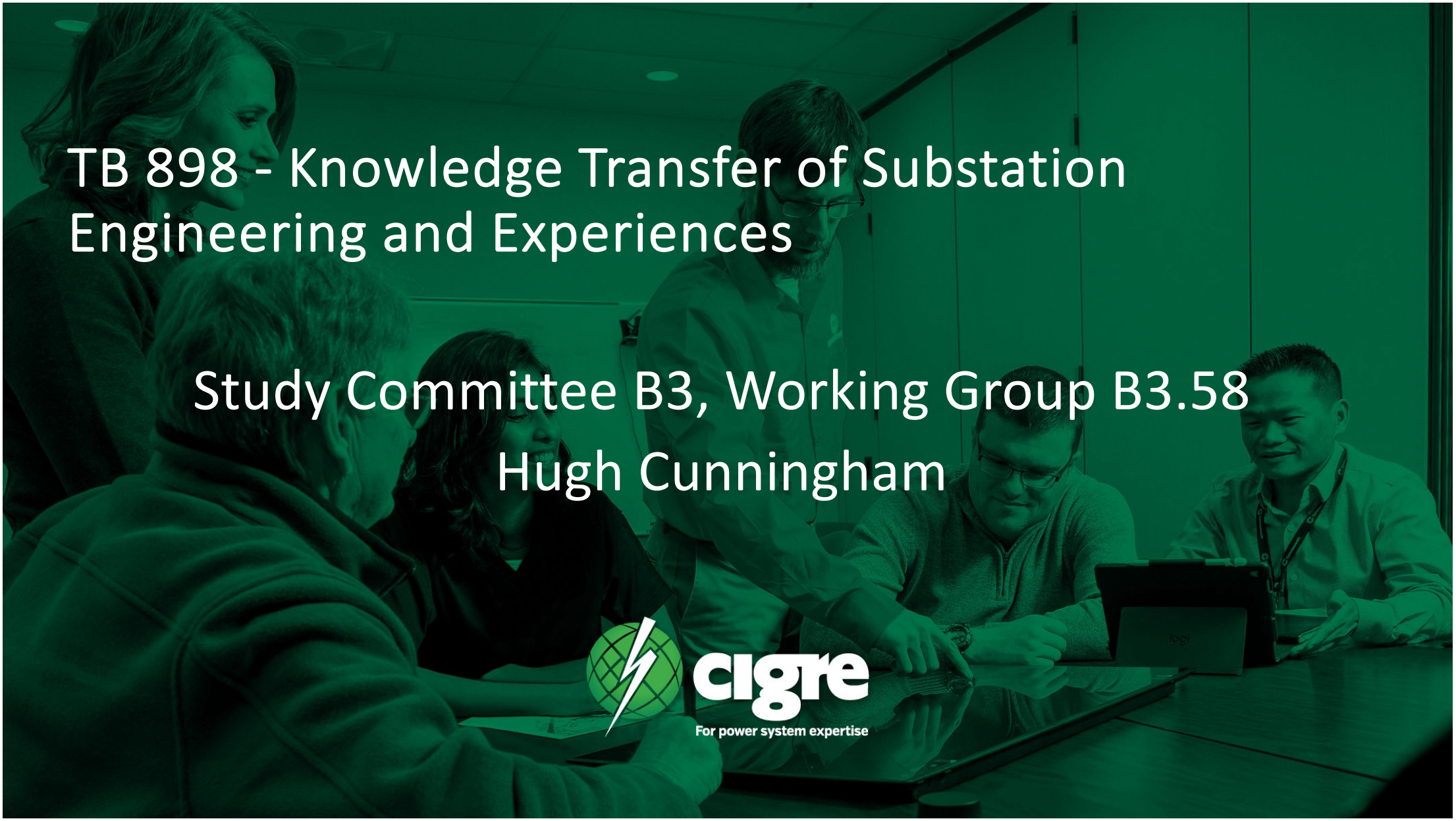
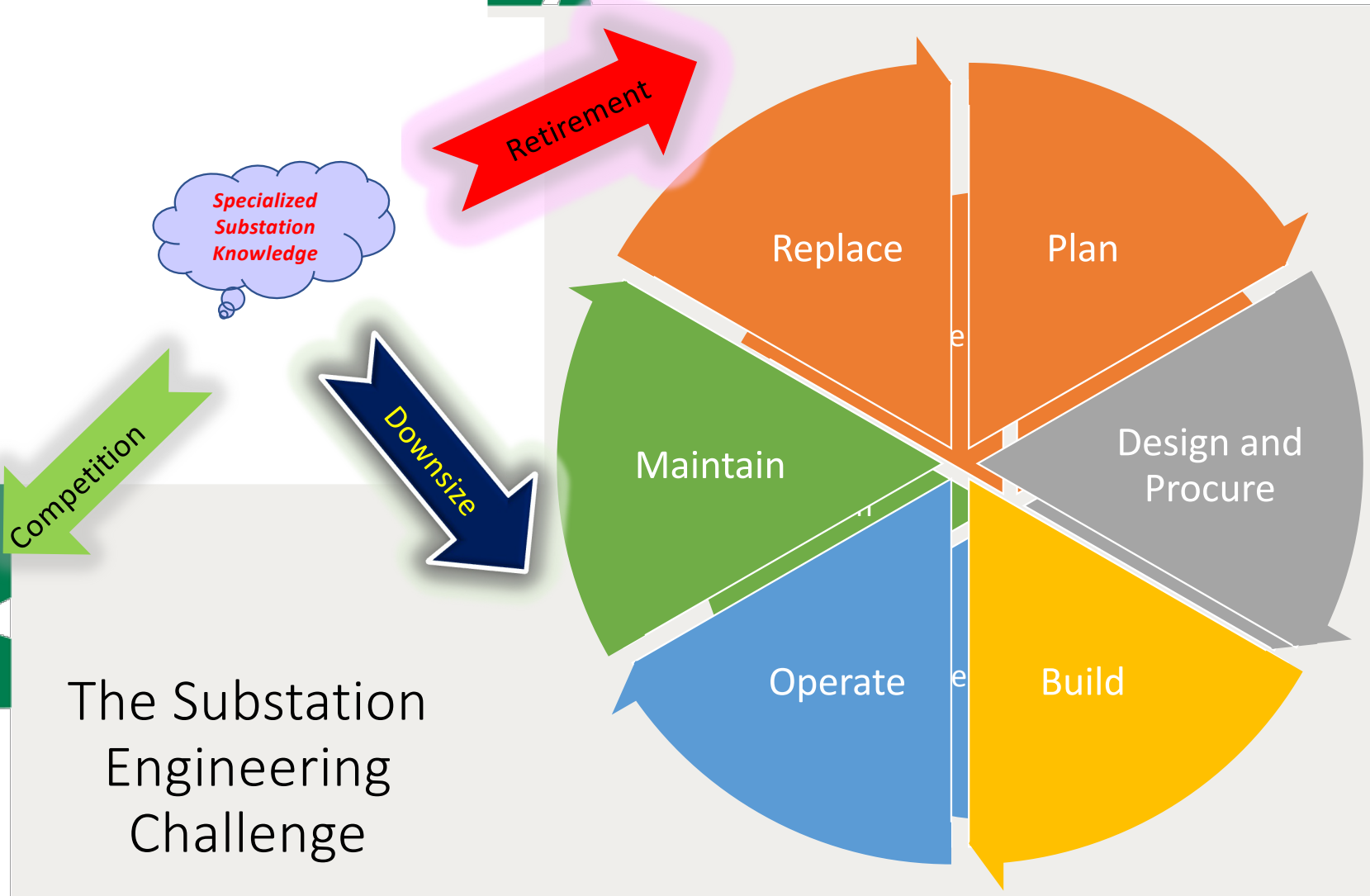

TB 898 - Knowledge Transfer of Substation Engineering and Experiences
Study Committee B3, Working Group B3.58
Hugh Cunningham
cigre
For power system expertise

Agenda

- The Challenge Facing Our Industry
- Overview of Survey
- Young Engineers Input
- People, Process, and Technology Framework
- Conclusions

The Substation Engineering Challenge



The Need to Transfer Knowledge and Experience

Is not new, but the challenges just presented have magnified it.

- University power engineering programs are not as prevalent today.
- Traditionally, a utility relied on classroom training and job rotation programs.
- These methods can be effective, but they may not provide the timely results necessary to support the rapid pace of retirement.
- Beyond training new hires, even senior engineers need to be educated in applying new state-of-the-art technologies.
- Today, a structured approach is required – one that addresses the People, Processes and Technologies involved.

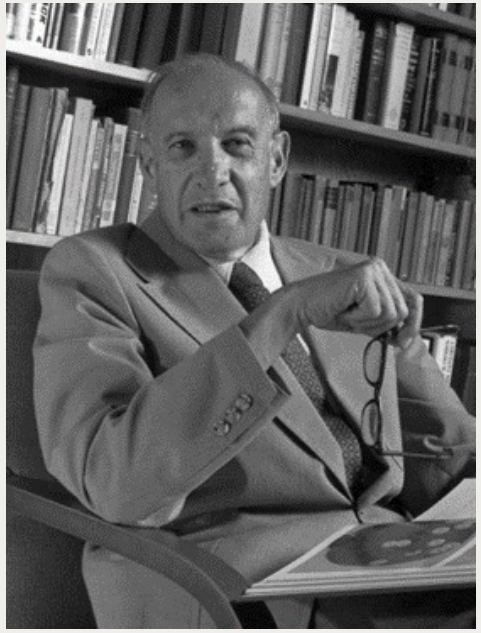
Beyond Technical Excellence

Perhaps the best possible expert advice on transferring knowledge for business success

"Every enterprise is a learning and teaching institution. Training and development must be built into it on all levels, training and development that never stop."

"We now accept the fact that learning is a lifelong process of keeping abreast of change. And the most pressing task is to teach people how to learn."

Peter Drucker (Austrian-American leading management consultant, educator and author)



Obtaining Input

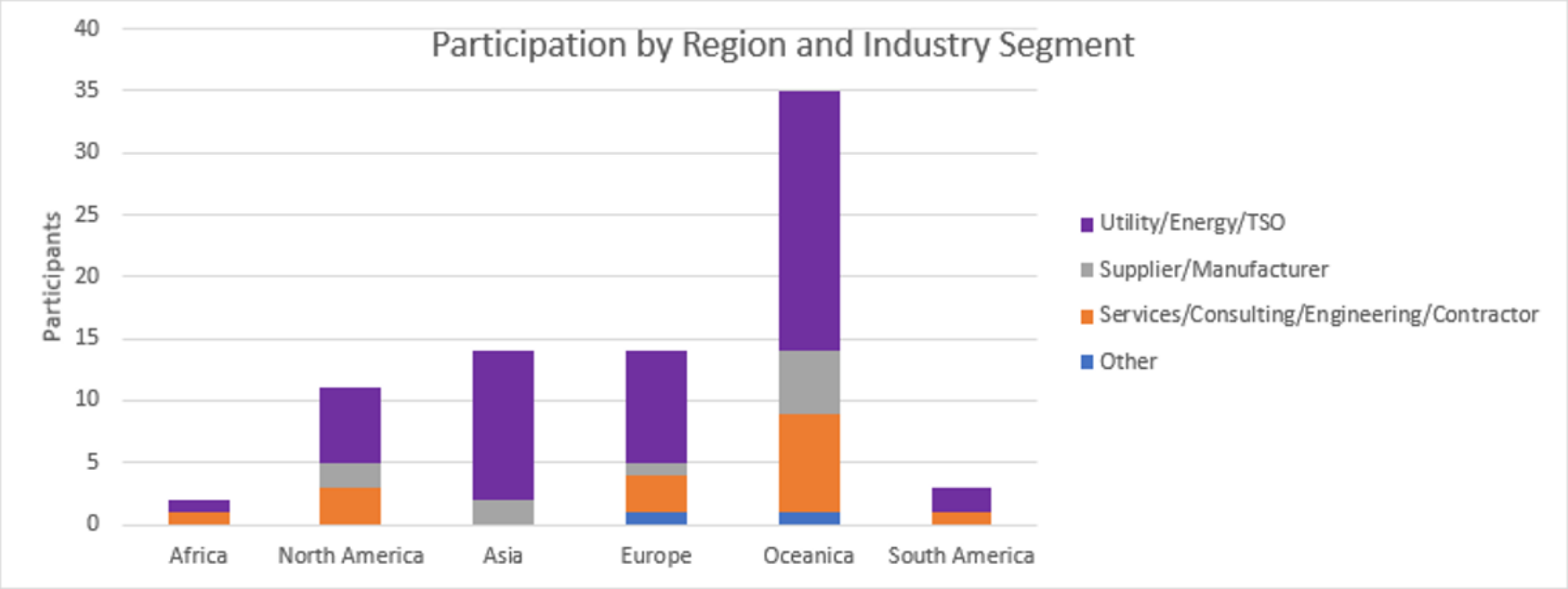
Obtaining Input for the Technical Brochure

The WG had extensive substation experience but also obtained input from the following:

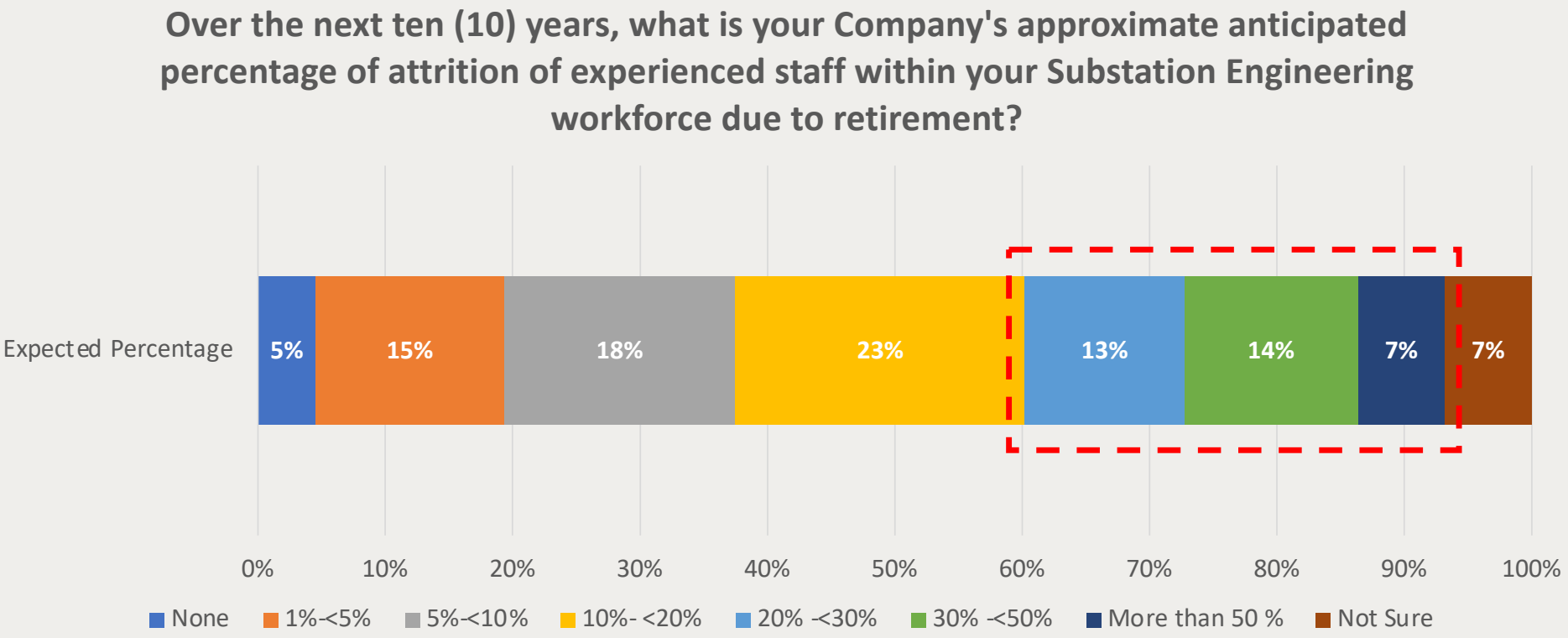
- Survey
- Workshop at the 2022 Paris Session
- Young Engineer Task Force
- Young Engineer Workshops

Survey

42 Questions-84 Responses from 16 Countries



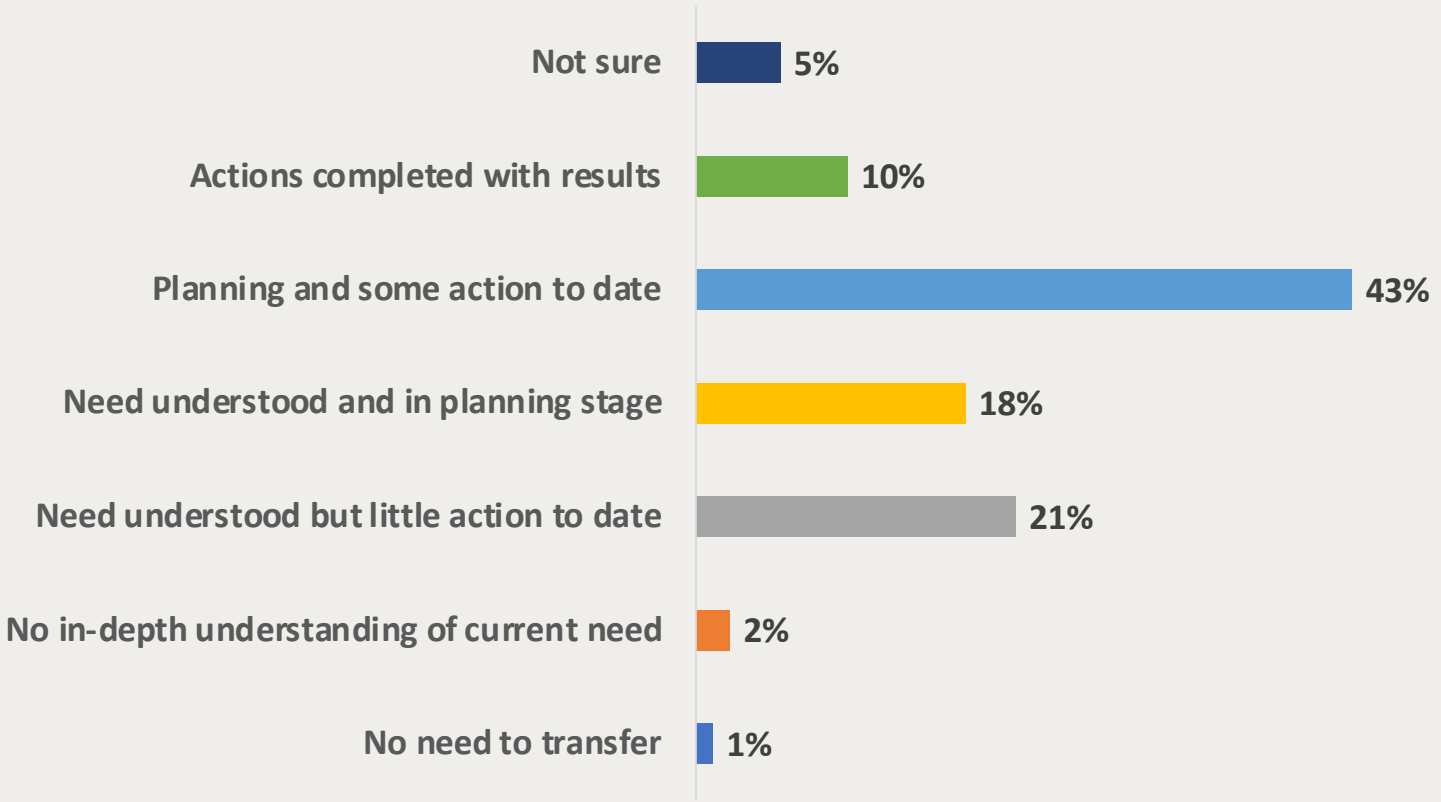
Survey – Example of Results



Survey – Example of Results

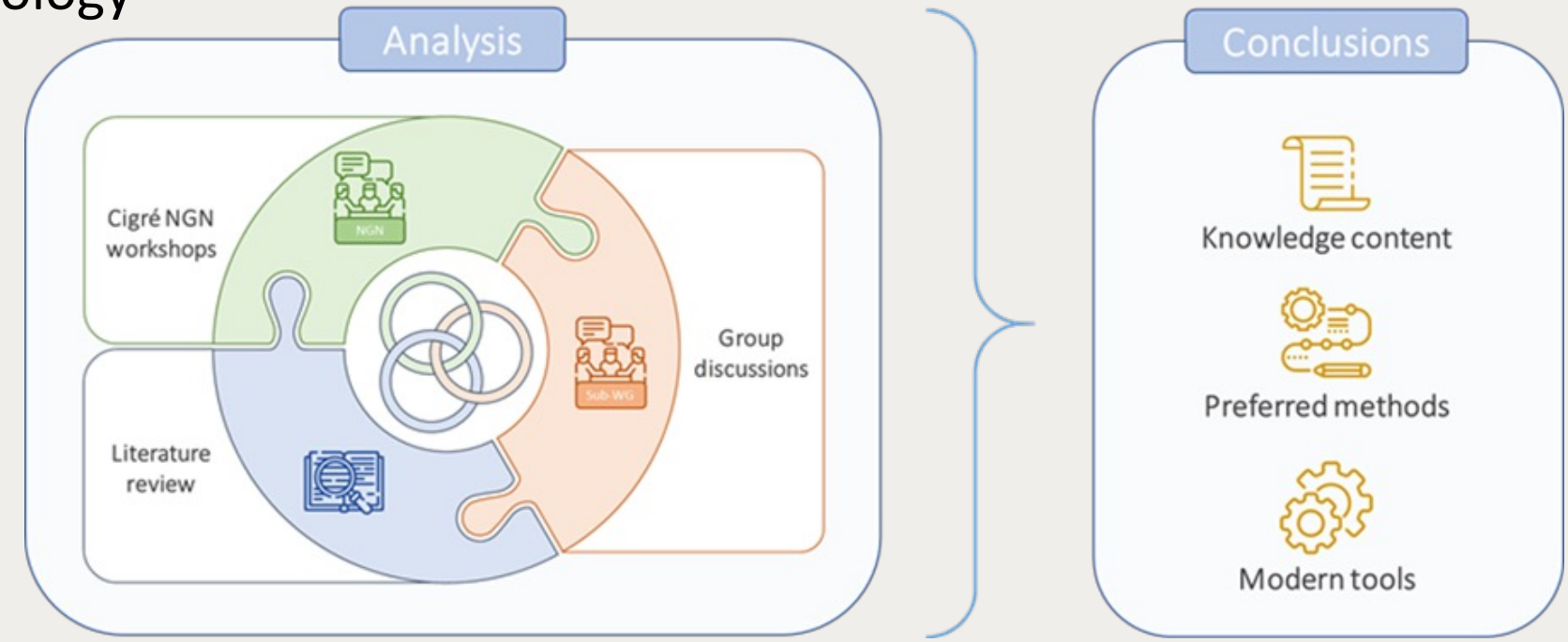
Most companies understand the need to transfer technical knowledge, but more action is required

- Need Explicit Knowledge (Technical)



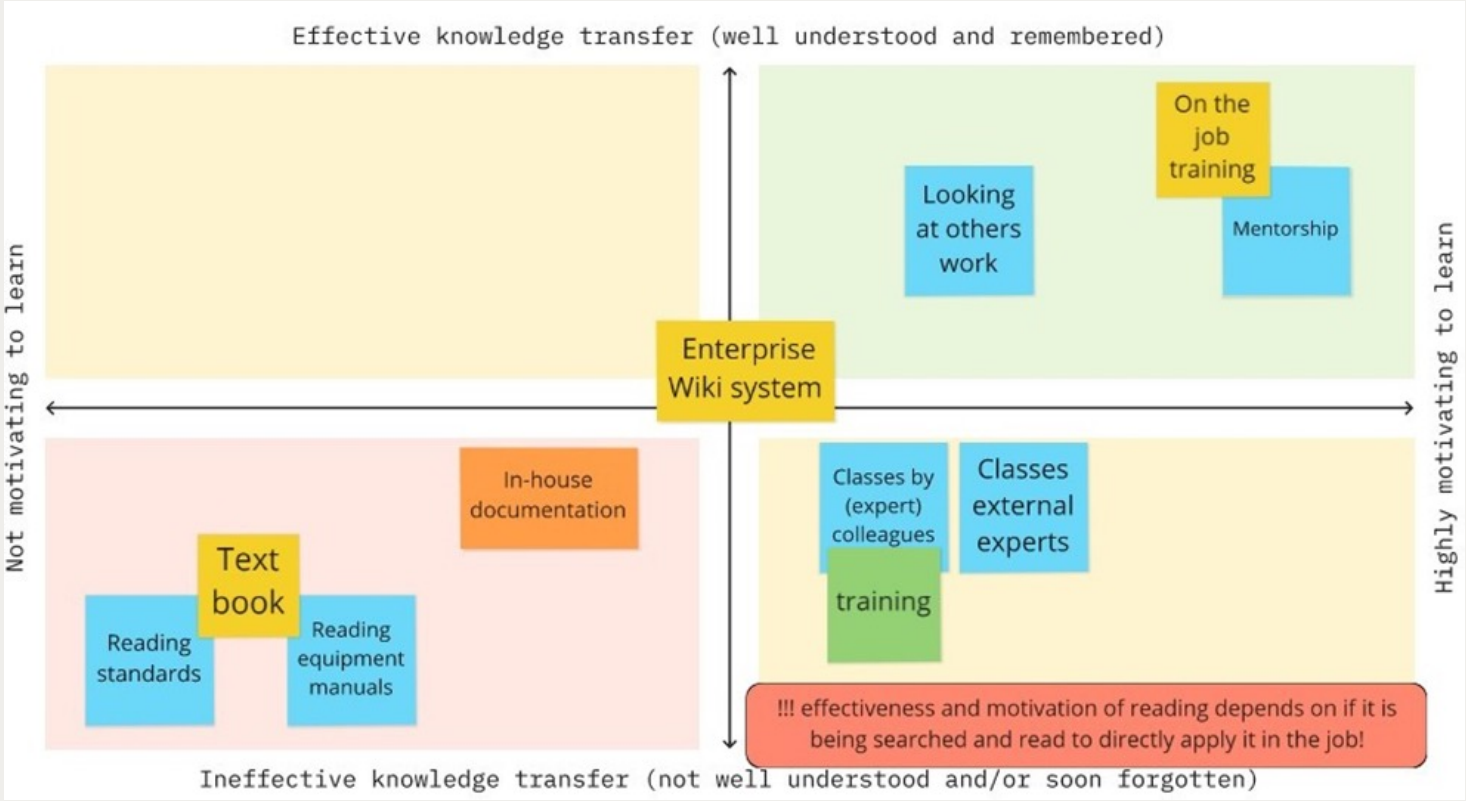
Input from the Young Engineer Task Force

- Young engineers Next Generation Network (NGN) Workshop input methodology



NGN Workshops:
Motivation vs. Effectiveness for tacit knowledge

Young engineers' input
on ranking some methods and processes for basic tacit knowledge transfer based on motivation vs. effectiveness



Considerations for knowledge transfer

Based on workshop input, programs for new graduate engineers should:

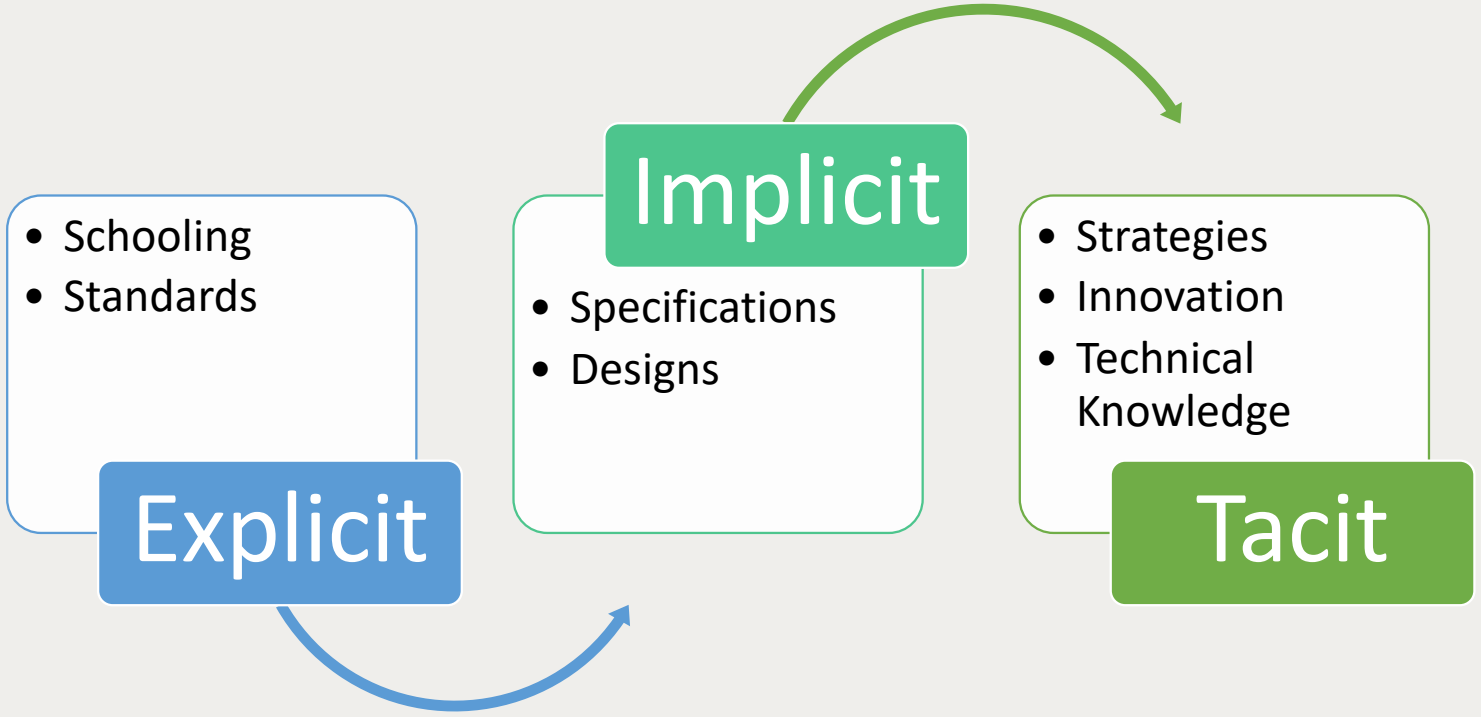
- Use methods that will be effective with how "millennial" and "generation Z" engineers acquire knowledge.
- Embrace one-on-one learning methods, like mentoring, but also relies heavily on 21st century technology.
- Deploys tools such as electronic knowledge management systems, on-line and on-demand training programs.

Forms of Knowledge

How do we define knowledge?

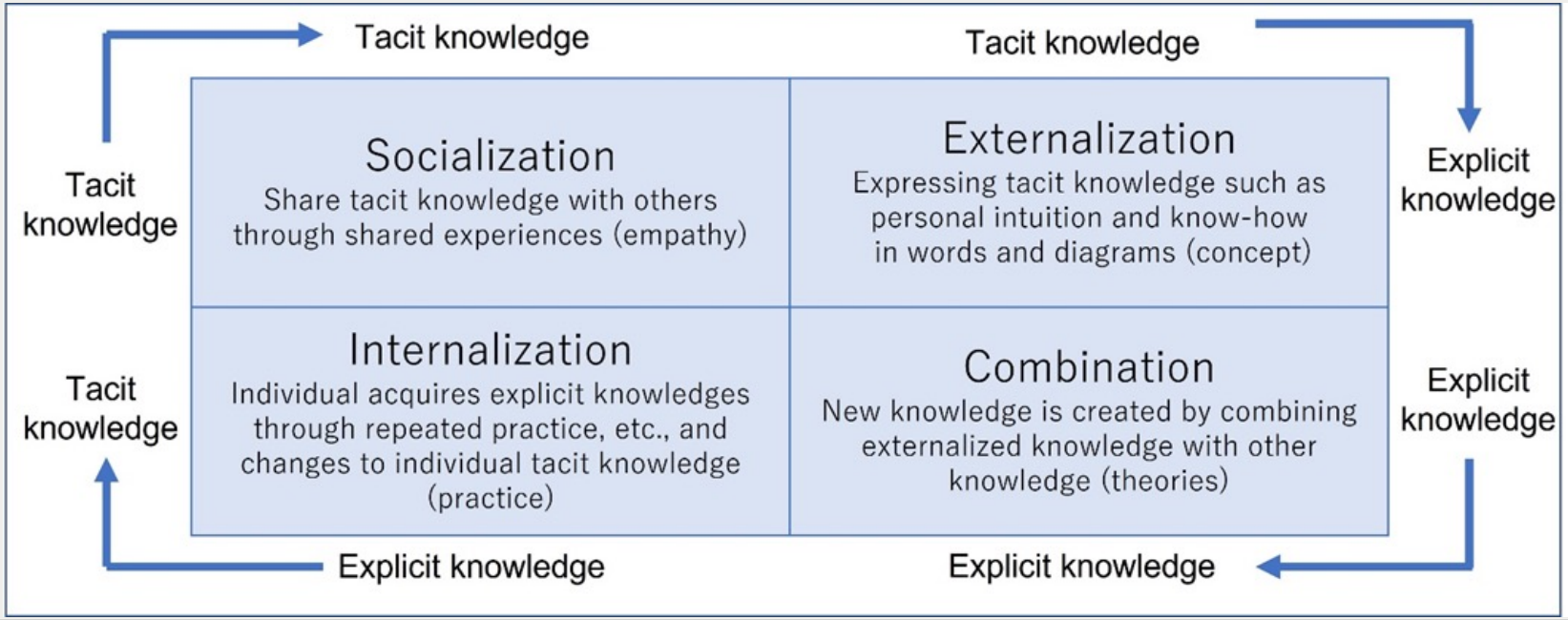
Basic knowledge types

- Knowledge exists in several forms; experts identify three basic types:



SECI Model

A framework that creates new knowledge based on 4 processes:
Socialization Externalization Combination Internalization



Identifying At Risk Knowledge

Prioritizing Knowledge Transfer

Importance
How important is this to the Organization/Team

+

Availability
How important is this to the Organization/Team

+

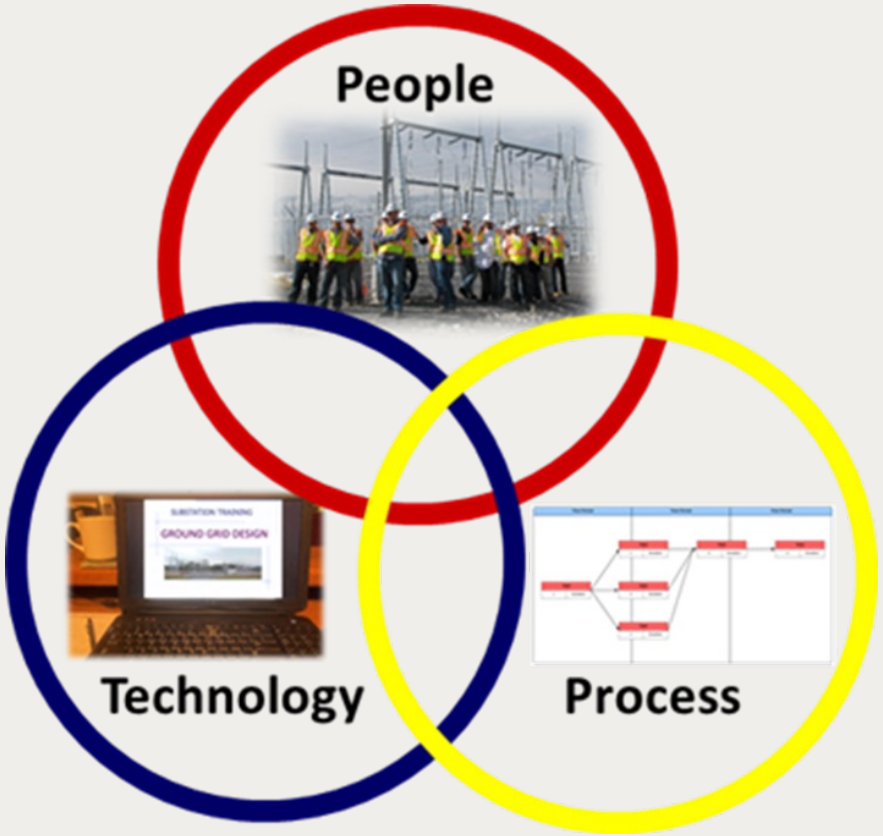
Frequency
How important is this to the Organization/Team

=

Priority = Importance + Availability + Frequency Ratings	
High	The knowledge is essential to achieving the organization's/team's objectives.
Medium	An action plan should be established to capture or transfer knowledge.
Low	The knowledge is not essential to achieving the organization's/team's objectives.

Substation Knowledge transfer

Can be described as the interaction of People, Process, and Technology



Training - an important aspect of knowledge transfer

TYPES: mentoring, classroom, on-line webinar, on-demand recorded videos, field trips, continuing education, rotation program, wiki system, on-the-job, and challenging projects

Training via in-class seminar

On-line webinars

Substation field trip for training

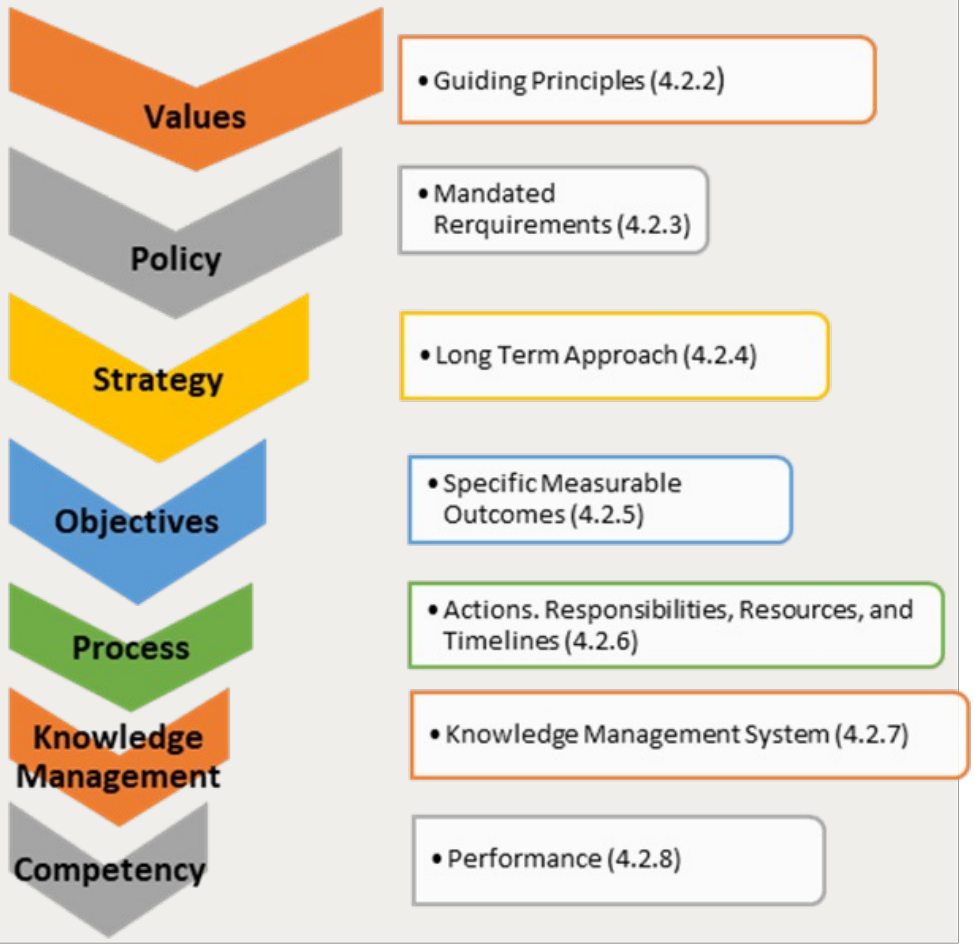
Mentoring

Of all the input gathered, most respondents believed that Mentoring was one of the best types of training for effectiveness and motivation.

- Mentoring is a professional relationship in which an experienced, more knowledgeable person assists a less experienced person in developing skills and knowledge that will enhance professional and personal growth.
- A great way to help ensure that substation knowledge and experience can be successfully transferred to new hires and less experienced staff.
- Successful mentoring require specific skills, effort, structure, disposition, desire and commitment from both participants to make it work.
- Benefits of mentoring are many, such as greater career success, possible promotions, pay raises, increased opportunities, and higher levels of employee engagement, retention, and knowledge sharing.

Process Hierarchy

Processes are essential components of a hierarchy of elements that support a company's mission and goals.



- It is important to note that the Process part of the framework will not be successful without the commitment of management and those that embrace sharing substation knowledge.
- This commitment ensures that the People and Technology parts of the framework are effectively supported.

Managing Knowledge in an Organization

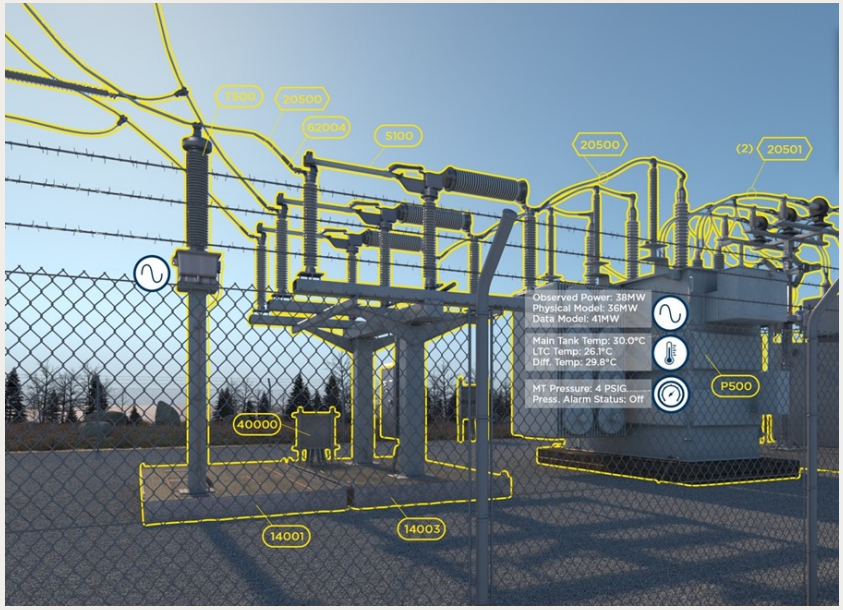
Nine steps for building a knowledge management strategy

1. Goals and Objectives
2. Prepare Organisation
3. Form Teams
4. Knowledge Audit
5. Select technologies
6. Knowledge Management System Attributes
7. Consolidate
8. Measure
9. Skills and Competencies

Using Technology for Knowledge Transfer

- Technology can be used as both a training tool and a design tool

Modular Substation 3D design.
Visualizing the station in the yard during design.



Virtual reality substation tour example.

Case Study

Transferring knowledge through CIGRE participation and leadership

- The experiences of NGN members who gained additional substation knowledge by:
  - Participation on Women in Engineering panel discussions
  - Electra Editorial Board
  - Green Book editing
  - SC leadership positions
  - Assisting with WG efforts while obtaining an advanced degree

Conclusions of the Working Group

Summary

Key Take-Aways

- The challenges noted in the introduction confirm a knowledge transfer crisis that cannot be ignored!
- Because of the short time available for this presentation, it was impossible to cover all of the material in the Technical Brochure in any depth.
- Due to the many variables in substation engineering organizations, this Technical Brochure cannot provide a universal model for knowledge transfer.
- Instead, it introduces multiple methods for knowledge transfer which can be selected to develop plans that meet the unique needs of a utility or consultant.
- However, the need for an effective substation knowledge transfer program and its execution cannot be denied.
- We highly recommend reading the full Technical Brochure for more insight into best practices to provide the industry with a roadmap for success.

Thank You for Attending

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