What Constitutes Best Practice in Safety Learning following Workplace Safety Events? A Literature Review based on Social Constructionism

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***Abstract*—Learning from incidents is an important aspect of safety negotiation within the social construction framework. This paper examined different social construction frameworks, in which safety was negotiated and learned following occupational incidents. A literature search performed through the "Science Direct" database between November 2015 and April 2016, resulted in 13 publications represented 8 nationalities and 6 industries. Thirteen social construction frameworks were extracted and thereafter were classified in six strategies; incident review meetings (2 studies), incident reporting systems (2 studies), incentives- based systems (2 studies), database systems (5 studies), cultural and behavioural setting frameworks (1 study each). Such different frameworks can be utilised in different industries to improve workplace safety and decrease future incidents, by utilising facilitators and overcoming barriers. It would be interesting to see the impact on workplace safety learning and its cost effectiveness when a firm adopts those strategies integrated into one framework.**

***Index Terms*—Safety learning from incidents, Safety management, Social construction framework, Workplace accidents.**

I. Introduction

Workplace accidents have a catastrophic impact, not only on the individual's life and his family, but also on the industry itself and the whole society in general [1]. However, accidents offer an opportunity to learn, correct and develop a strategic safety plan [2]-[5].

Learning from incidents is an important aspect of safety negotiation within the social constructionism. It helps to understand the way, by which individuals and organisations response to the workplace accidents and how they negotiate and situate learning to construct safety in the workplace [5]-[7].

This brief review tried to investigate what has been published on constitute safety learning in the workplace using a constructivist framework. The aim of this research was to develop an understanding of what can be constituted as best practice in this area.

II. Methods

The method used in this research was adopted from Hale and Borys [8], and included the following key steps:

1) The "Science Direct" database was searched using the keywords "safety learning", "accidents and incidents" for papers published between November 2015 and April 2016. A further refinement was applied by selectively including the topics of "safety", "accidents" and "incidents", with a focus on "organisation" and "safety management. The initial search resulted in 48 articles.
2) The next stage involved applying an inclusion and exclusion criteria, summarised in Table I. This resulted in 13 studies which informed this review.

TABLE I: The Inclusion and Exclusion Criteria

Inclusion Criteria:
Peer- reviewed, published in reputable journals.
Have a valid and relevant research question related to workplace safety.
Design is clear in relation to the methods used, data collection and prevention of any potential bias.
Focused on safety learning in a social framework.
Used a well known or a novel credible framework.
Focused on organisational learning.
The evidence obtained has a general applicability.
Exclusion Criteria:
Focused on occupational training/ learning alone.

III. Theoretical Framework

Theoretically, a well educated and trained worker has the ability to perform his tasks safely and efficiently. However, about 474 million workplace accidents occur every year and about 2.34 million people yearly die from such accidents [9], [10]. This implies that there are other aspects to safety that formal education and training miss. Recently, social constructionism has been offered as a theoretical framework for progressing our understanding of causation and management of accidents, incidents and safety [7], [11]. Such framework augments the understanding of different safety aspects, including the way in which individuals and organisations respond to workplace accidents; and how they negotiate and learn to construct safety in the workplace. Social constructionism presents several useful strategies for investigating workplace incidents and situating safety learning within organisations [7], [11]. Such strategies usually focus on the factors or ways that affect the perception of the reality of individuals and/ or groups. In the field of safety, it involves the investigation of such human factors pertaining to how the safety behaviour is created, put in practice and became a traditional performance among workplace stakeholders [12], [13].

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IV. Results and Discussion

Learning from incidents is an important aspect of safety negotiation. Nonetheless, it is not an easy task because information often is insufficient [4], [5], [14], [15].

The main findings of this review pertaining to the respective industries, populations and safety strategies extracted from the 13 articles reviewed are summarised in Table II. Each of these strategies is examined below.

A. Incident Review Meetings (IRM)-2 Studies

Effective incident review meetings may be facilitated by encouraging workers to participate and interact with others pertaining to safety incidents. Highly qualified safety leadership can improve the quality of safety discussions regarding the causes and solutions and result in prominent improvement of safety learning. Conversely, some other factors may hinder the review and analysis, such as when the organisational environment is not supportive, worker struggle with heavy workload and an autocratic style of safety leadership prevails [14]. There are two types of incident analysis and safety management; a structured official system and another unofficial one. Both have significant impact on individual learning that needs a high degree of involvement, iteration, examination of contributory processes and initiation of remedial actions. There is a need for all workers even that has no role in safety management, to join activities designed to promote learning following near misses and accidents. Actually, one of the commonest voluntary activities for learning is the elaboration on incident reports at different types of staff meetings.

TABLE II: Results of 13 Articles According to Industry, Country and Learning Framework

References	Industry	Country	Safety Strategy
[14]	Health	UK	IRM
[15]	Health	UK	IRS
[5]	Nuclear	Belgium	IRS
[4]	Chemical	Norway	IRM
[16]	Chemical	USA	IBS
[6]	Chemical	Italy	IBS
[12]	Chemical	Italy	OB
[17]	Heat treatment	Italy	DS- VSS
[3]	Transportation	China	OC
[18]	Transportation	China	DS- MOID
[2]	Retail and logistics	UK	DS- ADS
[1]	Various industries	Denmark	DS- INFO Cards
[13]	Various industries	Canada	DS- MATA-D

There are barriers to the effective individual learning, such as absence of training on incidents analysis for incident managers, focusing on the instantaneous instead of the root causes, focusing on new incidents and focusing only on measures needed at the frontline level and neglecting measures at the leadership or organisational ones. Another barrier is the time as a constraint factor, which plays negative role on the depth of the incidents analysis and the learning process from them [4].

B. Incident Reporting Systems (IRS)-2 Studies

IRS is a practice with learning outcomes through attempting to draw lessons from what have previously happened. Two main systems of reporting may coexist in one organisation, an institutional official system and another more informal flexible one, based on the situated perspective of learning [5], [15].

The informal flexible reporting system can also be divided into two sub- systems; the first is a negotiated, accepted drift from the formal system, which is based on the solidarity among workers and practiced within the close working group. The second is deviated from the drift and it is more contested practice than the first drift for it is generally marked by under- reporting [5].

Reasons for the second drift result from the fear of being blamed, a way of protecting other workmates from being blamed (different type of solidarity) or if the incidents were not serious or did not result in detrimental consequences. This type of reporting is a drift from a drift and often it hinders the collective organisational learning. Over-reporting may also occur when IRS is used for reasons other than safety learning, such as literal adherence to the rules, a way of indirect communication with other departments or services and a method of publicizing incident to discipline others [5].

Effective reporting may be hindered through various barriers; namely, insufficient training on methods of incident reporting, insufficient feedback, ambiguity about types of incidents needed reporting and the fear of consequences and blame. Furthermore, the workers perception of insufficient learning, the lack of obvious practice changes and more centralised organisations will negatively impact the staff adherence to the incident reporting [15].

C. Incentives based Systems (IBS)-2 Studies

It was proved that there is a contagion effect following a major accident in one chemical company that affected not only the equity prices of the company itself but also the competitor companies; whereas, minor incidents have the opposite effects. This contagion effect may motivate companies and organisations to adopt policy that prioritise safety and safety learning in the workplace [16]. On the individual level, a "Proactivity-and-consequence based safety incentive (PCBSI)" was introduced [6]. PCBSI is a symbolic reward system (may not be monetary) that aims to establish an effective methodology to motivate workers participation in the workplace safety through anticipatory and self- initiated risk- reporting activities. This will result in prioritizing control plans to diminish detrimental consequences. Effective reporting should focus on the quality of the report and the recommended control plan, not on the incentives for fewer injuries, in order to avoid the "Bloody pocket syndrome".

Proactivity and taking charge both have the ability to broaden learning in the organisation, induce positive changes and improve safety. There is a positive link between PCBSI effectiveness and the integration of appropriate safety training and learning in the organisation [6].

D. Database Systems (DS)-5 Studies

Database system is a strategy of reviewing the previous accidents to learn from them how to prevent detrimental accidents recurring. Five studies adopted a database of incidents as a framework to negotiate learning from incidents:

a) Video surveillance system (VSS)

It is superior in comparison to in- person surveillance. VSS provides more accurate, reliable and none biased data. It does not hinder work process and it is efficient in detecting unsafe practices. Structured analysis of the obtained data provides strong bases for effective safety learning [17].

b) Information (INFO) cards

Three types of information need to be recorded on those cards; first, observational data for hazards and presence or omission of physical and psychological safety barriers. Second, the quality of the safety barriers those are in practice or needed. Third, ways to establish and maintain the safety barriers in the workplace. There is a need for two sets of INFO cards, one set for employers and another for employees. INFO cards are good systematic framework to facilitate learning and improve safety [1].

c) "Multi-attributes technological accidents dataset (Mata-D)

It is an innovative database of 238 major industrial accidents from different advanced technology industries during the last 50 years. MATA-D is a comprehensive approach to achieve an extensive understanding and learning [13].

d) Audio diary system (ADS)

It is a cost-effective method to collect incidents data trying to determine events that trigger learning and describe the resulting model of learning in the concerned organisations. There are two models for learning from incidents; a single-loop learning that arises when workers detect errors, find a resolution within their understanding of the situation and the frame of the organisation policies and traditional practices without any impact on the latter. This model of learning promotes individual safety learning; however, it does not help to prevent recurrence of accidents. The second is double- loop learning, where workers investigate the situation that led to an incident, and develop an action plans that address the root problems. This usually results in changes in the organisational policies and performance traditions. Double- loop learning should be encouraged to stop accidents recurrence [2].

e) "Adaptable metro operation incident database (MOID)"

MOID addresses three types of safety events including serious accidents, minor accidents and near misses. It is proposed that successful management of near misses can reduce accident rate. A database of precursors that preceded an accident can be created and analysed in order to reach conclusions that help to avoid accidents recurrence in the future. The incidents attributes along with 24 precursors of accidents were identified through MOID, which indicates that MOID is a useful tool to examine the previous incident trends and learn to anticipate how to prevent future incidents and promote safety management [18].

E. Organisational Cultural (OC)-1 Study

Publications in this review represented diversity of nationalities and industries (Table II), which may explain the different frameworks, in which safety learning was negotiated or situated in the reviewed literature.

Obviously, different cultural setting impacts workplace environment, accidents analysis and the modes of investigations practiced following an incident, which in turn influence safety learning processes [19]. The effective incident investigation need to trace accidents possible causes in order to understand what went wrong and what safety lessons can be learned from it [3], [19]. Conversely, tracing the accident possible causes to identify responsibilities will hinder safety learning [3]. The agency for accident investigation needs to be permanent, independent, and investigations need to be non- judicial and non- punitive. A comprehensive collection of accident data facilitates reconstruction of the accident and simplifies communication of the investigation outcomes and safety advice to the public [3].

F. Organisational Behaviour (OB)-1 Study

OB can be classified into two categories; prosocial behaviours such as willingness to help others, care for them and focus on the safety of the group. On the other hand, proactive behaviours carry more challenging nature and try to modify workplace performance [12], [20]. It was proved that prosocial safety behaviours are linked to minor accidents or incidents with only property damage. Whereas, proactive safety behaviours are linked to near misses or lost-time injuries. Both types of safety behaviours significantly impact the safety participation and learning in the workplace [12]. Sharing the results of incidents analysis and investigations positively impact and promote organisational safety behaviour [14].

V. Recommendations for Best Practice

1) Workers need to effectively participate in incident review meetings even if they do not hold a role in incident management [14].
2) Safety managers need to receive sufficient training on incident analysis [4], [14].
3) An effective incentive system needs to be evident to the workers with full and careful explanation pertaining to its objectives and methodologies seeking to increase desired behaviours and decrease undesired ones [6].
4) Video surveillance systems are accurate, reliable and effective sources for safety data, it may justify the costs induced [17]. Whereas, audio diaries are cost- effective tools to collect accurate and abundant information in relation to recording safety events [2].
5) INFO cards are good systematic framework to facilitate learning and improve safety and safety learning [1].
6) It is recommended to develop "industrial accidents and near- misses data set", to help to address all circumstances that may result in risky behaviours or situations [2], [13], [18].

7) Ensure that daily work tasks are reviewed in their real setting to observe any deviation from codified practice and to examine the type of learning (single or double-loop) in the workplace and encourage double- loop learning, which is more dynamic approach and it can help to motivate workers to share their experiences, especially in a supportive workplace environment [2], [4].
8) Simultaneous implementation of both formal and informal types of incident reporting, follow up on incidents and identifying the accepted and contested drifts in incident reporting maximize the potential of learning outcomes in the organisation [4], [5].
9) Incidents scrutiny does not ensure valuable learning and furthermore, incident reporting should not be the main methodology for learning in an organisation. Rather, organisations need to seek multiple approaches or processes for organisational learning [15].
10) There is a need to consider culture differences for they influence incident analysis and affect learning outcomes [19].
11) Promoting an environment with prosocial and/ or proactive behaviours improve workplace safety and reduce detrimental consequences [12].

VI. Conclusion

Safety learning can effectively be achieved by learning from and through workplace incidents. This review, undertaken social constructionist frameworks, suggests that such learning can be enhanced if it involves all workplace stakeholders regardless if they have safety management roles or not. Strategies that develop and profile hazards in database are of paramount importance in facilitating safety learning to better management and future prediction of similar events. Other approaches can be added and embedded in different industrial contexts. Future works may further investigate the links between organisational culture and behaviour in learning from incidents, the applicability and cost effectiveness of integrating the above strategies in one framework to manage safety learning in an organisation.

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