
Moving from job analysis to test development: Putting job analysis results into action

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Introduction



- ◆ **Tim McGonigle, Caliber**
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Agenda

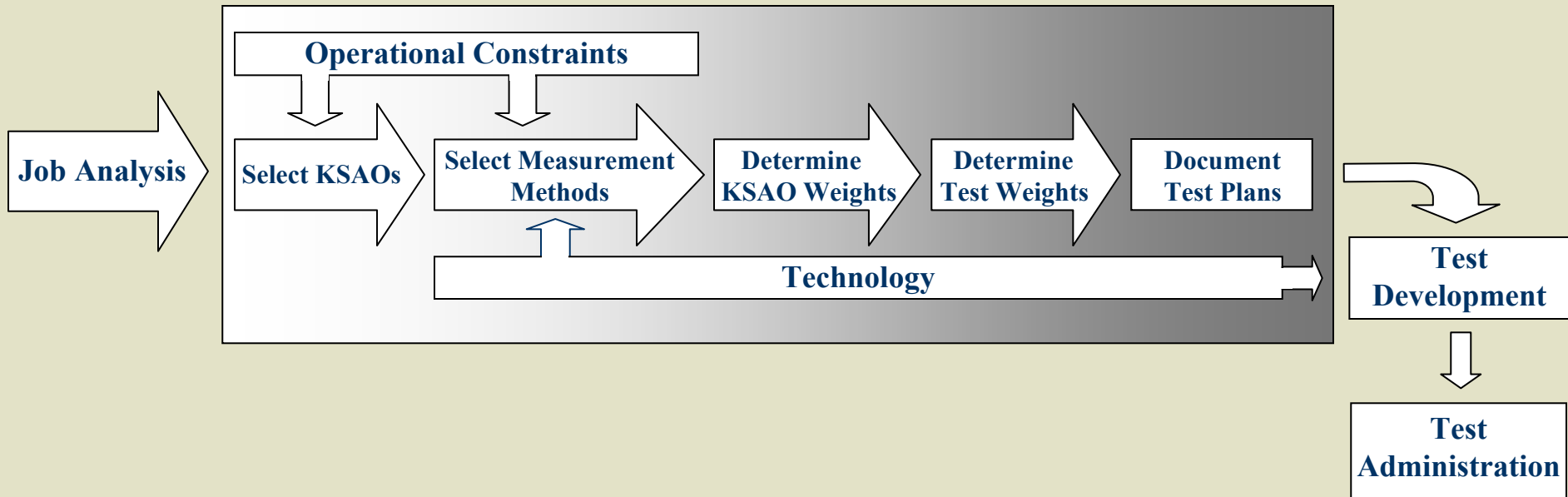
- ◆ **Selecting KSAOs to measure**
- ◆ **Choosing a measurement method**
- ◆ **Determining KSAO and test weights**
- ◆ **Documenting test plan decisions**
- ◆ **Technology pros/cons**

- ◆ **Ask questions at any time**

What is test planning?

- ◆ **The process of determining what and how to measure constructs**
 - **During our presentation**
 - **Highly-organized, sequential**
 - **In reality**
 - **Highly iterative**

Examination Flowchart





Selecting KSAOs to Measure

Identifying Appropriate Test Content

Criteria for Selecting KSAOs

- ◆ **Limit test to KSAOs that job analysis shows are:**
 - **Needed at entry**
 - **Important to job performance**
 - **Linked to critical work behaviors**
 - **Others...**

Criteria for Selecting KSAOs

- ◆ **Objective criteria (i.e., cutoffs)**
 - Easier to administer
 - Harder to defend
- ◆ **Expert judgment**
 - Harder to administer
 - Easier to defend



Adding KSAOs

- ◆ **Improves**

- **Content validity**
- **Criterion-related validity**
- **Applicant reactions**



Adding KSAOs

- ◆ **May not improve**
 - **Adverse impact**
 - **Operational considerations**
 - **Development cost**
 - **Administration cost**

General Considerations

- ◆ **Can you add the KSAO without adding another test?**
- ◆ **Does the KSAO address unique parts of the job?**
- ◆ **How confident are you in the stability of the job analysis data?**
- ◆ **How confident are you in the accuracy of the expert judgment?**

Choosing a Measurement Method

Determining Advantages and Disadvantages of Various Measurement Methods

Psychometric Criteria

- ◆ **Psychometric criteria to consider:**
 - **Reliability**
 - **Validity Evidence**
 - **Content Validation Support**
 - **Subgroup Differences**

Psychometric Criteria

◆ Reliability

- Degree to which the instrument tends to yield reliable scores as measured by traditional psychometric methods such as test-retest, internal consistency, or parallel forms reliability.



Psychometric Criteria

◆ Validation Evidence

- Degree of cumulative evidence in the research literature supporting inferences drawn from the instrument.

Psychometric Criteria

◆ Content Validation Support

- Degree to which the instrument lends itself to content validation—a mapping of the content of the job class against the content of the instrument.

Psychometric Criteria

◆ Subgroup Differences

- Degree of differences between racial and gender subgroup scores typically observed for the instrument.

Examples

EVALUATION OF SELECTION TOOLS AGAINST CRITERIA														
Criteria ↓	Selection Tools													
	Measures of Basic Attributes		Measures of Background, Training, and Experience					Measures of Declarative Knowledge and Procedural Knowledge and Skill						
	Cognitive Ability	Personality	Accomplishment Record/Portfolio	Interview	Biodata	GPA	Task-based Questionnaire	Job Knowledge	SJT	Work Sample/Job Tryout	Role Play	Leaderless Group	In-basket	Essay
Validation Evidence	H	M	M	M	M	L	M	H	H	H	L	L	M	L
Content Validation Support	M	M	H	H	M	L	H	H	H	H	H	H	H	M
Reliability	H	H	M	M	M	H	H	H	M	H	M	M	M	M
Subgroup differences	H	L	L	L	L	H	M	M	M	L	L	L	M	H



Operational Constraints

**Balancing Function and Utility
with Real-Time Limitations**

Operational Constraints

- ◆ **Constraints may affect the following:**
 - **Development**
 - **Administration**
 - **Scoring/rating**

Operational Constraints

- ◆ **Budget/Hard Dollar Costs**
 - **Facilities – typically for administration**
 - **Equipment/tools – typically for administration**
 - **Examination Materials**
 - **Buy/lease/rent examination/instruments**
 - **Reproduction costs for examination materials, booklets**
 - **Answer sheets**

Operational Constraints

◆ Time Limitations

- Time availability of staff/SMEs for assessment
- Timetable for completion of assessment

◆ Expertise

- Examination/Selection/HR staff
- SMEs

Operational Constraints

- ◆ **Candidate Numbers**
 - **How many candidates to assess**
- ◆ **Support**
 - **HR support**
 - **Program/Stakeholder support**
 - **Organizational/Management support**



Determining KSAO and Test Weights

**Are complicated weighting
methods worth the effort?**

Why Bother Using Weights?

- ◆ For test construction, the assumption is that increased validity & utility will result from increased weight being placed on more “important” KSAOs
- ◆ For testing purposes, the assumptions are that differently weighted tests will:
 - 1) increase validity of the selection process
 - 2) decrease adverse impact, and
 - 3) increase utility



Weighting Methods for KSAOs



- ◆ **Job analysis results**
- ◆ **Unit weighting**
- ◆ **SME judgments**
- ◆ **Other, more complex methods**
- ◆ **Combinations of methods**

Weighting Methods for Tests

- ◆ **Job analysis results**
- ◆ **Equal weighting**
- ◆ **KSAO by test linkage judgments**
- ◆ **SME weighting – Holistic/guesstimates**
- ◆ **Other methods (e.g., by validity)**



Factors to Consider



- ◆ **Collinearity among predictors**
- ◆ **Variance in predictor and criterion scores**
- ◆ **Size of applicant pool**
- ◆ **Selection ratios**
- ◆ **Adverse impact**

Conclusions

- ◆ The more complex methods of KSAO weighting don't appear to make a meaningful difference in the rank order of applicants.
- ◆ Unless you are dealing with large numbers of applicants/data, the more complex methods for test weighting don't appear to make a meaningful difference in the rank order of applicants.

Documenting Test Plan Decisions

What needs to be documented?



What needs to be documented?



- ◆ **Decisions that were made**
- ◆ **How the decisions were made**
- ◆ **Support for decisions in published literature**



Test Plan Outline

- ◆ **Criteria Used to Evaluate Instrument Types/Measurement Methods**
- ◆ **Explanation of Why Each Measurement Method was Chosen**
- ◆ **KSAO by Measurement Method Matrix**
- ◆ **Description of each proposed measure**
- ◆ **Could use our model of test planning to guide report structure**

Uniform Guidelines

- ◆ *(5) Relationship between the selection procedure and the job*
 - If any steps were taken to reduce adverse impact on a race, sex, or ethnic group in the content of the procedure or in its administration, these steps should be described

Uniform Guidelines

- ◆ ***(6) Alternative procedures investigated.***
 - The alternative selection procedures investigated and available evidence of their impact should be identified (essential). The scope, method, and findings of the investigation, and the conclusions reached in light of the findings, should be fully described (essential).

Storing test plan materials

- ◆ **Electronic files**
 - Reports
 - Test materials
 - Data/syntax
- ◆ **Hard-copy data**
 - Paper and pencil surveys/rating forms
- ◆ **Background information**
 - On SMEs
 - On jobs



Technology Pros/Cons

Integrating Technology into the Examination Development Process

Technology Uses

- ◆ **Technology can be used in various phases of the selection/examination process:**

- Job analysis
- Examination development
- Scoring criteria development
- Examination administration
- Examination scoring/rating
- Pass point setting

**With a focus on
Examination
Development...**



Examination Development Phases

Working with SMEs to:

- ◆ **Design/conceptualize test instrument(s)**
- ◆ **Develop test instrument content**
- ◆ **Design/develop scoring criteria/rating system**
- ◆ **Develop candidate instructions/materials**
- ◆ **Pretest/pilot test instrument(s)**
- ◆ **Document test development decision points**



Technology Sources

- ◆ **Written Communication**
- ◆ **Telephone Conference Call**
- ◆ **Video Conference Call**



Technology Sources

- ◆ **Computer-Based**
 - **E-mail**
 - **Real-time E-chat**
 - **Software Tools**
 - **Spreadsheets**
 - **Electronic Surveys**

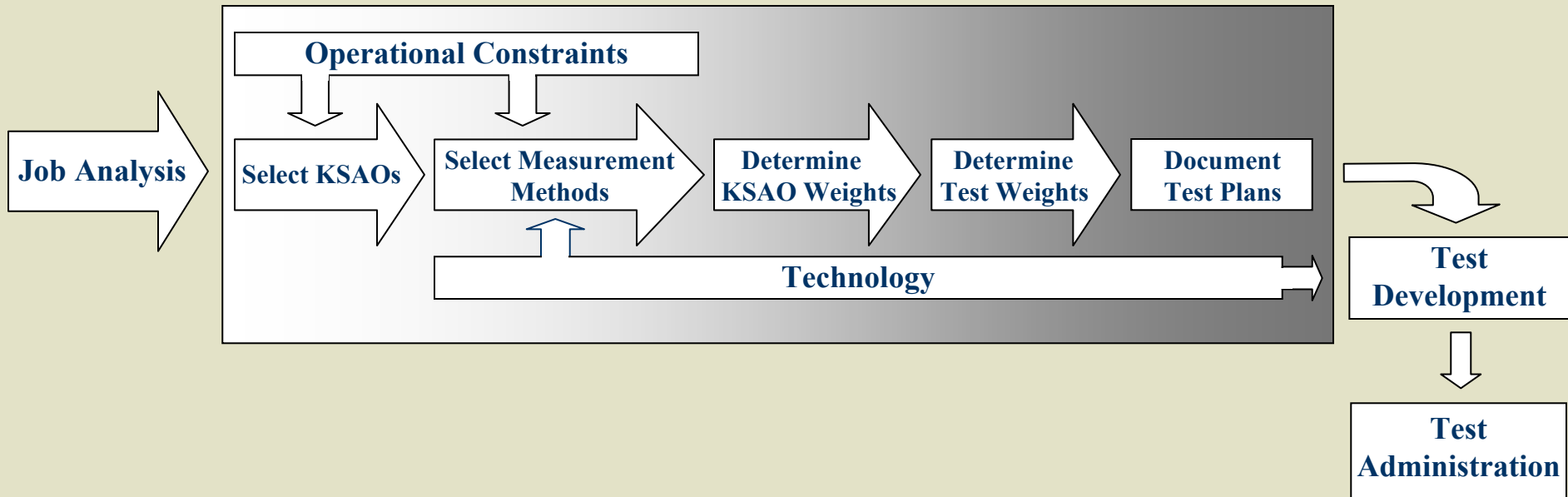


Technology Sources

◆ In-Person Meetings

- With all participants
- With multiple decentralized sub-groups
- One-on-one

Examination Flowchart



Selection Method Constraint Matrix - General Guidelines

	Structured Interview			Work Sample ⁷			Written-Open ⁸			Written-Closed ⁹			T&E Self-Rating			T&E Beh. Consist.		
	D	A	S	D	A	S	D	A	S	D	A	S	D	A	S	D	A	S
Budget¹			☼ ^a		☼ ^b	☼ ^a			☼ ^a		☼ ^c	☼ ^d		☼ ^c	☼ ^d			☼ ^a
Time²		☼ ^e		☼ ^f		☼			☼	☼								☼
Expertise³				☼	☼ ^g	☼			☼									☼
Facilities⁴					☼ ^h			☼ ⁱ			☼ ⁱ							
Candidates⁵		☼ ^j						☼ ^k						☼ ^l	☼ ^l		☼ ^k	
Support⁶		☼ ^m	☼ ⁿ		☼ ^m	☼ ⁿ			☼ ⁿ	☼ ^o								☼ ⁿ

D = Development stage of exam

A = Administration stage of exam

S = Scoring stage of exam

- ¹ Budget includes initial outlays as well as variable costs (e.g., scoring sheets)
- ² Time considerations include the exam deadline as well as availability of exam staff and SMEs
- ³ Expertise refers to expertise of the exam analyst(s) as well as subject matter experts (SMEs); checked indicates more compared to other methods
- ⁴ Facilities include rooms, equipment, etc.
- ⁵ Candidate group considerations include number as well as type of candidate (level)
- ⁶ Support is needed from exam management, program management/supervisors, and organizational/departmental executives (particularly for pass points)
- ⁷ Work samples include in-basket exercises, role plays, oral presentations, writing exercises, and assessment centers
- ⁸ Written open exams include short-answer as well as essay formats and are subjectively scored
- ⁹ Written closed exams use a variety of item formats (e.g., T/F, m-c) and include job knowledge, personality, situational judgment, and biodata exams

Selection Method Constraint Matrix - General Guidelines

- ^a Costs could be incurred if using paid raters
- ^b Work sample exams can be costly to administer if using expensive machinery or simulation apparatus
- ^c Costs could include scoring sheets and booklets (paper format) or hardware/software (computer format). Purchasing certain types of these types of exams can also be costly.
- ^d Typically requires scoring machine or variable cost if outsourced
- ^e Structured interviews tend to be very time consuming with large numbers of candidates
- ^f Work samples can be time-consuming to develop, depending upon their complexity
- ^g Work samples may require substantial knowledge of apparatus to administer properly
- ^h Work samples may require significant facilities depending upon how the skill is measured
- ⁱ Assembled exams require substantial facilities with large numbers of candidates
- ^j Most suitable when oral communication skill has been identified as important
- ^k Most suitable when written communication skill has been identified as important
- ^l Because dishonesty tends to be an issue on self-rating T&E exams, measures such as including "lie items" and warning candidates will likely be required
- ^m Obtaining management support can be challenging due to time requirements for raters and what may be perceived as "rigid" scoring systems
- ⁿ Obtaining support (and consensus) for who should rate the more subjective exams can be challenging
- ^o Certain types of multiple-choice exams (e.g., personality, biodata) may be difficult to garner management support for

Technology Pros and Cons for Examination Development Activities

Technology	Factors																
	Security		Equipment Costs		Group Dynamics		Speed of Interaction		Communication Clarity				Travel		Requires facilities	Requires "synch" with other members/groups	Easy to document
	Controlled (or easier to control)	Problematic /challenging to control	Typically minimal costs	Can be costly	Better/less problematic	Problematic (e.g., dominance)	Synchronous (instant response time)	Asynchronous	Clearer – allows for non-verbal cues	Clearer – allows for verbal cues	Fosters creative atmosphere	Synchronous sharing of visuals	Some travel	None required			
Written Communication <i>(Paper and Pencil)</i>		☹			☺			☺						☺		☺	☺
Telephone Conference Call	☺		☺			☹	☺			☺	☺		☺		☺		
Video Conference Call	☺			☹		☹	☺		☺	☺	☺	☺	☺		☺		
E-mail		☹	☺		☺			☺						☺			☺
Real-time E-chat		☹				☹	☺					☺		☺			
Software Tools <i>(e.g., spreadsheets)</i>		☹	☺		☺			☺						☺		☺	☺
In-person Meetings w/All Participants	☺		☺			☹	☺		☺	☺	☺	☺	☺		☺		
In-person Meetings w/Multiple Decentralized Sub-groups	☺		☺			☹	☺		☺	☺	☺	☺	☺		☺	☺	
In-person Meetings – one-on-one	☺		☺		☺		☺		☺	☺		☺	☺		☺	☺	

To use: consider the degree of applicability (high, medium, low) of each above-noted factor

Technology Pros and Cons for Examination Development Activities

	Pros	Cons
Written Communication (Paper & Pencil)	<ul style="list-style-type: none"> ✓ No travel required ✓ Convenient ✓ Equipment needs minimal ✓ Fewer problems with group dynamics (e.g., dominance) ✓ Very easy to document 	<ul style="list-style-type: none"> ✓ Security problematic ✓ Asynchronous interaction ✓ Multiple copies of documents required ✓ May not foster creativity (lack of real-time sharing of ideas) ✓ Non-visual and verbal cues absent, making communication more difficult ✓ Typically slow response time ✓ Must "synch" with other members; requires clear communication of progress, decisions, and results
Telephone Conference Call	<ul style="list-style-type: none"> ✓ No travel required ✓ Somewhat convenient ✓ Equipment typically on-hand ✓ Little training required ✓ Instant response time (synchronous interaction) 	<ul style="list-style-type: none"> ✓ Security may be problematic if document-sharing required ✓ Non-visual cues absent, making communication more difficult ✓ Group dynamics can be problematic (e.g., dominance) ✓ Difficult to share visuals ✓ Note-taker may be required
Video Conference Call	<ul style="list-style-type: none"> ✓ More secure than tele-conference ✓ No travel required ✓ Somewhat convenient ✓ Possible to share visuals ✓ Instant response time 	<ul style="list-style-type: none"> ✓ Specialized equipment required; can be costly ✓ Although present, non-visual cues may be difficult to observe ✓ Group dynamics can be problematic (e.g., dominance) ✓ Some training required ✓ Note-taker may be required

	Pros	Cons
E-mail	<ul style="list-style-type: none"> ✓ No travel required ✓ Convenient ✓ Equipment needs minimal; low cost ✓ Fewer problems with group dynamics (e.g., dominance) ✓ Very easy to document 	<ul style="list-style-type: none"> ✓ Security can be problematic ✓ Asynchronous interaction ✓ May not foster creativity (lack of real-time sharing of ideas) ✓ Non-visual and non-verbal cues absent, making communication more difficult ✓ Must "synch" with other members; requires clear communication of progress, decisions, and results
Real-time E-chat	<ul style="list-style-type: none"> ✓ No travel required ✓ Convenient ✓ Equipment needs minimal; typically low cost ✓ Instant response time 	<ul style="list-style-type: none"> ✓ Security can be problematic ✓ Non-visual and (often) non-verbal cues absent, making communication more difficult ✓ Group dynamics can be problematic (e.g., dominance) ✓ Can be difficult to document
Software Tools (e.g., spreadsheets, electronic surveys)	<ul style="list-style-type: none"> ✓ No travel required ✓ Convenient ✓ Equipment needs minimal; typically low cost ✓ Fewer problems with group dynamics (e.g., dominance) ✓ Very easy to document 	<ul style="list-style-type: none"> ✓ Security can be problematic ✓ Asynchronous interaction ✓ May not foster creativity (lack of real-time sharing of ideas) ✓ Non-visual and non-verbal cues absent, making communication more difficult ✓ Must "synch" with other members; requires clear communication of progress, decisions, and results

	Pros	Cons
In-person Meetings w/All Participants	<ul style="list-style-type: none"> ✓ Security easier to control ✓ Convenient ✓ Equipment needs minimal ✓ Instant response time ✓ Non-verbal cues allow for clearer communication ✓ Easier to establish creative atmosphere ✓ Can be easier to ensure full participation by each member 	<ul style="list-style-type: none"> ✓ Travel may be required ✓ Facilities required ✓ Group dynamics can be problematic (e.g., dominance) ✓ Note-taker may be required
In-person Meetings w/Multiple Decentralized Sub-groups	<ul style="list-style-type: none"> ✓ Security easier to control ✓ Equipment needs minimal ✓ Non-verbal cues allow for clearer communication ✓ Easier to establish creative atmosphere ✓ Can be easier to ensure full participation by each member 	<ul style="list-style-type: none"> ✓ Travel may be required, although can be minimal ✓ Facilities required ✓ Group dynamics can be problematic (e.g., dominance) ✓ Note-taker required ✓ Must "synch" with other groups; requires clear communication of progress, decisions, and results
In-Person Meetings One-on-One	<ul style="list-style-type: none"> ✓ Security easy to control ✓ Minimal facilities needed ✓ Equipment needs minimal ✓ Non-verbal cues allow for clearer communication ✓ Easier to ensure full participation by each member 	<ul style="list-style-type: none"> ✓ Travel may be required, although can be minimal ✓ Note-taker may be required ✓ Must "synch" with other groups; requires clear communication of results ✓ No real-time sharing of information and ideas