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How Knowledge Mapping is Being Used to Integrate Plans for Safe and Reliable Operations

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Intellectual property**



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Overview of presentation

Knowledge mapping is a powerful tool for coordinating nuclear programmes

- Understanding what knowledge is required and when is essential for operators and governments in managing valuable knowledge resources
- A structured knowledge map used as a single source of information can be used to integrate a range of National and local strategic plans
- All aspects of knowledge can be mapped: people, process and technology

First steps in Knowledge Management

Know what you need to know and when

- Intelligent decisions on prioritising and planning valuable knowledge resources depend on:
 - Knowing what you know
 - Knowing what you need to know, now and in the future
 - Systematically managing the gaps, risks and opportunities

Nuclear programme challenges

Complexity and duration require a collaborative, systematic approach to coordinate knowledge plans

- Nuclear programmes are large scale and long term and demand a systematic and comprehensive approach
- Numerous manifestations of knowledge need to be coordinated, planned and managed
- Typically these are produced independently but can be produced from one unified knowledge analysis map
 - *National nuclear manpower plan*
 - *National high level skills plan*
 - *Training plan*
 - *Personal development plans*
 - *Technology development plan*
 - *Community of practice structures*
 - *Document and record retention schedule*
 - *Information Asset Register*
 - *Taxonomy*
 - *Skills finder - Yellow pages*
 - *Knowledge Retention Plan*
 - *Learning plan*

Common frames of reference

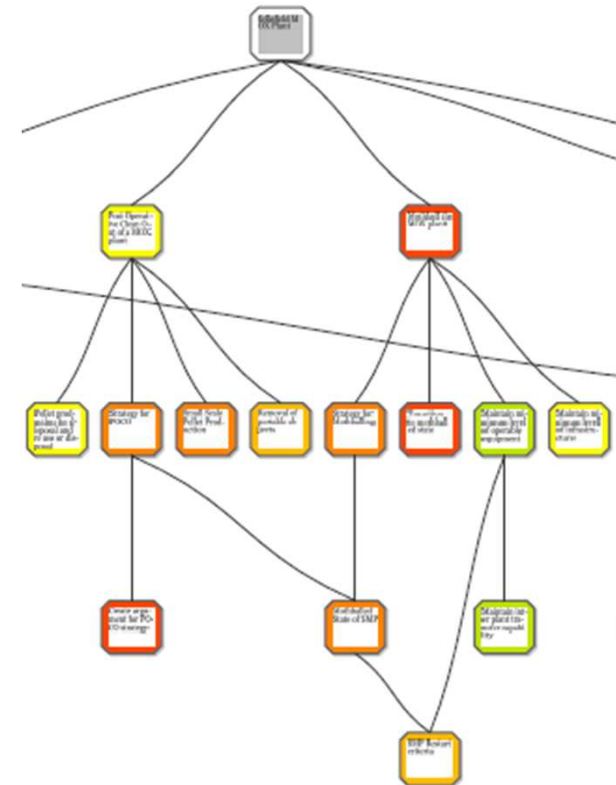
Different frames used by different analyses make comparison and coordination difficult

- Different frames of analysis are difficult to compare
 - Overlapping terms and inconsistent definitions to describe aspects of the same knowledge requirements
 - *Competency, ability, learning outcomes, knowledge, profession, skill, capability, capacity, proficiency, know-how, information, intellectual assets, human capital, talent, experience, wisdom, etc.*
 - Multiple but independent models, maps, lists and plans for developing essential organizational competencies

Knowledge mapping

Knowledge mapping is a tool for integrating the work of different groups

- Knowledge mapping can be used for the identification and scheduling of knowledge that people need in order to carry out activities
- A knowledge map is a tool to:
 - Analyse the fundamental building blocks and structure of knowledge
 - Prioritise knowledge
 - Develop a knowledge agenda
 - Formulate strategies
 - Coordinate management



Measuring knowledge - Knowledge attributes

Knowledge mapping is complicated and requires a multi dimensional analysis

- *Automotive attributes :*
 - *Materials: Metal, Rubber, Glass etc.*
 - *Components: Wheels, Engine, Passenger compartment, etc.*
 - *Colours : Black, Red, Grey etc.*
- Knowledge attributes :
 - **Domains** – technical, organisational, societal etc.
 - **States** – Explicit, implicit, tacit etc.
 - **Levels** – Know-why, know-how, know-what etc.
 - **Representations** – Documents, models, pictures etc.
 - **Categories** – Good practices, lessons, standards etc.
 - **Artefacts** – Buildings, tools, equipment, etc
 - **Capabilities** – Competency, ability, skill, intellectual assets etc.

Mapping parameters – identifying priorities

Multiple parameters are used to represent the dimensions of different knowledge attributes

I Importance: consequence of loss of knowledge

P Proficiency: quality of knowledge

C Codification: documentation of knowledge

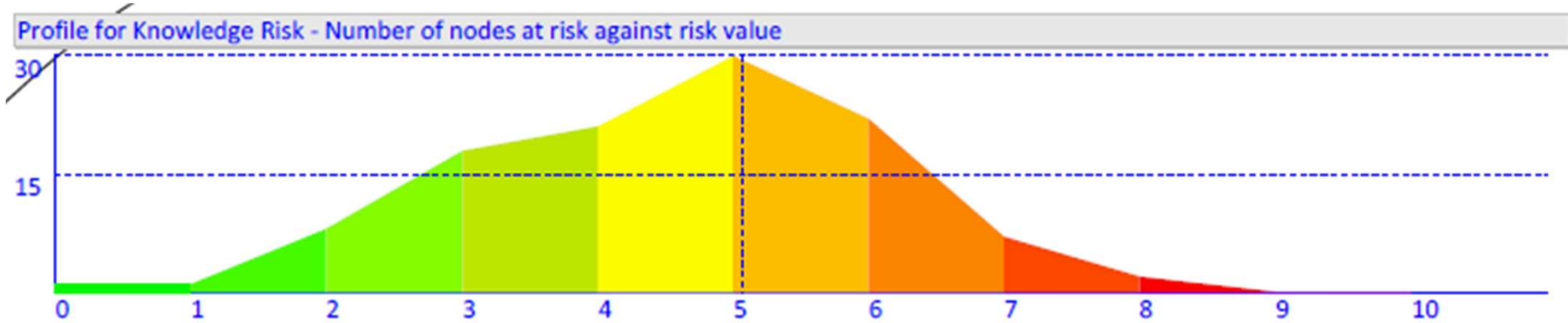
D Diffusion: spread of knowledge

- Recovery: effort to relearn knowledge
- Readiness: availability of knowledge
- Buy-Develop: sourcing of knowledge
- Study-Exp: the way knowledge is gained
- Known By: number of people knowing this
- Stability: rate of change

etc

Outputs - Knowledge risk

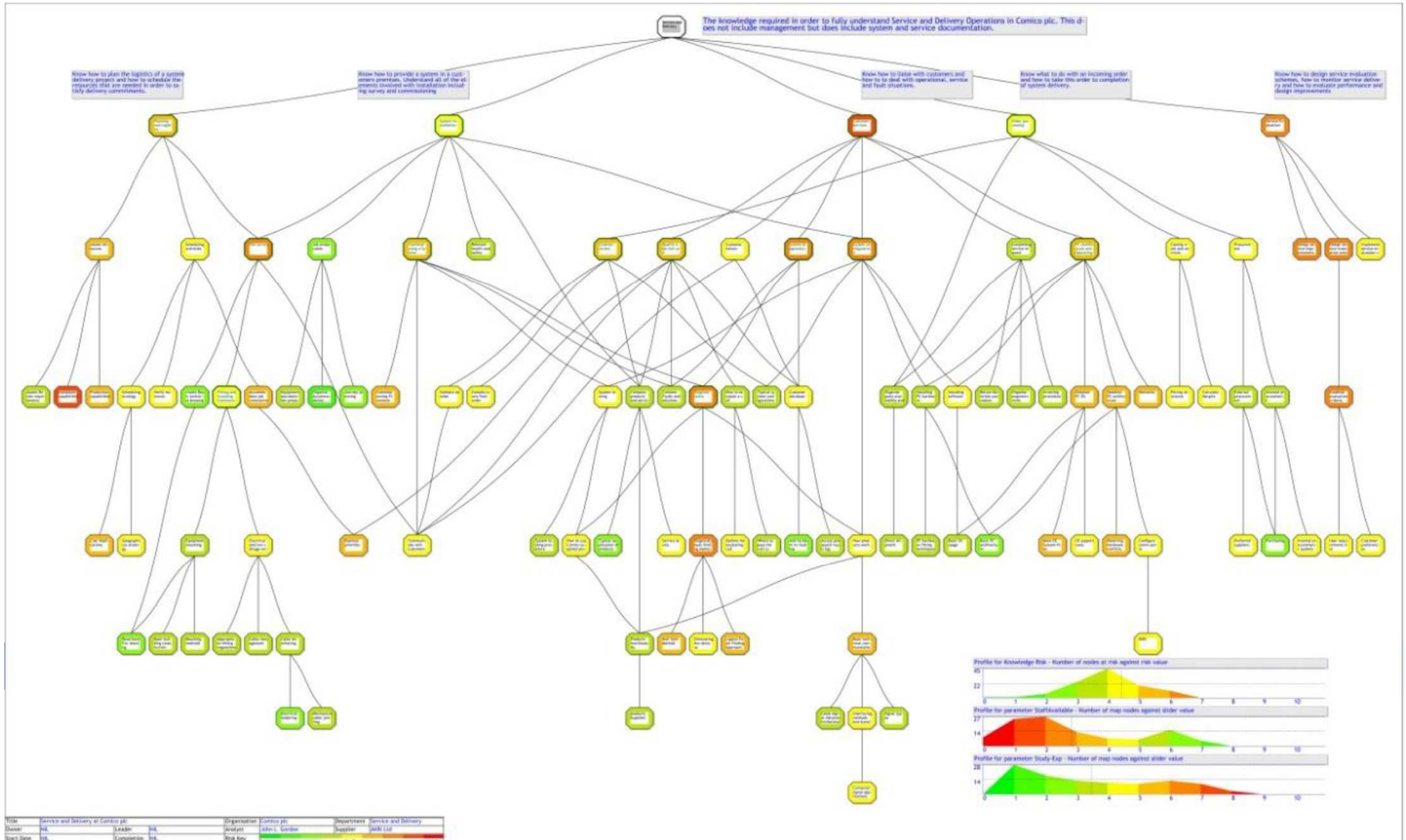
Algorithms translate parameters into measures of risk, (not just risk of knowledge loss)



Knowledge Risk = I × P × C × D

Outputs – learning dependencies

A visual representation of knowledge domain dependencies colour coded for risk



Outputs - KM interventions

Measures and gaps translate into KM interventions and plans

Codify expertise into information

Creating corporate memory (search/retrieval, document/content management)



Diffuse, share good practice

Creating communities of practice, peer networks



Proficiency and capability building

Research & Development, recruitment, partnerships, education and training

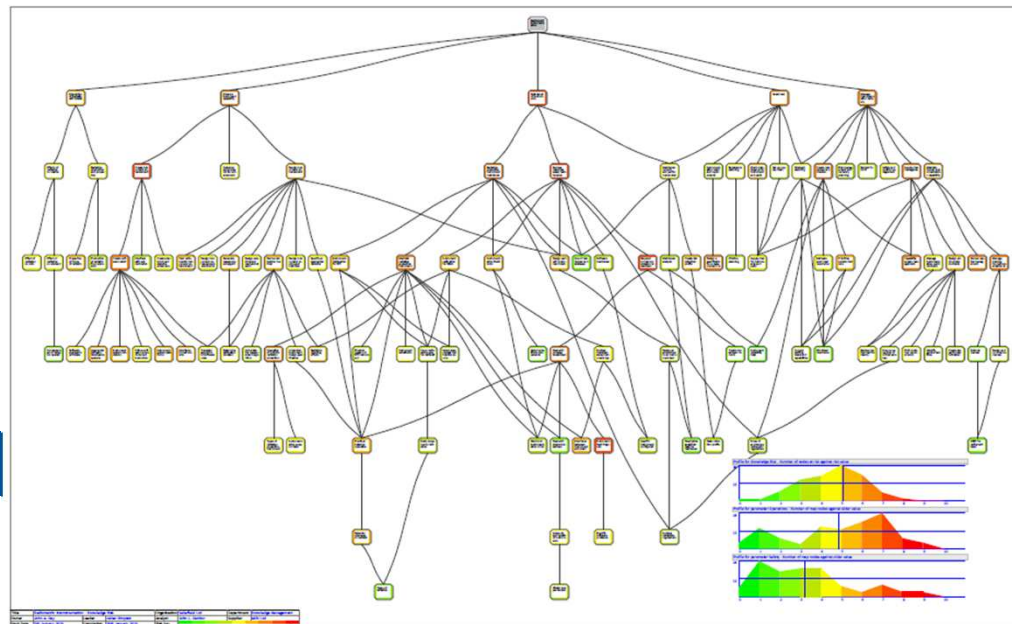


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Extending the map

A single map has the capacity to cover the full national nuclear programme

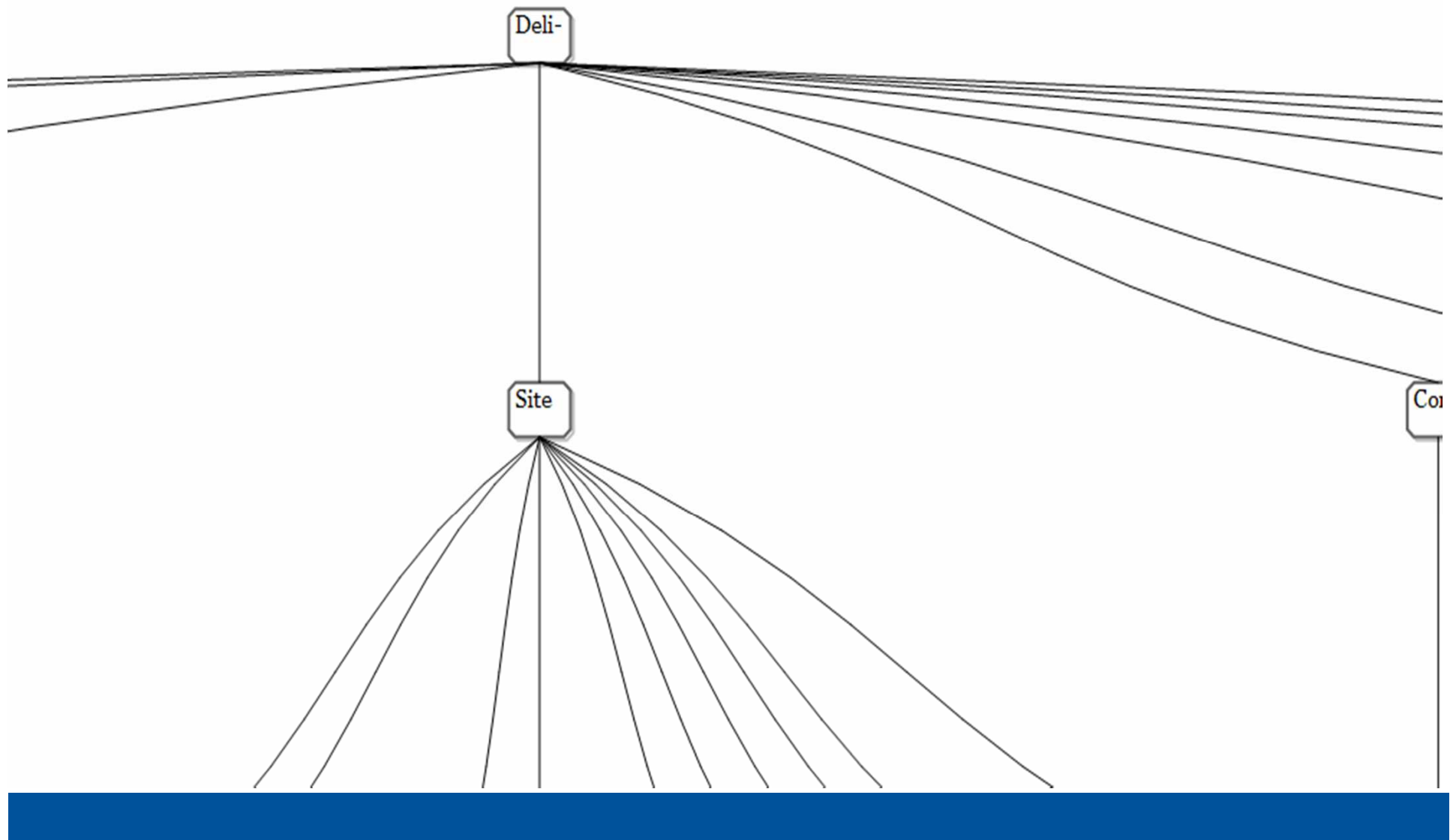
- The mapping process can be extended from a single department to
 - a whole site
 - national nuclear programme
 - timescales of the full nuclear cycle

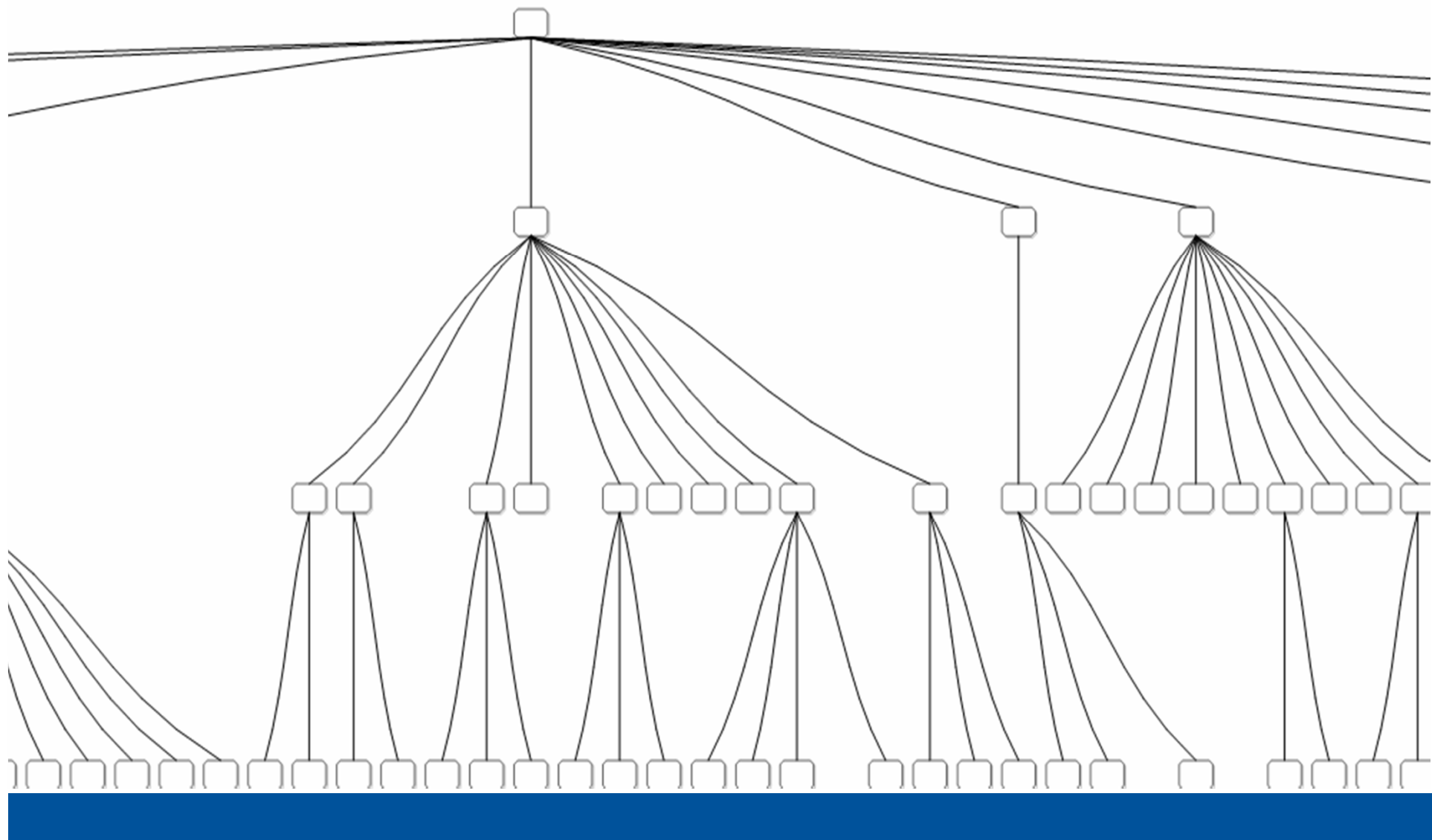


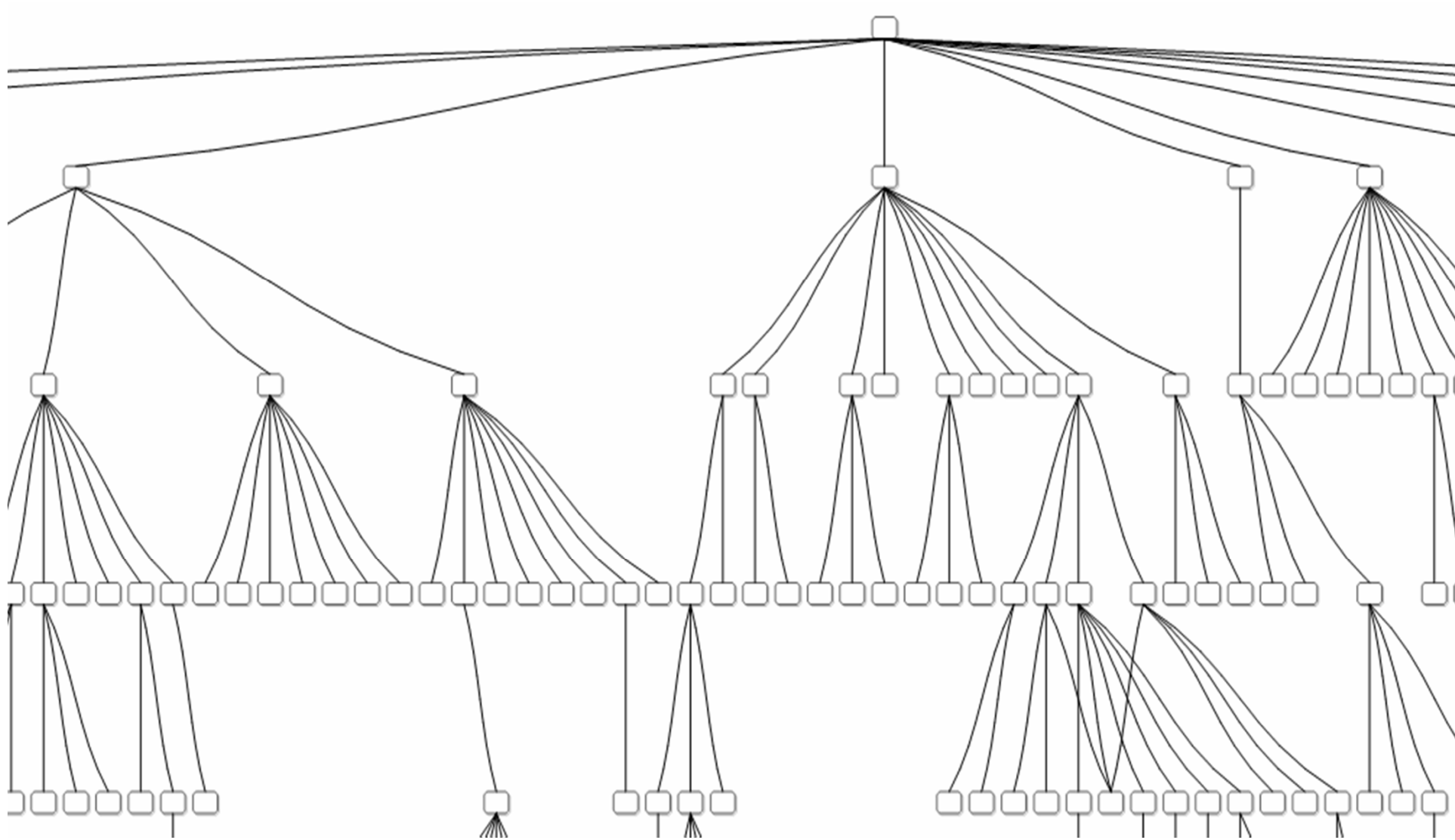
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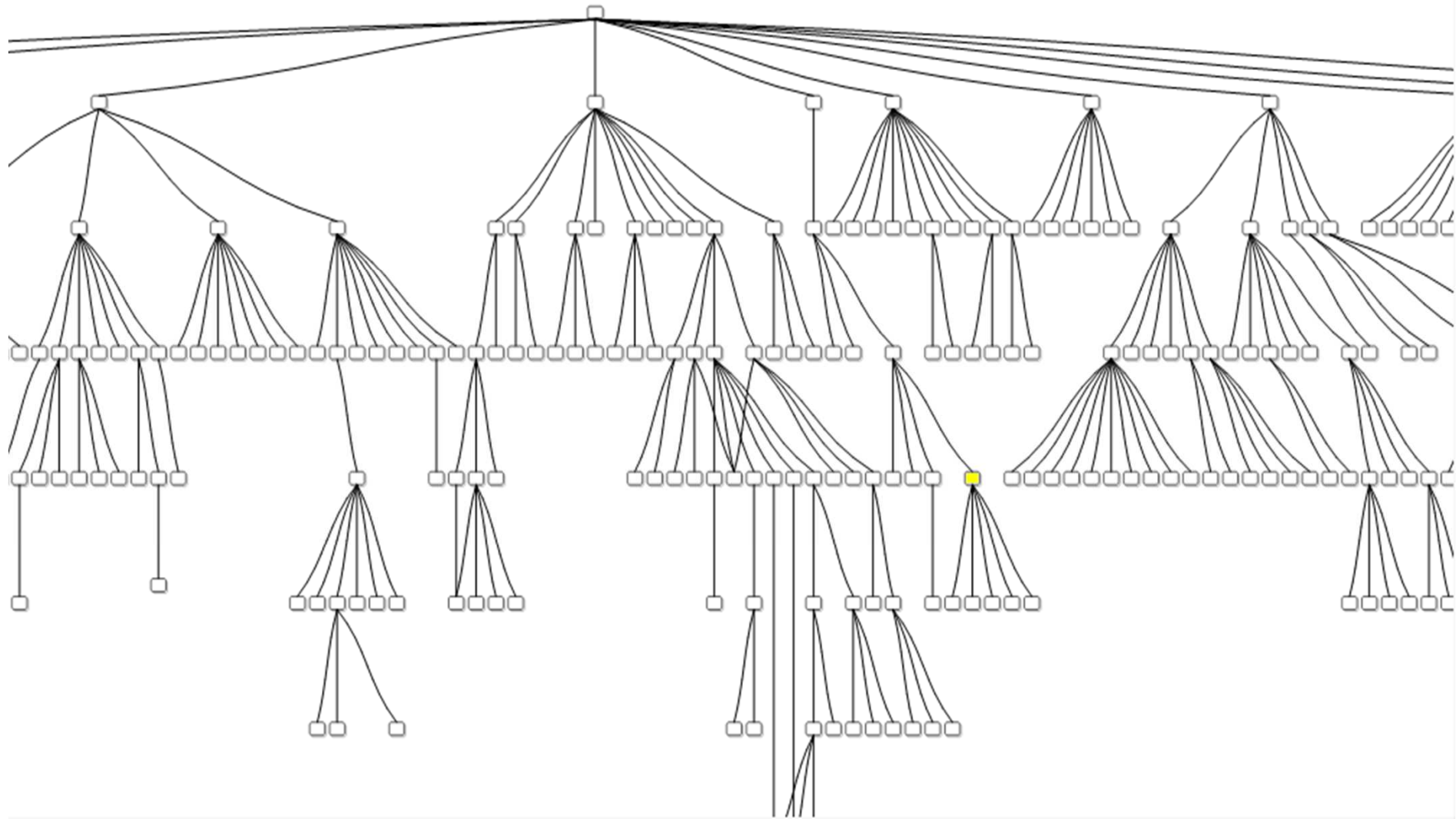
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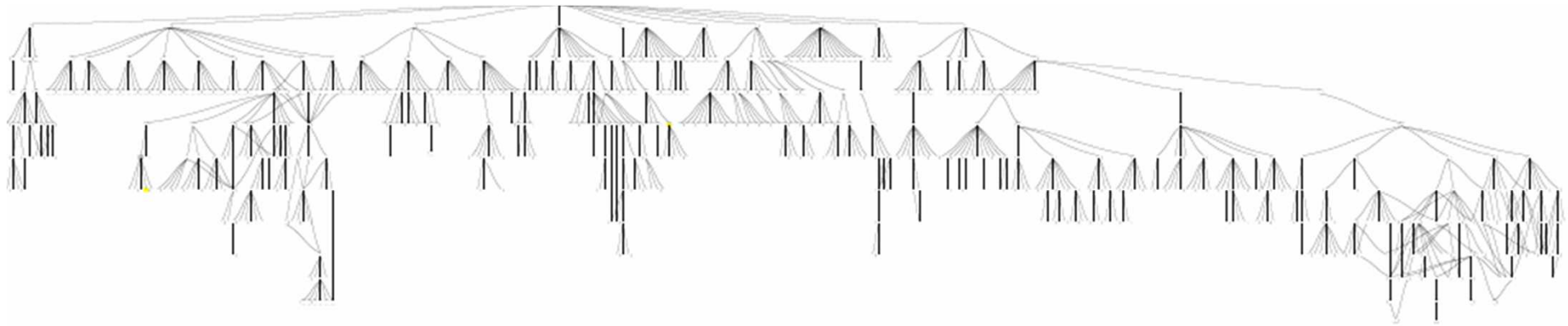


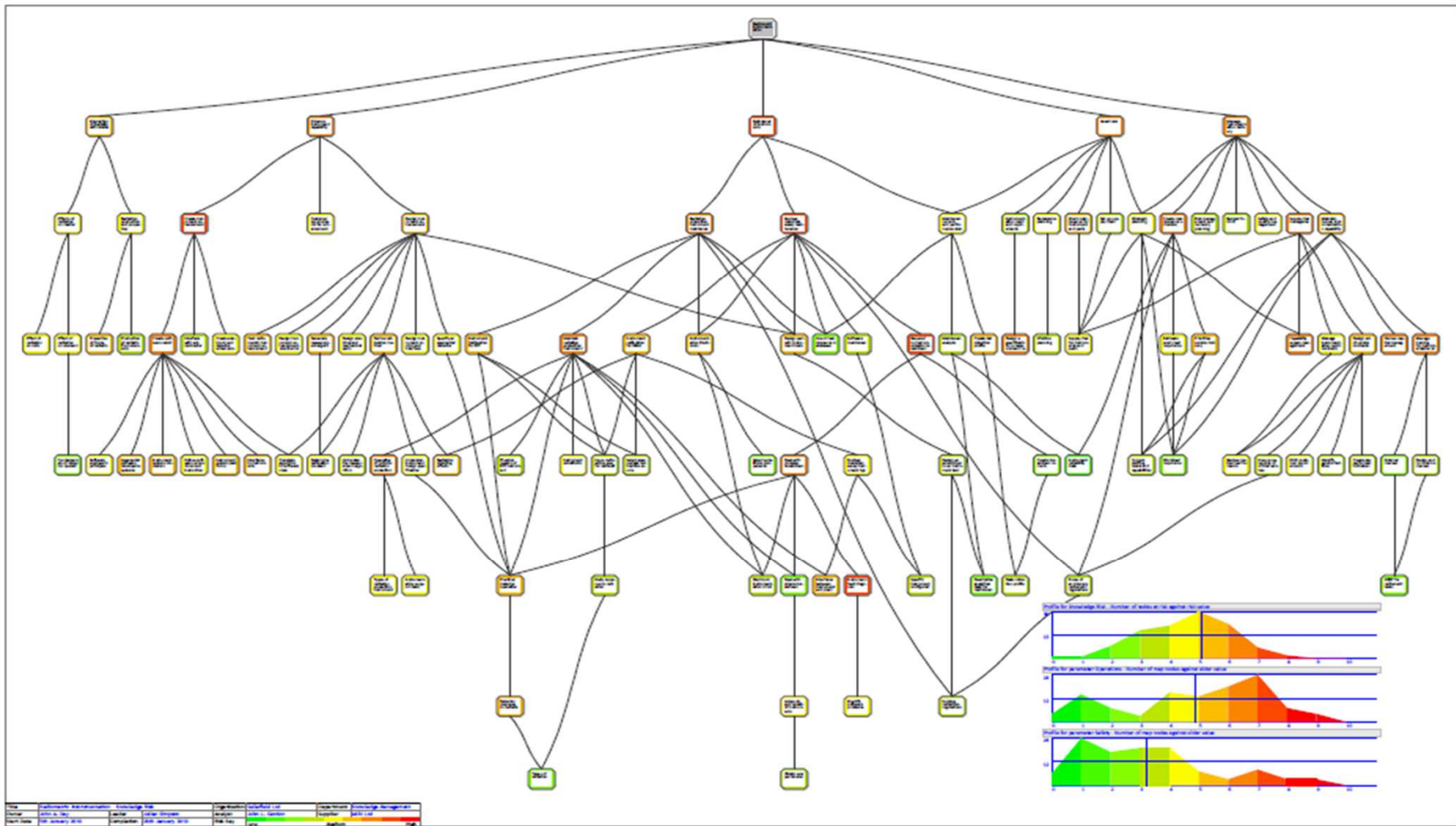












Multiple outputs

Using a single source multiple consistent outputs can be generated

- Knowledge maps are stable because the structure of knowledge is unchanging
- A single source map provides a solid basis for large-scale, long-term planning
- A definitive knowledge map integrates the work of different internal departments and external agencies
- A number of consistent outputs can be generated from the one map

- Examples.....

Analyses and Outputs



Analysis Question	Key parameter	Analysis Result
What competences do we have/need?	Importance Enough Experts	Recruitment plan
What knowledge does need to be covered by training?	Study, Experience Learn Time	Training plan
When do we need knowledge in the future?	When Needed	Manpower planning
Which roles need SQEP?	Safety	
What is the readiness of our technology knowledge?	Readiness	Technology development plan
Who knows what now?	People	Personal development plans

Analyses and Outputs



Analysis Question	Key parameter	Analysis Result
What is the Minimum Set of Records to be maintained and are we compliant?	Documented	Retention schedule
Where do our information assets reside?	Documented	Information Asset Register
How do we describe everything what we need to know and what is the structure?	The map	Taxonomy

Analyses and Outputs



Analysis Question	Key parameter	Analysis Result
What knowledge areas are our Centres of Expertise covering?	Dissemination, PeopleKnow	Community of practice agendas
What expertise is required and at what level?	EnoughExperts,	National nuclear manpower plan, National high level skills plan
Where do I go to find expertise?	People	Yellow pages
What knowledge is at risk?	Risk	Knowledge Retention Plan

Conclusions

- Intelligent decisions on prioritising and planning knowledge resources depends on knowing what you need to know and when you need to know it
- A systematic identification of knowledge needs is facilitated by the use of sophisticated knowledge mapping tools
- Knowledge maps can be used for a wide range of applications, from national nuclear manpower planning through to record retention schedules
- Collaboration on a single knowledge map can ensure consistency and efficiency in the activities of different departments and agencies