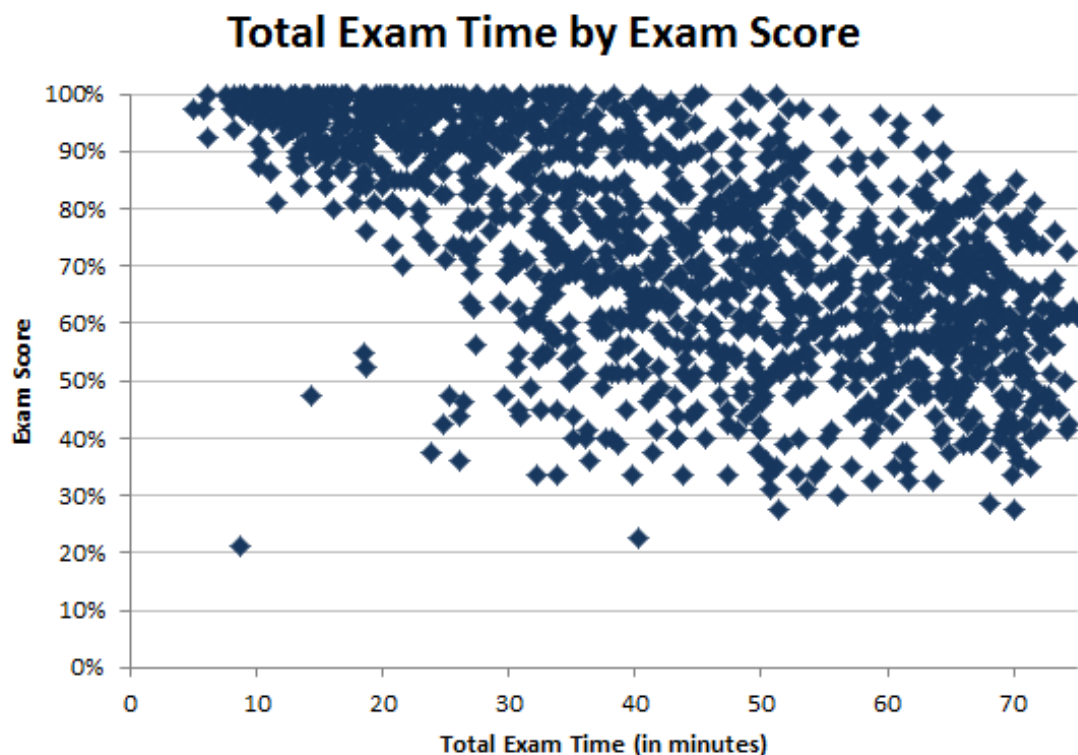
- Alpine Testing Solutions is an employee owned company that provides psychometric, test development, and credential management solutions to credentialing and educational programs.
- Customer-service driven, entrepreneurial, and team-oriented approaches to helping test sponsors develop, maintain, and continuously improve testing programs.
- Create solutions and pursue research that is practical in a business context and abides by the professional standards promoted in the testing industry.



# Proactive and reactive approaches

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- We will review how a global program can address security concerns proactively and reactively.





# Proactive Mitigation Strategies for High Volume Exams

- Seeding large-sized unscored item pools (~600) in large number of forms
  - Publishing 1-2 a year
- Seeding medium-sized unscored item pools (~350) to refresh fewer forms every 60 days
- Seeding smaller-sized unscored item pools (~220) to refresh fewer forms every 45 days by location



## 4 form Rapid republishing process

Initial launch  
of Rev1 (AB)

Analyze Beta  
PoolA for Rev1

45 days

Launch of  
Rev1 (CD)

Analyze Beta  
PoolB for Rev1

45 days

Launch of  
Rev2 (AB)

45 days

Continual Refresh Every 45 days

# Costs

- Increased item creation events for continuous seeding
- Publication costs and resources every 45 day publishing event per product
- Psychometric costs for analysis and forms build



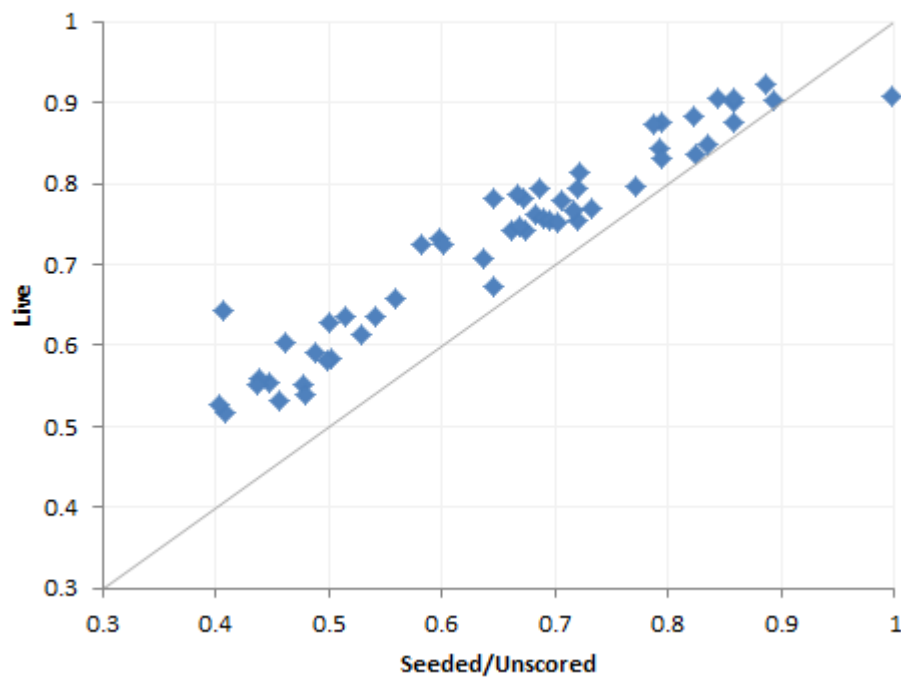
# Challenges

- Pass rates on this mitigation strategy shows less of an increase for the time allotted, compared to other mitigation strategies that we have implemented, but still have candidate anomalies in the data.
- Tracking the unscored items and item variants in each revision to meet blueprint.
- Continuous publishing in multiple programs.

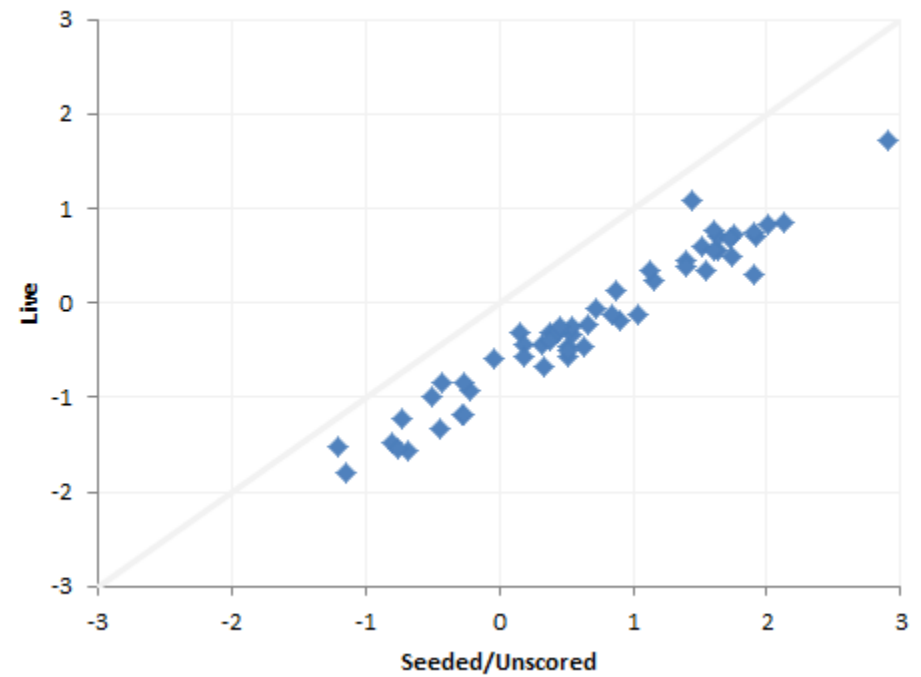
# Beneficial Impact on Item Analysis

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P-values



Rasch Measures





# Reactive Approach

- CompTIA has a robust proactive approach, but we wanted to be more reactive.
- Even with the proactive approach the statistical data could be potentially challenging to interpret. It was sometimes difficult for our stakeholders to make pass/fail decisions based on “skewed” data.
- We need to protect our brand and the industry.

# Considerations

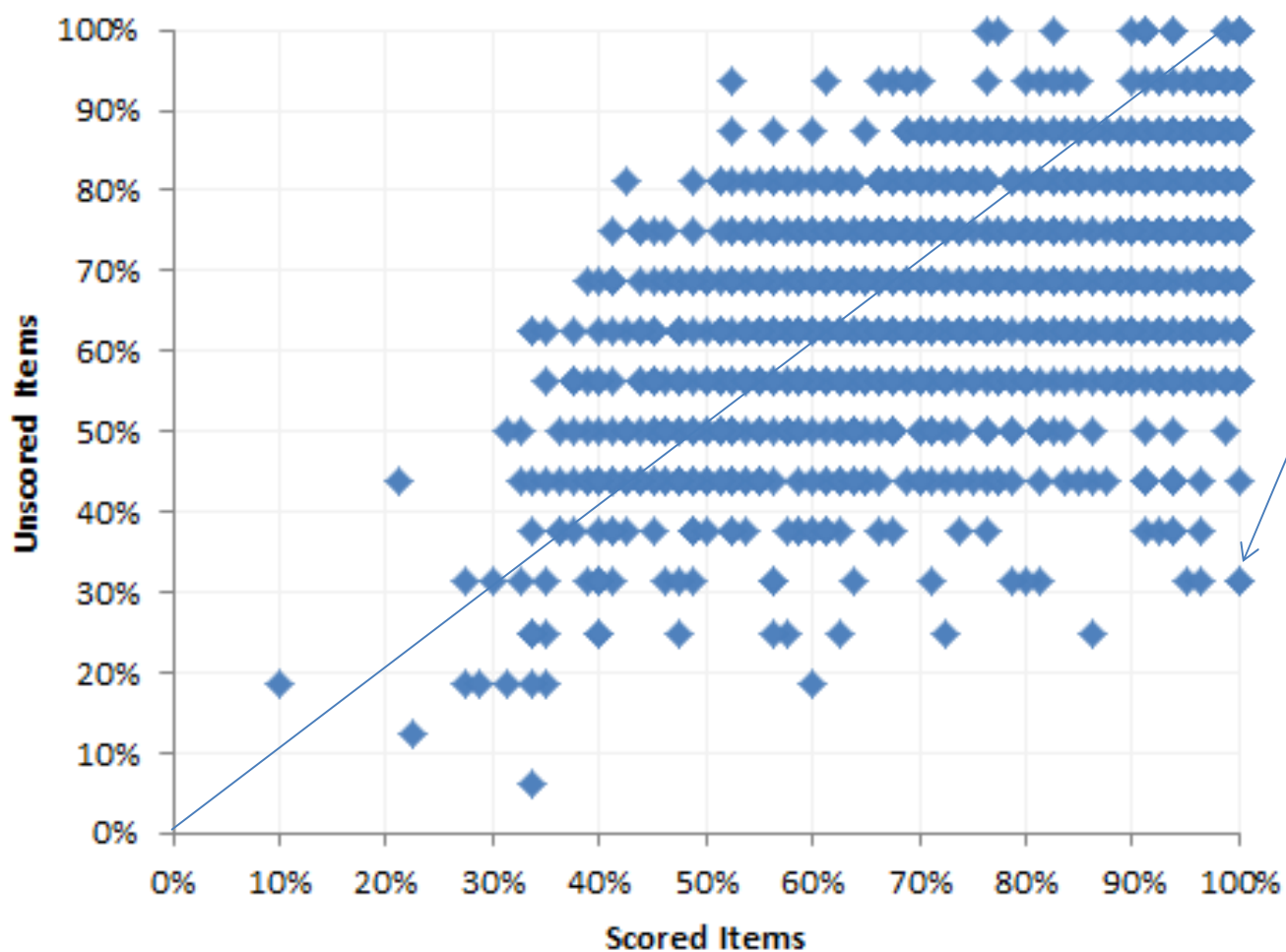
- Strong policies and legal agreements
- Support and approval from key stakeholders
- A process to ensure consistency
- Ground rules for using the data
- Resources



# DPF for Detection

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## Scored vs. Unscored



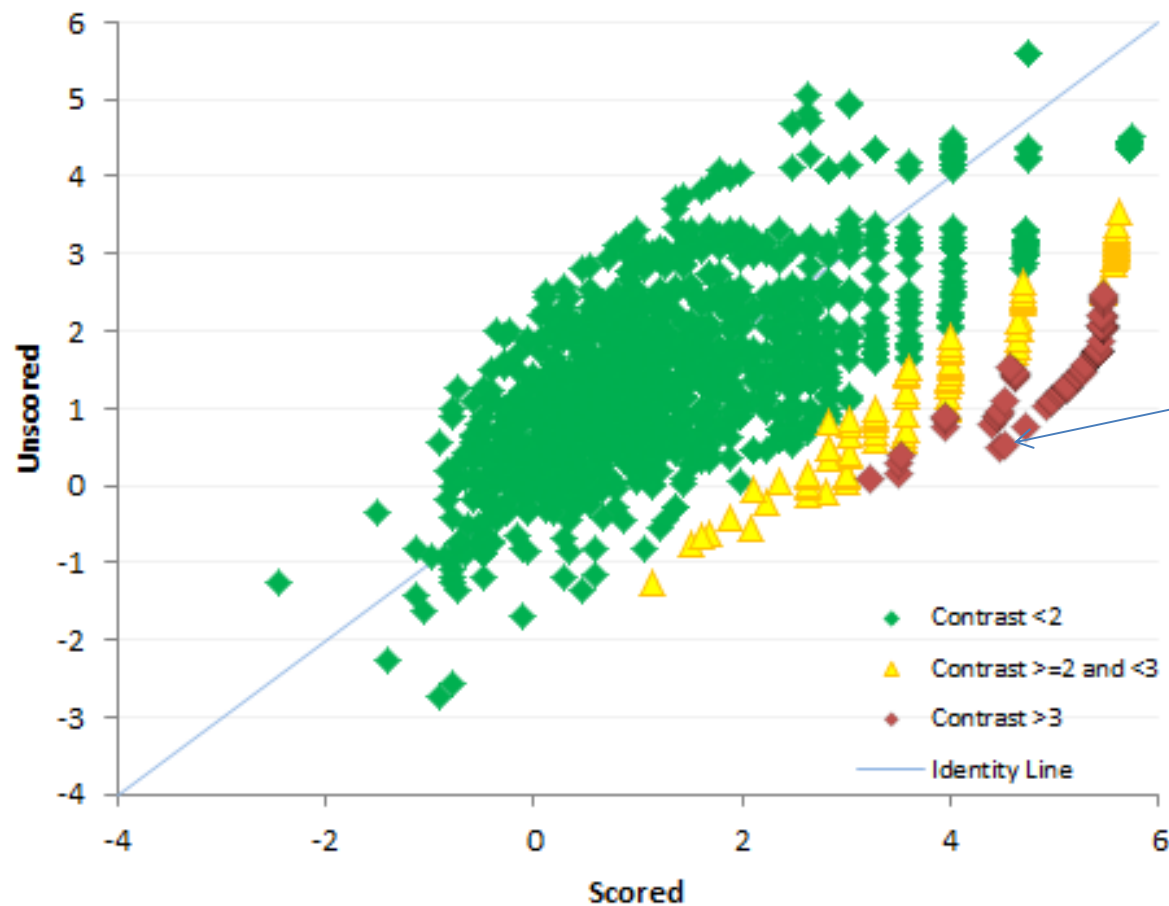
100% on the scored items

31% on the unscored items

# DPF for Detection

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Candidate Measures on  
Scored and Unscored Items



Scored item measure = 4.48

Unscored item measure = .05

Contrast = 3.98

Probability=.0001



# DPF & DIF in Exam Development Process with Rapid Republishing

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- Administer live forms with unscored items
- Conduct DPF to “scrub” data & identify suspect candidates
- Flag candidates with significantly high contrast

Conduct Health Check

Keep/Delete Decisions

- Review item statistics by scored status
- Conduct DIF on items by DPF flag status to detect exposed items

- Select bank items to be retained as acceptable for use
- Calibrate items statistics for newly proposed forms on “clean” items
- Update item bank with revised statistics

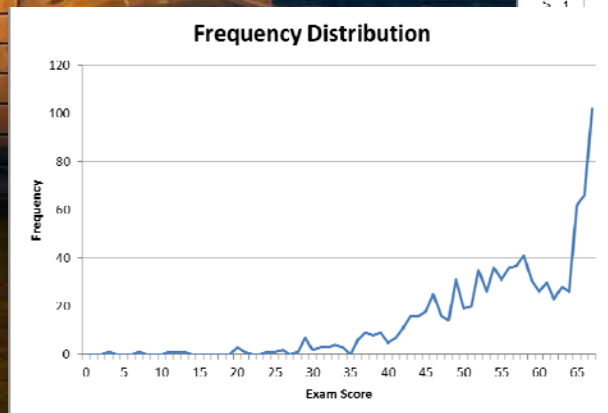
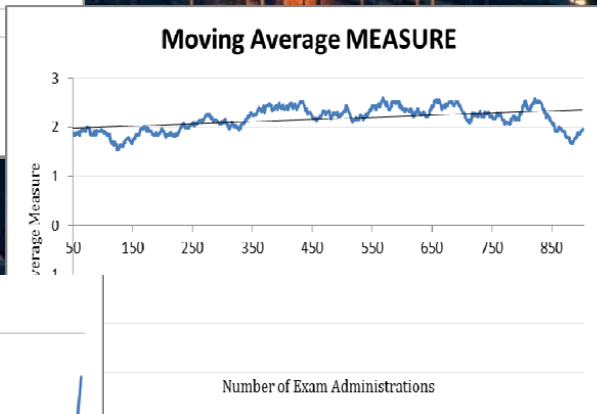
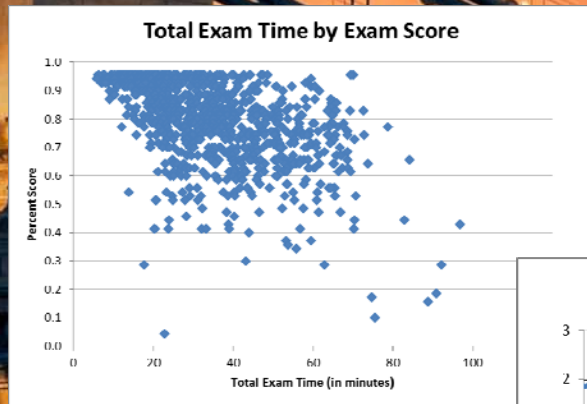
Forms Re-Assembly with Content Refresh



# DPF & DIF in Context

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- Multiple indicators of security and item exposure issues

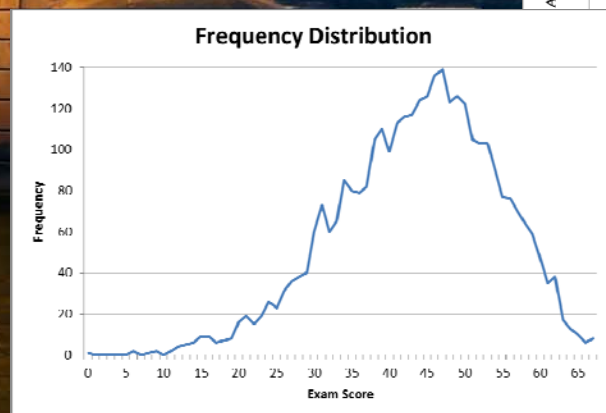
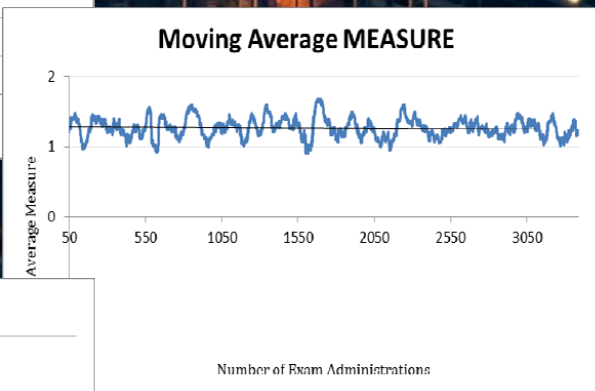
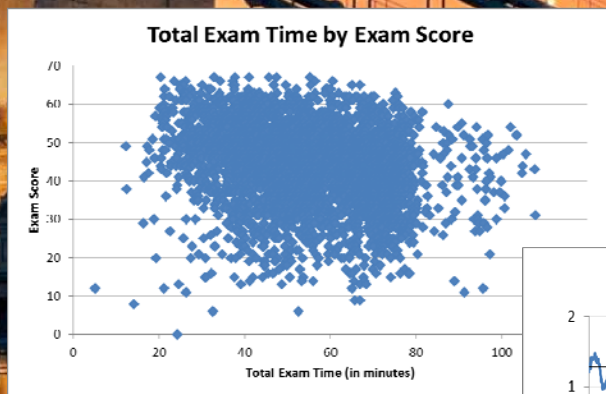




# DPF & DIF in Context

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- Security and item exposure indicators improve significantly after implementation of rapid republishing



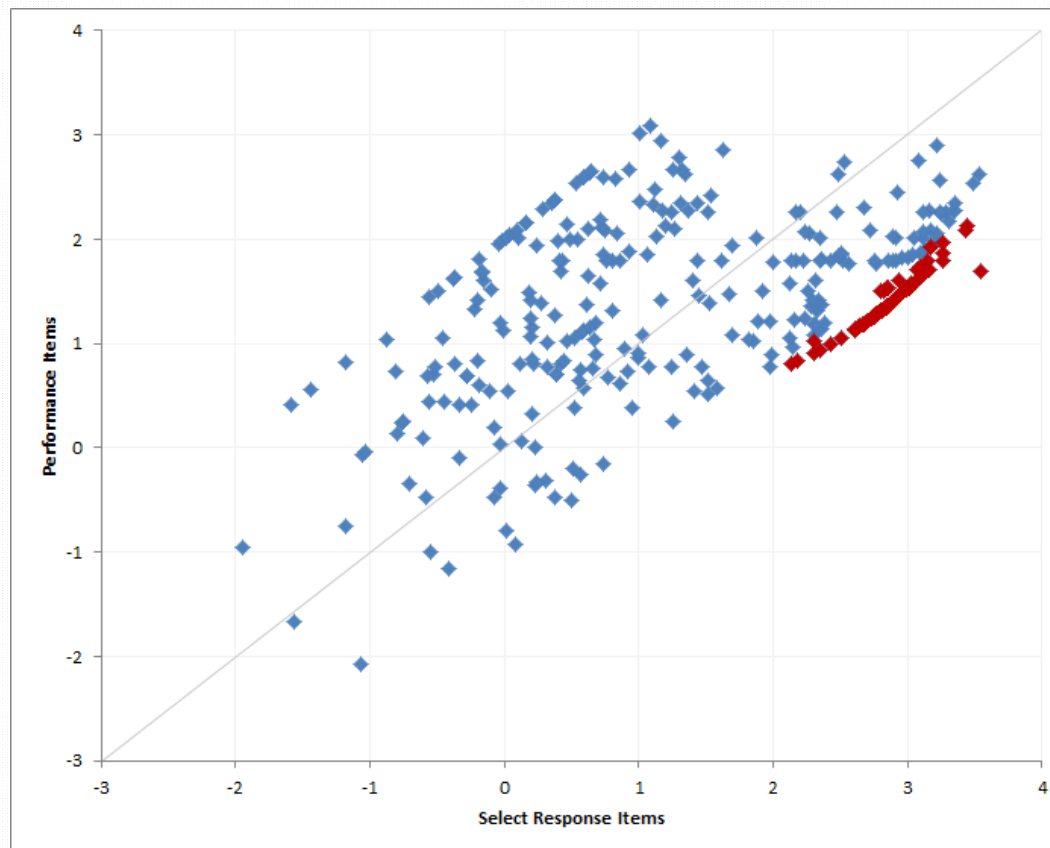
MAP OF PERSON AND ITEM			
MEASURE	PERSON	ITEM	MEASURE
<more>			<rate>
5			5
4			4
3			3
2			2
1			1
0			0
-1			-1
-2			-2
-3			-3
-4			-4
<less>			<frequent>

EACH "\*" IN THE PERSON COLUMN IS 14 PERSON: EACH "." IS 1 TO 13

# DPF & DIF in Context: Detection

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## ■ Candidates (DPF MC vs. Performance):

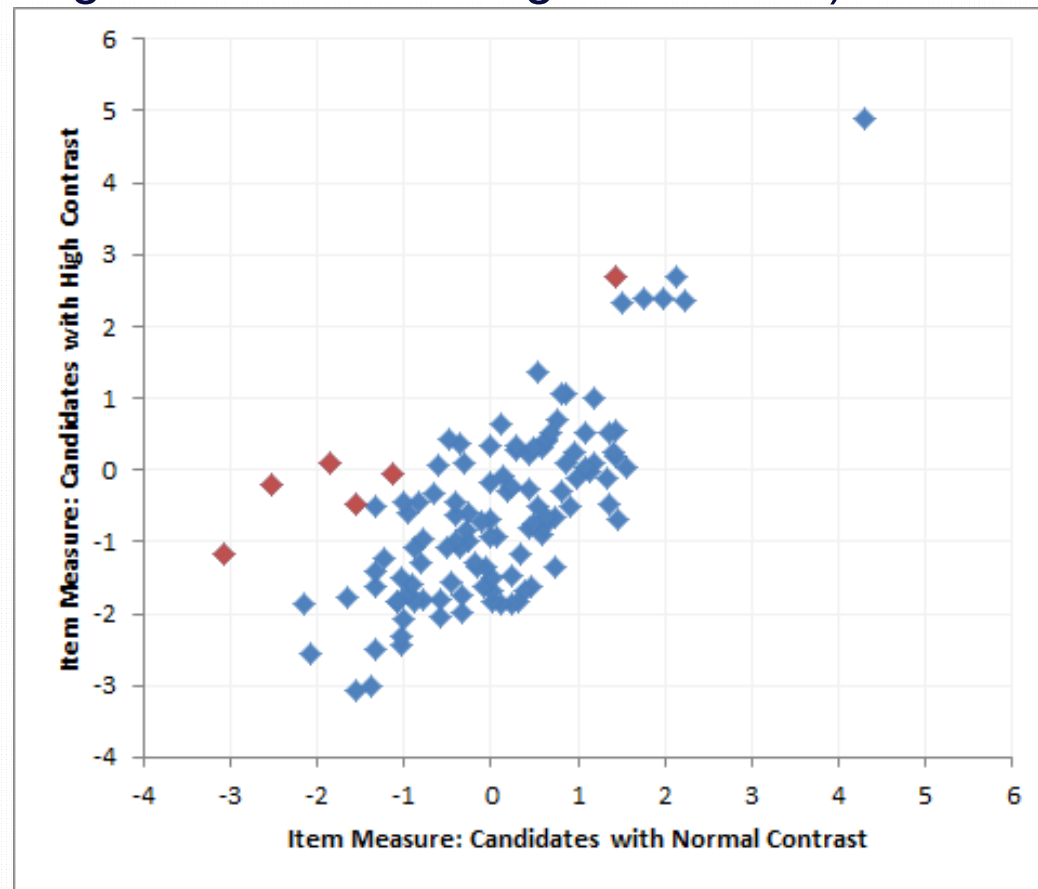




# DPF & DIF in Context: Detection

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- **Items** (DIF: using DPF results to flag candidates):

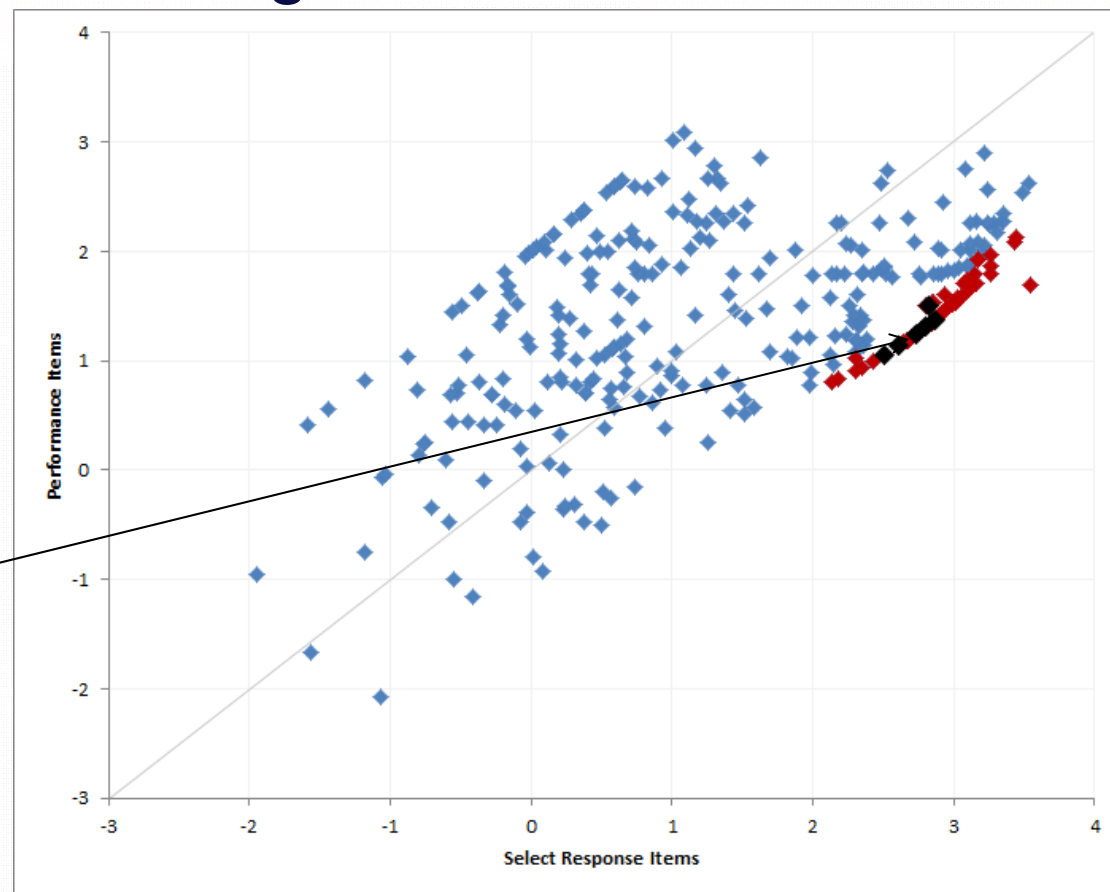


# DPF & DIF in Context: Enforcement

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- Aggregate and investigate:

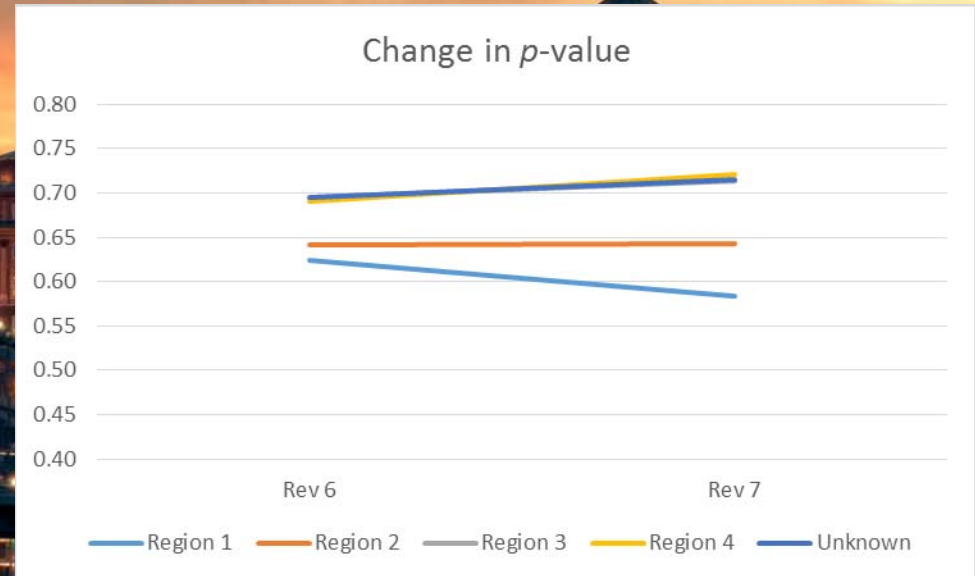
6 people from  
the  
same region





# DPF & DIF in Context: Geographical Information

- Aggregate anomalous records up to flag suspect test centers
- Categorize by geographical region to determine patterns within particular exams or across exam programs
- Use results to focus policy and administration decisions around global exam performance



Region	% of Examinees	% with DPF Contrast >1	Average Contrast
Region 3	3.0%	14.5%	0.182
Region 4	74.1%	11.4%	0.078
Unknown	20.2%	11.2%	0.069
Region 2	1.8%	9.9%	0.059
Region 1	0.9%	5.9%	-0.012
Region 5	0.1%	0.0%	-0.210

# Conclusions

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- Psychometricians and test sponsors need to understand the downstream implications of security breaches from a global perspective
- Security issues should not be considered from just an enforcement perspective, they impact both the approach to and interpretation of psychometric analyses
- We have had success using rapid republishing in conjunction with DPF and DIF to make better decisions about items, equating, scaling in conjunction with rapid republishing
- If the focus is on prevention, the need for psychometrics in detection and enforcement is minimized



# Next Steps...

- Focus more on region specific rapid republishing
- Include more performance based items – less impacted by security concerns
- Find ways to continue to streamline process to drive down costs
- Evaluate each region with major stakeholders and make a determination on risk

# Questions?

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