Background

Measuring and monitoring safety performance is one element of an effective safety management system (see research project T847 *High-level Safety Management System guidance and good practice*). Safety critical industries have traditionally relied on failure and incident data to monitor safety performance. The consequence of this approach is that improvements or changes are only determined after something has gone wrong. A more proactive approach is to monitor whether critical risk controls are in place and working effectively.

Both proactive and reactive safety performance indicators (SPIs) should be integrated into an organisation's safety management system to provide assurance. Recommendation seven of the Baker Report into the BP Texas City oil refinery accident in 2005 increased the focus of applying the theoretical concepts of SPIs. Guidance documents aimed at the process industries explain SPI concepts and a process for their development. At the outset of this research, some rail organisations had considered the use of both proactive and reactive SPIs, although no consistent or formalised practice had yet emerged.

Aims

The objectives of this research were to develop guidance representing good practice in the development of SPIs within the rail industry (with examples focussing on passenger train operating companies (TOCs)) and to review RSSB’s internal tools and services to aid the implementation of the guidance. This was completed through three main phases of work:

- Literature review and industry surveys
- Understanding and identifying TOC risk control systems
- Development of guidance and review of RSSB tools and services to support the guidance
Findings

Literature review and industry surveys

The ideas generated from the literature review were grouped into five themes relating to SPIs: definitions, application, characteristics, measurement, and programme cycle. The first four themes relate to the principles behind SPIs and their use. The last theme, programme cycle, relates to the process for identifying and reviewing SPIs.

Interviews with subject matter experts reinforced many of the principles identified in the literature review such as:

- The need for senior management commitment and involvement of the workforce.
- Measuring a mix of proactive and reactive indicators.
- Focussing on the areas of greatest concern or where there is a known vulnerability.

At the time of the survey, no formal SPI programmes were identified as being carried out in the GB railway industry and there was generally a heavy reliance on outcome indicators.

Understanding TOC risk control systems

Developing potential SPIs is relatively simple. However, the difficulty is in identifying those that will prove to be the most meaningful and useful. To obtain an effective selection of indicators an organisation must understand its risk profile, where its vulnerabilities lie and the criticality of its risk control systems.

Development of guidance and review of RSSB tools and services to support the guidance

Development of the guidance required clear terminology. The Baker Report referred to 'leading' and 'lagging' SPIs but these terms often led to confusion as to whether an indicator was one or the other, or both. Instead the terms 'activity' and 'outcome' indicators were adopted, where:

- Activity indicators measure whether a risk control system is in place.
- Outcome indicators measure events after they have occurred.

Figure 1 shows how these terms relate to the concepts of 'leading' and 'lagging' on a continuum.
‘Results’ relate to the specific outputs of an activity, whereas the ‘precursors’ are events that occur in the accident causal chain.

Other topics of guidance were also identified for further deliberation. These included understanding how to prioritise and scope SPI development and the SPI programme steps. Trials of the guidance document led to two TOCs identifying a suite of indicators for their chosen scope. Trials enabled the participants to gain a better understanding of their SPIs and hazards, and also led to some efficiency changes in the practices they scrutinised. Feedback from the trials was overall positive and identified areas where the guidance could be improved. The review of RSSB tools and services identified thirteen potential improvement ideas. The majority of these were considered to involve significant effort and six required more industry experience before being considered for initiation.

**Deliverables**

Industry guidance, *Measuring Safety Performance*, will be published in hard copy and electronic formats. This will be supported by, initially, two case studies (available to members on request) that describe how the guidance has been applied in different settings. It is anticipated that further case studies will be developed.

**Methodology**

A literature survey involving a review of fifty documents, most of which related to the process industry, was undertaken to establish current good practice. Seven non-rail industry organisations and one overseas rail company, with some experience of implementing SPIs were interviewed in order to identify further good practice. These included representatives from the chemical, petrochemical, nuclear and aviation industries as well as overseas railways. Several GB rail organisations were interviewed and their period safety performance reports analysed to understand current practice. To develop an understanding of how SPIs can be identified and prioritised an exercise to create a risk control matrix for the whole TOC risk profile was carried out.
The matrix was used to select prioritised risk controls, for which potential activity and outcome SPIs were developed. The exercise led to practical insights into developing risk control matrices and generating SPIs and identified gaps where further thought was required. A guidance document was drafted and the initial stages trialled by two TOCs. Feedback from the trials was used to strengthen the guidance in terms of presentation, key messages, and clarity of text. In addition, RSSB carried out an internal review of several tools, products and services to see how these could be improved in the future to support the identification and measurement of SPIs.

Next Steps

Safety Policy Group sponsored this piece of research and has suggested that through implementation of the guidance, railway undertakings will see benefits with respect to:

- Better management and reduction of risk
- Greater confidence in safety performance
- Reinforced positive safety culture
- Shared knowledge on safety issues
- Enhanced efficiency

The research led to the identification of items for further consideration, including the:

- Development of a briefing note, slide pack and further case studies to support the guidance document and the creation of a web-based SPI toolkit.
- Creation of a training course for SPI champions and a forum to discuss SPI issues.
- Investigation and development of risk analysis tools and services to help prioritise SPI selection.

These are being taken forward and developed into a proposal for further work to enhance the guidance on SPIs.

Contact

For more information please contact:

Michael Woods
Head of Operations and Management Research
R&D Programme
RSSB
enquirydesk@rssb.co.uk