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Leading indicators for monitoring major accident risk

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Piper Alpha disaster, 1988


Deepwater Horizon blowout, 2010


Texas City refinery explosion, 2005

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Why leading indicators?

- **Lagging indicators**
  - TRIF/LTIF
  - The Iceberg Theory – Time to move on
- **Leading indicators**
  - Accident theories
  - Proactive approach to safety management
  - Research characteristics:
    - Vast amount of indicator/-sets

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The major issue

- ***Which leading indicators have a potential to predict major accident risk in the operational phase of offshore oil and gas installations?***
  - Major accident risk
    - Future major accident event (A)
    - Consequences (C)
    - Associated uncertainties (U)

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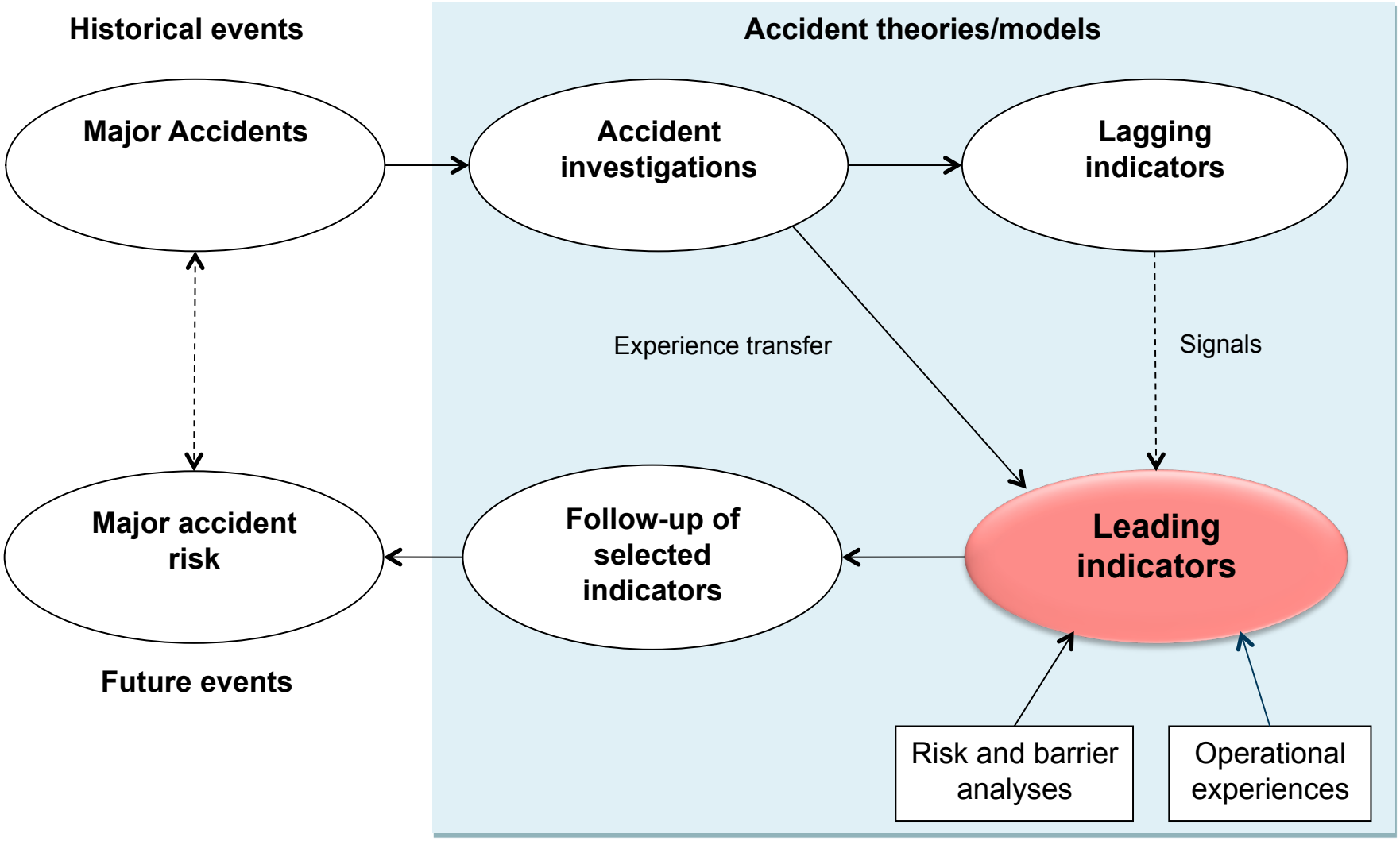
Conceptual model



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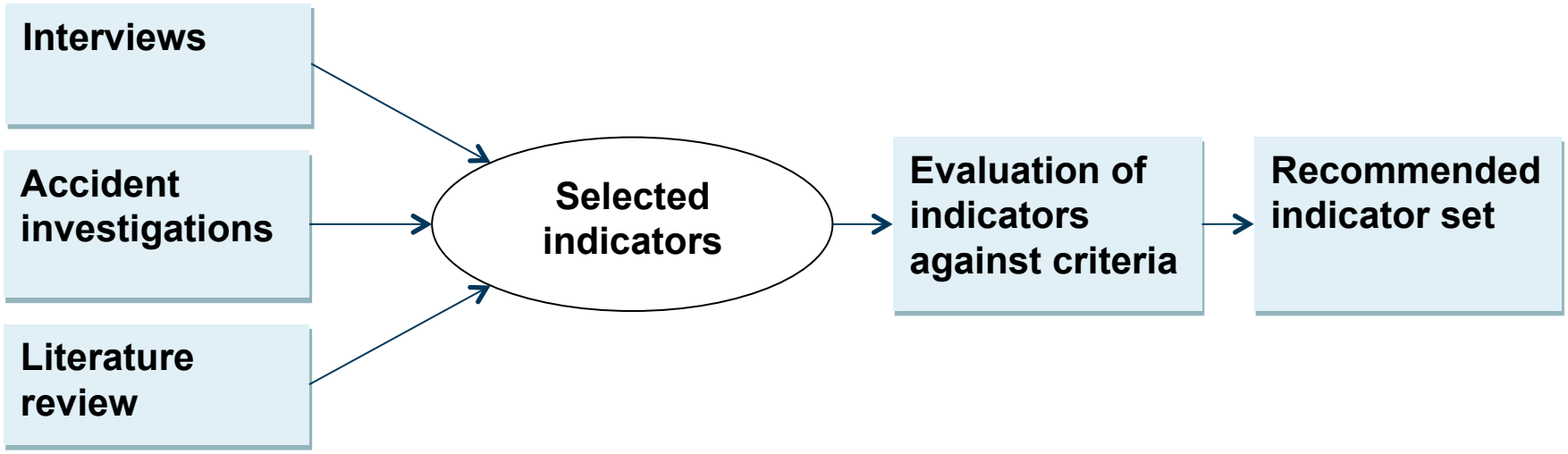
The analysis process



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Evaluation system

- Indicator criteria and weights

Criteria	Weight
Observable and measurable	1
Reliable	2
Sensitive to changes	3
Intuitive and meaningful (Relevance)	2
Robust to manipulation	1

- Grade - system

Grade	Numerical value
B	3
C	2
D	1
E	-1
F	-3

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The recommended set of leading indicators

RIF	Leading indicators
Monitoring technical barriers	Number of hours backlog in maintenance on safety critical equipment
	Number of failures on safety critical equipment during testing
	Status/condition of technical barriers
Planning of activities	Number of plans sent onshore for reassessment and improvement.
	Total number of work permits in one specific area (process area)
	Total number of work permits for hot work class A and B
	Maximum number of simultaneous activities last month
Dispensations	Number of dispensations on HC – systems
Follow-up and closing of actions	Number of open findings from barrier verifications
	Number of overdue actions in Synergi with respect to HC-leaks
Competence and training	Average number of years of experience with the specific systems
	Average number of years of experience on the specific installation
	Fraction of operating personnel that have received system training last 3 months
	Number of workers in each personnel category whose training are overdue
	Turnover of personnel during last 6 months
Risk information	Number of SJA operating personnel have attended last 3 months

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Key RIF's and indicators

- **Monitoring technical barriers**
  - *Backlog in maintenance on safety critical equipment*
- **Planning of activities**
  - *Total number of WP's in one specific area*
  - *Number of plans sent onshore for reassessment and improvement*
- **Competence and training**
  - *Number of years of experience on the specific installation*
  - *Number of workers in each personnel category whose training are overdue*

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Concluding remarks

- Gap between safety researchers' wishes and OIMs understanding of the importance of leading indicators

1. Important to build understanding and ownership to a limited set of indicators

2. Communicate the proactive and predicative value of leading indicators to key personnel

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Thank you

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