

Total Safety Management: Principles, processes and methods

1. Introduction

Over the recent past, the incidence of major mishaps, crises and accidents have made it clear that organizations must still improve their capabilities to address safety through the application of a systematic and proactive approach. Whereas traditional safety programs were mostly reactive and implemented on the basis of incident investigations, or as a result of enforcement, new integrated and proactive approaches have been endorsed by safety advisory and regulatory bodies. Safety management systems (SMS) are changing from a prescriptive style to a more 'self-regulatory' and 'performance oriented' model that is more proactive, participative and better integrated with business activities. To this end, several proposals have been made in safety management systems (e.g., Strategic Safety Management and Integral Health Management) and international standards (e.g., ISO 31000).

For many years, the Total Quality Management principles have provided a basis for developing several health and safety systems. Building on TQM, Goetsch (1998) introduced the concept of Total Safety Management (TSM) as a performance-oriented approach that gives organizations a sustainable advantage in the marketplace by establishing a safe work environment that is conducive to peak performance and continual improvement. The fundamental elements of TSM include a strategic approach to safety, emphasis on performance assessment, employee empowerment, reliance upon robust methods of risk analysis, and continual improvement. However, more specific and practical organizational processes for total safety have been proposed by the Strategic Safety Management (SSM) approach that emphasized an integration of safety into the corporate strategy and the demonstration of a business value of safety (Rahimi, 1995; Zou and Sunindijo, 2015).

In a total safety approach, business processes are integrated with safety engineering techniques within a continuous improvement culture that affects all levels in the organization. In the SSM approach, the safety target becomes the analysis of 'work processes' rather than the analysis of isolated safety-critical activities. A work process is a complex web of interdependencies between physical entities, information, communication and knowledge channels and decision-making activities. Hence, by analyzing what is wrong with a work process, safety practitioners can evaluate the entire system and cater for safety, quality and productivity. The SSM is deeply ingrained with participative safety management in the form of self-managed teams as advocated by TQM approaches. To exploit operational feedback, the SSM relies on performance

measures that relate to work processes rather than 2 work outputs (e.g., incident and injury rates). These SSM principles have been applied by Zou and Sunindijo (2015) in the development of safety programs for the construction industry.

In the Integral Health System (IHM), the value of health is seen as a key element of corporate policy in addition to the reduction of incidents and their associated costs (Zwetsloot et al., 2003; Zwetsloot and van Scheppingen, 2007). The IHM principles have been based on earlier TQM approaches and Business Excellence Models which provide a good basis for integrating safety with quality and other business processes. The IHM approach requires a shift from solving safety problems and reducing risks to the positive business values that safety can bring to the organization. The focus is no longer on risk reduction, medical problems or product safety but on a combination of them and their relationships to organizational and business development. In this sense, health and safety is associated with business values which increases its strategic role.

The integration of safety with quality, environment and productivity can be done at different levels, according to Jorgensen et al (2006):

- Strategic and cultural integration in order to enhance learning, continuous performance improvement, stakeholder involvement and participative management;
- Coordination of common business processes between safety, quality and environment (e.g., policy, planning, procedures, audits, control of non-compliance, preventive and corrective actions and management reviews);
- Correspondence of different standards (e.g., ISO 9001, ISO 14000, OHSAS 18001) with cross-references and possibly a common information system.

The earlier SSM and IHM approaches have mainly addressed the strategic and cultural integration and, to a lesser extent, the coordination of common business processes. The correspondence of standards usually falls outside the remit of safety advisory bodies but has been taken on board by many safety consulting firms aiming to develop informational systems that facilitate transfer of data and analysis of compliance across standards. In addition, there are a growing number of studies focusing on conceptual frameworks and methods to map standards of safety, quality and environment in an Integrated Management System (e.g., Santos et al. 2012; Hamidi et al., 2012; Bragatto et al., 2007).

Building on the advances in strategic and cultural integration, further studies are now needed to examine the coordination of common processes to support the integration of safety with other business activities and demonstrate the benefits of Total Safety Management. Therefore, the aim of this paper is to consider the principles of TSM and examine how safety can be integrated with other business processes that may be used for quality, productivity and design. The first part

presents the five principles of TSM whilst the second part describes an integration of safety processes. The third part presents an overview of the results of a European project (Total Operations management of Safety Critical Activities) that developed specific tools to manage a Total Safety Management approach. Detailed descriptions of some of the TSM tools of the TOSCA project are presented in a number of papers published in this special issue of Safety Science.

2. Principles of Total Safety Management

Over the past two decades, a number of risk management (RM) standards have been developed to meet new demands from industry and higher expectations from regulators for managing risks (e.g., AS/NZS 4360; FERMA; COSO; ISO 31000). Most RM standards share common principles and processes as they require systematic methods in safety oversight, understanding of acceptable risk tolerances (ALARP), formal risk assessment, risk mitigation, communication of risks and review of safety investments.

The new ISO 31000:2009 standard offers principles and guidelines for risk management (RM) and remains widely applicable to industry. It also serves to unite risk management processes with existing standards of quality and environmental management and offers a common approach to address risks without leading to a process of certification. The standard can be used by any public, private or community enterprise, association, group or individual. ISO 31000 provides general principles for risk management and proposes management processes for implementing a system for managing risks. It can be applied to both industrial safety and project risk management which provides a good basis for elaborating the principles of Total Safety Management. In particular, the principles of effective risk management in ISO 31000 are as follows:

1. Risk management should create and protect business values;
2. RM should be central to the organization's processes;
3. All decision making within the organization involves the explicit consideration of risks and the application of risk management to some appropriate degree;
4. RM should be based on best available information;
5. Continual communication with external and internal stakeholders, including comprehensive reporting of safety performance;
6. RM should be comprehensive and clear about accountability for risks, controls, and risk treatment processes;
7. It should be systematic, structured, and timely applied to critical activities;
8. It should take into account human and cultural factors;
9. It must be dynamic, iterative, and responsive to change;
10. It must facilitate continual improvement of the organization.

The first three principles refer to what has been termed the 'business value of safety' (CCPS, 2008) where all decision making and organizational processes should involve the explicit consideration of risks while risk management provides a capability for creating value for business. The fourth principle suggests that RM should be based on best available information about hazards, available methods and safety measures that have been implemented. This principle on the use of best available risk information is elaborated by the NORSOK Standard Z013 which proposes an inventory of risk information about hazards, risk acceptance criteria, risk contributing factors, risk assessment tools, and uncertainties or assumptions related to such information. The fifth principle refers to the involvement of external and internal stakeholders in the risk management process as well as to their continual communication including the reporting of risk information. This is similar to the participative management approach pointed out by Strategic Safety Management and Total Quality Management.

A vital part of all safety standards concerns the risk assessment process, the people who would be involved, the techniques, the scope of analysis, and the context of work. The next three principles (6, 7 and 8) refer to the allocation of safety responsibilities and the conduct of risk assessment that should take into account the context of work (i.e. the technical environment and the human factor). In this regard, the organization should manage any valuable knowledge about risks (e.g., people's views, standard procedures, audit reports, incident investigations) and make it available to the risk assessment process. Finally, the last two principles refer to a feedback mechanism that monitors risk reduction measures, evaluates results and facilitates continual safety improvement.

The proposed TSM approach builds on these principles and further elaborates the performance requirements of a risk management system as follows:

1. RM should be part of all decision making and organizational processes and provide a capability for creating value for business;
2. RM should be based on best available risk information to create a common operational picture about risks;
3. Participative risk management must ensure that all the needs of stakeholders are taken into account while their knowledge about risks is brought into play;
4. Knowledge management should be part of risk management so that all knowledge about risks is managed effectively and all RM techniques are better integrated;
5. Performance monitoring and operational feedback is necessary for making RM dynamic, iterative, and responsive to change. At the same time, this will facilitate continual improvement of the organization

The five TSM principles are further elaborated below, using existing knowledge from risk management standards, earlier approaches to total safety and our recent experience with a three year European project (TOSCA) that applied the

TSM principles to develop useful processes and methods in Total Safety Management.

Business case for safety

Employers are required by legislation, and by social responsibility, to provide a safe working environment while also being required by shareholders to deliver financial profit. For many years, process industries have viewed productivity as being at odds with safety. This is partly justifiable since investments in safety may not show short-term returns whilst major accidents or injuries may occur after long time periods; this can make managers quite skeptical in investing in safety and biased towards attending to pressing production issues to ensure economic survival in a competitive world. For this reason, many institutions and researchers have emphasized the need for risk management to demonstrate a business value to organizations.

For instance, in its HSG96 publication, the Health & Safety Executive (HSE, UK) provided some evidence that 'Good Health is Good Business', since work accidents can come at a high cost to the business. Other studies argued that the 'business case' of safety should be supplemented with an 'ethical case' of safety. For instance, Wright (1998) suggested that many managers are more likely to be motivated by factors such as company values, peer expectations and perceived threats to individual and corporate reputation. The Royal Society for the Prevention of Accidents (RoSPA, UK) supported the idea that the ethical case needs to be advanced as the primary reason for taking action on health and safety (Bibbings, 2003). For example, Small-Mediums Enterprises (SMEs) often 'care' about their employees but do not know how to turn this 'care' into practical action. In 2006, the Centre for Chemical Process Safety conducted a benchmark study with the chemical processing and petroleum industries and found that companies that implemented efficient safety management systems achieved many returns from their investment such as, productivity increases, production and maintenance cost decreases, lower capital budgets and lower insurance premiums.

To be Continued in the next issue

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Published by : D. L. Shah Trust,
Bell Building, 2nd Floor,
Sir P. M. Road
Mumbai 400001
email: dlshahtrust@yahoo.co.in
Ph: 022-22672041
Subscription: Free on request
(soft copy only)

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