



A Framework for Early Warning & Proactive Control Systems in Food Supply Networks

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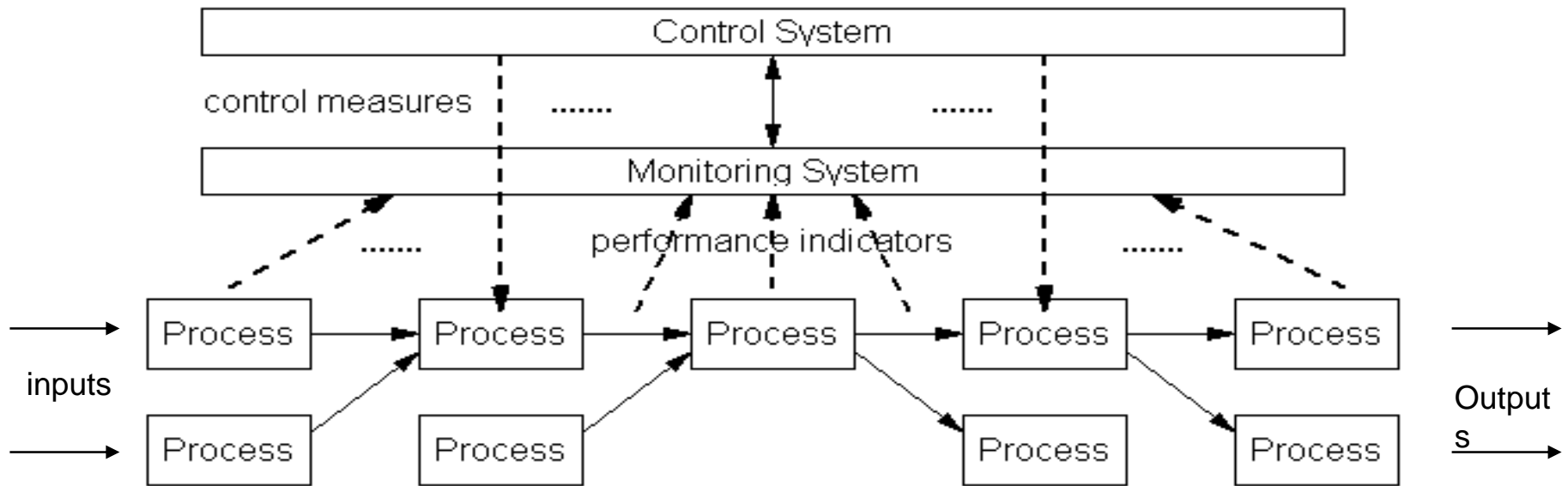




Agenda

- Background
- Objective & questions
- Method & steps
- Results
- Conclusions

Background - Food supply chain networks



Complexity, variability, uncertainty...



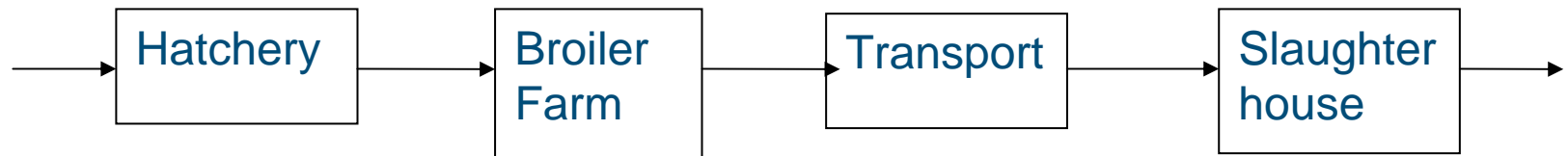
Background - Performance Indicators (PI)

- Quantification and Qualification of Performance: Identify PI's.
- Different aspects:
 - quality
 - speed
 - dependability
 - flexibility
 - cost
- Aim at PI's within control limits. Outside that: deviation.



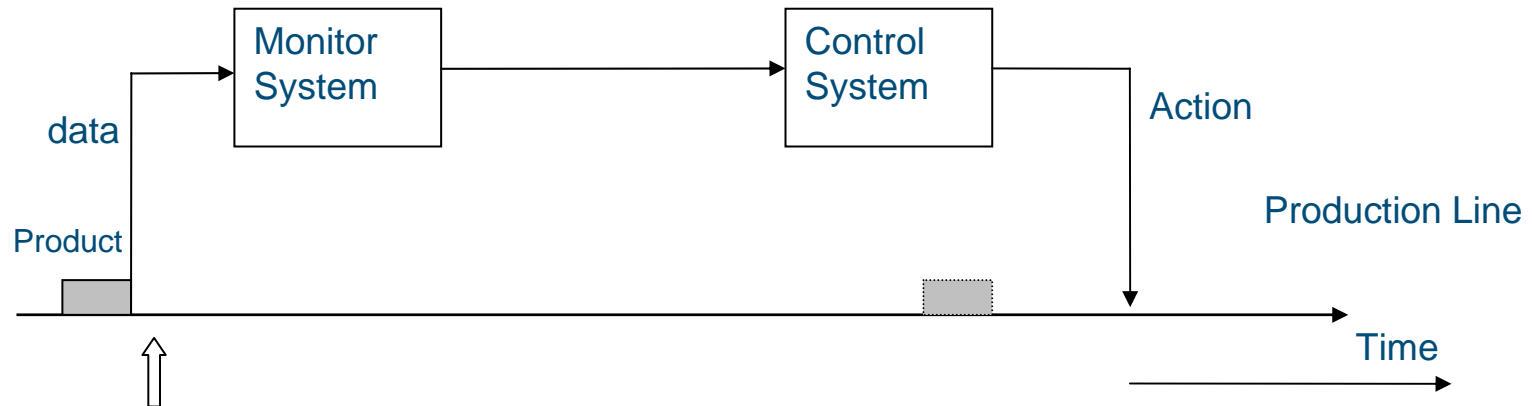
Case study

- Stages of the chicken supply chain:



- One of the Performance Indicators: chicken's death rate upon arrival
- Deviation: chicken's Death-On-Arrival (DOA)

Early warning & Proactive control



■ In DOA case,

- predict DOA based on status of determinant factors
- Determinant factors: transportation time, catch method, etc.
- prevent DOA with appropriate decision varieties
- Decision varieties: shorten transportation time, change catch method at farm



Objective & questions:

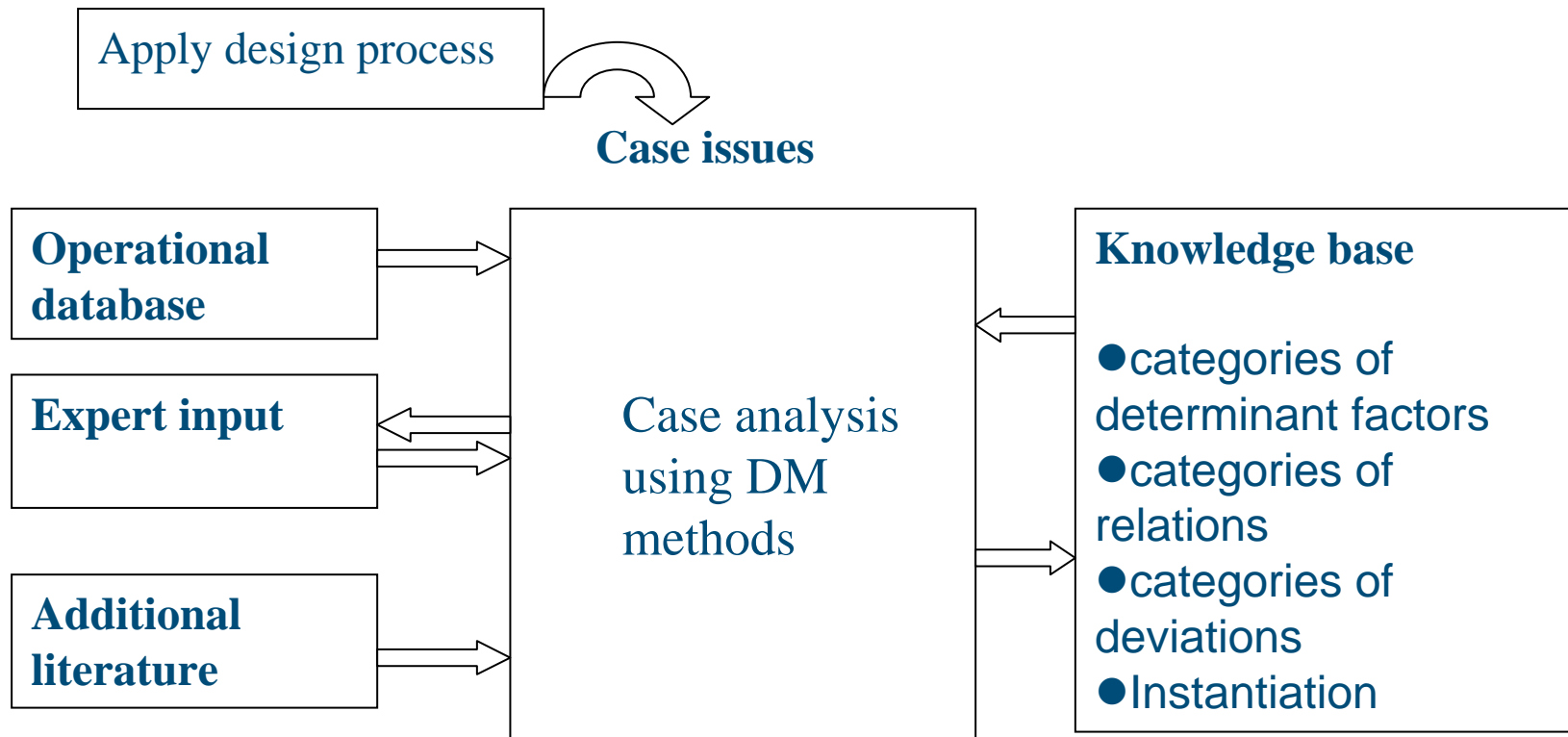
■ Research Objective

- Design prototype for Early Warning & Proactive Control System in Food Supply Chain Networks

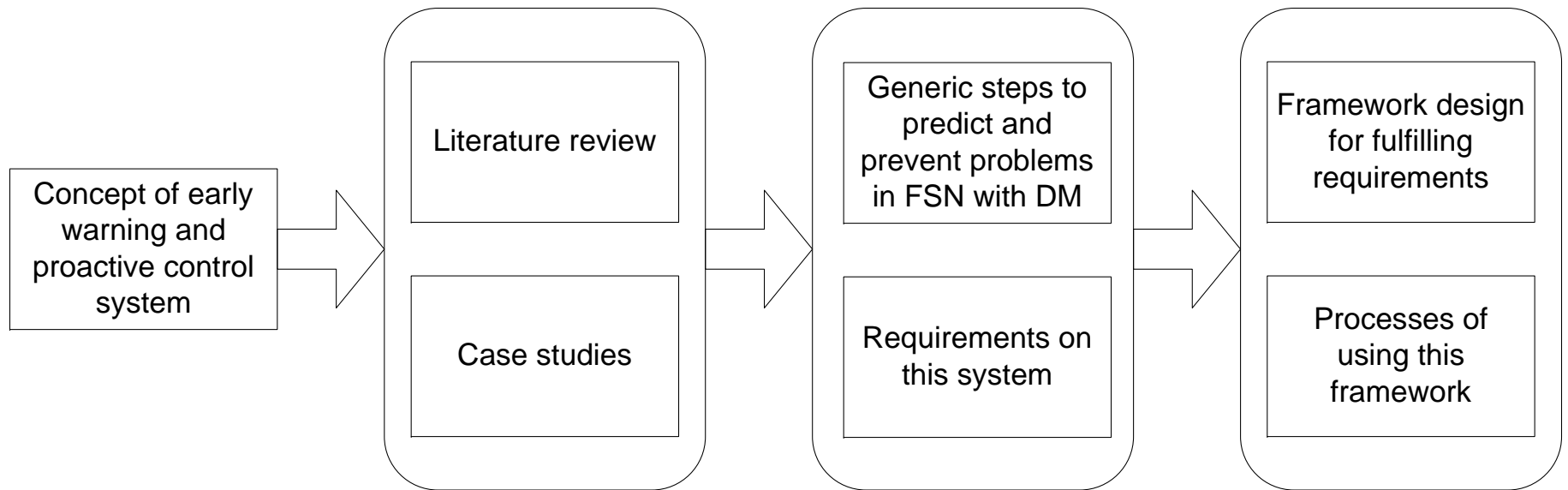
■ Research questions

- What types of deviations and causal relations exist in food supply networks?
- What are requirements for building early warning and proactive control systems?
- Which Data Mining techniques have potential to contribute to early warning and proactive control?
- How can we support and guide users of such systems?

Research design

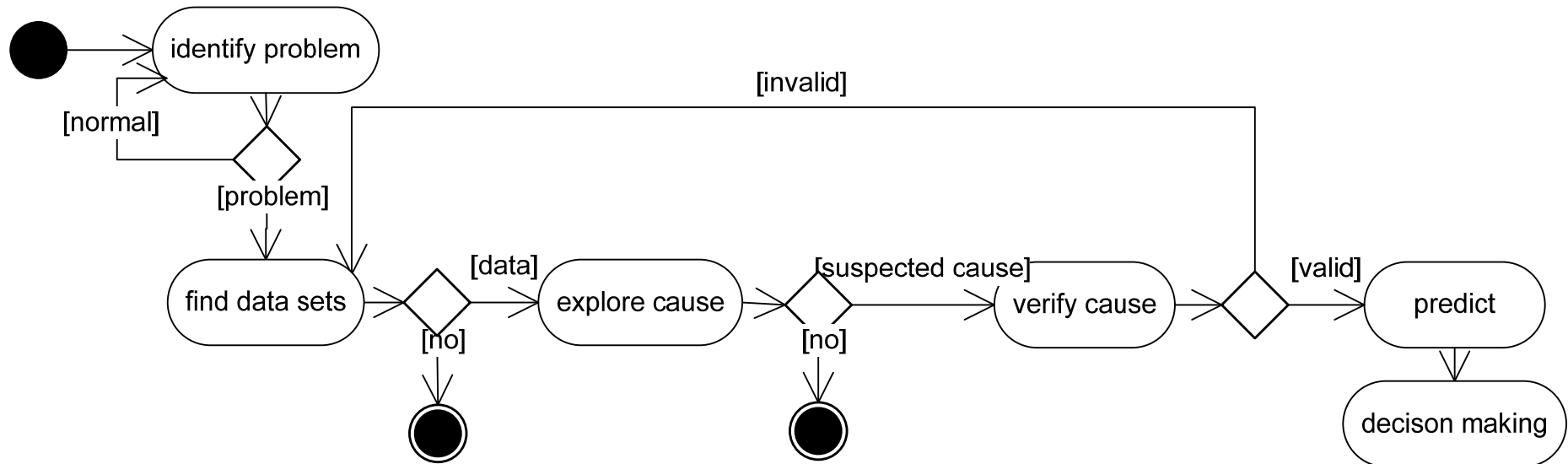


Research approach



Research result - I

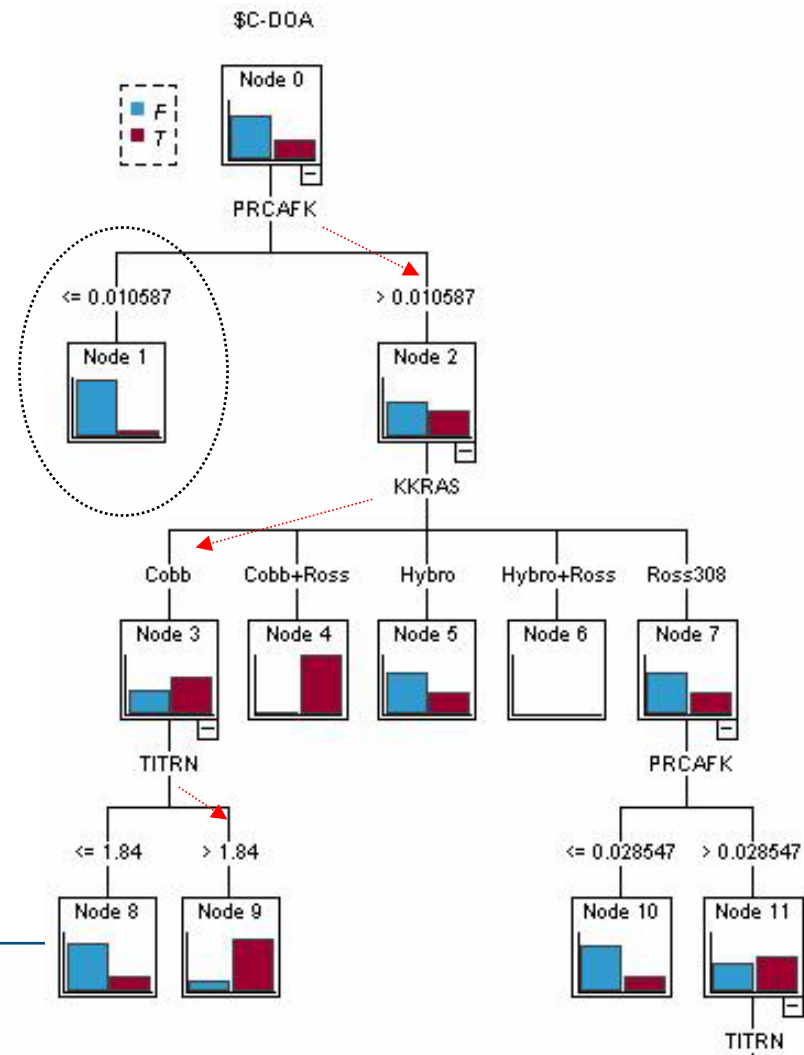
Generic steps for EW&PC with DM methods:



Data mining

■ Various data mining methods (e.g. decision trees, neural networks)

- Different functions
 - Classification
 - Clustering
 - ...
- Different representation power
 - Trees
 - Networks
 - ...



Research result - II

Requirements on EW&PC systems:

■ Functional requirements

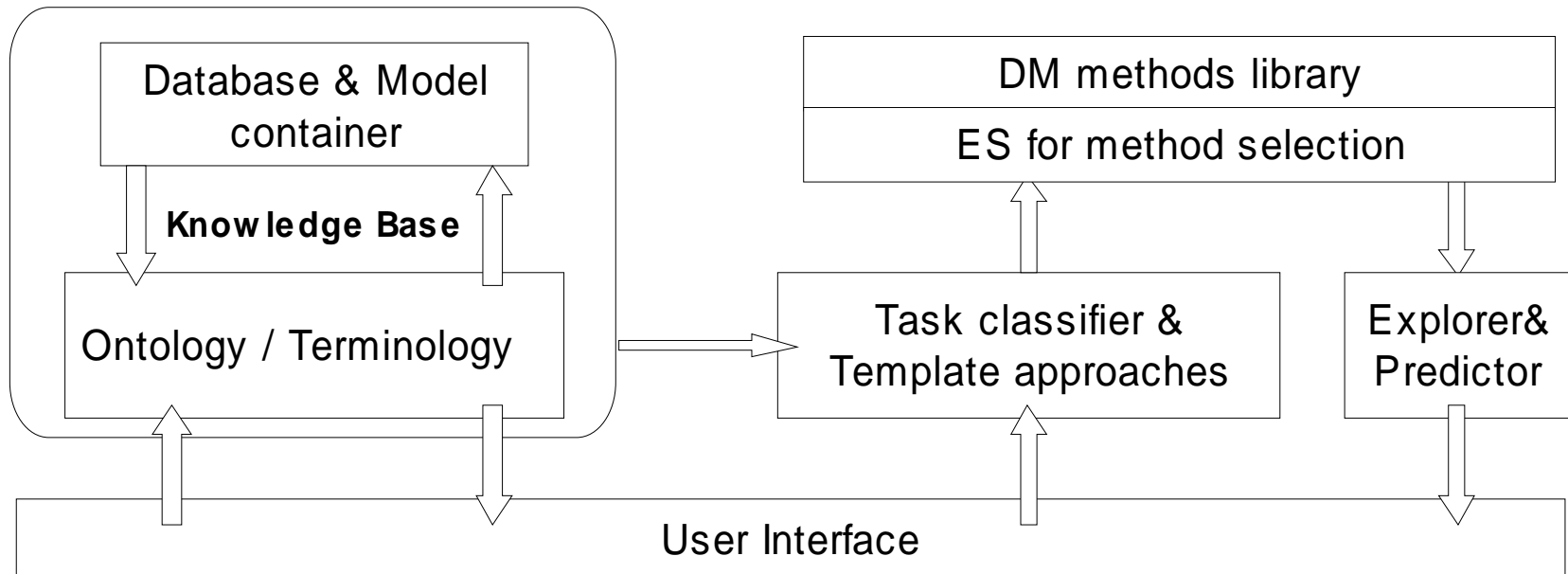
- Support problem recognition and expression
- Support data disclosure
- Provide modeling facilities for analysis and reasoning
- Support prediction of problems
- Support evaluation of solutions

■ Other performance requirements

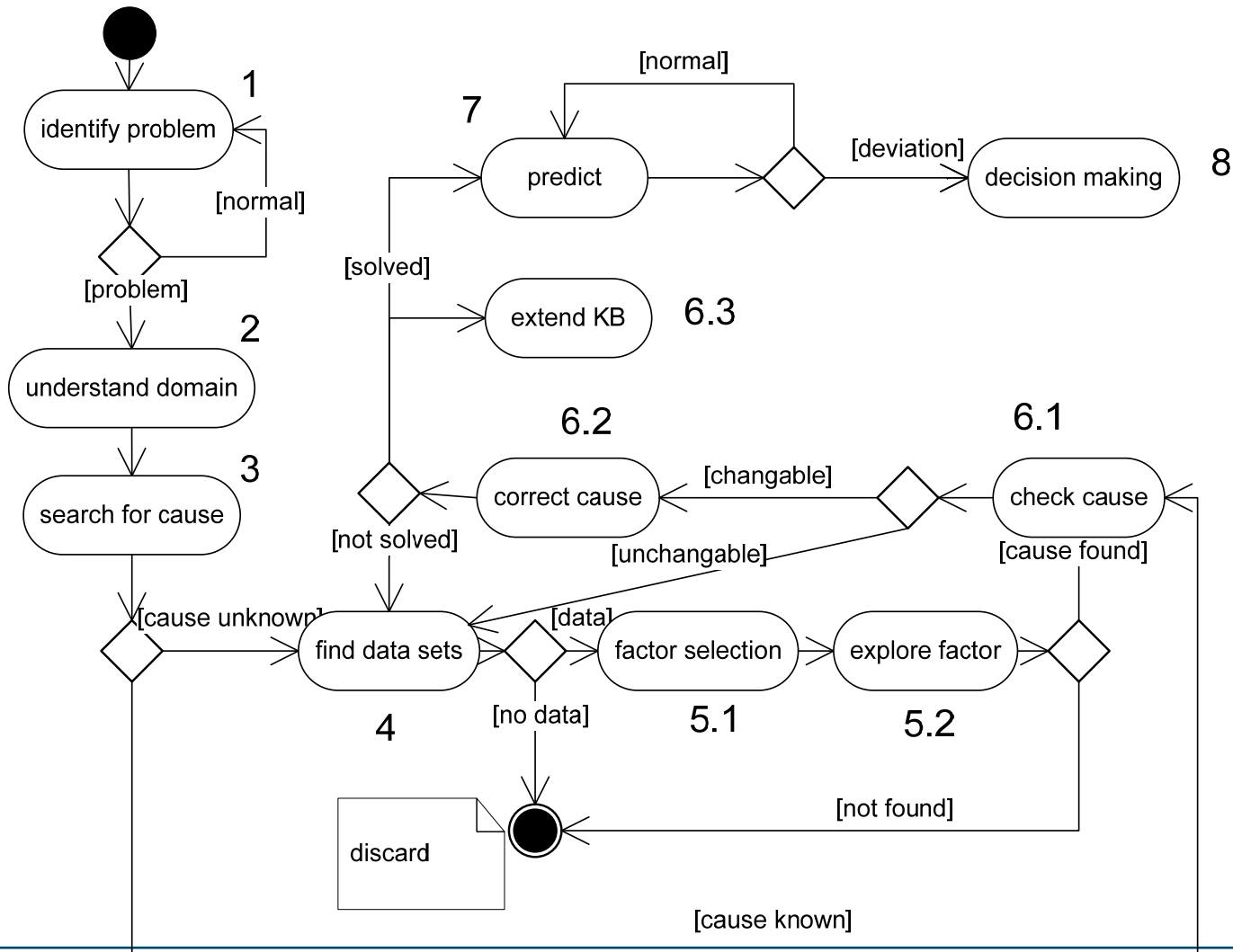
- User Friendly (Process Guidance)
- Reduce Time and Knowledge needed to use this system (use case, process and domain knowledge)

Research result - III

Framework for EW&PC system



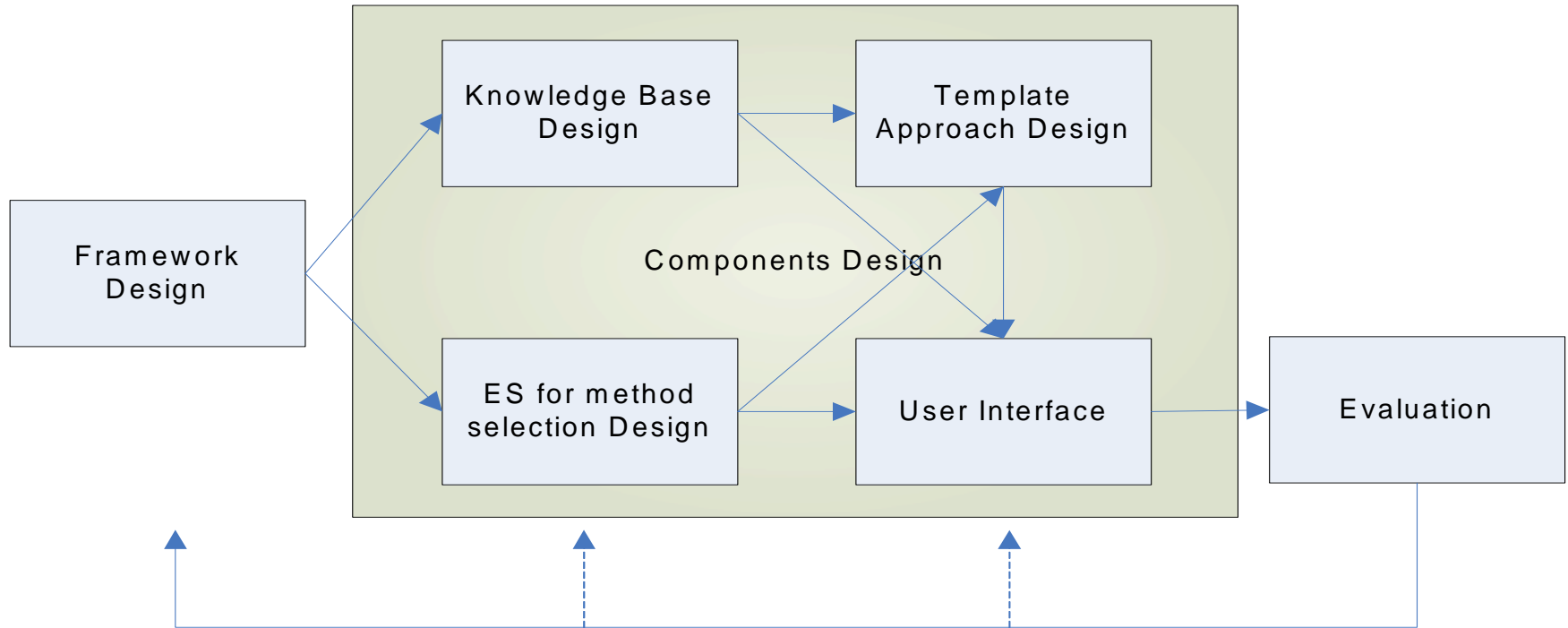
Research result - IV



Where are we now?

- Framework for EW&PC systems
- Case studies
- Expert System for method selection
- Part of Knowledge base
- Part of Template approaches

Further steps

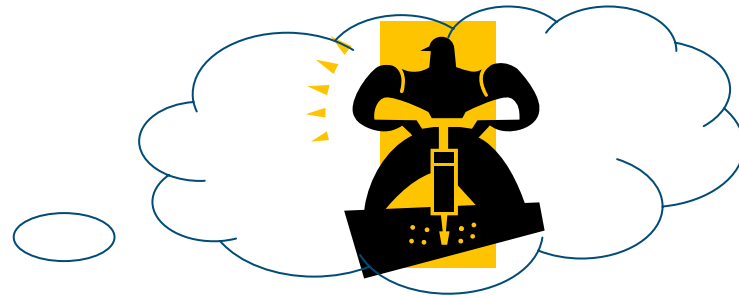


Questions?

- Thanks for your attention!

Data mining - I

- Huge amounts of data being recorded



I need Data mining!

Data mining - II

Data mining: Extract valid, previously unknown, comprehensible and actionable information from databases and use it to make crucial business decisions (Simoudis, 1996).

- **Discovery driven**

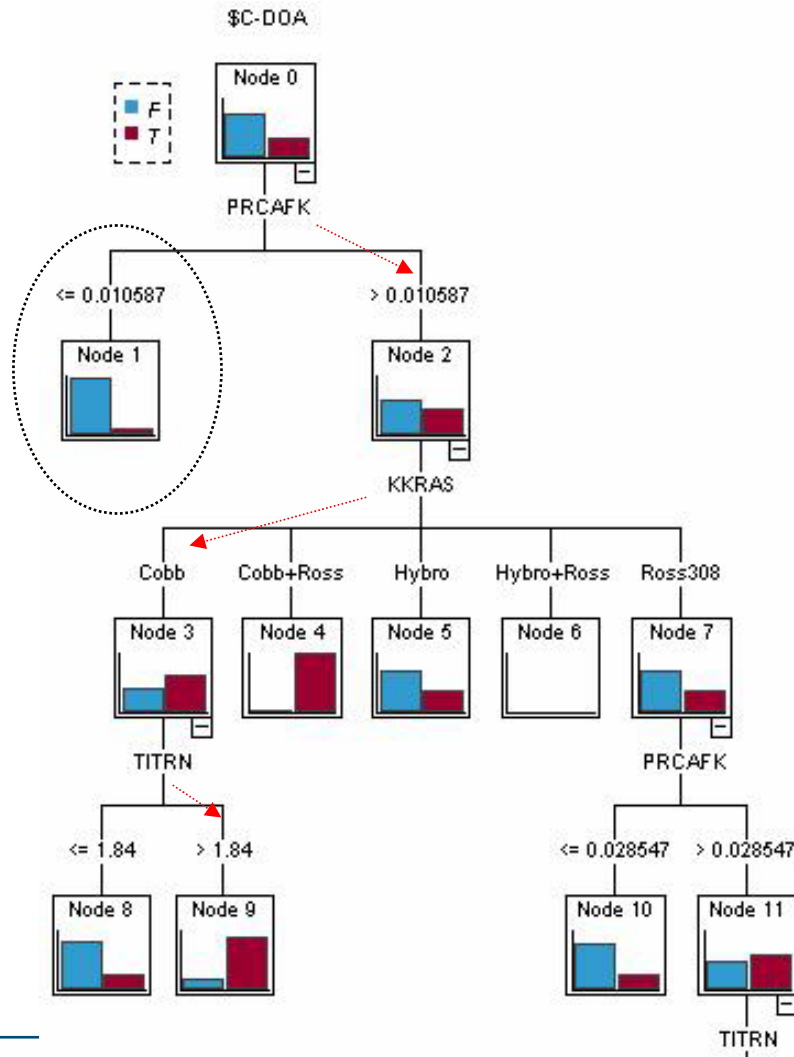
observation -> hypothesis

- **Verification driven**

hypothesis -> experiment

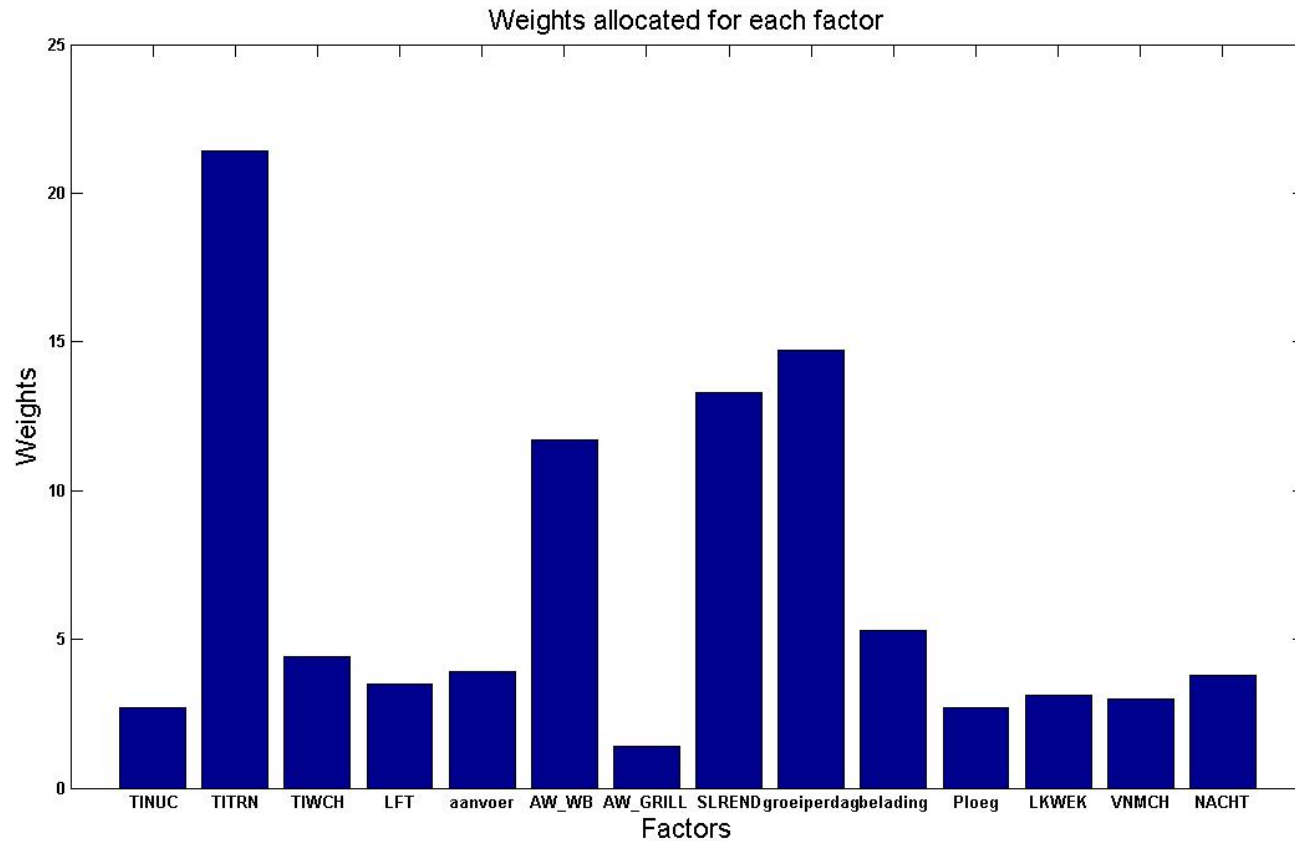


Case study – result with Decision Trees



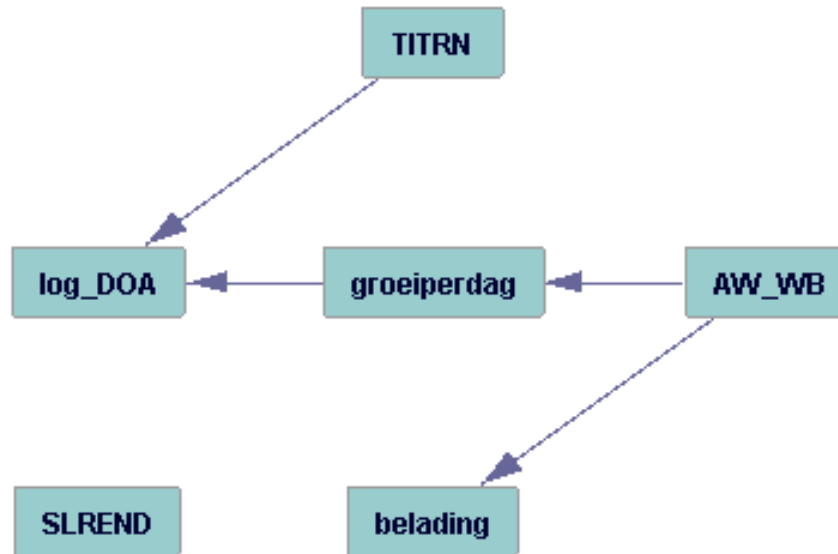
Case study – Result with Neural networks

- Sensitivity analysis on Neural networks, for Cobb

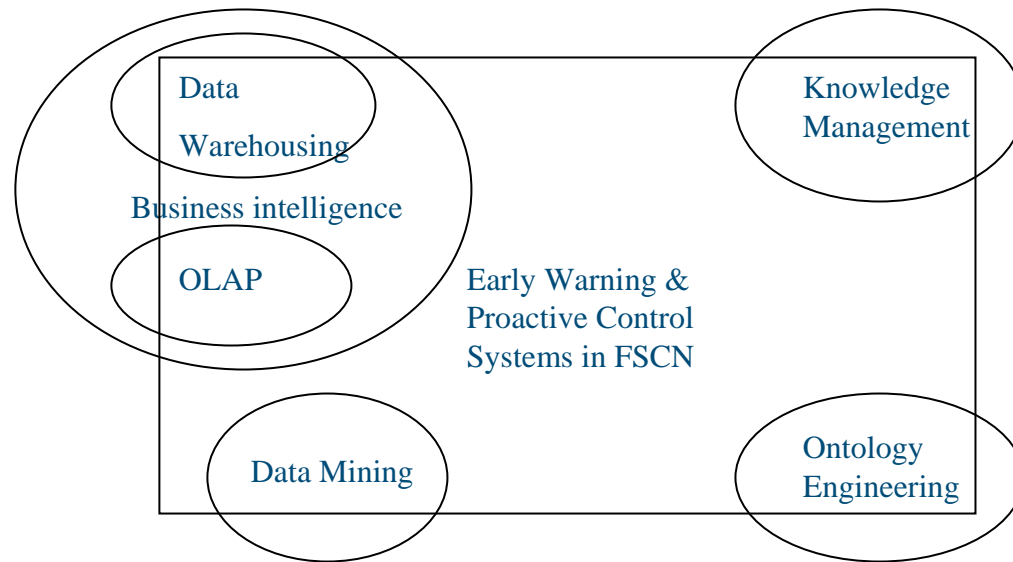


Case study – result with Causal modeling

- Causal modeling with TETRAD IV, for Cobb



DEW&PC and research areas.



Components of framework:

- Components of the framework and relation to generic processes and requirements for EW&PC systems. The discussion is organized around:
- *Knowledge Base,*
- *Task classifier and Template approaches,*
- *DM methods library with Expert System (ES) for method selection,*
- *Explorer and Predictor, and*
- *User Interface.*
- These components interact with each other and with users (i.e. managers) to solve various problems in FSCN.

Questions?

- Thanks for your attention!