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Computer-Based Testing: *Considerations for Planning and Use*

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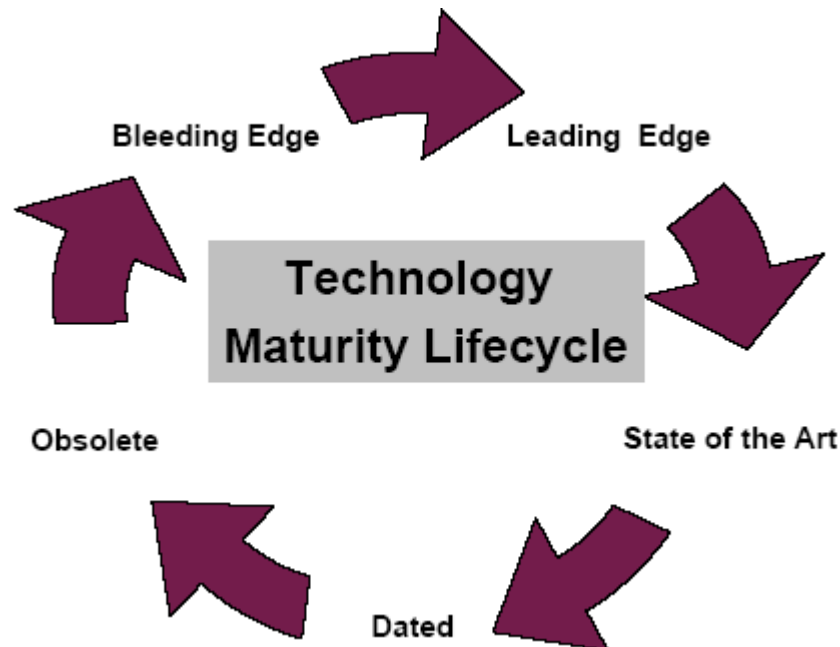
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Promoting Regulatory Excellence



Introduction

- Much has changed in 15 years!
 - Better, faster, cheaper technology
 - CBT has gone from bleeding edge to state-of-the-art





Looking Back

- 1995 CLEAR Resource Brief
 - Primary focus was transition from paper to CBT
 - Computer-Adaptive Testing was emerging
 - Most CBT-delivered questions looked the same as questions delivered in paper exams
 - Most CBT testing was done in vendor-owned testing centers

(Showers, 1995). Planning for Computer-based Testing: Resource Brief 95-4. Council on Licensure, Enforcement and Regulation.

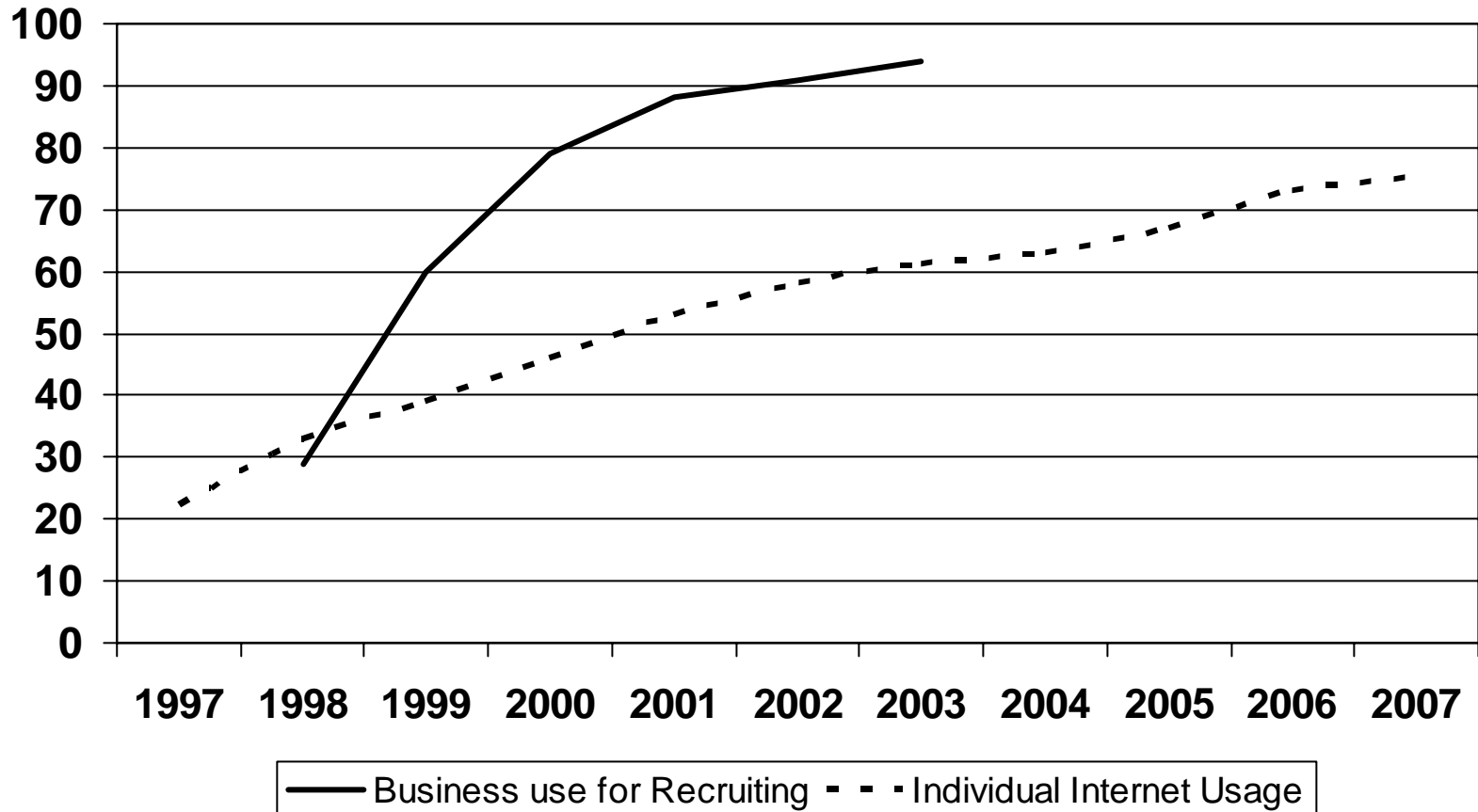


What's Changed?

- Technology drivers
 - Software automation
 - System integration
 - The Internet
- Social networks & communication
 - Internet adoption rates
 - Online banking, iTunes



Internet use has passed “Tipping Point”



Reynolds & Weiner (2009): Internet adoption percentage rates, for businesses ('98-'03) and individuals ('97-'07).
Sources: iLogos, 2003; U.S. Dept. of Commerce, 2002; Pew Internet and American Life Project, 2007.



CBT Considerations

1. Common CBT System Designs
2. Content Management Systems
3. Test Assembly & Security
4. Test Delivery Options
5. Key Considerations
6. Planning & Risk Management
7. Conclusions & Future Trends



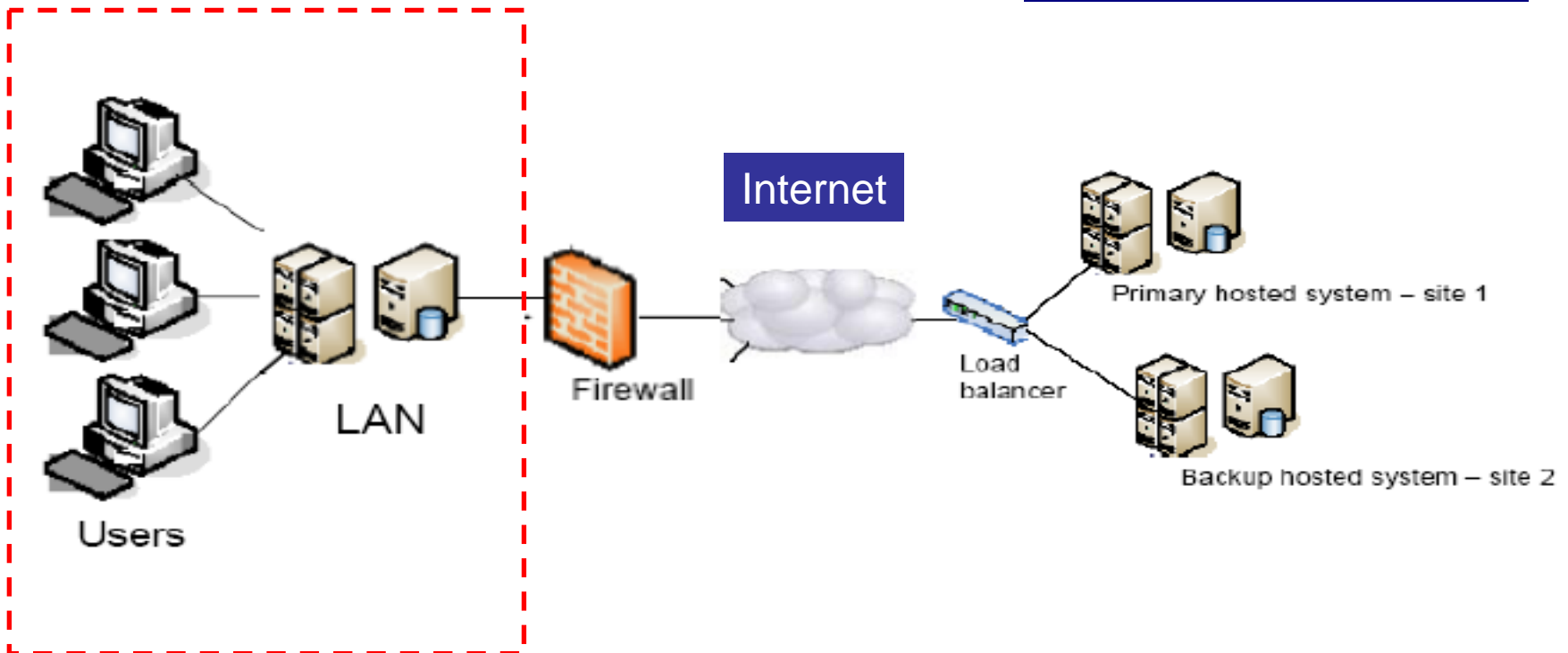
1. Common CBT System Designs

- CBT
- IBT
- Internet delivery methods
- Vendor system integration

CBT System - Example

Test Delivery

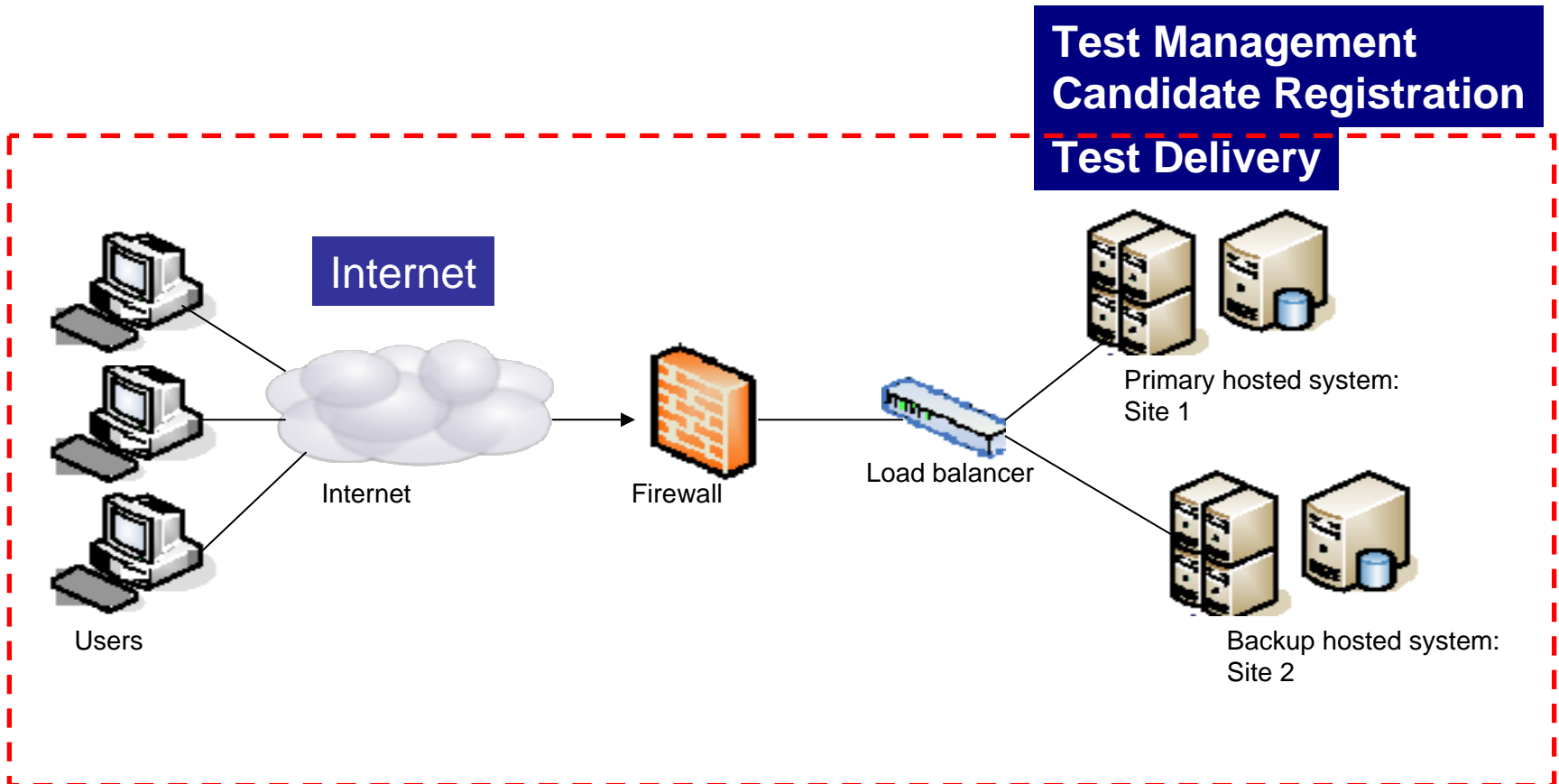
Test Management
Candidate Registration



Local Computer Network

Remote Server

IBT System - Example



Test Management
Candidate Registration
Test Delivery

Remote Server



Internet Delivery Methods

- Supporting different testing models
 - Server-based test pool delivery
 - Server-based test form delivery
 - Item-by-item online delivery during test
- Data capture & recovery methods
- Test purging & onsite retention policies



Vendor System Integration

- Collection of candidate fees
- E-commerce charges & policies
- Candidate registration & scheduling
- Test delivery & administration
- Scoring & reporting
- Invoicing



2. Content Management Systems

- Item bank & test form management
 - Vendor-managed systems
 - Client-managed systems



Vendor-managed Systems

- Typical Requirements
 - Programs fit tests to vendor's system & software
 - Vendor fees whenever tech support is required
 - Lead time to amend test items & introduce new forms
- Advantages
 - Program staff deliver item changes & new test forms to vendor staff to be implemented for them
 - Less need for program staff to learn vendor systems, limitations or software requirements
 - Shared costs with other users



Client-managed Systems

- Typical requirements
 - Program staff to master use of online test management tools
 - Software development, maintenance, and licensing fees
- Advantages
 - Control item content & enter new forms directly
 - Client-specific system features, functions & test centers



3. Test Assembly & Security

- Technology-driven testing practices
 - Computer-generated tests
 - Innovative item types
 - Security



Computer-generated Tests

- Item Bank-based Exams
 - Advantages vs. Fixed Forms
 - Cost, time, maintenance, exposure
- LOFT
 - Linear on the fly
 - Fixed-length equivalent test forms
- CAT
 - Adaptive
 - Variable length, non-equivalent test forms



Innovative Item Types

- Multi-media
- Multiple-answer multiple-choice, complex scoring
- Drag & drop
- Hot spot
- Constructed response & automated scoring
- Simulations – scenario tests
- Decision tree/branching



Security

- Proctoring & Management
 - Automated functions
 - Technology enhanced practices
- Biometrics
 - Fingerprint & palm print readers
 - Facial recognition software
- Data Forensics
 - Analytics
 - Digital signatures



4. Test Delivery Options

- Dedicated Test Center Networks
- On-Demand Temporary Test Centers
- Migrating Paper to CBT
- Event-based vs. On-demand Sessions
- Migrating among CBT vendors



Changing Array of CBT Vendors

- Prometric
- PearsonVue
- PSI
- Kryterion
- ACT (mainly in community colleges)
- AMP (mainly in H&R Block offices)
- Education & training networks (CATS, ITS, Pedagogue, NOCTI, Questionmark, et. al.)



Dedicated Test Center Networks

- Vendor-owned & operated test centers
- Contracted centers in college & community college test centers
- Contracted centers in private facilities such as corporate training centers
- Client-directed test center networks



On-Demand Temporary Test Centers

- Conferences & association meetings
- Employer facilities on the job
- Remotely proctored testing in candidates' homes and offices
- Limited security certification tests
- Unproctored practice tests



Migrating Paper to CBT

- Prepare, update & expand item banks
- Assemble test specifications or forms to meet delivery system requirements
- Set scoring & reporting criteria within vendor delivery system
- Amend test policies & practices to match CBT delivery details



Event-based vs. On-demand Sessions

- Paper-based programs are typically windows based
 - Mass testing sessions
 - Manual administration, scoring & reporting
- CBT suited for continuous testing
 - Automated administration & scoring
 - Immediate results
- Transition from “windows” to on-demand requires planning & transition



Migrating among CBT Vendors

- Monitor changes in delivery options
- Respond to changes in match between program needs & CBT delivery options
- Prepare, update & expand item banks
- Assemble test specifications or forms
- Set scoring & reporting criteria within new CBT vendor delivery system
- Amend test policies & practices to match CBT delivery details



5. Key Considerations

- Measurement Considerations
- Practical - Administrative Considerations
- Candidate Considerations
- Cost Considerations



Measurement Considerations

- Event testing
 - Allows analyses that may reveal problems in performance or data soon after they occur
- On-demand testing
 - Assumes that item pre-testing, calibration & scoring have identified most potential problems
- Small-volume programs
 - may retain the weak elements of both models
- Migration from paper to computer forms
 - Requires psychometric analysis – equivalence, testing time



Practical-Administrative Considerations

- Candidate registration & notification
- Verify test scheduling procedures
- Permitted test aids & references
- Retesting options
 - How soon vs. how many test forms?
 - May impact size of item pool required



Practical-Administrative Considerations

- Problem resolution policies & procedures
 - Loss of power to a test center
 - Loss of internet connection to a center
 - Chain of authority in resolving a problem
 - Proctor procedures for restarting tests
 - Waiving retest fees when a test center proctor fails to follow procedures
 - Discovering & resolving possible security breaches with follow-up investigations



Candidate Considerations

- Test-taking strategies may differ
 - CAT does not allow returning to a question
 - Forward-only testing also blocks returning to or skipping a question
- CBT security may change exam
 - Randomized item order
 - Randomized response order
- Candidates may expect instant response
 - Investigations of problems still take time



Cost Considerations

- Delivery models impact cost
 - Unproctored testing
 - Candidate-initiated proctored testing
 - Program-directed test center networks
 - Vendor-staffed & managed test centers
- Vendor policies impact candidate fees
 - Cancellation & rescheduling deadlines
 - Audit invoices carefully



6. Planning & Risk Management

- Risks to CBT Systems
- System Planning & Design
- Planning Checklist

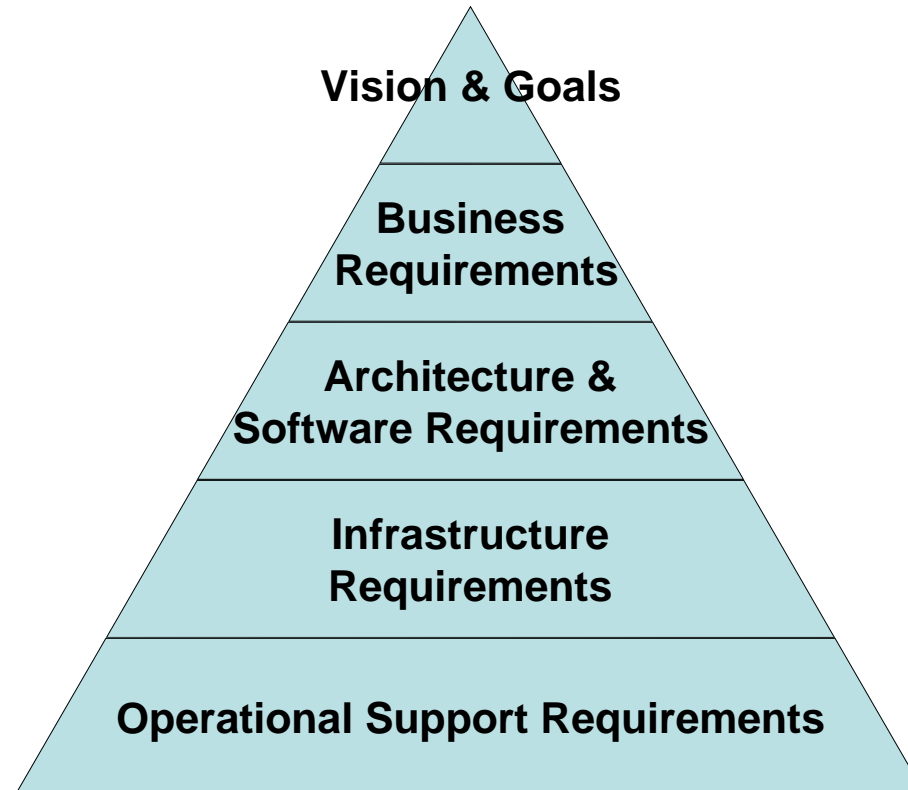


Risks to CBT Systems

- Planning: today & tomorrow
- Resources: people, funding
- Technology: design, implementation, maintenance
- Support: IT, client, candidate
- Management: change, delivery, growth



System Planning & Design



Reynolds & Weiner (2009)



Planning Checklist

- *Buy or Build?*
 - Conduct a cost-benefit analysis
- *Impact on existing business processes?*
 - Will changes in business processes will be required?
- *Implementation Planning*
 - Work with a range of SMEs: IT, Software developers, Psychometricians, Operations, Customer Service
- *Planning for growth and change*
 - Systems are dynamic and must be designed to accommodate changing needs and requirements.



7. Conclusions & Future Trends

- CBT is the state-of-the art
 - Best practices are maturing
 - Cost-effective, research-based guidance
- Assessment practices are evolving
 - Higher fidelity to the job
 - Shorter development cycles
- Delivery models are evolving
 - IBT, new devices
 - Technology-based proctoring



Thank you



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