

Systems-based Framework for Future Air & Space Cyber Workforce Investment, Development, and Integration

Dr. Adedeji B. Badiru
Air Force Institute of Technology
and

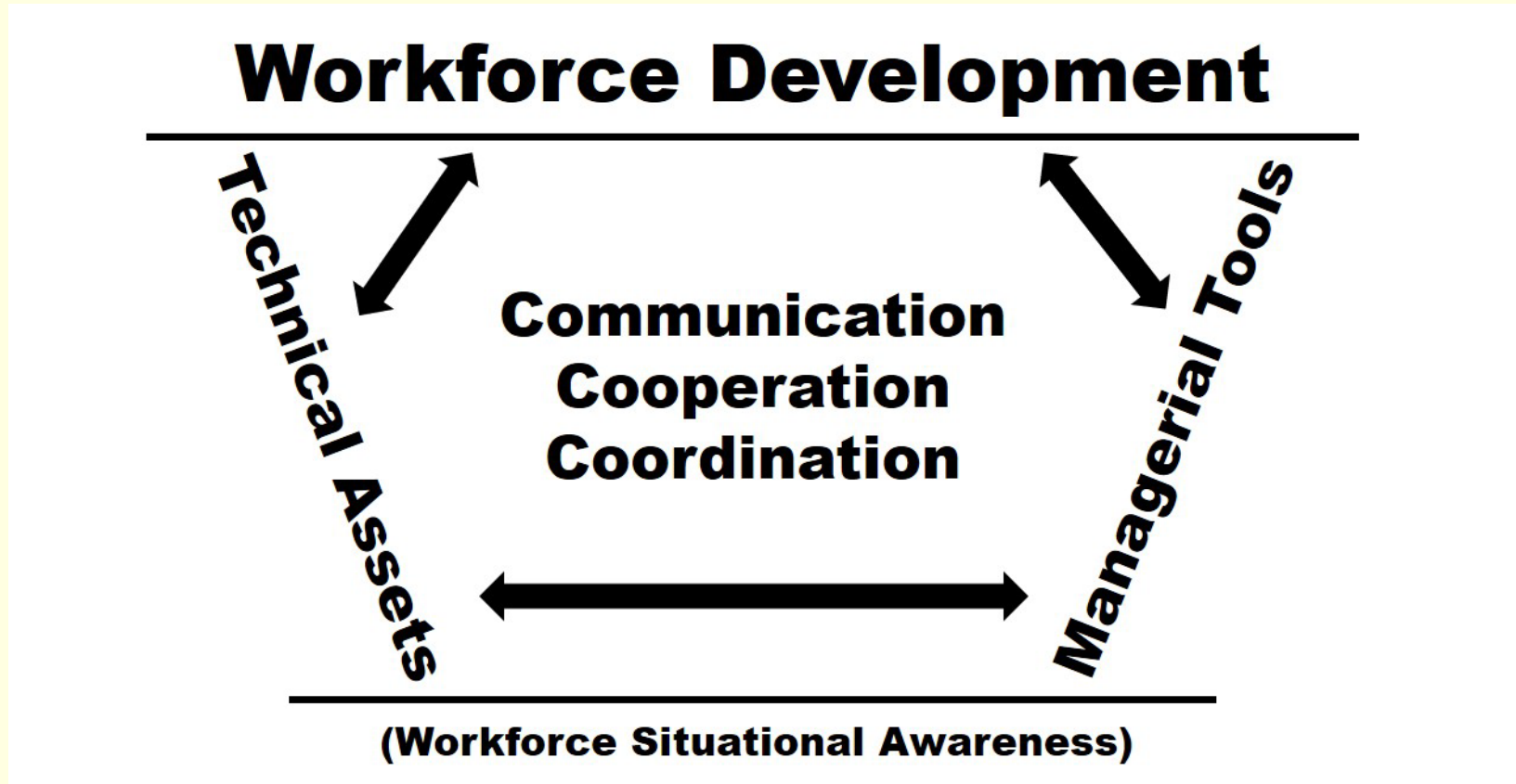
Miss Katelyn Smittle

DAFITC Conference
Montgomery, Alabama, 28-30 August 2023

Problem Statement

- Operations work best when addressed from a systems perspective.
- Future workforce development (WFD) is a major item of attention for all organizations
- Cyber workforce is currently in short supply and continue as such into the future
- We must tap into the population that will become the future workforce
- Unfortunately, the decision makers and policy makers of this era come from a population that will not be a part of the future workforce.
- Mitigating organizational and operational impediments translates to leveraging the perspectives of the present younger generation (e.g., college students and high school students)

Elements of Cyber Workforce Development



Recommended WFD Investment Strategy

- An integrated systems approach is desired.
- A **system** is a collection of interrelated elements whose collective output, together and in unison, is higher than the mere sum of the individual outputs. For a Systems approach to be practical, profitable, realizable, and sustainable, systematic frameworks must be instituted, subject to real-world constraints.
- Dealing with objectives and constraints creates a need for the **involvement** of the younger generation.

The Value of Involvement

“Tell me and I forget;
Show me and I remember;
Involvement and I understand.”
- Confucius

- Involving the younger generation now, at the college and high school levels, will pave the way for a proper understanding of the challenges and opportunities.
- It is in this context that the co-presenter of this paper is a high school student.

What does the future workforce care about?

- Environmental issues
- Social justice
- Sustainability
- Earth-friendly manufacturing and products
- International collaboration
- IT-influenced efficient buildings
- Fairness and social responsibility
- Stable and reliable cyber infrastructure

Montana Case Example

MONTANA

Young activists win 1st climate change trial

By Amy Beth Hanson and Matthew Brown
Associated Press

HELENA, MONT. — A Montana judge on Monday sided with young environmental activists who said state agencies were violating their constitutional right to a clean and healthful environment by permitting fossil fuel development without considering its effect on the climate.

The ruling in the first-of-its-kind trial in the U.S. adds to a small number of legal decisions around the world that have established a government duty to protect citizens from climate change.

District Court Judge Kathy Seeley found the policy the state uses in evaluating requests for fossil fuel permits — which does not allow agencies to evaluate the effects of greenhouse gas emissions — is unconstitutional.

Judge Seeley wrote in the ruling that “Montana’s emissions and climate change have been proven to be a substantial factor in causing climate impacts to Montana’s environment and harm and injury” to the youth.

However, it’s up to the state Legislature to determine how to bring the policy into compliance. That leaves slim chances for immediate change in a fossil fuel-friendly state where Republicans dominate the statehouse.

Julia Olson, an attorney for the youths, released a statement calling the ruling a “huge win for Montana, for youth, for democracy, and for our climate.”

“As fires rage in the West, fueled by fossil fuel pollution, today’s ruling in Montana is a game-changer that marks a turning point in this generation’s efforts to save

the planet from the devastating effects of human-caused climate chaos,” said Olson, the executive director of Our Children’s Trust, an Oregon environmental group that has filed similar lawsuits in every state since 2011.

Emily Flower, spokeswoman for Montana Attorney General Austin Knudsen, decried the ruling as “absurd,” criticized the judge and said the office planned to appeal.

“This ruling is absurd, but not surprising from a judge who let the plaintiffs’ attorneys put on a week-long taxpayer-funded publicity stunt that was supposed to be a trial,” Flower said. “Montanans can’t be blamed for changing the climate — even the plaintiffs’ expert witnesses agreed that our state has no impact on the global climate. Their same legal theory has been thrown out of federal court and courts in more than a dozen states. It should have been here as well, but they found an ideological judge who bent over backward to allow the case to move forward. ...”

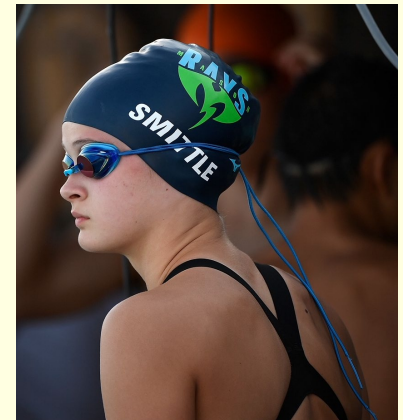
Attorneys for the 16 plaintiffs, ranging in age from 5 to 22, presented evidence during the two-week trial in June that increasing carbon dioxide emissions are driving hotter temperatures, more drought and wildfires and decreased snowpack. Those changes are harming the young people’s physical and mental health, according to experts brought in by the plaintiffs.

The state argued that even if Montana completely stopped producing CO2, it would have no effect on a global scale because states and countries around the world contribute to the amount of CO2 in the atmosphere.

Introduction to Co-presenter: Miss Katelyn Smittle



- Gen Z Model
- High School Junior
- Student-Athlete
- Represent the future workforce



The Value of Gen Z

Depending on what source you're using, people in Gen Z were born between 1996 and 2012.

- Technology advancements since 1996
 - 1996, Google was invented
 - 1997, Broadband was invented
 - 1999, WiFi was available to the public
 - 2001, The iPod was invented
 - 2001, Digital Satellite Radio was invented
 - 2007, The Kindle was released
 - 2007, iPhone hits the market
 - 2010, iPad becomes available to the public

REFERENCE: "Technology from 1996-2012 Timeline | Timetoast Timelines." *Timetoast Timelines*, <https://www.timetoast.com/timelines/technology-from-1996-2012>. Accessed 13 August 2023.

The Value of Gen Z

**** High Schoolers have grown up in a digitized world***

- As toddlers we were navigating iPads and other electronics to keep us entertained
- In elementary school, I learned how to:
 - use Google Slideshow and gave my first presentation in front of the class in third grade; this involved creating the presentation as well as narrating the presentation to the class while advancing slides
 - type properly through a website with interactive activities vs. using manual typewriters in high school
 - use various apps/websites to learn quick math vs. rote memorization
 - do basic coding

The Value of Gen Z

**** High Schoolers have grown up in a digitized world***

- In middle school, I learned how to:
 - use technology to get through 7th and 8th grade through COVID
 - use “virtual labs”, where we conducted various experiments while changing independent and dependent variables to study the results; we also learned how to create data charts through Google Docs depicting experiment results and data outputs
 - create an educational trivia game through a website called “Kahoot”
 - make things on a 3D printer
- In High School, I learned how to:
 - use technology to problem-solve; modern calculators can factor quadratics, solve systems of equations, create data charts, etc.
 - use the technology skills that I learned in elementary and middle school to more efficiently manage my homework load
 - use technology to communicate and stay connected with teachers and fellow students; we watch livestreams of Congressional meetings
 - navigate social media in a responsible way

The Value of Gen Z

* *High Schoolers and the impact of sports*

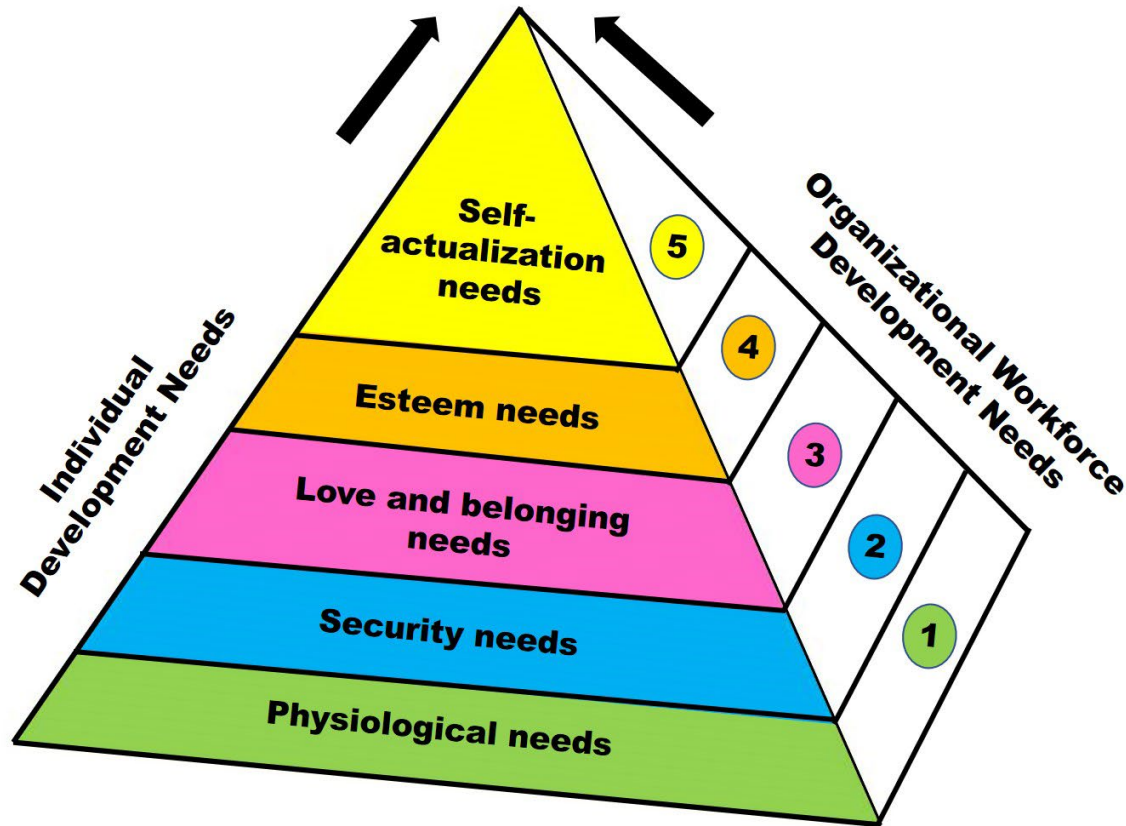
- Today's high schoolers face increased pressure to pursue sports programs from a very young age; many kids grow up as pre-schoolers bouncing between T-ball, soccer, football, swimming, basketball, gymnastics, dance, etc
 - I tried soccer as a pre-schooler and ended up on a competitive swim team by the time I was 6 years old
 - From a very early age, I had to learn to manage my time between school and swim so I could get my homework done; this involved completing homework and having dinner in the car on many nights
 - As a high schooler, I spend approximately 20+ hours per week after school, between swim practice and weight training, while managing Honors classes, including: Mandarin IV, Calculus II, Advanced Chemistry, etc.
 - I have seen parents put pressure on their high schoolers to perform at a high level so they can compete for college scholarships; I am very lucky to have access to the Montgomery GI Bill, and I swim because I love it.
 - Competitive sports teaches the value of teamwork and pride and it helps develop a strong work ethic

The Value of Gen Z

** Having a Gen Z-er on your team*

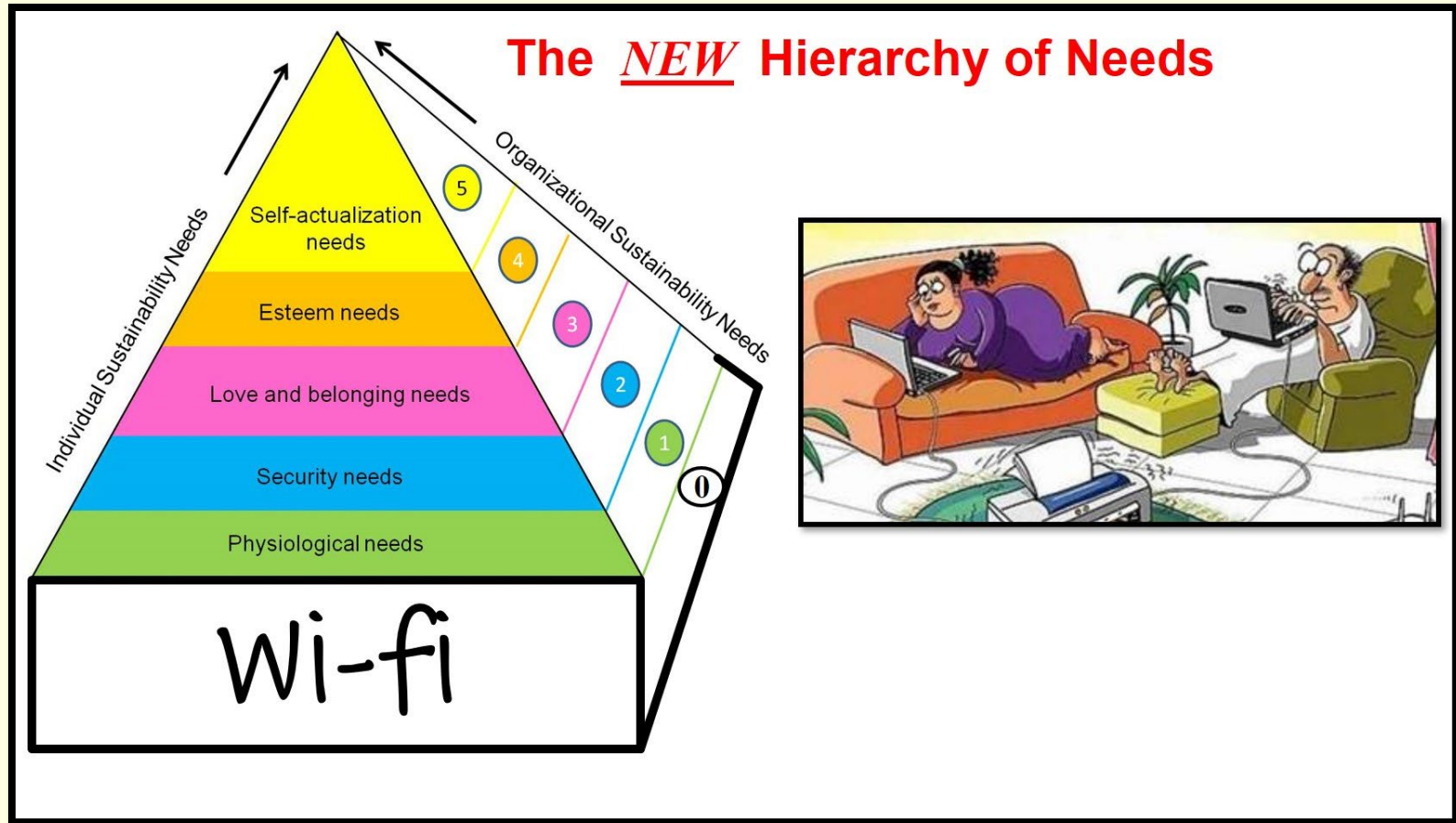
- Why you want Gen Z employees on your team
 - Using technology is part of who we are, therefore, Gen Z employees are very efficient
 - Gen Z employees navigated middle/high school during COVID and learned how to problem-solve and think outside the box
 - Gen Z employees learned how to manage time, while juggling sports and extra curriculars
 - Gen Z employees know how to manage social media and can use social media to raise money as well as for advertising and market initiatives
 - Gen Z employees have learned the value of teamwork and collaboration through organized sports
 - Gen Z employees are likely to have a strong work ethic since we've had to manage advanced classes with a strong emphasis on extra curriculars
 - Gen Z employees are likely to be more in tune with their own mental health because they have access to more mental health helping agencies, with less stigma for using them

Recognizing the Unique Needs of the Future Workforce: Maslow's Hierarchy of Needs



Reference: Maslow, Abraham H. (1943), "Theory of Human Motivation," *Psychological Review*, Vol. 50, No. 4, pp. 370-396.

Parody of the Cyber Workforce of the Future



Cyber Work Design and Expectations for Future Workforce

Considerations for future workforce:

- Work leadership
- Work rules and regulations
- Work flow
- Work space
- Work teams
- Work duties and responsibilities
- Work compensation
- Work fulfillment
- Investment
- Workforce preservation

References:

1. Badiru, A. B. and Sharon C. Bommer (2017), **Work Design: A Systematic Approach**, Taylor & Francis/CRC Press, Boca Raton, FL.
2. Badiru, A. B., “Workforce Development and Its **Preservation**,” Reader Comment, *THISDAY Newspaper*, Lagos, Nigeria, Vol. 7, No. 2172, April 3, 2001, page 14.
3. Badiru, A. B. and Cassie Barlow (2020), “Developing **workforce in era of COVID-19**,” *Dayton Daily News newspaper*, May 15, 2020, page B7.

System Formulation for Workforce Development

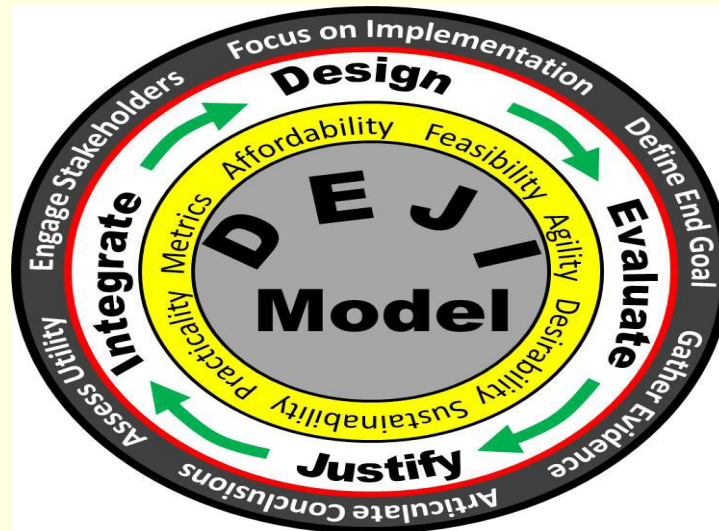
Introduction to DEJI Systems Model®

- System DESIGN
 - System EVALUATION
 - System JUSTIFICATION
 - System INTEGRATION
- Leads to multi-objective policy formulation
 - Includes a mixture of quantitative and qualitative methodologies

Reference: Badiru, A. B. (2023), **Systems Engineering Using DEJI Systems Model: Design, Evaluation, Justification, and Integration with Case Studies and Applications**, Taylor & Francis CRC Press, Boca Raton, FL.

Application of DEJI® Systems Model to Workforce Development

- Integration is the key in Workforce Development Programs
- We advocate using a Systems Engineering Model for achieving and promoting and sustaining workforce development
- The **DEJI® Systems Engineering Model** (Badiru, 2014) has been found to be effective for program **D**esign, **E**valuation, **J**ustification, and **I**ntegration
- The model “forces” appropriate investments in workforce development



Systems Elements for Workforce Development

DEJI Systems Model Components	HRM Description	WFD Tools & Techniques
D esign	• Define HRM goals • Set human expectations • Identify critical factors	• Work standards & training • Performance metrics • Identify critical factors
E valuate	• Set measurement parameters • Assess attributes • Evaluate benchmarks	• Benefit-Cost ratio • Workforce retention • Retirement benefit
J ustify	• Economic development impacts • Technical & managerial feasibility • Alignment with strategic goals	• Education benefits • Workforce equity • Legal requirements
I ntegrate	• Identify common elements • Verify symbiosis • Check value synergy	• Workforce preferences • Hierarchy of needs • Teamwork synergy

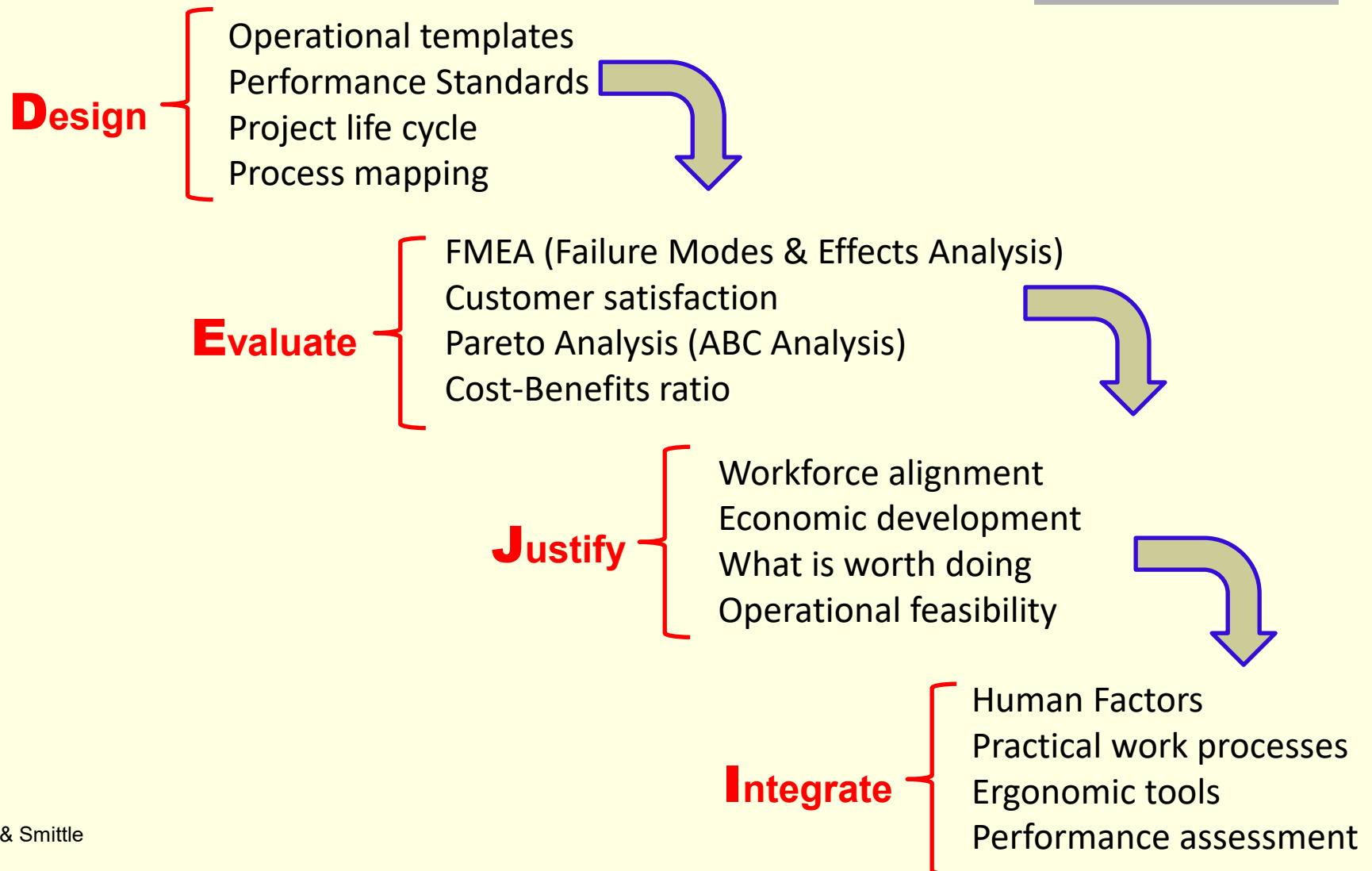
Cyber Workforce Model Elements

Attributes could be structural integrity, aesthetics, durability, resilience, capacity, adaptability, modularity, sustainability, reliability, and affordability. Attributes are considered to be a combined function of factors.

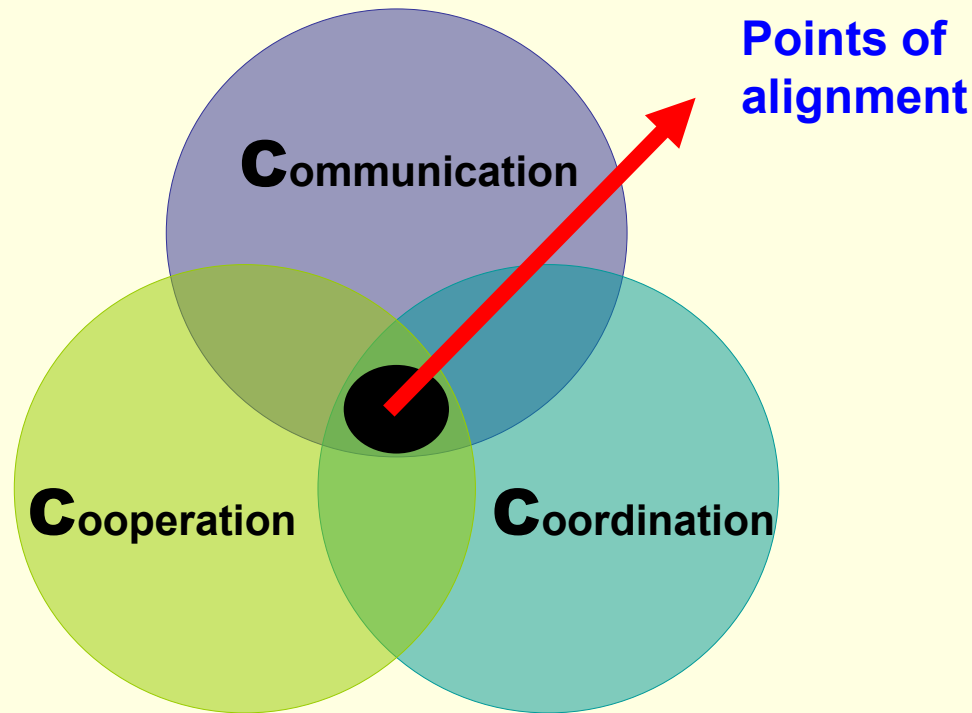
Factors could include flexibility, comfortability, utilization level, safety, and design functionality. Factors are themselves considered to be composed of indicators.

Indicators could be visual appeal, maintainability, acceptability, accessibility, escapability, modularity, and reconfigurability.

Pursuit of Workforce Development via Optimization in DEJI Systems Model



Triple C Approach for Human Factors (Qualitative) Interfaces



Reference: Badiru, A. B. (2008), **Triple C Model of Project Management: Communication, Cooperation, and Coordination**, Taylor & Francis CRC Press, Boca Raton, FL.

Conclusion and Recommendations

- Apply rigorous quantitative and qualitative methodologies to operations management.
- Utilize latest optimization software tool.
- Leverage the efficacy and potency of the DEJI Systems Model.
- Think systems across operations management.
- Design, Evaluate, Justify, and Integrate aspects of the work into how the prevailing generation of workers prefer to work.
- Sustain the efforts enterprise wide.

THANK YOU!

QUESTIONS ???