

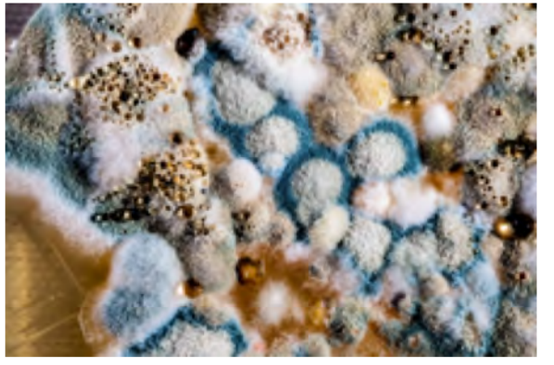

Human and Organizational Issues




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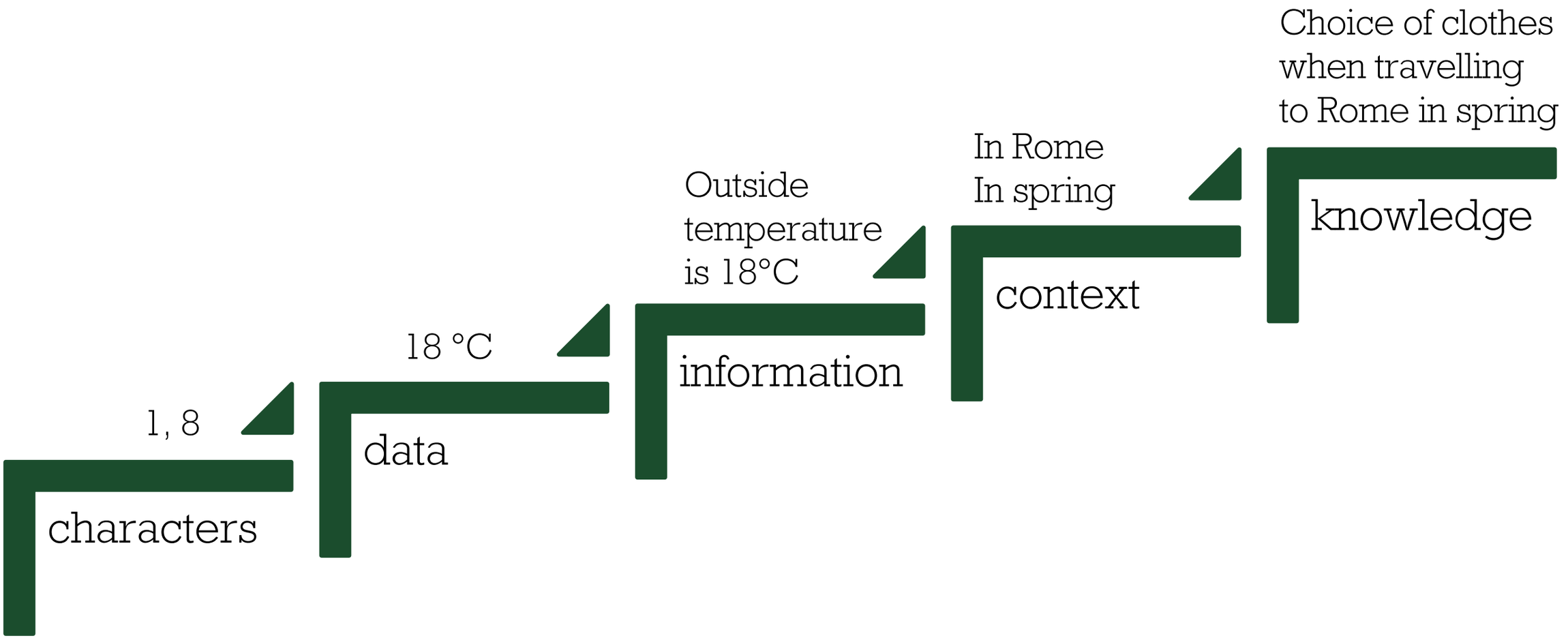
KNOWLEDGE MANAGEMENT

Data, information, knowledge



Types of knowledge

Explicit	Implicit	Tacit
• Written, documented • Easily deployed • Independent from person • books, processes, instructions	• Undocumented • May easily converted in explicit knowledge • Access only in direct contact with bearer • Thoughts, orally transmitted information	• Undocumented • Sometimes unaware • Transferred by doing, training, apprentiship • Tactile and manual skills,gut feeling

Knowledge levels

Individual

- Explicit knowledge
- Implicit knowledge
- Tacit knowledge

Collective

- Proficiency
- Codification
- Dissemination

Long-term

- Forgetting
- Learning
- Maintaining
- Consolidating
- Reconstructing
- Mothballing

Individual Knowledge
Ability – Skill - Competence

Ability

- physical ability
- fit for the job
- examinations

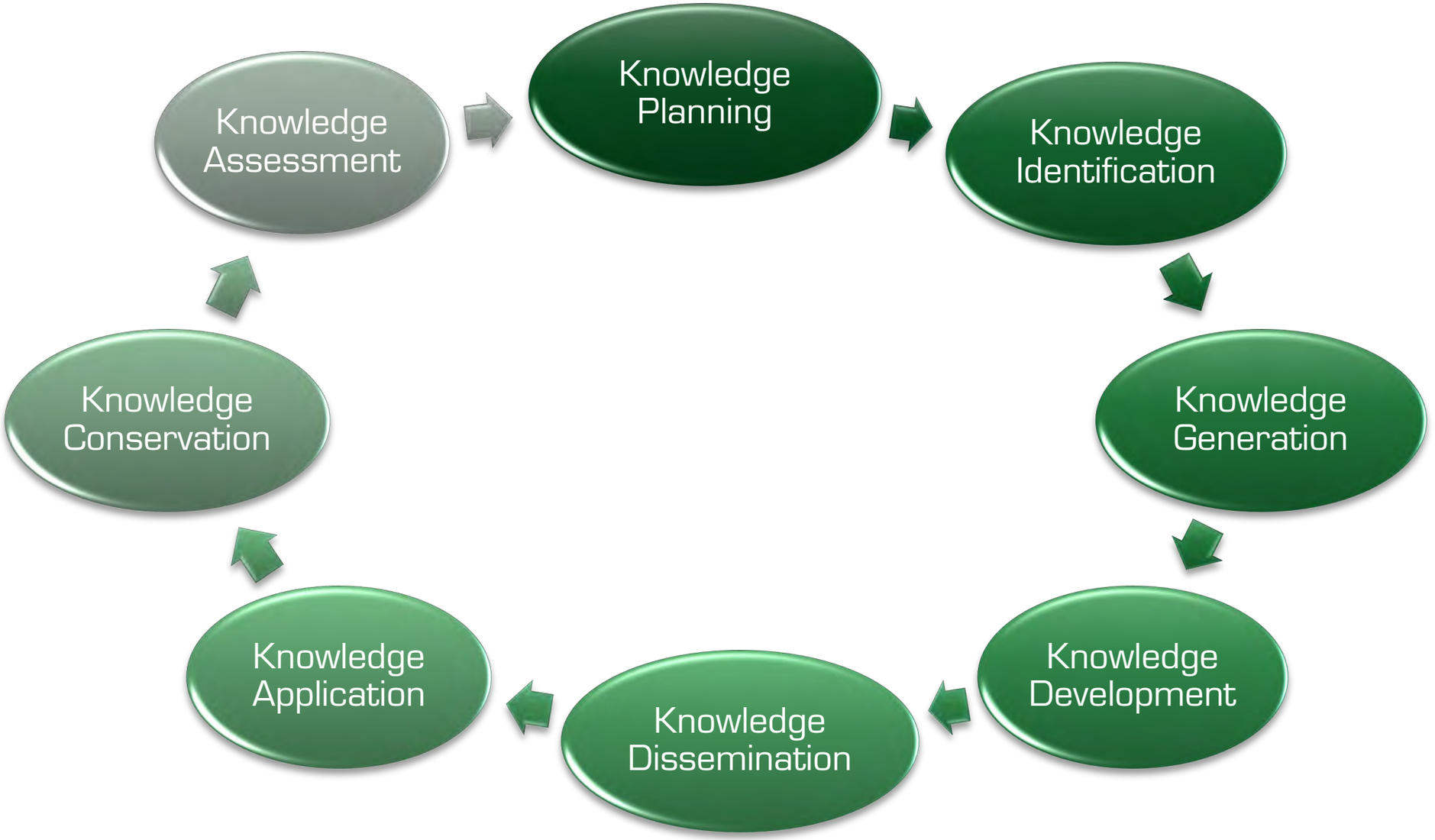
Skill

- Textbooks
- Trainings
- Learning by doing

Competence

- Experience
- Application in different boundary conditions

KM cycle


Knowledge Planning
Knowledge Identification
Knowledge Generation
Knowledge Development
Knowledge Dissemination
Knowledge Application
Knowledge Conservation
Knowledge Assessment

DIFFERENCES BETWEEN OPERATION AND DECOMMISSIONING

KM in Operation vs Decommissioning

Operation

- Repetitive task
- Process control is key
- Planned succession

- Supplier requirements
- Short term (next generation)
- Steady organisation
- Steady plant state
- Knowledge for operation

Decommissioning

- One-of task
- Clear end state
- HR issues
  - Motivation
  - Leaving Knowledge
- Supplier interaction
- Long-Term frontier (ER, Disposal)
- Organisational changes
- Rapidly changing plant state
- Knowledge for decision making

Organizational Changes

- Process oriented line organization changes in a project organization
  - Process control is key in operation. Understanding of process in depth and conduction with high safety, precision, reliability and quality
  - Change is key in decommissioning. Self-elimination the aim
- Task changes:
  - Control of safety functions: reactivity, criticality, heat removal, activity confinement, dose limitation) changes into only some safety functions and the separation of radioactive material from the matrix

Funding Changes

- Cash-cow becomes a cost centre
- Change of economic processes
- Impact on motivation and attitude esp. of leaders
- Impact on self-consciousness and understanding
- Investments rather in ,,doing‘‘ than in ,,thinking‘‘, it is so much easier to defend…

HR Issues

- Some positions (mainly reactor operation, fuel handling) will become completely obsolete
- Respective persons have a very specific and time consuming education
- Respective persons have a very high reputation in the operational organization
- Remaining personnel has the aim to eliminate their own jobs
- Missing perspective will not be motivating to contribute to KM

Supply Chain Interaction

- Decommissioning comprises tasks that have never been carried out in operation
- The competence for these tasks is not within the organization
- Strong interaction necessary with supply chain
  - Data on plant specific details to supplier
  - Boundary conditions and licensing conditions to supplier
  - Safety relevant data on technology from supplier
  - Licensing relevant data from the supplier

Examples for non-operational tasks

- System decontamination
- Under water segmentation and packaging of core internals
- Concrete segmentation
- Characterization
- Logistics
- Decontamination of parts
- Decontamination of buildings
- Packing of waste containers & grouting
- Documentation for waste containers
- Documentation of clearance

Regulatory Changes

- Separate license might be necessary
- Licensing conditions change
- Regulator and TSO may also be new to decommissioning
- In case of phase-out decisions,
  - TSO and regulator will also become obsolete
  - TSO and regulator will shift operational personnel to decommissioning
- Licensing department, TSO and regulator have no interest in timely achievement of the final license part

Change and Configuration Management

- Change will not stop before achievement of end state
- Speed of change may vary depending on current phase of decommissioning
- Configuration may change on daily basis
- Configuration management of operation may be of limited use
- Configuration management has many aspects on inventory distribution, on fire load, on other conventional and radiological hazards

PLANNING AND IMPLEMENTATION OF KNOWLEDGE MANAGEMENT FOR D&D

Decommissioning Strategy Considerations

- For direct dismantling, a critical review and adaption of existing knowledge management system is necessary
- For deferred dismantling, it is necessary to decide:
  - Which knowledge needs to be maintained
  - Which knowledge becomes obsolete
  - Which knowledge needs to be engineered out
- For complex sites, not all necessary knowledge will be obvious in the beginning
  - Decision trees may help to understand possible pathways to the agreed end state
  - At all junctions, the necessity of maintaining knowledge for the branch not choosen is eliminated

Timescales

- Months to years:
  - Knowledge on certain systems
  - Operational knowledge
- Years to decades:
  - Knowledge on deferred plants
  - Knowledge on radiological data
  - Dose data, HR data
  - Environmental remediation
- Decades to centuries
  - Waste package contents
  - Waste package documentation

Cost-Benefit Considerations

- What is the value of knowledge?
- What is the cost of not having knowledge?
- What is the cost of knowledge recreation?
- What is the cost to make knowledge obsolete?
- What is the benefit of possible future technologies?

Motivational Aspects

- Working on a decommissioning project
  - Means eliminating your job and income (if working for operator)
  - Means securing your job and income (if working for supplier)
- Giving long term perspective in the beginning
  - Ensures concentration on decommissioning task
  - Prohibits the negative selection
  - May speed up decommissioning if perspective is more attractive
- Incentivation of KM participation and knowledge sharing

Company Cultures

- General openness enhances willingness to share
- Sharing of knowledge and information needs to be part of aims
- Informal exchange may help
- Complex tasks may require high diversity in teams
- Knowledge culture
- Leading by example is key
- Need to know vs. necessity to keep confidential
- Learning organization and paranoia do not go together well

Management Commitment

- Leadership
- Responsibility chain (difficult in matrix organizations)
- Accountability
- Anchoring KM in policies and executive aims

Knowledge gaps

- known knowns (topics the organization is aware of knowing),
- unknown knowns (things the organization may know without being aware of),
- known unknowns (missing knowledge the organization is aware of) and
- unknown unknowns (missing knowledge the organization is not (yet) aware of missing).

IT CONSIDERATIONS

Interfaces

- Operational knowledge
- Design and built knowledge
- Waste pathways and acceptance criteria
- Waste documentation and national WIRKS
- End states
- Fleet or mother company
- Communities of practice

User Acceptance and Usability

- Usability is defined in EN ISO 9241 with the aspects of :
  - Appropriate for the task
  - Self-descriptive
  - User-adaptive
  - Error tolerant
  - Conform to expectations
  - Customizable
  - Support learning

Data Sustainability

- Given the timeframes of decommissioning, data sustainability should not underestimated
- Data retrievability (physically, software to retrieve)
- Data readability (software to read)
- Data manipulation (software to work with data)

- Open source systems seem to have a clear advantage
  - Accessible source code
  - Documentation
  - Community

Cost Benefit Aspects

- Implementation by pareto principle
  - Invest where current system hurts most
  - Expand to low hanging fruits

- Knowledge is the more valuable
  - The less persons share it
  - The less readily available it is
  - The more difficult it is to sustain
  - The less available in the supply chain
  - The more expensive to reconstruct or to regenerate
  - The more time critical ist application is

International Decommissioning Network