Development of a Methodology for assessing Safety & Operational Reporting within Safety Critical Industries

Maria Chiara Leva  
*Technological University Dublin, maria.leva@tudublin.ie*

Ewan Douglas  
*Trinity College Dublin, Ireland*

Sam Cromie  
*Trinity College Dublin, Ireland*

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Development of a Methodology for assessing Safety & Operational Reporting within Safety Critical Industries

Ewan Douglas*, Sam Cromie, Chiara Leva
Centre for Innovative Human Systems, Department of Psychology, Trinity College Dublin, Dublin 2, Eire
Outline of InnHF Project

Functional Analysis

Hazard Identification

Risk Evaluation

Risk Monitoring

PHM

Diagnosis and Prognosis

Detection, Diagnosis and Prognosis

HF

Task Analysis

Human Error Identification

Human Error Quantification

Physiological Measurement

OF

Process Modelling

Organisational Support for Human Performance

Organisational Risk Quantification

Reporting
PhD Project

- Develop a best-practice model based on literature and industrial experience
- Industrial Case Studies to allow a cross-industrial comparison
- Develop a suite of techniques that can be used cross-industry to assess the effectiveness of a reporting system
- Propose a theoretical framework for the effective implementation of risk and hazard reporting as an input for safety management
Why should reporting be assessed?

- As far back as Heinrich (1941) the importance of identifying each and every hazard has been appreciated.
- Risk Assessments etc. are only useful if they identify each and every hazard.
- Industrial regulations and standards are increasingly calling for a Safety Management System to be rolled out.
- Reporting systems are seen as a key input to SMSs.

(Carter & Smith, 2006)
PhD Project

Research Questions

• Reporting systems need to incorporate an effective process (Reporting is easy, feedback is provided, action is taken, etc.) that is communicated clearly to stakeholders

• How do we understand differential motivation to report across organisational departments?

• How do we understand differential motivation to report across hazard types?
PhD Project

- Task Modelling
- Reporting Culture tests,
- Analysis of historical reporting systems based on quality and number of reports submitted
- Self-Assessment Tool is a research output that is a method of applying the research findings in a robust way to allow the findings to be better understood and repeated in the future
Introduction to Case Studies
Biotech Case Study

- 6 Month Secondment Embedded in Industry
- Bespoke research methodology developed
- Task Modelling
- Survey
  - Factor Analysis
  - Hazard Perception
Biotech Case Study

- Explored barriers and quantification of barriers to reporting
- Determined relationship between reporting and hazard perception.
Airport Ground Operations

- Small Italian Regional Airport
- Previous TCD Project developed a Just in Time Approach to reporting
- Allows staff to highlight anomalies in a turn-around as part of their usual paperwork
Airport Ground Operations

- Mini case study to look at the effect of the proactive just-in-time approach on the safety level within the organisation
- “Closing the loop” and allowing a complete methodology for reporting to be developed in addition to the other case studies
High Level Process of Reporting

- Anomaly
  - Detection & Perception
  - Reporting
  - Analysis
  - Feedback & Mitigation

- Individual
- Organisational

Survey

Self Assessment Tool (SAT)/ Task Modelling

Douglas et al. (2015)
Task Modelling - SCOPE

SCOPE is a software tool to assist in task analysis and risk assessment processes

Creates a visual model based on the Business Process Modelling (BPM) iconography

Allows for a model of the reporting process to be made
1. Report arrives via Mirashare
   Mirashare

2. Report is processed
   Safety Manager

5. Is report a "Good Save" or an escalatable incident
   Good Save
   Incident

3. Good Save

4. Incident

6. Processing of Good Save

7. Processing of Escalated incidents
Analysis of Historical Reports

• In order to determine the motivational factors that can influence reporting initially it was necessary to determine the number and quality of reports found within a department.

• From an early stage it was clear that different departments had different reporting behaviours, some departments were happier to report and produced better quality reports whereas other departments simply met the quota

• 1250 incidents analysed

• Coded on a 5 point scale

• Validated
Assessment of reporting Culture

- Used an adaption of an existing survey from Aerospace Maintenance
- Based on the Delphi methodology
- Gives a score for reporting within the organisation.
- Survey was rolled out within the organisation
- Sample size of 220
Survey Questions

- Reporting procedures are not always followed in the organisation*
- Safety reporting is routinely carried out within this organisation*
- Near Miss reports are used well and widely within the organisation*
- I can contribute all kinds of safety information though the Program*
- The Reporting program within the organisation is fair, just and open*
- I am satisfied with the Reporting Programe at the Organisation

Questions adapted from (Wang et al. 2013)
Assessment of Reporting Culture

Scatterplot of Reporting Culture vs Average Number of Reports

- Reporting Culture
- Average Number of Reports

- Points on the graph show an increasing trend as the average number of reports increases.

Trinity College Dublin, The University of Dublin
Hazard Perception

- **Provided Three scenarios that can occur within the organisation:**
  - Distraction in a precision task – Measuring a product in a loud environment
  - Deviation in a procedure – Breech of gowning procedure
  - Deviation in a safety critical task – Unsafe use of a Forklift
- **Based on Methodology in Gormley (2009)**
Hazard Perception Analysis

Performance Shaping Factor

Explicit Factors (77)
- Driver Pressure (7)

Deviation

Procedure Not Followed (26)
- EM Excursion (6)

Uncleaned Containers (17)

Implicit Factors (208)

Consequence

Other (1)
- Environment Damage (9)

Production (53)
- Plant Damage (24)
- Production Delay (5)
- Lost Time (3)
- ERT (6)

Production Delay (5)

Environment Damage (9)

Other (1)

Implicit Factors

Missing Bund (14)
- Collision (7)

Container Damage / Spill (75)
- Containers Fall off Pallet (22)
- HCL Vapour Release (2)

Injury (89)

53

5

26

8

36

7

2

3

5
Weighting Survey & Factor Analysis

- A custom designed survey was developed to determine the weighting of barriers and motivational factors to reporting.
- Survey was rolled out within an organization within the Biopharma industry in industry.
- Representative sample size of 263.
- Survey consisted of a number of Likert scales based on areas identified within the literature and industrial experience.
Determining Weighting

- Factor Analysis produced 5 components
- There is no overlap between the two reporting systems which suggest that reporting behaviour is systematic and not organisation wide
- The extracted components will be used to develop the weighting for the R-SAT
Determining Weighting

Factor Analysis

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<th>3</th>
<th>4</th>
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<td>EHSContributeSafety</td>
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Kaiser-Mayer-Olkin test for Sampling Adequacy -0.827
Barnett's test of Sphericity was significant at p<0.001
## Self Assessment Tool

### Preliminary screenings | Analysis | Criteria definition

**Criteria for category: Strategy**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Activity performed</th>
<th>Evidence collected description</th>
<th>Rating of fulfillment of criteria</th>
<th>Evidences uploaded</th>
</tr>
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<tbody>
<tr>
<td>Goals set are aligned with overall company strategy</td>
<td></td>
<td></td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>A clear KPI for each goal has been agreed</td>
<td></td>
<td></td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>There is a shared understanding of the goals and the common needs</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Challenges and barriers to attaining those goals have been identified</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Positive answers**

![Radar chart showing strategy and integration with actual values: Strategy Min: 1, Actual: 4, Max: 4]
Final Work

- Use loadings from Factor Analysis to develop a Bayesian network that will allow the reporting culture from other industries to be quickly assessed.
- Build Self Assessment Tool based on final factor analysis weighting
- Finalize Stepwise Regression on Hazard Perception test
- Finalize a new model on reporting culture reflecting on the
Thank You