IAEA
Atoms for Peace and Development

Knowledge Management Methods and Tools

Regional Workshop
12-15 July 2022
Virtual Event

Content

- Identification of critical knowledge
- Prioritization of knowledge
- Considerations for selection of KM methods
- KM methods
- How to effectively transfer knowledge

Identification of Knowledge

- Critical knowledge is a sub-set of the organization's knowledge base
- Important to identify critical knowledge and conduct a knowledge loss risk assessment
- Should be identified proactively

Quadrant 4 - Personal and behavioural competences	Quadrant 1 - Competences related to the legal, regulatory and organizational basis
4.1 Analytical thinking and problem solving 4.2 Personal effectiveness and self-managemer 4.3 Communication 4.4 Team work 4.5 Managerial and leadership competences 4.6 Safety culture competence	1.1 Legal basis 1.2 Regulatory policies and approaches 1.3 Regulations and regulatory guides 1.4 Management system
Quadrant 3 - Competences related to regulatory body's practices	**Quadrant 2 - Technical disciplines competences**
3.1 Review and assessment 3.2 Authorization 3.3 Inspection 3.4 Enforcement 3.5 Development of regulations and guides	2.1 Basic science and technology 2.2 Applied science and technology 2.3 Specialized science and technology

Identification of Critical Knowledge

- Identify explicit and tacit knowledge
- Interpret the term knowledge broadly
- Consider formal and informal responsibilities

Corporate knowledge
- Onboarding
- Corporate culture

Role Knowledge
- Education
- On the job training

Expert Knowledge
- Unique experiences
- Professional judgement
- Lessons learned

CNSC Guide to Identifying Critical Roles

Purpose:
The purpose of this exercise is to identify critical roles to facilitate staffing requests, succession planning, knowledge transfer and setting learning objectives

Definition:
A critical role (representing one or more positions) has functions crucial to the organization's ability to meet a legal obligation; to prevent unreasonable risk to the health, safety and security of the public, meet international obligations or disseminate scientific, technical and regulatory information. Leaving the position(s) unfilled, even for a short period, would result in a negative impact on one or more of these factors

Considerations:
- To what extend does the position require rare/unique competencies or a deep specialization?
- Would the departure of an employee in this position impact other employees in task completion or productivity?
- Would it be difficult to delegate the duties assigned to this position to someone else?
- Does this position directly impact any of the organization's critical relationships or partnerships?
- Which positions, if left vacant would be detrimental to the health, safety or security of the public?
- Will it be difficult to fill the position due to a lack of qualified talent in the labour market?
- Is the position vulnerable to attrition/retirement risk?

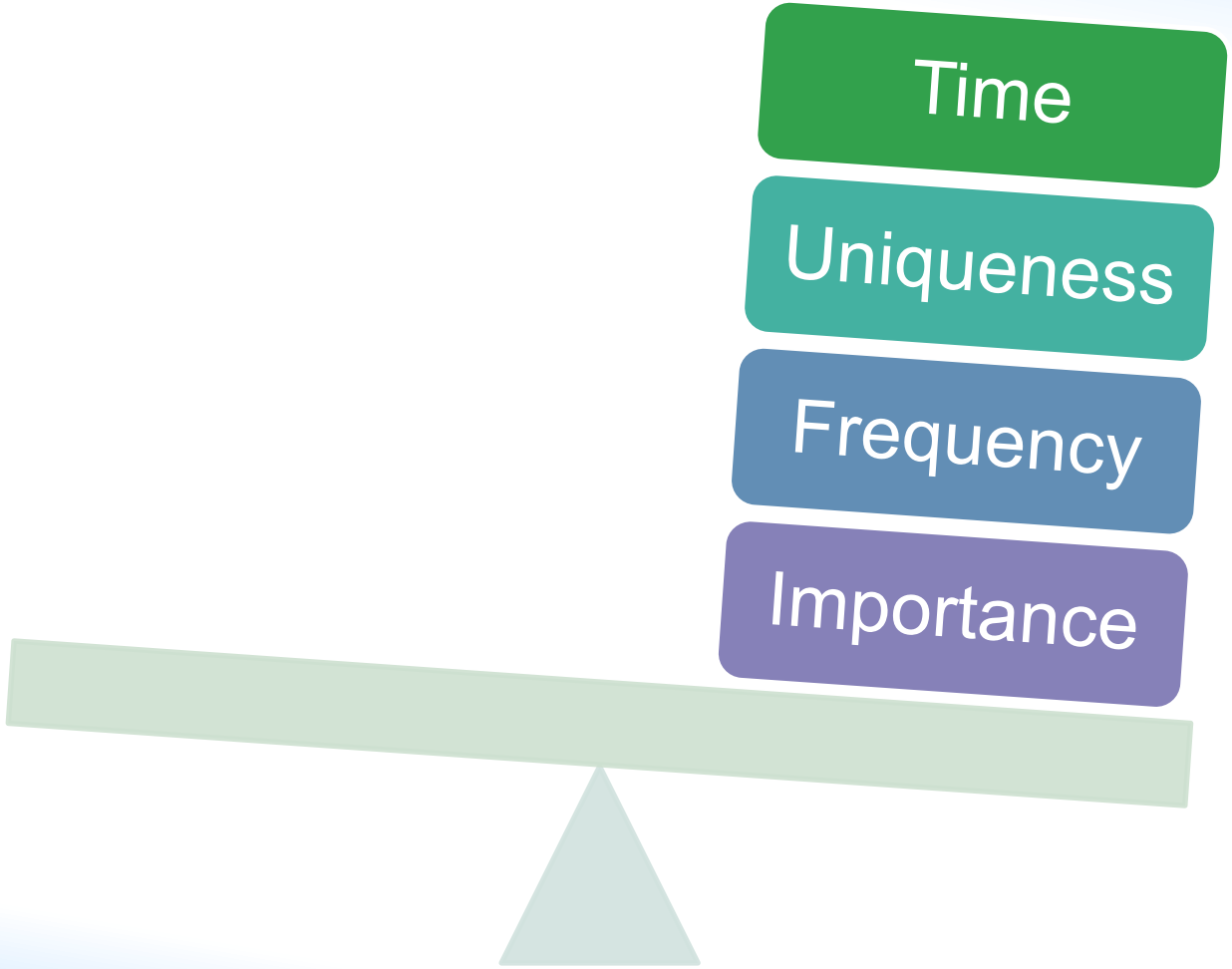
Sample Critical Roles Inventory

Role	Description	Vacancy / Knowledge Loss Risk
Fire Protection Specialist	The Fire Protection Specialist assesses nuclear facilities' compliance and fire protection codes, to ensure the safety of the facilities, its employees, the public and the environment.	• delays/inability to assess nuclear facilities' compliance with fire protection codes • delays/inability to review and assess nuclear facilities' fire protection programs • delays/inability to review and evaluate fire hazards assessments, fire safe shutdown analysis and code compliance • delays/inability to assist and perform fire protection inspections
Severe Accident Expert	Assessing containment and associated systems challenges, including performing analyses using computer tools. Assessing hydrogen challenges, including performing analyses using computer tools.	• decision / regulatory body could be ill informed and may lose credibility • potential delays in high priority work • insufficient and inadequate knowledge transfer • excessive and unsustainable demand on current staff • business-unit mandate would be at risk

Sample Questions to Elicit Tacit Knowledge

- Looking back, what things do you wish you had been taught early on in your career that you eventually learned the hard way?
- What type of equipment or tools do you use in order to perform your tasks?
- What unique undocumented skill or knowledge related to the equipment or tool would you pass on?
- What materials (e.g. standards, procedures, charts, websites, textbooks), do you commonly use as references when performing your tasks?
- Who do you interface with in order to perform your tasks? What networks do you participate in that are key to your role?
- What stories or incidents describe important learning / experiences gained in your career?
- Describe or list any special knowledge that is needed to recognize patterns, situations, or events that are predictors of future problems or failures. In other words, potential concerns that would be easily missed by inexperienced staff.

Prioritization of Knowledge



Sample Prioritization Tool

This worksheet will help you assess whether a specific knowledge area should be retained, and help you prioritize several knowledge areas in cases where it may not be possible or practical to act on all areas because of a limited amount of time or resources.

Step 1: Summarize Knowledge Areas: A, B, C, D, E

Step 2: Rate the Knowledge Areas in Terms of four characteristics:

			Knowledge Areas				
Characteristic	Rating Scale		A	B	C	D	E
• Time to learn: How can the knowledge be learned? More critical when time to learn is longer (i.e. weeks → years):	Reading material:	1					
	Training course:	2					
	Events that occur periodically:	3					
	On the job training:	4					
	Generally, only over a long time:	5					
• Uniqueness: Who else possesses the knowledge?	More than 20 staff members:	1					
	10 staff members:	2					
	A few others:	3					
	One or two others:	4					
	Nobody else:	5					
• Frequency: How often is the knowledge used? More critical if it is used frequently.	Once every few years:	1					
	Annually:	2					
	A few times per year:	3					
	Monthly:	4					
	Daily/Weekly:	5					
• Importance: What would happen to the quality of your product or service if knowledge was lost.	Errors or omissions possible with no consequences:	1					
	Many errors or omissions, but no severe consequences:	2					
	Some errors or omissions, with mild consequences:	3					
	Some errors or omissions, with significant consequences:	4					
	Many errors or omissions, with significant consequences:	5					
	Total Scores:						

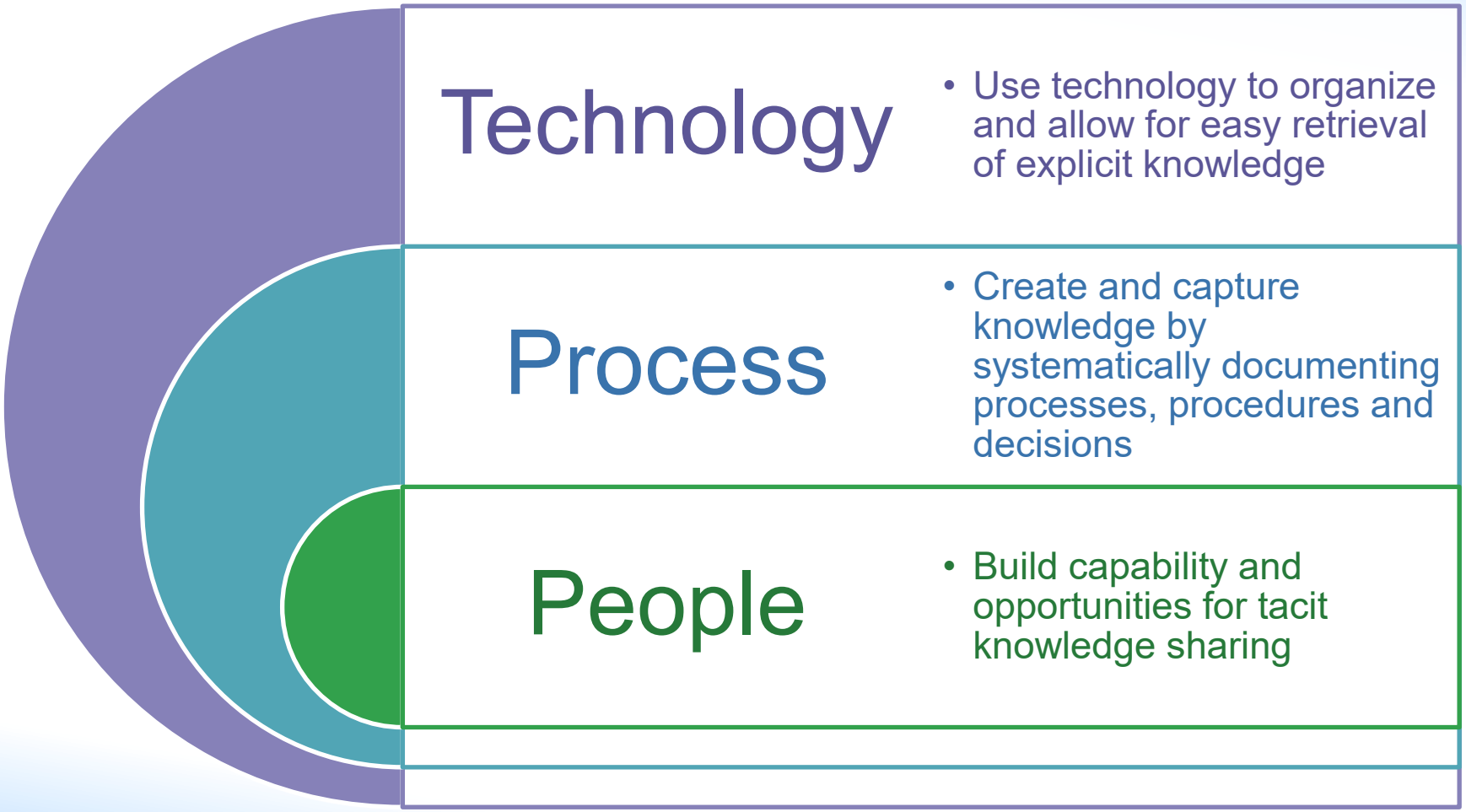
Best Fit

Considerations:

- What is the organizational context?
- Do we have a KM budget and implementation team?
- Will the activates selected help deliver on stated objectives?
- What types of knowledge are you trying to manage?
- Who are the knowledge holders?
- Who are the knowledge receivers?

Given the above considerations, which knowledge management activities are best for your organization?

KM Focus Areas



KNOWLEDGE MANAGEMENT METHODS

Knowledge Management Methods and Tools

Group

- Communities of practice (CoPs)
- Critical incident reviews
- Expert panel
- Expert storytelling
- Knowledge fairs
- Lesson learned debrief
- Networks
- Open committees
- Training and development
- Speaker series

Individual

- Alumni (retiree) programme
- Cross-training
- Field visits
- Job shadowing
- Knowledge transfer plans
- Mentoring programme
- Phased retirement
- Reading and research
- Rotational programme
- Simulations
- Structured On-the-Job Training (OJT)

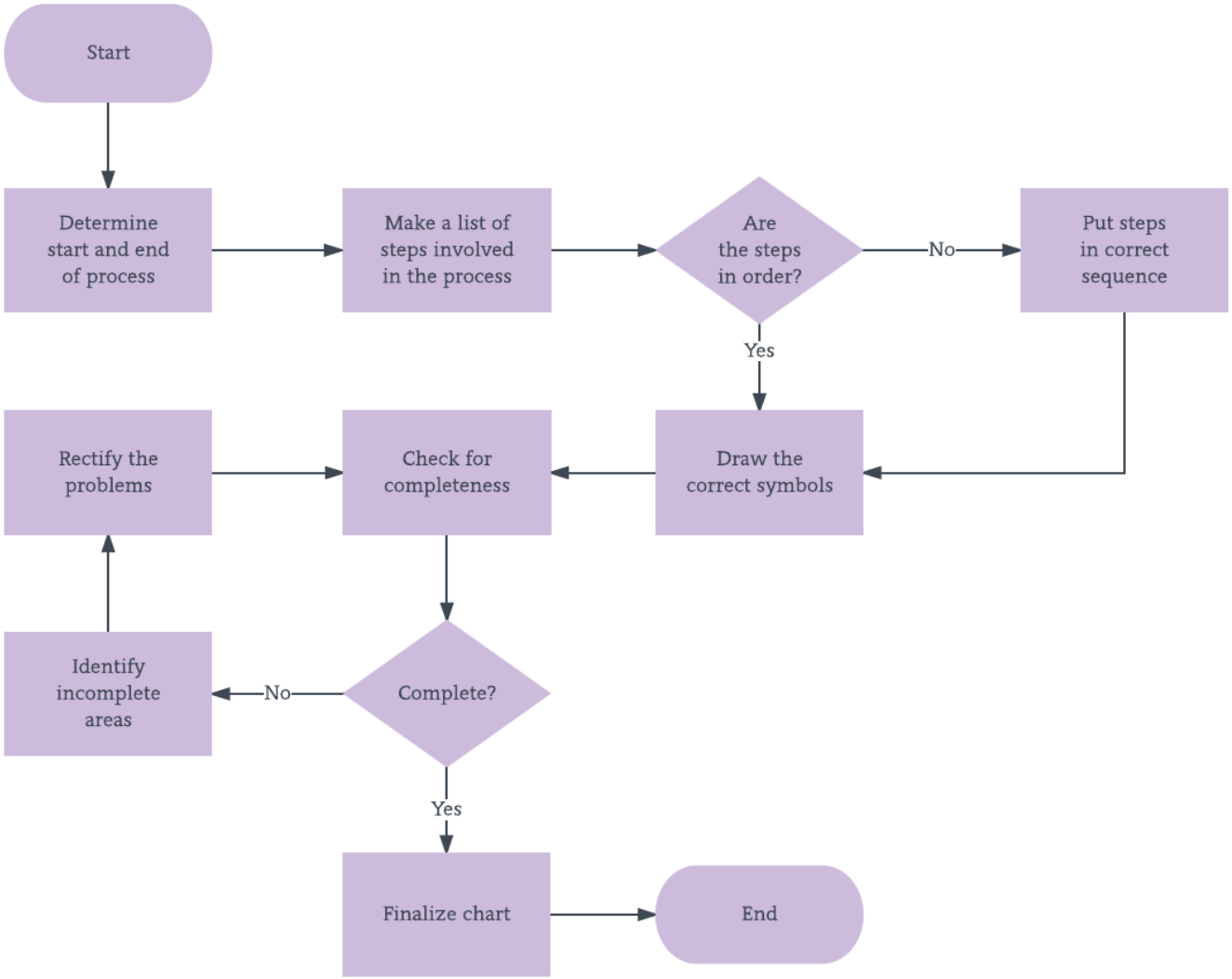
Multi-media

- Blogs
- Educational repositories
- e-leaning
- Expert interviews (audio/video)
- Expert directories “yellow pages” or “expert libraries”
- Gamification
- KM portals
- Knowledge maps
- Online Integrated Management System
- Wikis

Process Modeling

- Process knowledge is characterized by steps, actions or events, with each step having inputs and outputs
- Process modeling is often found in procedures
- Explicit and tacit knowledge can be depicted in a process map
- Process modelling takes many forms

Sample Process Map



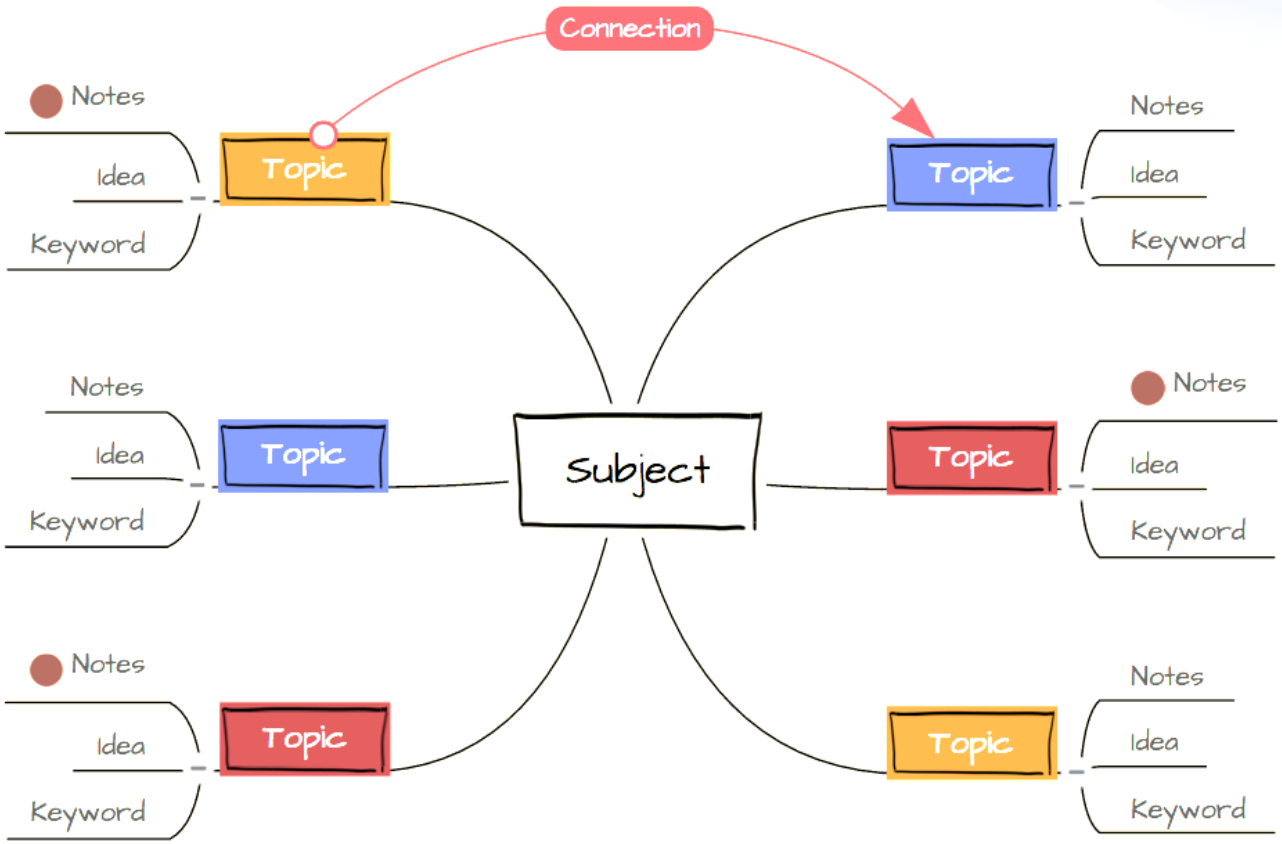
Expert Interviews

- Interview questions should be designed to draw out critical and tacit knowledge
- It is beneficial to have an interviewer who is familiar with the knowledge being captured
- Interviews should be conducted proactively
- Captured knowledge from interviews should be validated, codified and shared

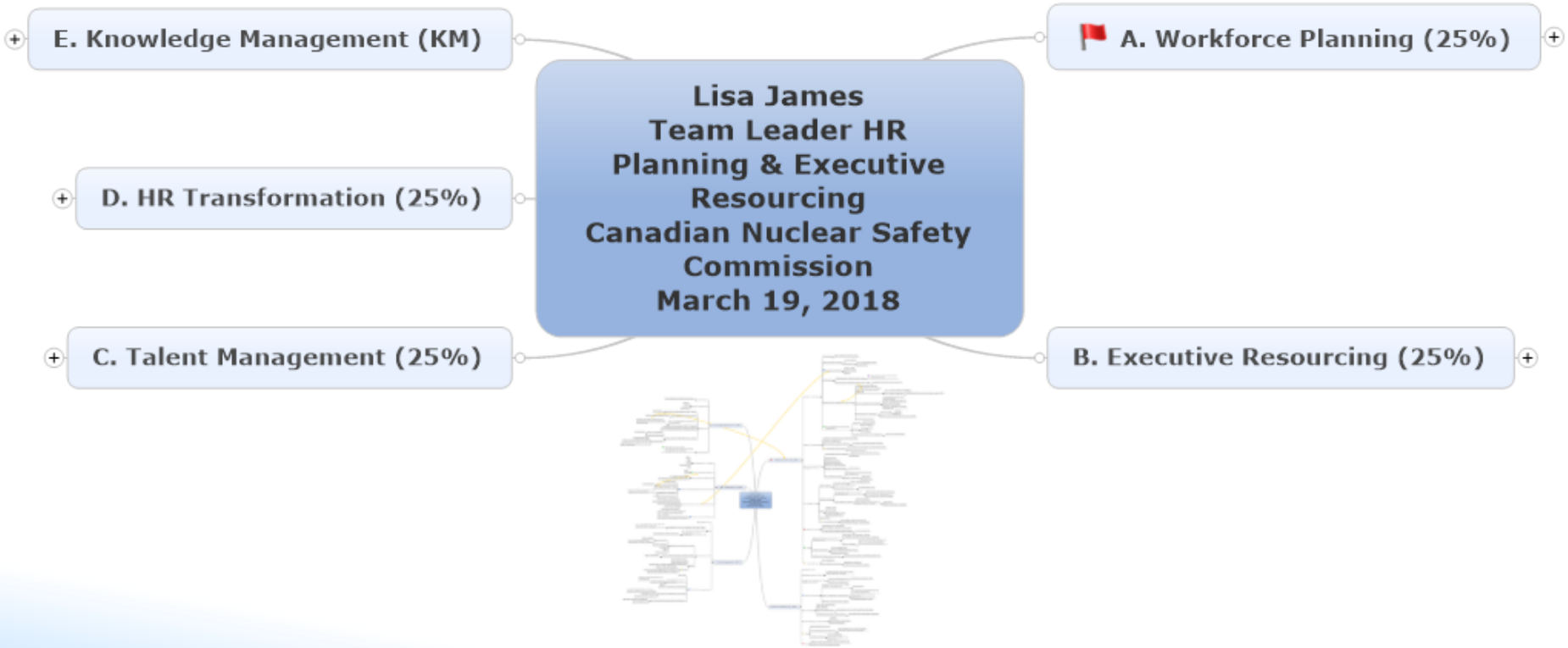
Knowledge Maps

- Maps provide a good visual method of representing knowledge
- Maps can be used as a means of processing and representing knowledge from an interview, transcript or other knowledge sources
- IT tools are available to facilitate both the creation and storage of knowledge maps

Example Knowledge Map



Broadscope™ by Transition Path



Job Shadowing

- A less experienced employee is paired with an expert with knowledge transfer as the objective
- Job shadowing can take may forms
- Should include an opportunity for questions or a de-brief session to support knowledge transfer objectives
- Ensure both parties are clear on expectations and desired outcomes

Speaker Series

Subject matter experts (SME) are asked to give a short lecture, with a questions and answers (Q&A) period. Each session is on a specific topic, and together form a series of lectures.

Benefits:

- Group method of knowledge transfer that may be relevant to new and experienced staff
- Allows questions to be addressed for the benefit of all
- Interactive forum may appeal to a broad audience
- Increases collective knowledge in a specific topic area
- Sessions can be captured and shared later

Sample Topics for Speaker Series

Division	Topic
Probabilistic Safety Assessment and Reliability Division	The Regulatory Role of Probabilistic Safety Assessment (PSA) and Its Role as a Complement to Deterministic Safety Analysis (DSA)
Operational Engineering Assessment Division	Probabilistic Assessments for Pressure Boundary Components Aging
Physics and Fuel Division	Fuel Qualification and Inspection
Directorate of Regulatory Improvement and Major Projects Management and Assessment Integration Division	Application of the graded approach for regulation of small modular reactors (SMRs) and advanced reactor technologies
Physics and Fuel Division	CANDU Fuel Thermal Hydraulics – Current State of Knowledge and Challenges

Knowledge Fair

An event that showcases information about a specific topic. Fairs offer space in which interaction is encouraged, allowing participants to meet with experts to exchange information.

Benefits:

- Group method of knowledge transfer that may be relevant to a target audience or group
- Participants play an active role
- Increases collective knowledge in a specific topic area
- Fairs can be hosted virtually

Example of Knowledge Fair

Build your Network - Launch into Your Future!

Meet with Subject Matter Experts (SMEs) from across the CNSC. Find out about the tools and resources available to develop your career and build your professional network.

Community of Practice (CoP)

A group of individuals sharing a common domain of interest, and through regular interactions they increase their collective learning and experience

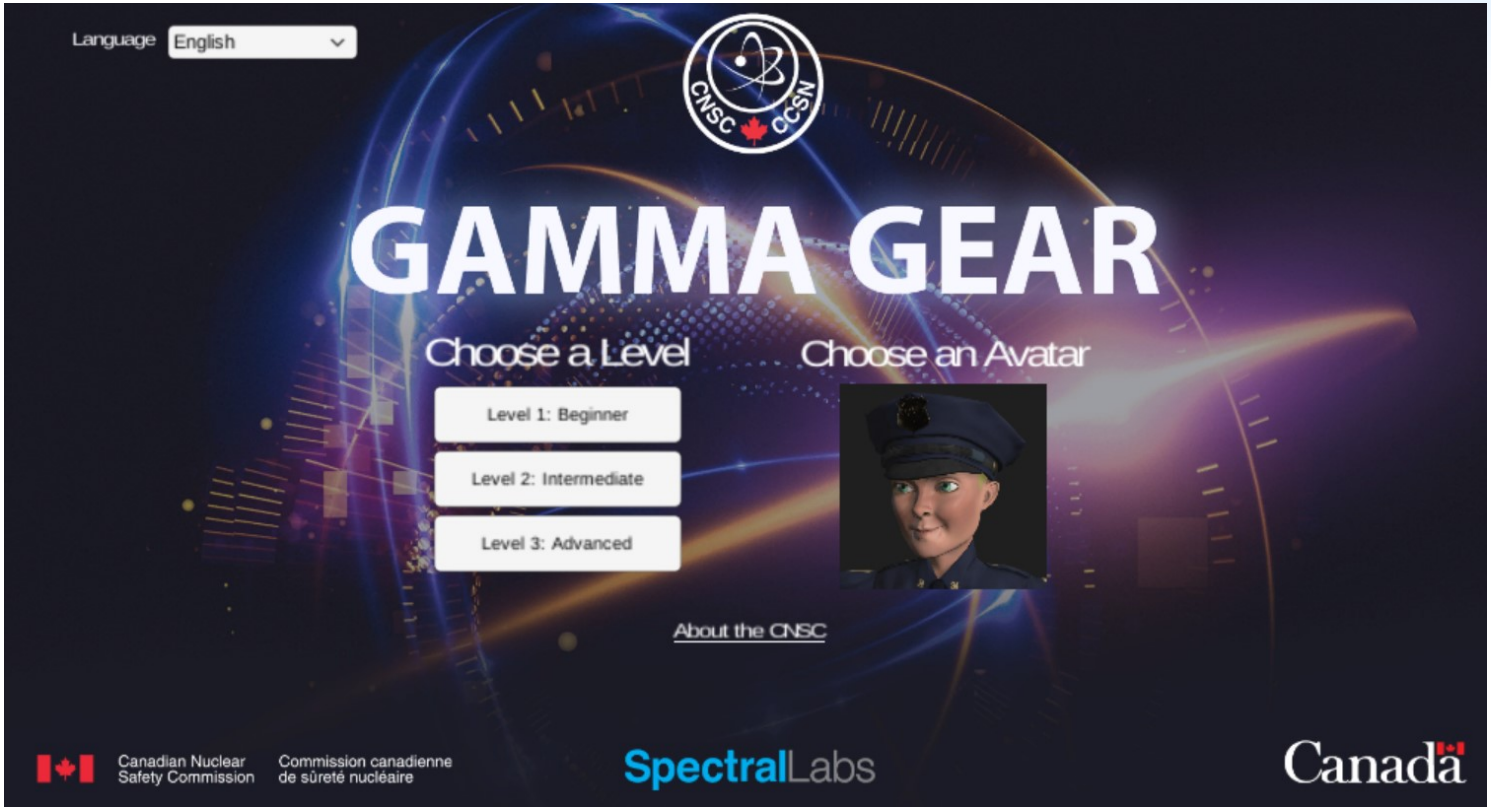
Why focus on communities of practice?		
	for members	for organizations
short-term value	• help with challenges • access to expertise • confidence • fun with colleagues • meaningful work	• problem solving • time saving • knowledge sharing • synergies across sectors/districts • reuse of resources
long-term value	• personal development • enhanced reputation • professional identity • networking	• strategic capabilities • keeping up-to-date • innovation • retention of talents • new strategies

From: Wenger's *Cultivating Communities of Practice: a quick start-up guide*

Phased Retirement or Alumni Programmes

- Incumbent changes roles to focus solely on knowledge transfer and mentoring
- Incumbent delays retirement but works reduced hours
- Retired employees return as Alumni to support training and knowledge transfer

The Future: Gamification



Gamma Gear

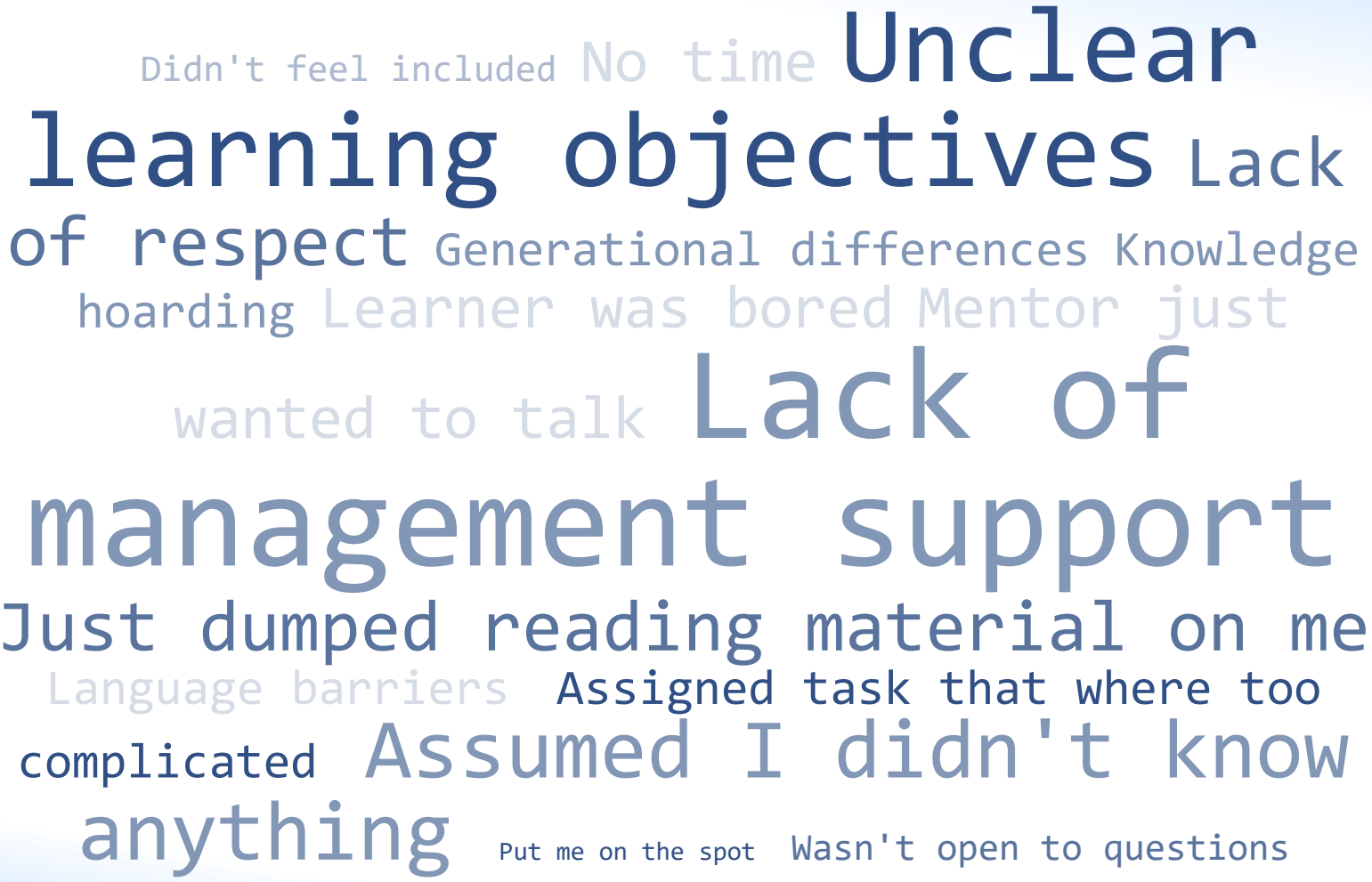
KNOWLEDGE TRANSFER

Formal Knowledge Transfer

Characteristics of **formal** knowledge transfer:

- Based on a trusting partnership between an expert and learner
- Outcome orientated
- Structured approach to transferring knowledge
- Within specified timeframe

Barriers to Effective Knowledge Transfer



Challenges of Transferring Tacit Knowledge

Experts possess years of accumulated tacit knowledge however:

- It takes time and effort to capture/transfer
- Not all experts are interested in sharing their knowledge or are good mentors
- Those who do want to share their knowledge say they find it difficult to describe all they know

Who are the knowledge holders?

- Are they interested in transferring their knowledge?
- Do they trust the organization?
- Do they respect the learner?
- Are they able to transfer their knowledge?

Good communication:

- Increases productivity and the quality of workplace relationships
- Requires the ability to adapt to the preferred communication styles of others
- Involves mutual respect and collaboration

Who are the knowledge receivers?

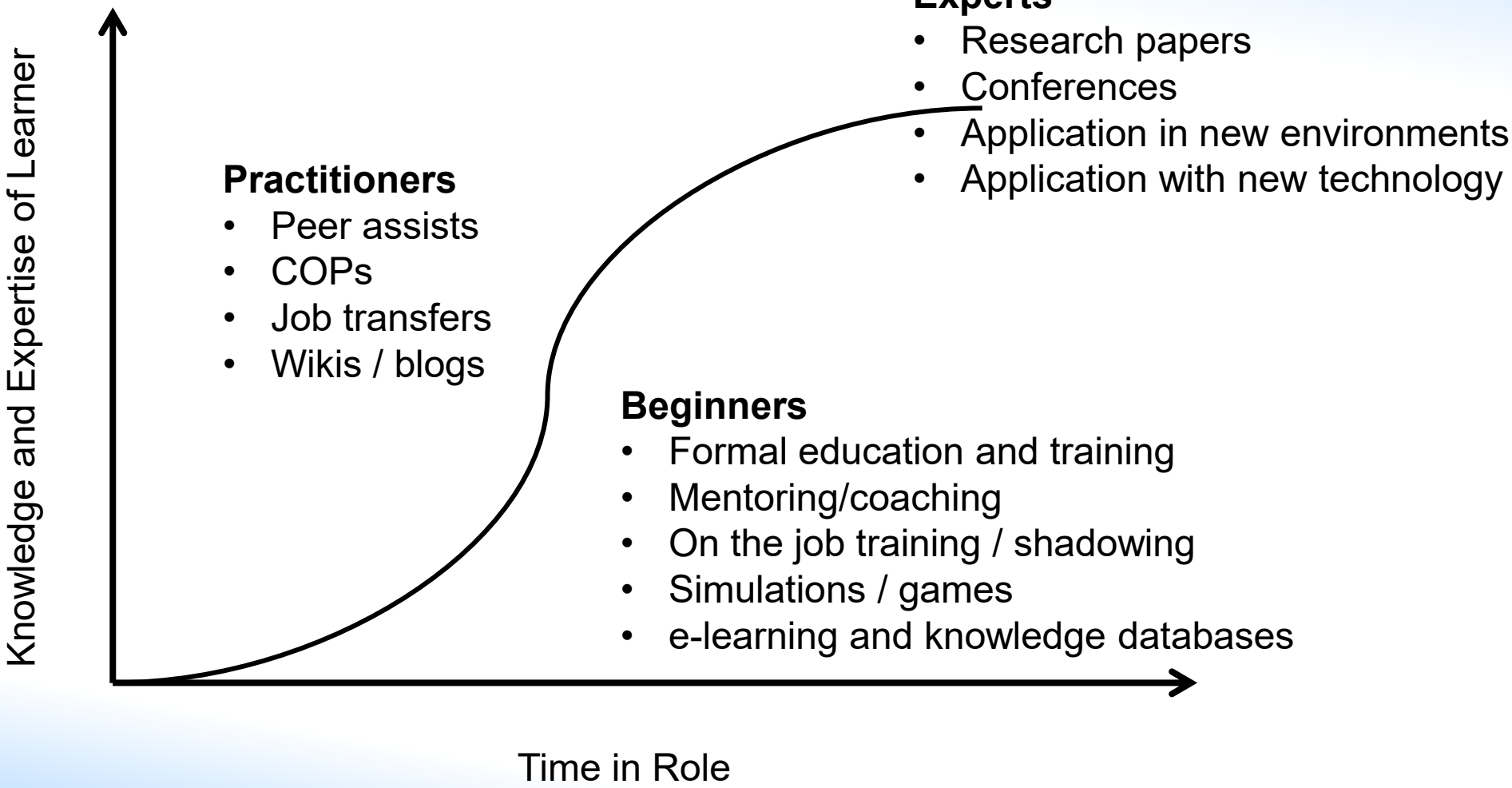
- Do the knowledge receivers have learning agility?
- Do they have generational / individual learning preferences?
- Do they respect and trust their mentor?
- Are they skilled?
- Are they motivated?

Skill/Will Matrix

High Will	GUIDE
	(low skill, high will)
	• Invest time early on
	• Provide tools, training, guidance, coaching, feedback up front.
	• Reduce risks, obstacles, constraints.
	• Relax control as progress is shown.
		DELEGATE
		(High skill, high will)
		• Provide freedom in job methodology.
		  ○ Set objective, not method
		  ○ Praise, don't ignore
		• Encourage trainee to take responsibility
		• Involve in decision making
		• Use "You tell me what "you think"
		• Communicate trust and recognition.
		• Develop stretch goals, broaden responsibilities, treat as "partner".
		• Provide freedom to do the job

Low Will	DIRECT (low skill, low will) • Provide clear briefing, identify motivations, develop vision of success. • Structure tasks for "quick wins", train/coach patiently • Provide frequent feedback and clear expectations. • Supervise closely with tight control and clear rules/deadlines	EXCITE (high skill, low will) • Identify reason for low will. • Develop intrinsic motivation, incentives, value alignment. • Monitor and provide recognition to reinforce positive behaviours. • Provide feedback
	Low Skill →	High Skill

KT Methods and the Learning Curve*



*Adapted from the Conference Board.org

Adult Learning Principles

- Adults are self-directed
- Adults have life experience
- Adults are goal oriented
- Adults learn by doing
- Adults want to be respected

Learning Objectives

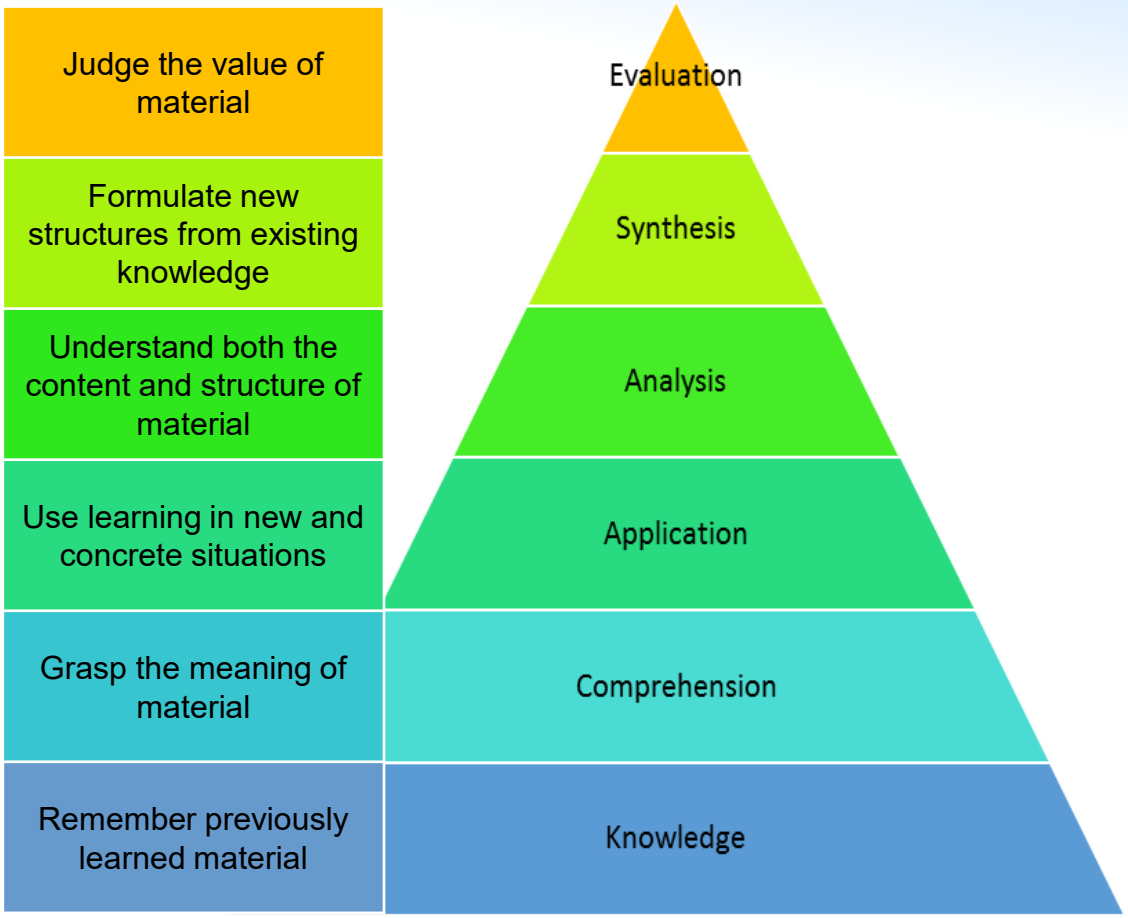
Are essential because they:

- Ensure that the knowledge transferred is in alignment with job requirements
- Clearly communicate these expectations to the learner
- Provide an objective benchmark for assessing progress
- Structures the learning path
- Define the type and depth of learning the learner is expected to achieve

Writing Objectives

Bloom's taxonomy can be used to:

- write clear objectives
- assess the learner's current competency level
- assess and evaluate a learner's progress



Examples of Learning Objectives

LEVEL	LEVEL ATTRIBUTES	EXAMPLE OBJECTIVE
Knowledge	Memorization, recognition, or recall of facts	The learner will be able to **recite** Newton's three laws of motion
Comprehension	Understanding what the facts mean	The learner will be able to **explain** Newton's three laws of motion in his/her own words
Application	Correct use of the facts, rules, or ideas	The learner will be able to **calculate** the kinetic energy of a projectile
Analysis	Breaking down information into component parts	The learner will be able to **differentiate** between potential and kinetic energy
Synthesis	Combining parts to make a new whole	The learner will be able to **develop** an original problem to consider when dealing with the principle of conservation of energy
Evaluation	Judging the value or worth of information or ideas	The learner will be able to **determine** whether using conservation of energy or conservation of momentum would be more appropriate for solving a dynamics problem

Measurable Action Verbs

Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Define	Convert	Assess	Breakdown	Anticipate	Conclude
Describe	Discuss	Demonstrate	Debate	Construct	Critique
Identify	Explain	Determine	Distinguish	Design	Defend
Name	Give examples	Develop	Infer	Formulate	Interpret
Recall	Restate	Predict	Research	Validate	Rate

Learning Objectives Checklist

- ☐ Focus on outcomes
- ☐ Check that outcomes reflect the knowledge required to do the job
- ☐ Start each objective with an action verb
- ☐ Use only one action verb per learning outcome
- ☐ Avoid vague verbs such as know and understand
- ☐ Check that the verbs used reflect the level of competency required
- ☐ Ensure that outcomes are observable, measurable and achievable
- ☐ Check that the outcomes align with the knowledge transfer goals

Developing a Knowledge Transfer Plan

An effective KT plan:

- includes clear objectives, that align with the critical knowledge and competency level required
- takes into account the learner's current skill/will
- is organized in a logical sequence
- is broken down into manageable learning milestones
- includes a date by which the learner must be able to demonstrate competency
- Management approval/validation aligned with expectations

Thank you

Questions?