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Joint ICTP-IAEA School of Nuclear Knowledge Management

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Capturing & Transferring Knowledge: Basic Concepts

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Presentation by Ed Boyles & Andrey Pryakhin

Contents

The Three Step Process

CRITICAL KNOWLEDGE RETENTION
PROCESS FLOWCHART

Step 1
Conduct
Risk Assessment

Step 2
Determine &
Implement Plan

Step 3
Monitor & Evaluate

Prepare Management → Assess Risk Factors → Prioritize Positions → Inventory Knowledge/Skill "Clusters" → Assess Criticality → Develop Knowledge Retention Plans → Coordinate and Review KR Plans → Implement KR Plans → Monitor & Evaluate KR Plan Progress
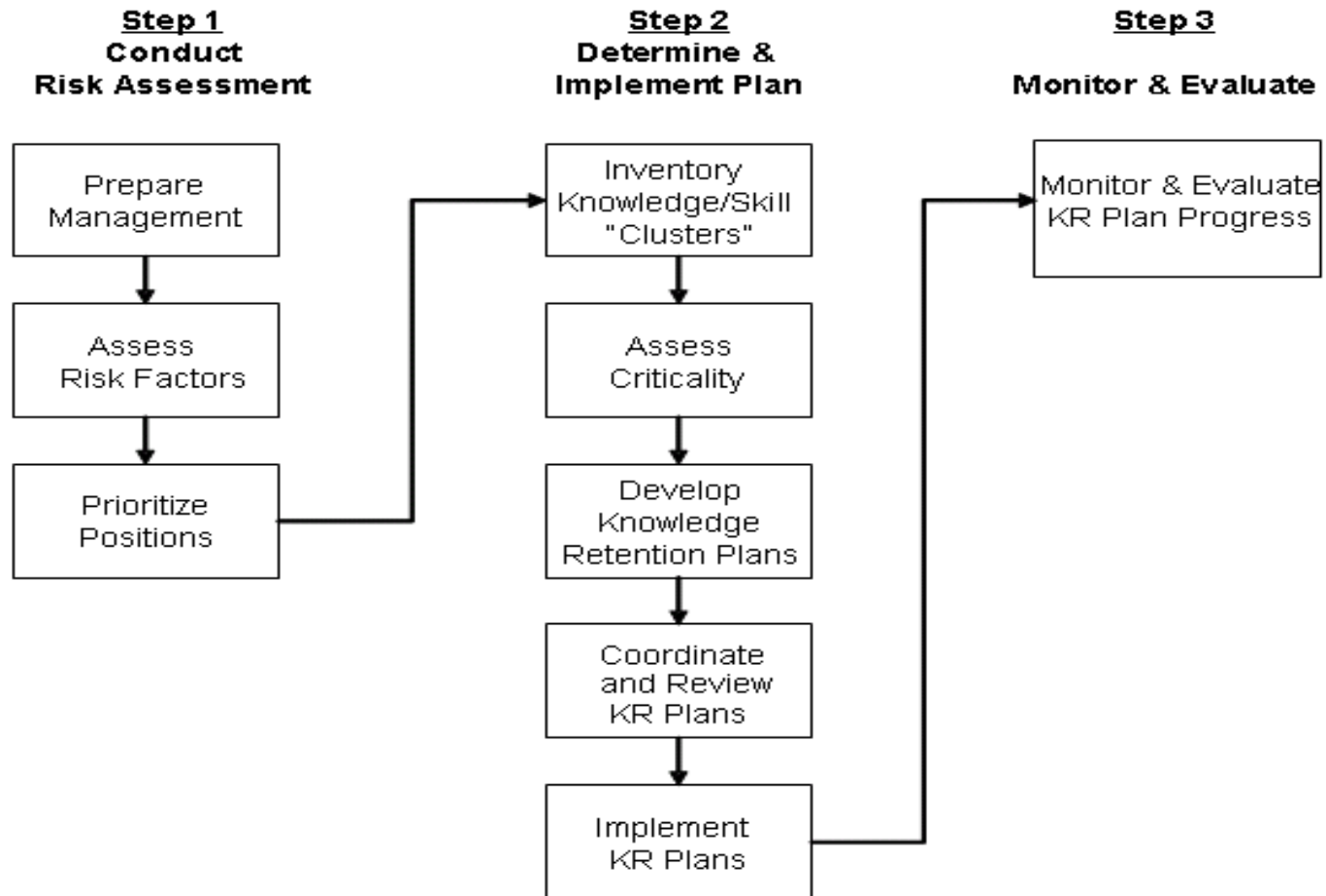
IAEA Publication

Knowledge Retention Plan

KNOWLEDGE RETENTION PLAN

Employee: ___Konstantin Peradze___ **Position:** ___Senior Trainer, INPP Training Center___ **Position Risk Factor:** ___5___

Summary and Situation Assessment: Mr. Peradze is a Senior Instructor at the INPP Training Center. He has worked at INPP for ___ years, ___ years in his current position. Previously he has worked in _____ positions. He is responsible of the training of Senior Reactor Operators and as such is very knowledgeable of the simulator operations. The lead time for training of a replacement is expected to be 6 months to one year if an experienced SRO is selected. During the interview several areas of knowledge and skills were identified that are considered to be at risk if Mr. Peradze were to leave INPP. These areas are as follows:

- Design and development of the simulator - experience gained during simulator development in Germany – **Undocumented:** **If this knowledge is lost it would impact the refurbish/modification of the simulator which had a direct impact on the quality of training and ultimately on plant performance.**
- Operator responses during simulator training - response time and actions - **Undocumented**
- Differences in the MCR console and the simulator (e.g., recorders)
- Team decision making process
- Application of SAT process at INPP - **Undocumented**
- Modeling (e.g., neutron kinetics)
- Instructor skills specific to INPP - **Undocumented**
- Practical knowledge of training methods at INPP – **Undocumented**

Mr. Peradze plans to retire in ___ years. The following Knowledge Retention Plan has been developed to address the potential loss of this critical knowledge

At-Risk Knowledge or Skill	Actions Steps which will be taken to retain this critical knowledge/ skill and/or minimize the impact of its loss.	Assigned To:	Target Date(s) for Completion	Status and Issues
Design and development of the simulator - experience gained during simulator development in Germany – **Undocumented**	Develop manual on design & development of simulator. Include historical information important to future modification and maintenance of simulator	K. Peradze	15 August 2008	Provide support to Mr. Peradze including relief from normal duties as necessary to support action completion.

KM IT Support Tools

Knowledge Loss Risk Assessment - 20 or Greater   Sensitive Information   Monday, April 02, 2007

Org: COO TVAN   Dept ID: *

Risk Factors

Organization and employee information

Knowledge Retention Plan Status

Name		Job Title	Job Code	Sch	Grd/Band	Projected Retirement Date	Source*	Retirement Factor	Position Risk	Attrition Factor	KRPlan Need	Der'd	OnTrk
C619000000	PLTOPR REL	SPEC, COMPONENT (VALVES)	JR0019	M	SM	01.01/2008	Self-Id	5	5	25	☑	☑	☑
C61B100000	CMP ENG/CS	I&C Engr, Computer Sys, (NUC)	AI0021	CE	D	06.01/2008	Self-Id		5	25	☑	☐	☐
C61B200000	CE/PLTSP	MGR, PLANT SUPPORT SYSTEMS	JN0077	M	SM	06.01/2007	Self-Id	5	5	25	☐	☐	☐
C64A800000	CORP LIC	GEN MGR, NUC LIC & INDUST AFFS	KP0041	M	OE	10.01/2007	Self-Id	5	5	25	☑	☐	☐
C64E8A0000	CIVIL ENGG	Prog Mgr, Engg Mechanics	JO0031	M	SM	11.01/2007	Self-Id	5	5	25	☑	☐	☐
C64E8A0000	CIVIL ENGG	PM, ure Mechanics	JO0049	M	SM	12.01/2007	Self-Id	5	5	25	☑	☐	☐
C64E8A0000	CIVIL ENGG	Mgr, Civil Engineering	JN0098	M	SM	01.01/2008	Self-Id	5	5	25	☑	☐	☐
C64E8D0000	NMTLS/CDS	PM, ASME Boiler & Pv/Code (ISI)	JO0045	M	SM	01.01/2008	Self-Id	5	5	25	☑	☑	☐
C64E8D0000	NMTLS/CDS	Prog Mgr, NMTLS/CDS	JO0045	M	SM	06.01/2008	Self-Id	5	5	25	☑	☑	☐
C615000000	PLT MGR-SQ	PLANT MANAGER, NUCLEAR	KS0002	M	OE	01.01/2008	Self-Id	5	4	20	☐	☐	☐
C615110000	MAINT & MO	MGR, MAINTENANCE & MODS	KR0005	M	OE	01.01/2008	Self-Id	5	4	20	☐	☐	☐
C615111000	MODS	SUPV, NUCLEAR MODS SHIFT FIELD	IN0011	M	CM	06.01/2008	Self-Id	5	4	20	☐	☐	☐
C615112110	MS SHOP B	ELECT HEAD FMN	005195	TB	OO	08.01/2008	Self-Id	5	4	20	☐	☐	☐
C615112270	MS SHOP A	NUCLEAR MECH TECH III	004081	TB	OO	01.01/2008	Self-Id	5	4	20	☐	☐	☐
C615112270	MS SHOP A	NUCLEAR MECH TECH III	004081	TB	OO	03.01/2008	Self-Id	5	4	20	☐	☐	☐
C615112310	INST MAINT	SR INST MECH INSTR	007515	TB	OO	03.01/2008	Self-Id	5	4	20	☐	☐	☐
C615112310	INST MAINT	SR INST MECH	007513	TB	OO	09.01/2008	Self-Id	5	4	20	☐	☐	☐
C615181000	OPS TRNG	INSTR, OPERATIONS (LEAD)	GI0005	M	CM	12.01/2007	Self-Id	5		20	☐	☐	☐
C615184000	TECH TRNG	MGR, TECHNICAL TRAINING	GJ0050	M	CM	12.01/2007	Self-Id	5	4	20	☐	☐	☐

* Source: Self-Id - Employee shared date   WFP-Report 41   Page 1 of 4
            Default - Assumed retirement age 56 (no data received)

            Default - Assumed retirement age 56 (no data received)
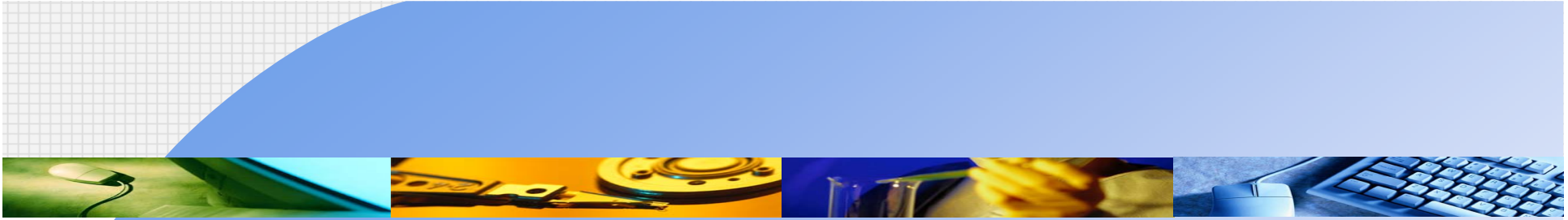
Approaches to Capture & Transfer

Knowledge Type Drives Approach

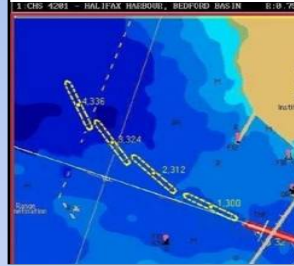**Identify types of knowledge to be elicited from each expert**

Historical	Job/task performance	Predictions	Information sources	Thought Process *Expert* *Novice*
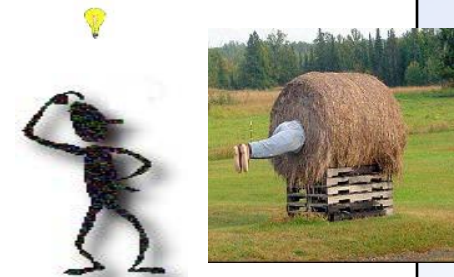
Select approach to knowledge elicitation and capture

Elicitor interacts with expert	Self-elicitation and capture	Advanced knowledge capture

Community of practice

Application

Process
Knowledge

Concept
Knowledge

Process Modelling

✓**Most used**

Interviews

✓Most used

Laddering

**Concept
Mapping**

✓Most used

**Constrained
Tasks**

Observation
✓**Most used**

Commentating

Rep grid

**Concept
Sorting**

Explicit
Knowledge

Tacit
Knowledge
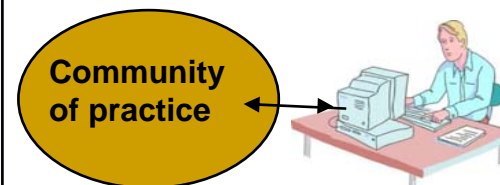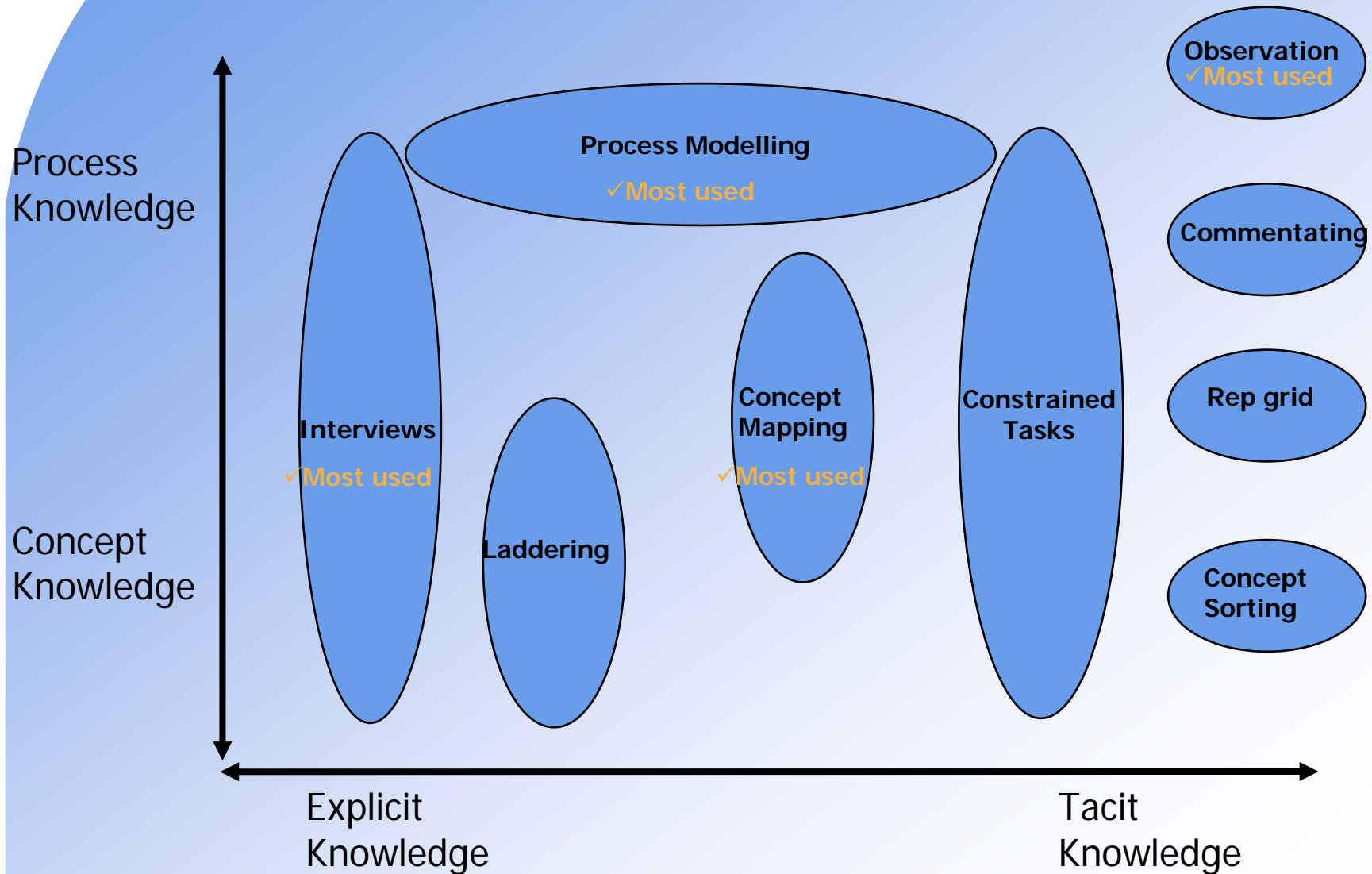
Approach Examples

- Interviews

Concept Maps
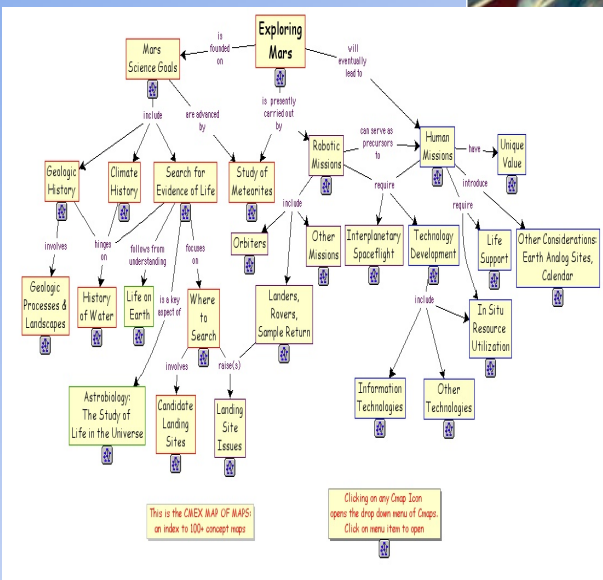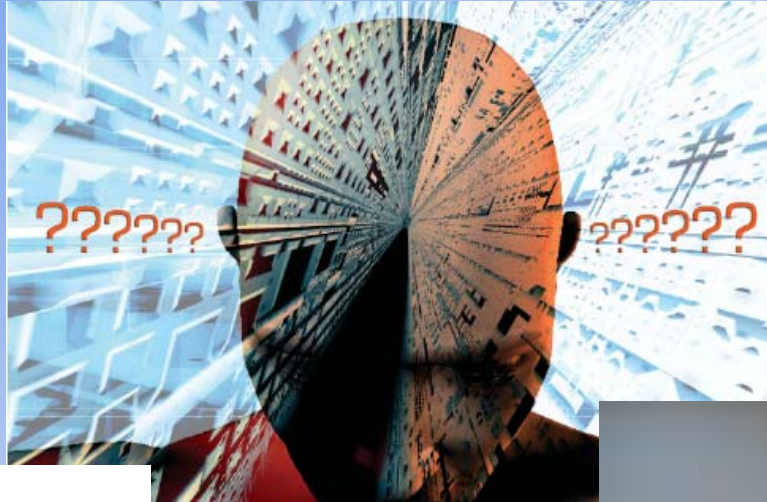
Observation (Video Capture)

Interviews with SME

- ## Knowledge Clusters (Initial Interview)
  - What?
  - So What?
  - Now What?

- ## Semi- Structured
  - Extraction of Critical Knowledge
  - Determine other approaches

Guide to Identifying Knowledge Clusters

Preliminary Interview

Instructions

The purpose of this questionnaire is to help you identify your critical skills and knowledge, especially those unique knowledge and skills that might be lost when you leave (organization name).

Some things to think about as you work through these questions:

- Knowledge or skill can mean several different things. We want to use a very **broad definition** that could include anything that new employees would need to know to do a job like yours (except for the exclusions noted below).
- **Do not include standard skills** that are common to your particular job or that are assumed for a particular certification or degree (e.g., journeymen electricians are expected to be able to read a blueprint, etc.). If you're not sure it is common, include it here.
- Some of the questions will appear to ask the same thing several different ways. We do this on purpose to make sure we do not miss valuable information. When the answer is something you have already discussed, simply say so rather than repeat the information again.
- When we ask you to describe or list things, give us a general description and not a detailed description. Don't try to tell us how to do something. We will come back and gather this level of detail later. For now we are just trying to build lists to evaluate and prioritize.
- For each major piece of knowledge, try to give us some sense of how important it is and how much trouble we may be in due to attrition. Tell us if the knowledge is written down somewhere or not, who knows it besides you, what would likely happen if no one knew this, how long it takes someone to learn it, etc.
- The questions under section B will produce lists. In many cases these lists will already exist in job descriptions, training programs, preventive maintenance procedures, and/or various databases. If so, simply refer to the appropriate source or list and tell us how to find it. In other words, there is no need to try to rewrite the list in the interview.

A. General Questions

1. What kinds of knowledge or skills do you now have that (organization name) will miss most when you leave?
2. If you had to leave (organization name) suddenly and only had one day left to brief your replacement, what would you put on your list of things to tell them?
3. Looking back, what things do you wish (organization name) had taught you early in your job that you eventually learned the hard way?

Knowledge Capture
Semi-Structured First Interview

INPP Staff Name	
Group	
Position	
Location / Extension	
Interviewer's Name	
Date Interview	
Location	

1. Introduction

'It is [date] at [time]. The first generic interview between [interviewer's name] and [interviewee's name] of INPP is now being recorded from [location]. The purpose of this session is to ask some generic questions to support the knowledge transfer process within INPP. This generic questionnaire will aim at recording specific topics and is a pre-cursor to a more technical questionnaire which will be carried out at a later date and will target the technical knowledge and experience to be retained.'

The interview is to be divided into a number of stand-alone sections. A brief introduction will be given at the start of each section and each will terminate with a summary discussion to ascertain the importance and the issues communicated with each answer.

2. General Points

This section is a 'warm-up' section and covers simple questions relating to the role of the leaver.

Q2.1: How long have you worked for INPP? And how long have you held your current position?
R2.1:

Q2.2: What roles / responsibilities have you had most recently (max over the last 10 years)?
R2.2:

Q2.3: What important knowledge would INPP miss most when you leave?
R2.3:

Q2.4: Have your responsibilities been assigned to another INPP member of staff? If Yes: has the handover been carried out? And has it been effective? What were the strongest/weakest areas in terms of handover? If No: do you have any suggestions to ensure that these responsibilities are handed over effectively.
R2.4

Q2.5: When you leave, what do you consider to be the main risks to INPP (related to your current role)
R2.5:

Interviews with Experts

SME's 5X5=25

Professor of Reactor Physics

Senior Operations Instructor

- **Senior Instructor, Operations and Simulator Training**
  - **5X5=25**

1. **Design & development of simulator - experience gained during simulator design and development:** *If lost would impact the refurbish/modification of the simulator which would have a direct impact on the quality of training and ultimately on plant performance - Undocumented*

2. **Operator responses during simulator training - response time and actions - Undocumented**

3. **Differences in the MCR console and the simulator (e.g., recorders)**

4. **Modeling (e.g., neutron kinetics)**

5. **Instructor skills specific to plant - Undocumented**

6. **Practical knowledge of training methods at plant– Undocumented**

Prof. A. B. Jones

- **Knowledge Clusters**

Gen V Reactors

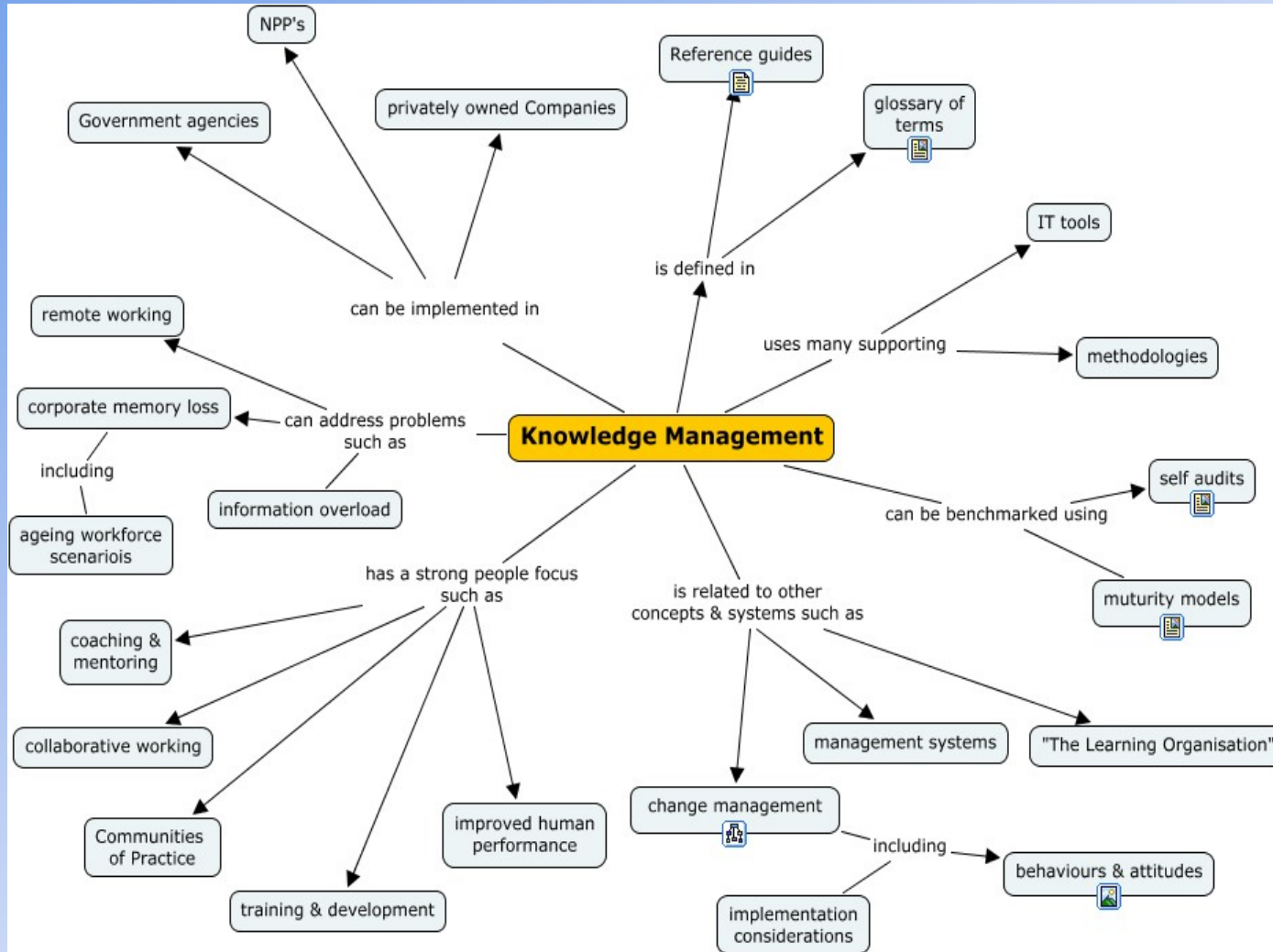Training of Specialist

Cyclotron Experiments

Theoretical and Practical Physics

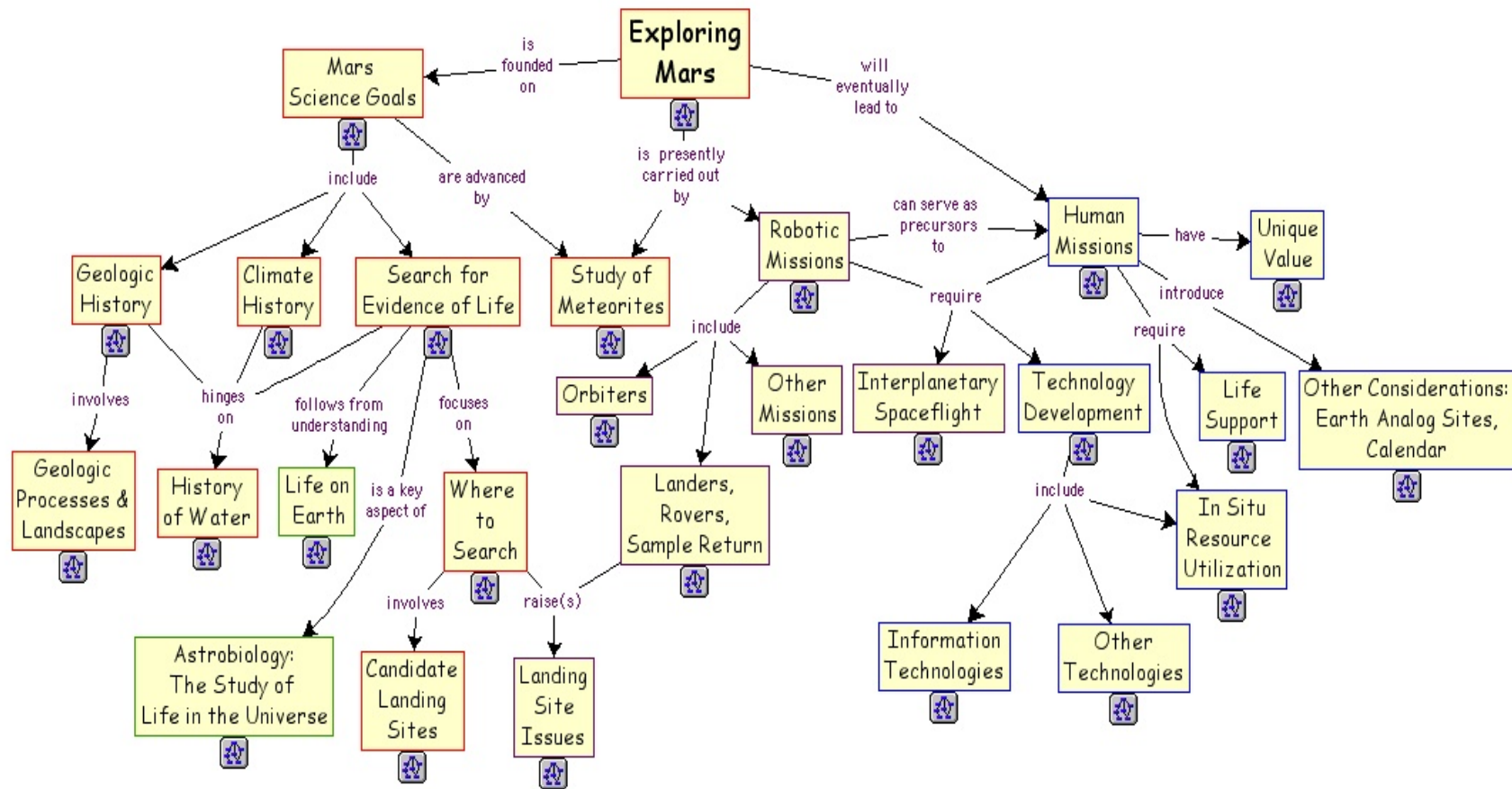History of Laboratory (FSU to Market Driven)

Professor of
Reactor Physics

KM Concept Mapping Example

NPP's

Government agencies

privately owned Companies

Reference guides

glossary of terms

IT tools

is defined in

can be implemented in

uses many supporting → methodologies

remote working

corporate memory loss ← can address problems such as

including

information overload

Knowledge Management

can be benchmarked using → self audits

ageing workforce scenariois

has a strong people focus such as

is related to other concepts & systems such as

muturity models

coaching & mentoring

collaborative working

Communities of Practice

improved human performance

training & development

change management

including → behaviours & attitudes

implementation considerations

management systems

"The Learning Organisation"

NASA Example

Observation (Video Capture)

SME

Mfg. Process

3-D Animation

Thank You !

Ed Boyles *& Andrey Pryakhin*

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