

JOINT INDUSTRY PROJECT: INTEGRATING HUMAN AND ORGANISATIONAL FACTORS WITHIN RISK MANAGEMENT

PROJECT BACKGROUND AND AIMS

MMS has recently completed its involvement in a Joint Industry Project (JIP) which has developed a technique called the Influence Network (IN) for the integration of human and organisational factors within risk management in high hazard industries. This three-year programme has been led by risk management consultants BOMEL who are based in the United Kingdom. The JIP has involved 6 participating organisations including oil and gas operators, classification societies and industry regulators. The aims of the JIP were to:

- Establish the Influence Network approach for use in industry to integrate human and organisational factors into risk management.
- Test the methodology through trial applications.

THE INFLUENCE NETWORK

The Influence Network (IN) is a risk management technique with the fundamental purpose of identifying effective measures to improve performance. This is done using a model of the typical factors that influence risk. The approach originated in the maritime industry for the formal safety assessment of ships. The IN model is customised for the specific problem to be analysed and then assessed in a workshop using a group of subject experts. An example of an Influence Network is shown below.



Figure 1 - A generic version of the Influence Network

The key benefits of using the Influence Network include the following:

- A structured framework for systematically assessing current practice.
- The ability to identify poor quality or deteriorating influences, assess their significance and determine what can be done.
- Insight to the paths, mechanisms or levers of influence that should be focused on, and comparison of the potential impacts of addressing those issues.
- A baseline measure of performance which can be used as an auditable measure for making and monitoring change.

BACKGROUND RESEARCH

A number of reviews were carried out to inform the development of the Influence Network (IN) approach. These included the following:

- **A review of influence diagram (ID) approaches** – The IN originates from a type of decision support aid approach known as influence diagrams (ID). Influence diagram approaches were reviewed to identify features that might improve the IN technique.
- **A review of human reliability assessment (HRA) techniques** - The IN allows the human contribution to risk to be semi-quantified and so HRA techniques were reviewed to inform the IN process.
- **Comparison of IN with other HRA and ID approaches** – The findings from the HRA and ID reviews were compared with the draft IN approach and possible improvements to the IN which could be taken from other methods were identified.
- **Accounting for human bias in expert judgement** – It is vital to capture good quality information in the IN workshop that is used to assess an IN model in order that the output can effectively inform risk management. It is therefore important to control the various forms of bias that can arise in group judgements. This report identified such bias and how this can be dealt with in an IN workshop.
- **Options for quantification of the Influence Network** – The judgements made in an IN workshop can be used to semi-quantify the IN model. This allows assessment of the key factors and critical paths of influence through the network. The report reviewed the options for quantification of the IN and how to deal with uncertainty and variability in the analysis.
- **Human factors data availability for validation of the Influence Network** – It was recognised that it would be of great benefit to demonstrate the validity of the output from an application of the IN. However, this would require data on the human and organisational contribution to risk e.g. incident data which identifies human factors causes. This report reviewed the available data and the options for addressing the validity of the IN.

METHOD DEVELOPMENT

The IN methodology was developed based on the JIP background research and taking into account lessons that had been learned from trial applications of the technique prior to and during the early stages of the JIP. Method development covered the following:

- A generic version of the IN with an associated set of generic definitions and rating scales for the factors contained within it. The generic IN can be used as the starting point for an IN assessment.
- Rules to govern the linkages which can be established between IN factors.
- A methodology for customising the IN for the specific problem to be analysed. This includes defining a risk scenario, establishing levels of influence, defining factors to be placed at each level of the network and developing rating scales which can be used to make judgements on the quality of each factor.
- A methodology for running an IN workshop including procedures for obtaining importance weightings and quality ratings from the group, taking account of group biases, identifying key factors throughout the network, and discussing improvement measures for the key factors.
- A methodology for quantification of the IN based on the judgements that are made in an IN workshop. The quantification can be used to provide a baseline for monitoring future performance and to identify the strongest paths of influence through the network and, therefore, where risk controls would be most effective. The quantification method takes into account the treatment of uncertainty in the data that is generated by an IN workshop group.
- A description of approaches which could be used in a follow-up to an IN assessment by allowing a more detailed assessment of certain IN factors.

INFLUENCE NETWORK SOFTWARE

The Modeller of Influence Network Diagrams (MIND) software has been developed to assist in the modelling of risk scenarios using the IN approach. The MIND software helps with the facilitation of an IN workshop by:

- Providing a user-friendly graphical user interface which allows IN workshop participants to visualise an IN model.
- Allowing IN workshop participants to discuss factors on the network and make judgements on the importance (in terms of linkages to other factors) and the current quality of each factor on the network.
- Combining and display graphically the judgements which IN workshop participants have made in order that the factors exerting most influence on a given risk scenario can be viewed.
- Facilitating the brainstorming of ideas for improving key IN factors.

- Displaying graphically the results of an IN workshop.

A screenshot from MIND showing the weighting assignment form is provided below. In the example, participants would use this form to weight the importance of a number of potential influences on 'Process Integrity' on a 5-point scale from low to high.

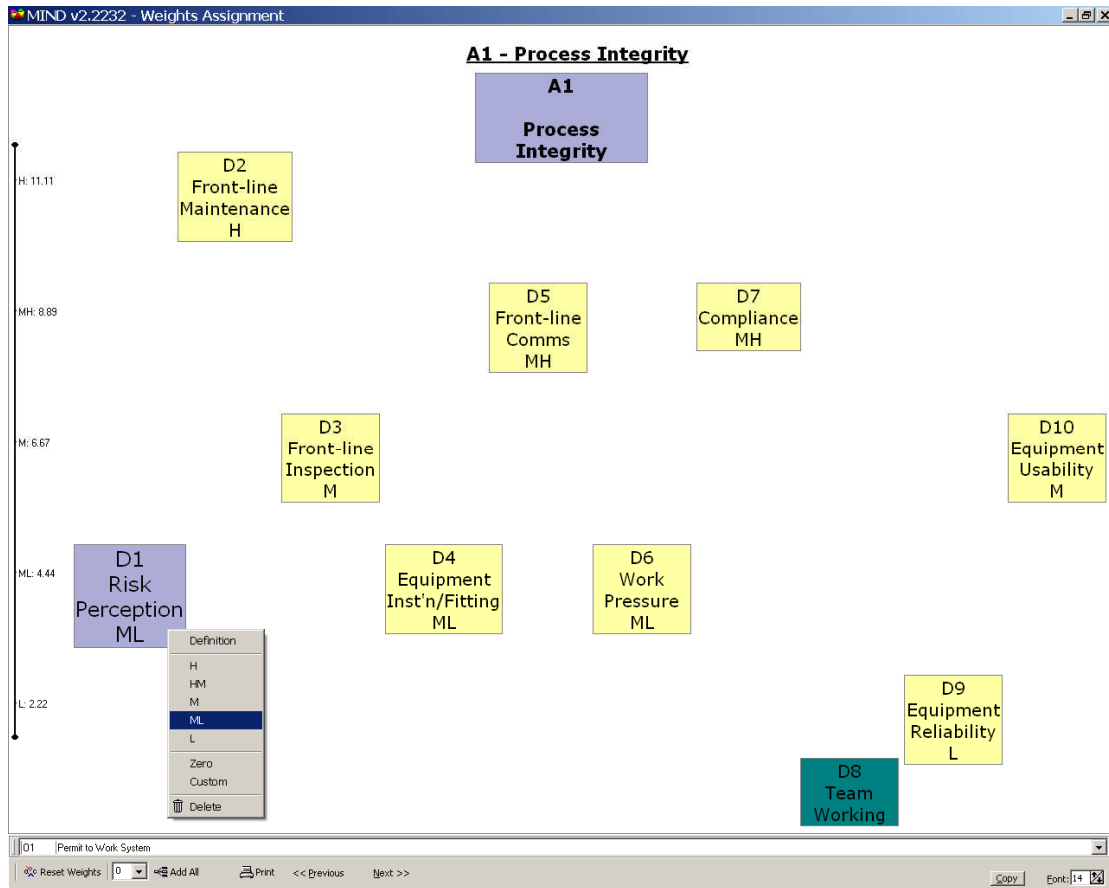


Figure 2 - The weights assignment form in MIND

TESTING THE INFLUENCE NETWORK

The Influence Network has been tested as part of the JIP through a series of case studies which have been carried out by each of the participating organisations. For each case study, the organisation has chosen a risk scenario which is relevant to its business and the IN has been customised to model this. A workshop has been carried out to assess the model using people with specific knowledge of the risk scenario under consideration. Finally, a report has been produced for each case study outlining the method that was adopted, the key findings from the workshop, and recommendations for reducing risk in each case. As of March 2008, the case studies that have been carried out are:

- An assessment of the human and organisational factors in dropped object incidents on an offshore installation in the North Sea.
- Evaluation of the key factors in process integrity incidents in the US Pacific oil and gas region and how to improve the inspection of these factors.

- Analysis of the key factors in loss of propulsion incidents on tankers and how the risk of such incidents could be reduced.

THE INFLUENCE NETWORK USER GUIDE

The final output from the JIP is a comprehensive Influence Network User Guide which was finalised in March 2008. This document provides each JIP participant with detailed guidance on creating an IN model, running an IN workshop, analysing IN data and interpreting the results. The guide will be of value to anyone with an interest in risk management, as the Influence Network (IN) technique can be used to address a range of risk scenarios. The guide explains how the IN can be applied in a wide variety of different areas including:

- **Assessing management systems**
- Safety and risk management
- Incident/accident analysis
- Usability analysis
- **Managing people**
- Risk profiling
- Performance improvement
- Evaluating the impact of projects and initiatives

FOR MORE INFORMATION

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