

# NICE Webinar Series

NATIONAL INITIATIVE FOR **CYBERSECURITY** EDUCATION



Accredited Credential Programs- Building Trust Between Employers  
and Credential Providers Through Rigorous Assessments

May 19, 2021



## Center on Education and Training for Employment

***Accredited Credential Programs: Building Trust Between Employers and Credential Providers Through Rigorous Assessments***

***NICE Webinar, 2021 (May 19)***

***James T. Austin & Bridget McHugh***



# Overview

- As IT credentialing has increased over 30 years , what are some trends?
  - Credential Engine an emerging repository (ANSI-ANAB, Lumina, & collaborators)
  - Accreditation (voluntary) strengthens certification programs
  - Certification used by vendors, organizations, and government (DoD, IC, etc.)
- Grounds for concern
  - Confusion over standardization & types of credentials (certificates vs certifications)
  - Issues around credential meaning, content, quality, validity, comparability, and relationships between credentials covering same space
- Initiatives / innovations to address concerns
  - NICE framework – revised with addition of competencies – is MAJOR
  - Accreditation (voluntary) as a key avenue for evaluating credential quality
- Solar Winds / Colonial Pipeline show why skilled cybersecurity workforce is vital\*\*

# Our Learning Goals:

- Understand credentials and accreditation (quality)
- Which credential (certificate / certification) is appropriate for CTE / K12 cybersecurity pathways leading to PS education / Careers
- Overview creation of valid / reliable assessments used for certification (NOTE: more is needed for accreditation)
- Identify elements of ISO 17024 (2012) and NCCA (2016) standard and the processes managed by accreditation bodies
- Discuss stakeholder collaborations on CTE / K12 emerging workforce

# What is credentialing?



*Credentialing is the process to award some verifiable indicator that a student or person has demonstrated **qualification / competency in a content area** (IT Career Field, Cybersecurity Pathway)*

# Types of Credentials

- Credentials take a variety of forms. They include:
  - academic degrees at multiple levels (CS; familiar to faculty)
  - state licenses (mandatory for practice)
  - training certificates and assessment-based certificates (ABC)
  - continuing education units (CEU)
  - board certifications (prominent in health sciences)
  - internal (vendor-, factory-) credentials (prominent in IT/ Cyber)
  - digital badges (discrete learning, & certification / recertification)
- Our focus is certifications in Cybersecurity

# Why Use Credentials?

- Credentialing can “signal” info relevant to work performance:
  - Knowledge & Skills, Competencies (NICE Framework)
- Provides data during transition points (HS – PS – Labor Market)
- Adelman’s (2000) “parallel PS universe” emphasized IT
  - HS to PS to labor market (career-spanning)
- Enables lifelong learning, supports “stacking” of credentials
- Remember: credentials are NOT “created equal” and there can be significant differences in quality, meaning, and perception

# Certificate vs Certification

	Certifications	Certificate Programs
Focus	<ul style="list-style-type: none"> <li>• Verifying education/ training &amp; experience obtained elsewhere</li> <li>• Assessing current KSA</li> <li>• Maintenance: learning / competence</li> </ul>	<ul style="list-style-type: none"> <li>• Educating/training individuals to achieve intended learning objectives (ILOs)</li> <li>• Assessing attainment of ILOs</li> </ul>
Core Elements	<ul style="list-style-type: none"> <li>• Eligibility requirements (prerequisites)</li> <li>• Assessment + maintenance of competence</li> </ul>	<ul style="list-style-type: none"> <li>• Learning event(s) MAJOR FOCUS</li> <li>• ILO attainment assessed</li> </ul>
Attributes	<ul style="list-style-type: none"> <li>• Can be revoked</li> <li>• Designation &amp; associated acronym</li> </ul>	<ul style="list-style-type: none"> <li>• Cannot be revoked</li> <li>• No designation/ acronym</li> </ul>
Content Domain	<ul style="list-style-type: none"> <li>• Based on formal job/practice analysis (occupation across settings) with verification</li> </ul>	<ul style="list-style-type: none"> <li>• Based on curriculum, derived from procedures that <u>may</u> be formal</li> </ul>
Cyber-Ed Strategies	<ul style="list-style-type: none"> <li>• Orient to desirable creds &amp; prereqs</li> <li>• Determine preparation strategies</li> </ul>	<ul style="list-style-type: none"> <li>• Design certificates around NICE &amp; consider accreditation standards</li> </ul>



# Credentialing Examinations

- Chain of content evidence from job task analysis to blueprint to item development to maintenance of the item bank (supporting > 1 “forms” of exam)
  - Scores are criterion-referenced to NOT norm-referenced
- By examination score, “passing” persons showed their knowledge / skill by meeting a practitioner-recommended cutoff (typical range: 65-80%), while “failing” did not
  - Passing & failing levels ordered in their knowledge-skill (“warrants”)
- Certification criteria: apply, meet prereqs., take / pass exam(s), accept ethics code
- Purposes: valid/ reliable assessment of “Required Competence” (blueprint)
  - Industry knowledge (IT Basics, Cyber – Penetration Tests, Incident Handling);
  - Key occupation-related skills, abilities, and relevant competencies
- Format: Knowledge (multiple choice), practical (performance), combination (multiple hurdle or composite)

# Credentialing Examinations

- Exams are purpose-built to evaluate occupational competency (fairly, validly)
  - Initial framework / scheme requires scope/ purpose and content domain
  - Nutshell: Job-Task Analysis consists of a panel, followed by a verification survey (“survey says”) and panel review of results
    - Panel develops task statements (grouped) to reflect WHAT is done
    - Panel develops knowledge / skill (KS) to reflect HOW tasks done
    - NICE framework with components rated (via survey) would qualify
    - (ISC)2 defines and revises Common Body of Knowledge using JTA
    - Surveys: background info, task & K-S ratings, global (Qualtrics or other)
    - Response rates, missing data, & repeated statements used to evaluate
  - Analyses yield weights (# items for duties/ tasks or K-S), often crossed with cognitive rigor (recall, application, analysis / evaluation is a common system)

# Credentialing Examinations

- Blueprint represents the transfer of work domain to exam development, guides item writing by establishing composition of item (question) bank to support exam forms
- Aids communication with stakeholders (employers, educators, learners) – how?
  - Employers could: compare their job analyses (NOT job descriptions) to the body of knowledge / skill in the certification, evaluate value proposition
  - (Local, State, & National) educators could: ensure that scope & sequence of educational-technical content standards align to certification BoK
  - Learners could: review candidate handbooks at certifier website to see if they qualify, how to prepare
- **What could certifying bodies do to support these three stakeholder populations? Let us count the ways!!**

# Credentialing Examinations

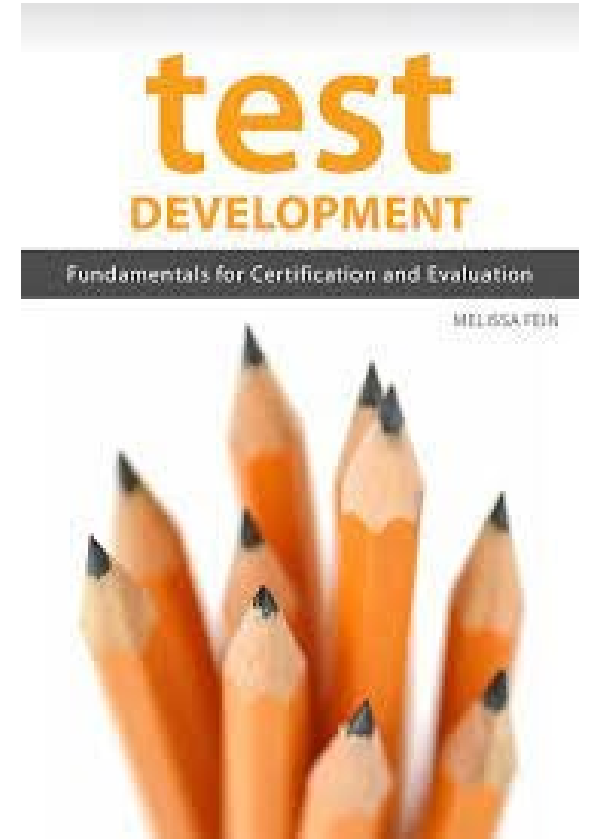
- Item Writing (IW) remote or in-person (pandemic balanced), test security crucial
  - Knowledge-cognitive skill measured by MC questions
    - Rigor can be enhanced using scenarios, figures, and other “auxiliaries”
  - Practical “items” created from task(s) with skill as the psychological construct but REQUIRE a scoring guide for assessors to evaluate performance
  - Combos must balance coverage of blueprint/content outline (duplication)
- Item review occurs after item development:
  - Edits / graphics, Subject Matter Expert ratings, psychometric analysis of ratings
- ALWAYS write more items than needed to support multiple forms (equated):
  - Ratings and field test data yield stats for form selection (match blueprints)
  - Keep items in a secure database with programming (queries, meta-data tagged to item – difficulty (p), item differentiation, “exposure”, “option” functioning, etc.

# Credentialing Examinations

- Passing point (cutoff, cut score) is very important because it is the “standard” against which exam performance is judged – judgments informed by data
  - Focus usually on minimal / borderline competence (rather than top-down)
  - Balance correct decisions & decision errors (False Positive & False Negative)
- Many, many methods exist (Cizek, 2012 provides a recent review)
  - Angoff variations are probably most common, defensible
  - Bookmark methods are increasingly used
  - Extended Angoff, analytic judgment, body of work, & dominant profile
- Recruit a panel ( $N \geq 10$ ), train panelists on minimal competence and allow for practice / sharing, make TWO rounds of ratings with discussion between (sometimes additional information is provided during Round 2, analyze judgments, submit recommendations to higher authority, create technical documentation)

# Credentialing Examinations

- Resources for credentialing examination development: several key sources
  - Lane, Raymond, & Haladyna (2015). *Handbook of test development* (2<sup>nd</sup> ed.)
  - Henderson (2019). *Certification: The ICE handbook* (3<sup>rd</sup> ed.) – single best resource (IMHO)
  - Fein (2012). *Test development*.
- As stated earlier, certification body websites provide information for candidates, employers, educators, etc.
  - (ISC)2 is at <https://www.isc2.org/>
- Psychometric or delivery vendors: ACS Ventures, Alpine, Pearson VUE, Prometric, PSI, & Yardstick (YAS)



# SHORT BREAK #1

- Please submit any questions through the webinar functions

# Growing Trend: Accreditation

- **Accreditation of Certification Programs (NOTE: ISO 17011 covers accreditation bodies)**
  - Educators (higher education) familiar with program or institution accreditation (*mandatory*)
  - For certification progs, *voluntary* (accreditation bodies review applications, check for conformity)
    - Pros:
      - Standards and guidelines for program definition (road map): certifications or certificates
      - Quality assurance for certification or certificate credentials: if program chooses to apply
      - Federal level interested in accreditation for creds across government (DoD, IC)
    - Cons:
      - Alignment with K12 Cybersecurity Education-Training (key role for NICE & framework!!)
      - Difficult for HS students to meet prerequisites to sit for the examination (pre-HS diploma)
- Accreditation requires:
  - Policies & procedures, appropriate persons to conduct work, & documentation (vital)
  - Application process with documentation and auditing / review (see below for steps)
  - If accreditation granted, “surveillance” of certification bodies requires annual reports to accreditor



## Key Accreditors for Certifications and Certificates

Accrediting Body	Certificate Programs	Certification Programs
ANSI (since 2003) <a href="https://anab.ansi.org/credentialing/">https://anab.ansi.org/credentialing/</a>	<del>ASTM E2659-18 Std Practice for Certificate Progs</del>	ISO/IEC 17024:2012 (updated from 2003 original) <i>Conformity assessment – General requirements for bodies operating certification of persons – 10 clauses</i>
NCCA (ICE) (since 1977) <a href="http://www.credentialingexcellence.org/NCCA">www.credentialingexcellence.org/NCCA</a>	<del>ANSI/NOGA 1100 – (2019) Std for Assessment-Based Certificate Progs</del>	NCCA <i>Standards for the Accreditation of Certification Programs</i> (2016) – 24 standards from Purpose to Renewal (currently under revision)
ICAC (since 1996) <a href="http://www.icacnet.org/affordable-accreditation/">www.icacnet.org/affordable-accreditation/</a>	<del>N / A at this time</del>	ISO/IEC 17024:2012 <i>Conformity assessment – General requirements for bodies operating certification of persons – 10 clauses</i>

# ISO 17024 Accreditation

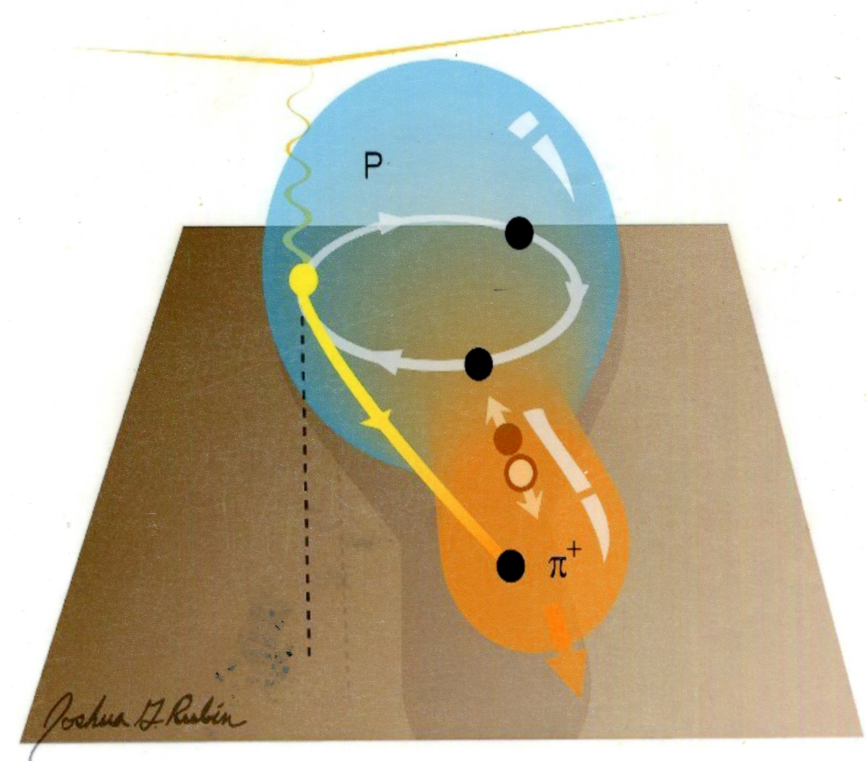
## What are the key elements: Depends on “role”

- 10 clauses: certification scheme & process
  - Scheme = framework fit around “certification process” from application to suspension
  - Process = apply, test, decision to award
- Management system an important requirement
- Reference: Judd’s *17024 Compliance Handbook templates (served as an ANAB auditor)*

ANSI/ISO/IEC

# 17024 Compliance Handbook:

*Guidance and Templates  
for Personnel Certification Bodies*



# ISO 17024 Accreditation

1. Scope
  2. Normative references
  3. Terms and definitions
  4. General requirements (important, but outside our purview)
  5. Structural requirements (important, but outside our purview)
  6. Resource requirements (important, but outside our purview)
  7. Records and information requirements (important, but outside our purview)
  8. **Certification schemes (focus today)**
  9. **Certification process requirements (focus today)**
  10. Management systems requirements (important, but outside our purview)
- Annex A - Principles



# ISO 17024 Accreditation

## **Scheme is the framework; Process is the steps for candidates**

- Scheme includes 6 sub-clauses
  - 8.1 shall be a scheme (shall=must for ISO)
  - 8.2 elements: Scope to Code of Ethics
  - 8.3 process reqs: Initial Certification to Scope Change
  - 8.4 documentation required (membership, discussions, deliberations, votes & decisions of SC)
  - 8.5 reviewed-validated on an on-going, systematic basis
  - 8.6 scheme ownership requirements

# ISO 17024 Accreditation

## **Scheme is the framework; Process is the steps for candidates**

- Elements of a scheme / framework (8.2):
  - Scope of certification (Name/designation, level, population, etc.)
  - Job-Task Description: JTA with verification (very important)
  - Required competence (Exam Blueprint+ Knowledge-Skill)
  - Abilities (Physical, Psychomotor, Cognitive)
  - Prerequisites (education, experience, etc.)
  - Code of Conduct / Ethics

# ISO 17024 Accreditation

## **Scheme is the framework; Process is the steps for candidates**

- Process requirements of a scheme / framework (8.3)
  - Criteria for INITIAL certification & recertification
  - Assessment Mechanism for INITIAL certification & recertification (plus a blueprint)
  - If applicable, SURVEILLANCE methods / criteria
  - Criteria for SUSPENDING or WITHDRAWING certification
  - If applicable, criteria for CHANGING SCOPE/LEVEL

# ISO 17024 Accreditation

**Scheme is the framework; Process is the steps for candidates**

◎ Other requirements of a scheme / framework (8.4 to 8.6)

-8.4 documentation required (membership, discussions, deliberations, votes & decisions of committee)

-8.5 reviewed-validated on an on-going, systematic basis

-8.6 scheme ownership requirements (types of owners)

# ISO 17024 Accreditation

## Clause 9: Process covers steps for candidates

- 9.1 Application process
- 9.2 Assessment process
- 9.3 Examination process
- 9.4 Decision on certification
- 9.5 Suspending, withdrawing, or reducing the scope of certification
- 9.6 Recertification process
- 9.7 Use of certificates, logos and marks
- 9.8 Appeals against decisions on certification
- 9.9 Complaints



# How to earn accreditation:

## Stages of accreditation application process

**Step 1**  
Become familiar with ANAB Personnel Certification [Policies and Procedures](#) by visiting the [Personnel Certification Documents and Resources](#) section of this website. Purchase and study the standard [ISO/IEC 17024](#).

**Step 2**  
Attend a [Personnel Certification Accreditation Workshop](#) to understand the requirements of the standard and to identify documents that are required to meet the standard.  
**Note:** Participation in a workshop and purchasing ISO/IEC 17024 are **not** mandatory requirements for ANAB accreditation.

**Step 3**  
Recommended: Request ANAB to conduct an [Informational Visit](#) (pre-assessment). This is normally performed by one assessor within one day and helps organization determine its compliance with the requirements through this "live test" before a more expensive full initial assessment is conducted.  
**Information visit is billed at \$1,250 per assessor per day plus expenses.**  
**Note:** An information visit is **not** a mandatory requirement for ANAB accreditation.

**Step 4**  
Fill out preliminary application form [PCAC-FR-503](#).

**Step 5**  
Upon receipt of the eligibility letter, pay the application fee and complete and submit **PCAC-FR-504** in three copies with the supporting documents to ANAB. Please refer to all the [guidance documents](#) available online. **PCAC-FR-504** will be sent to you upon preliminary eligibility approval.

**Request a Quote**

**EXPLORE MORE**

- Overview
- How to Apply
- Accreditation Directory
- Documents and Resources
- Personnel Certification Accreditation Committee
- Feedback

WE'RE HERE TO HELP

<https://anab.ansi.org/credentialing/personnel-certification/how-to-apply>

## Step 6

Submit additional documents that are requested by the assessment team.

## Step 7

Prepare and participate in ANAB onsite assessment.

## Step 8

Provide necessary documents to close any nonconformity identified during the assessment process.

## Step 9

Upon successful closure of all nonconformities, the certification body will be awarded accreditation under ISO/IEC/17024.

## Step 10

Ensure compliance with ANSI standards!

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If you have further questions, please contact Eveyln Nash at 202-331-3638 or [enash@anab.org](mailto:enash@anab.org).



The ANSI National Accreditation Board (ANAB) is a wholly owned subsidiary of the American National Standards Institute (ANSI), a nonprofit corporation.

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[Contact ANAB](#)

<https://anab.ansi.org/credentialing/personnel-certification/how-to-apply>

# NCCA Accreditation

## **Institute for Credentialing Excellence (formerly NOCA, since 1977)**

- Autonomous: National Commission on Certifying Agencies is accrediting body
  - Commissioners represent administration/operations and psychometrics
- Published 2016 standards for accreditation (under revision, expected 2021-22)
- Certifying bodies submit applications (3 windows / year), internal reviews conducted (adequate or inquiry), then applications are reviewed / voted upon by Commissioners
  - If conformity established, accreditation is awarded
  - If non-conformity exists for one or more standards, time-limited process to correct
  - Accreditation, like certification, granted for a specific “term” (5 years is common for accreditation, while 3-5 years is common for certifications)
- Conducted Remote Live Proctoring pilot, also allowed exemptions during 2020-21

# NCCA Accreditation

## **Institute for Credentialing Excellence (formerly NOCA, since 1977)**

- 24 NCCA Standards (2016) are grouped into 5 categories
  - (1-5) Purpose, Governance, & Resources
  - (6-12) Responsibilities to Stakeholders
  - (13-21) Examinations (SME Panels, JTA, Test Specifications, Item Writing, Standard Setting, Test Administration, Scoring-Reporting, Reliability, Examination Equating)
  - (22-23) Maintaining Certification
  - (24) Maintaining Accreditation

# NCCA Accreditation

- NCCA standards comparable to the ISO standard, but provide specificity (essential elements & commentary)
- ICE is an organization bringing together stakeholders (certification bodies, vendors, etc.); ANAB is accreditor
- ICE offers Credentialing Specialist training (certificate) and is creating a Credentialing Professional Certification



# Examples: Accredited Cyber Certs

19	<a href="#">CertNexus</a> Certified Internet of Things Practitioner (CIoTP) CyberSec First Responder (CFR)	1208
20	<a href="#">Cisco Systems</a> <a href="#">CCNA (Cisco Certified Network Associate) CyberOps</a> <a href="#">CCNA (Cisco Certified Network Associate) Route and Switch</a> <a href="#">CCNP (Cisco Certified Network Professional) Route and Switch</a> <a href="#">Cisco Certified Network Associate Security (CCNA Security)</a> <a href="#">Cisco Certified Network Professional Security (CCNP Security)</a>	0734
21	<a href="#">CompTIA Certifications, LLC</a> <a href="#">CompTIA A+ ce</a> <a href="#">CompTIA Advanced Security Practitioner (CASP+)</a> <a href="#">CompTIA Cloud+ Certification Exam</a> <a href="#">CompTIA Cybersecurity Analyst (CySA+)</a> <a href="#">CompTIA Linux+ ce</a> <a href="#">CompTIA Network+ ce</a> <a href="#">CompTIA PenTest+</a> <a href="#">CompTIA Security+ ce</a>	0731



# Judgments Of Accredited Cyber Certs

In the certification space of Cyber, few are widely accepted as "Industry Standard"

1. Certified Ethical Hacker (CEH)
2. CompTIA Security+
3. Certified Information System Security Professional (CISSP)\*\*
4. Certified Information Security Manager (CISM)
5. Certified Information Systems Auditor (CISA)
6. NIST Cybersecurity Framework (NCSF)
7. Certified Cloud Security Professional (CCSP)
8. Computer Hacking Forensic Investigator (CHFI)
9. Cisco Certified Network Associate (CCNA)

# SHORT BREAK #2

- Please submit any questions through the webinar functions



# People Behind Scenes

- Best exams driven by certification bodies who manage teams of experienced practitioners, psychometricians, IT, and other specialists
- My prototype reflective / experienced practitioner: Tom O'Neill, Butler Career & Technology Schools (Butler Tech) in SW Ohio (networks, cyber among his courses)
  - Tom an instructor since 2001, provides PS level information in HS classes at Ross High School (satellite location of Butler Tech)
  - Item writer for state testing system (we met “back in the day”)
  - Struck by rigor (Tom’s items) and reactions (peer instructors)
  - Provides real world experience to his students (PS+RW)
  - Coaches award-winning student teams in competitions
- NOTE: Tom was warned in early May about his “prototypicality”!!



# People Behind Scenes

- Best exams driven by certification bodies – teams of seasoned-novice practitioners, IT, psychometricians, and many other specialists
- Prototype reflective / experienced psychometrician: Liberty Munson, PhD
- Liberty's doctorate from University of Illinois (I-O Psychology, Psychometrics)
  - Began with Microsoft after graduate school
  - Current position: Director of MS Certification programs (new areas: Azure, Power Platform)
  - Contributor to field (ATP, ICE, WorkCred, .....), mentor,

Who is this psychometrician?



# People Behind Scenes

- Accreditation bodies work in teams as well
- Prototype reflective / experienced accreditation director: Linda Anguish is the director for I.C.E.
- Linda's background featured work for a certification body (accredited, naturally)
- In her current role, Linda works with other I.C.E. staff and consultants, the NCCA Commissioners, and certification bodies before, during, and after their submission – she is a hub for many
- Involved in revising the NCCA Standards (ongoing)



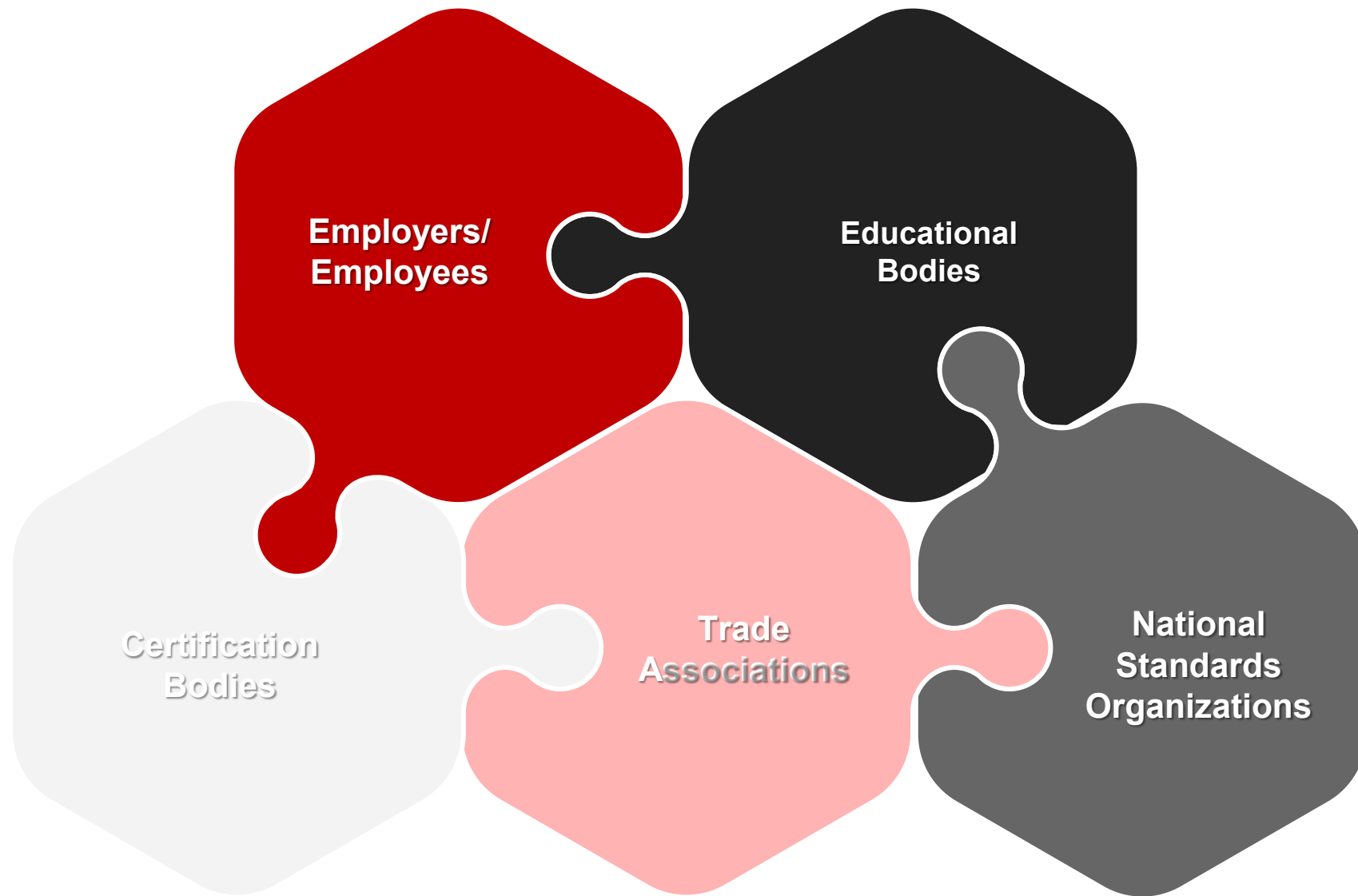
# Stakeholders in Credentialing

*Credentials are widespread, stakeholders are numerous, and value propositions may vary*

*We focus on relationships between:*

- Employers*
- Education (CTE, K12)*
- Certification bodies*





# Stakeholders in Credentialing

**Employers-** Employers often look at degrees / certifications as indicators of competence, and may use them in hiring, promotion, & placement decisions. Certification includes healthcare, personal fitness, & information technology

**Education Community-** produces potential certification holders, Career-Technical & K-12 programs with pathways to PS education and Cyber careers

**Certification Bodies-** Major hardware / software manufacturers (MS, Cisco), certification bodies such as (ISC)2; CompTIA (vendor-neutral)

**Trade Associations-** Organizations representing membership, including Institute for Credentialing Excellence (I.C.E.) and Association of Test Publishers (ATP; Divisions: Certification, Licensure & Workforce Credentialing, etc.)

**National Standards Organizations-** American National Standards Institute (ANSI) is the U.S. member of ISO and has authority to designate Standards Developing Organizations (SDO); ANSI National Accreditation Board (ANAB) handles the accreditation activities for both certifications (focus) and certificate programs (very brief coverage)

# Stakeholder Collaborations

- Credentialing interest (signaling independent of degrees, “parallel universe”)
  - Career start without post-secondary degree (through self-study, training)  
– **parallel universe**
  - How can K12 (HS) education enter the dining hall (be “at the table”)?
- How can stakeholders work together better?
  - Value for each stakeholder group collaborating?
    - Certification bodies increase awareness in HS populations (market)
    - PS as a “bridge” between HS and career, not necessarily
    - Certification bodies do not want to compromise exams, but could evaluate prerequisites (education, experience) to minimize barriers

# Stakeholder Collaborations

- Government is another key stakeholder
  - NICE is a prime example
- Bipartisan bills introduced in House and Senate to allow 529 College Savings Plan funds to pay certification and recertification costs
  - [Freedom to Invest in Tomorrow's Workforce Act](#)
- State governments are approaching credentials by paying for costs if the candidate earns the certification



# Conclusions

- Credentialing (independent of degrees), focus is on persons
  - Career start without PS degree (self-study, training) – **parallel universe**
- No vetted value proposition for certification or accreditation for EMPLOYERS
  - Do cred OR accredited cred help bottom line? Predict job performance?
  - Value of certification & salary surveys suggest positive relationship
  - Accredited credentials are assumed better by most stakeholders
- Accreditation expense (expensive although this varies by accreditor)
- NCCA ~\$2655; does not use auditors (can prep ISO 17024 WorkCred, with NICE input, built a framework for certs within Bachelors-level degrees, but articulating to HS remains problematic)
- For HS: Screen certs for accreditation prior to recommending

**Questions?**  
**DISCUSSION**

# Contact Information

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Psychometric Team Lead

# Thank You for Joining Us!

## **Upcoming Webinar:**

“Digital Citizenship: Safety and Security for an Online World”

**When:** Wednesday, June 16, 2021, 2:00-3:00PM ET

## **Register:**

<https://nist-nice.adobeconnect.com/webinarjune2021/event/registration.html>

[nist.gov/nice/webinars](https://nist.gov/nice/webinars)