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A US DoD University Affiliated Research Center

SERC Research Council Panel: The Future of Systems Engineering Research

November 9, 2010

Jon Wade, Stevens Institute

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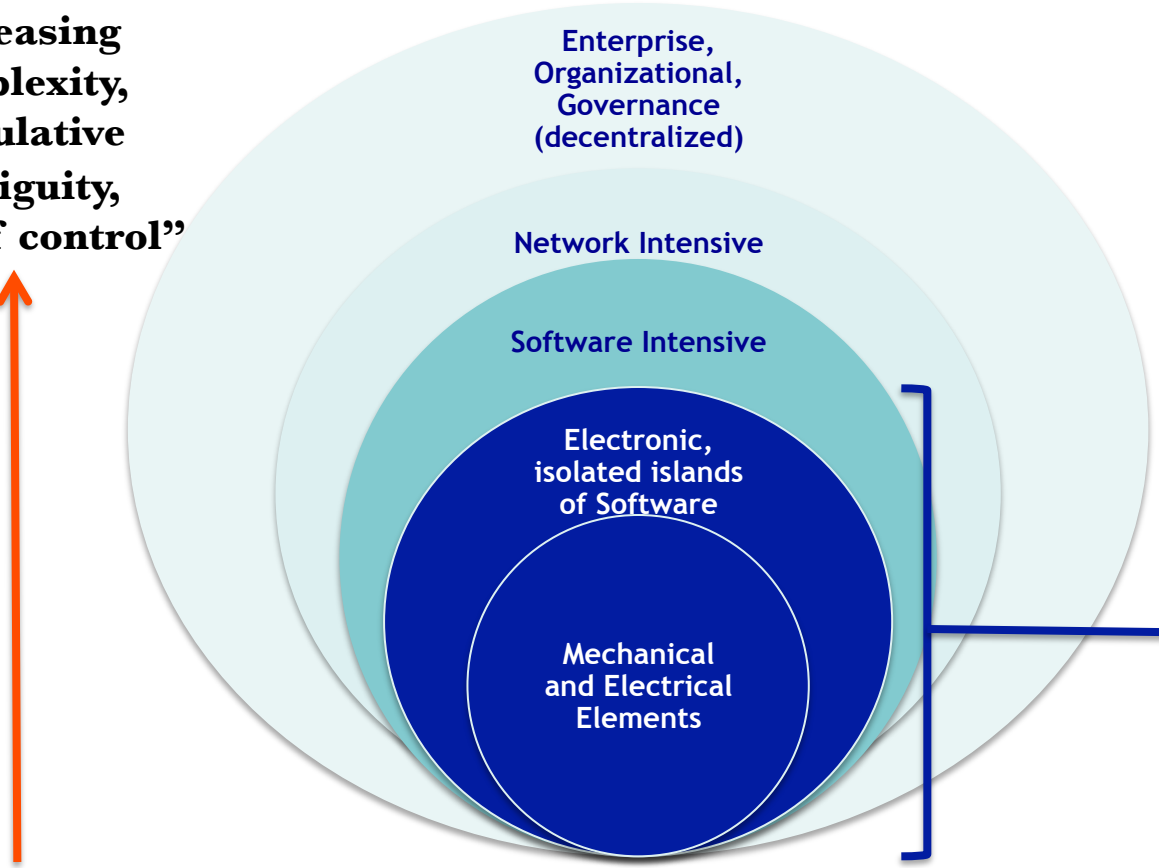
Complexity & Scope

Increasing complexity, cumulative ambiguity, "lack of control"



Classical Systems Engineering has this heritage. Much of the SE toolkit in use today has roots in such systems, and is best applicable to such systems

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Accelerating Rates of Change

Threats are adaptive and quickly evolving

Uncertainty in our new environment is demanding a rapid response

Yet we are often constrained by legacy

Rate of Change

Criticality

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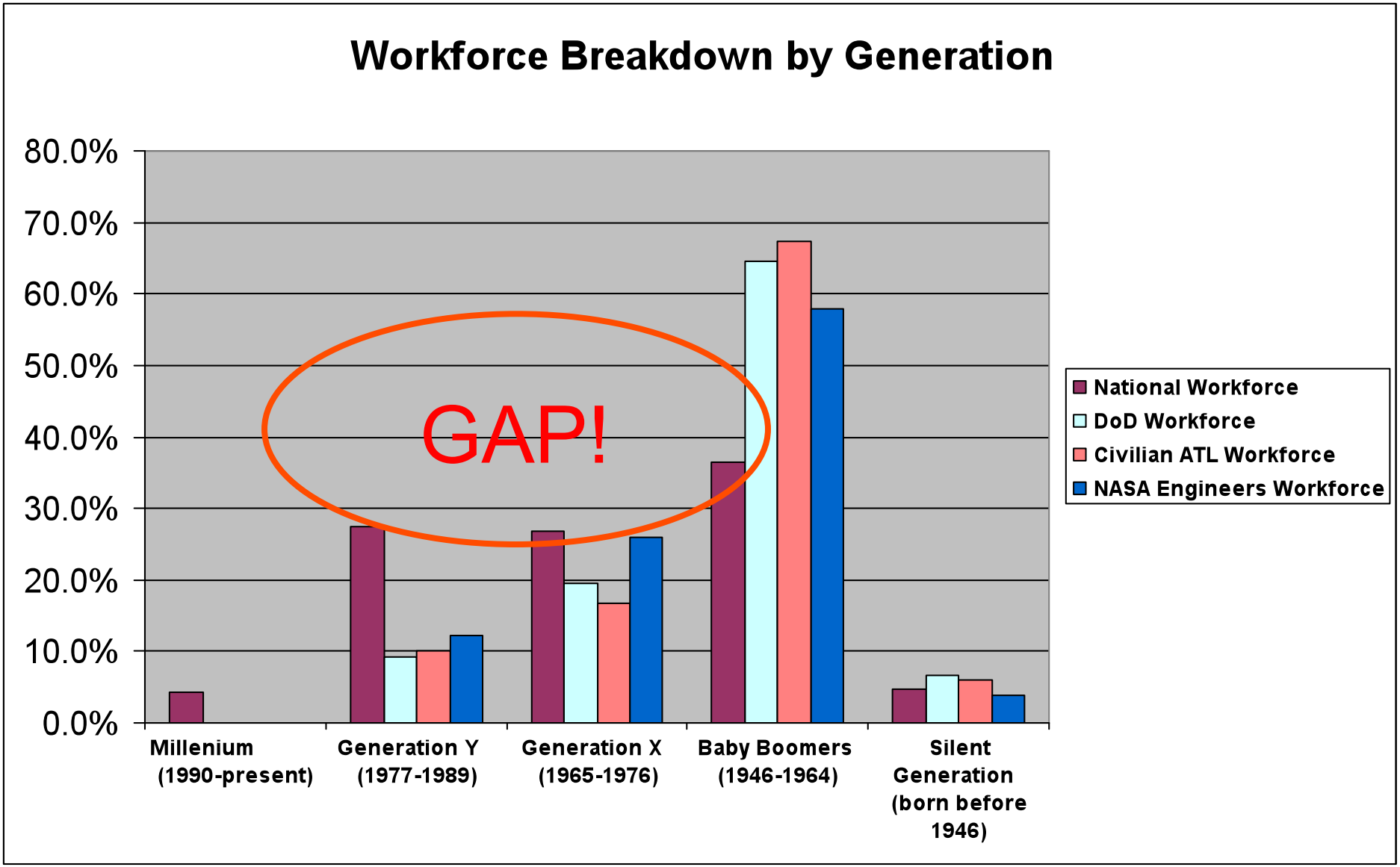
Workforce Shortages



Source:"Human Capital Strategy Review", www.dau.mil/doddacm/dod/Juza; NASA Workforce Profile cube, http://wicn.nssc.nasa.bov/cognos/cgi.bin/ppdscgi.exe

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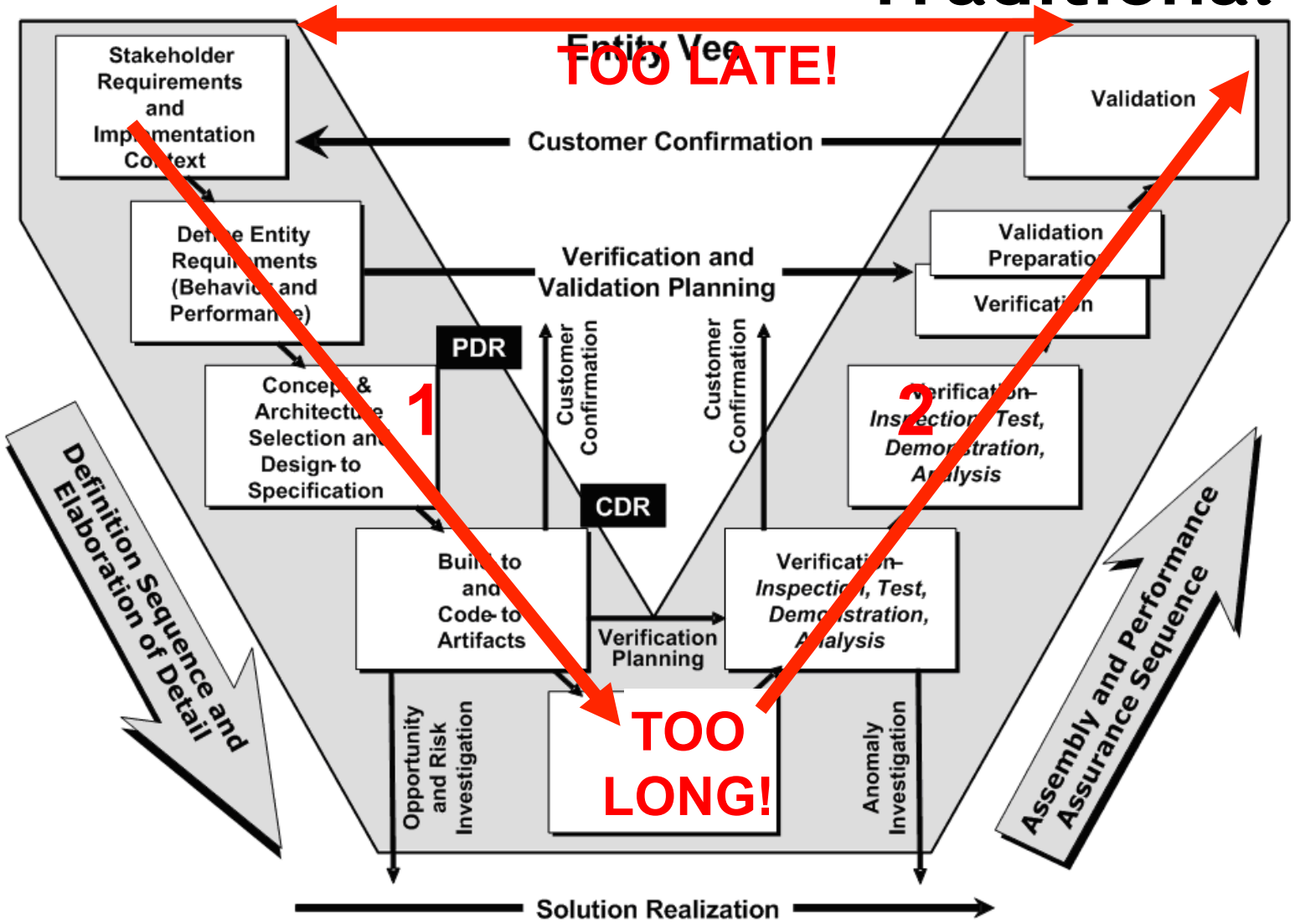
Traditional SE



Source: wpedia.goo.ne.jp/enwiki/Dual_Vee_Model

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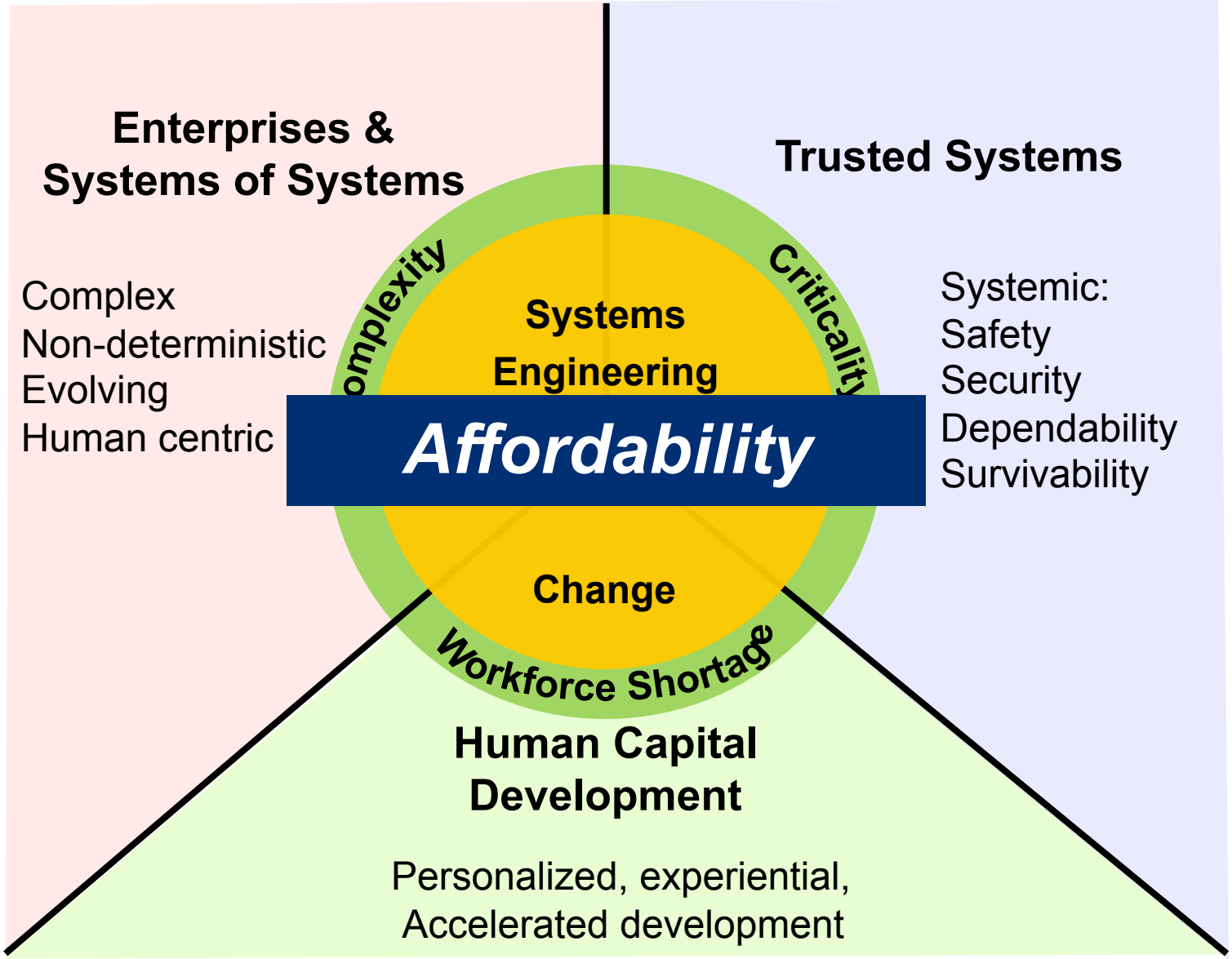
SE Research Areas



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SERC Research Portfolio

SE & Mgmt Transformation

Systems Engineering Transformation (10)

DoD Systems 2020 (20)

Rapid CONOPS Development Environment for Agile SE (3)

Integration of Modeling and Simulation, Software Design, and DoDAF (24)

Verification, Validation and Accreditation using Modeling and Simulation (21)

Assessing SE Effectiveness (15)

Evaluating MPTs (9)

Reconfigurable Architecture for SE Knowledge (2)

System Maturity Model & Mgmt Tools (12)

Valuing Flexibility (18)

Enterprise & SoS

Requirements Definition for Net-Centric Enterprises (25)

FAA NextGen Governance (28)

Trusted Systems

Security Systems Engineering (8)

Human Capital Development

SE Development Experience Accelerator (16)

SE Capabilities within Universities (STEM) (19)

Develop SE Technical Leaders (4)

SE Body of Knowledge and Graduate Reference Curriculum (1)

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Research Focus Areas

Enterprise Systems and Systems of Systems: Addresses the evolving needs of Enterprise scale systems, also known as Systems of Systems. These are complex systems in which the human behavioral aspects are critical and emergent behavior is the norm.

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Research Focus Areas

Trusted Systems: Addresses the challenges in conceiving, developing, deploying and sustaining systems that are safe, secure, dependable and survivable. These are all emergent properties for which it is essential that the complete system is considered, once again, including the human element.

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Research Focus Areas

Systems Engineering and Management Transformation: Address the challenges of complex systems with rapidly changing requirements and technology, while being deployed into evolving legacy environments. Decision making capabilities to manage these systems are also critical as determining how and when to apply different strategies and approaches. The focus is on the creation of MPTs that leverage the capabilities of computational, visualization, communication and IT technologies to keep systems engineering and management on the curve.

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Research Focus Areas

Human Capital Development: Addresses the challenges presented by the retirement of the baby boomer generation, the reduced numbers of US citizens entering the technical workforce and the new systems challenges facing our technical staff. Research is needed to determine the critical knowledge and skills required for our workforces as well as determining the most efficient and effective means by which this can be instilled in our workforce over the their entire career.