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INCORPORATING LABOUR INSPECTORS' REQUIREMENTS INTO AN ACCIDENT INVESTIGATION METHOD

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Abstract. *Despite the availability of a number of Accident Investigation Methods (AIMs), Labour Inspectors (LIs) are not sufficiently supported by a structured method. Specific requirements of LIs are discussed and they are used to compare selected AIMs. Selected AIMs fulfill most of the requirements specified, except for the legal requirement. The need for the development of a new AIM, especially designed for LIs, has emerged. Existing AIMs could be useful but a special method, taking into account legal factors as well, is more appropriate. The development of a new method including the search for legal factors may be of great assistance to companies, raising awareness and facilitating proactive behaviour. A new accident investigation method, especially designed for LIs would also support the decisions and planning of the relevant Ministry of Labour in terms of policymaking, prioritisation of actions, campaigns and accident prevention programs.*

Key Words: *Accidents; Investigation methods; Labour Inspectors; Root causes; Legal factors*

1. INTRODUCTION

Labour Inspectorate is the body responsible for ensuring the protection of workers at work and promoting legislation adapted to changing needs in the workplace (1). A Labour Inspectorate exists fundamentally in each country to improve working conditions, a phrase incorporating many different elements, but the emphasis here is on measuring the improvement in occupational safety and health, as being the one function common to all labour inspectorates (2).

Except for the proactive activity of the Labour Inspectorate, that is carrying out regular worksite inspections and measuring the performance of companies against fundamen-

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tal legal requirements, there does exist the reactive activity, which is the investigation of accidents. Some of the objectives of the accident investigation are to collect facts, find primary and underlying causes, prevent a similar accident from happening, find any breaches of law, make recommendations and decide on information dissemination (3).

Reporting occupational accidents by the Employer is mandatory, and Labour Inspectors (LIs) investigate accidents to establish causes and consequences and to initiate prosecution in case of any breach of requirements imposed by the health and safety legislation. While carrying out an accident investigation, LIs must guarantee their independence and integrity. They should have understanding and empathy for those affected by the accidents and they should secure the trust of those who were involved in the accident to encourage their cooperation in providing all relevant information (4). In Ontario, the Ministry of Labour has carried out customer surveys to identify gaps in and ways to improve customer service. In health and safety, clients rated the following attributes, among others, as most important to them: impartiality and knowledge ability of the staff and professional treatment of the inquiries (5).

Regarding the official accident investigation practices and methods in the European Union (EU), a survey has been undertaken (6). A basic questionnaire was sent to all EU Member States and from the responses received, it was concluded that there was a variation in the procedures between countries and even within the same country, depending generally on the seriousness of the consequence. Of all the EU member states, the Nordic countries were those the central authorities provided the LIs with books or manuals on how the investigation should be performed but they were unfortunately in the country's own language. Austria, the Netherlands and the United Kingdom (UK) have guidelines (although not regarded as formal methods) and Ireland, Portugal, Spain and Greece are examples of countries where a written guidance does not exist at all. Occupational Safety and Health Organization (OSHA) in USA has a directive on accident investigation but it does not cover how the investigation should be approached, like a structured investigation technique would.

Accident investigation reports serve as a basis for subsequent legal action (2) but at the same time, they are subject to critical review, both in the Press and in the Courts. OSHA, for example, received extensive criticism of accident investigation and initiated a research project in order to overcome such criticism (7).

Besides, there is a tendency for LIs to become so interested in the causes and so anxious to demonstrate that they have carried out a comprehensive investigation that they write unnecessarily long and detailed reports which are simply filed. However, according to Richthofen (2), one highly computerized inspectorate requires normal accident reports to be drafted in 85 words.

One way to argue against constraints on investigations is to have a recognised formal method. A further advantage of using a standard methodological approach to investigations is the possibility of quality control: by following well-established procedures, LIs can be confident of producing sound work. Only if a standard accident investigation method is adopted to be used by the entire inspection service in each country, will it be possible to aggregate and interpret the data on a national (and subsequently international) basis.

It is important that LIs are supported by a procedure or other documented structure (method/technique) that guides the investigation. In the absence of such a structure, while LIs ask about the accident conditions and gather data, their knowledge, experience and

prior observation as well as their assessment of the competence and commitment of management, essentially govern the content of such questioning (2). In other words, in the absence of a concrete guidance, many LIs are forced to devise their own personalized methods and interpretations. There will always be a place for intuition from the investigators, but it would be desirable to have a formal method, which could be applied by all investigators. Besides, such formal methods should enable underlying causes to be discovered as soon as possible.

The aim of this work is to provide a preliminary comparison of selected AIMs according to requirements of LIs. This is a first attempt to incorporate requirements of LIS into AIMs and reflect on the development of a new method especially designed for LIs.

2. EXISTING AIMS FOR OCCUPATIONAL ACCIDENTS

The initial task was to select AIMs among a number of methods for accident investigation, which have been developed during the last decades. Most of the methods were specifically developed for major accidents occurring in complex technological systems and not for ordinary occupational accidents, which are investigated by LIs.

Selection was therefore based on the following criteria: the methods should have been described in the literature, they should be recently developed following a systems approach and should have been used in the investigation of ordinary occupational accidents. Based on these criteria, the following methods were selected:

2.1. Work Accidents Investigation Technique (WAIT)

The method was developed by Jacinto and Aspinwall (8) and it integrates the theoretical approaches developed by Reason (9) and Hollnagel (10). It evolves from the active failures associated with the accident chain of events, to the latent organisational conditions behind them. In between these two levels, the technique directs investigators to scrutinise other contributory elements associated with the working environment, the person, and the job. These are called, respectively, influencing factors, individual factors and job factors.

2.2. Health and Safety Executive (HSG245)

The method was developed by the Health and Safety Executive (11) as a guide to adopt a systematic approach to investigate the accident. It follows Reason's (9) accident causation model. The starting point is the event and the aim of the analysis is to find immediate, underlying and root causes. Immediate cause can be the agent of injury, underlying causes are unsafe acts and conditions and root cause is the failure from which all other failings grow, often remote in time and space from the accident.

2.3. Control Change Cause Analysis (3CA)

The method was developed by Kingston (12) in order to provide supervisors and line managers with an easy investigation method. Although it does not follow a specific accident causation model, it can be considered as systemic because it covers the management system. The 3CA investigator views the occurrence of an accident in the context of a continuous flow of changes in the sequence of events. Some of the events in the sequence

are significant in the sense that they allow further changes to occur. After establishing the significant events, the investigator can identify the ineffectiveness of prevention through examination of barriers and controls that could have prevented them or limited their effects, description of the shortcomings of each barrier/control and reasoning about the processes and management arrangements that allowed the barrier or control problems to exist at the time of incident.

From the selected AIMs, it can be established that the existence of multiple causes is recognized and the identification of management and organisation failures and their interactions with the working activities is an important issue for the understanding of occupational accidents.

3. Association of Requirements of LIs With AIMs for Occupational Accidents

Accident investigation is one of the basic duties of LIs and it should fulfil 5 main requirements: *legal* (satisfy legal requirements, document any violations of the health and safety legislation, sort out legal liabilities), *descriptive* (describe events and circumstances surrounding the accident), *causal* (identify probable causes of the accident), *prevention* (recommend what changes could be made that would decrease the probability of a similar accident in the future) and *research* (gather accident information for use in the accident research and prevention programs).

Regarding the legal requirement, the duty of the LIs is to enforce the law and document any violations of health and safety legislation. None of the selected AIMs, presented in Paragraph 2, documents safety code violations, which can be expected, provided that the selected methods are not designed to be used by an Inspection body. This shortcoming may, on the other hand, be considered as a weakness of the position of LIs in relation to fundamental accident investigation because they need to concentrate on those aspects that may indicate whether or not a prosecution would be justified (13).

To fulfil the descriptive requirement, requires both objectivity and the knowledge of what facts are relevant. An investigation method should provide some guidance with respect to the relevance of facts surrounding the accident. Selected AIMs provide a detailed description of the accident and thus fulfil the descriptive requirement.

Each accident investigation method should fulfil the causal requirement and be revealing, which means that it identifies all causes by making a distinction between events and underlying causes, in order to guarantee that the investigator will think about underlying causes, which are the less obvious reasons for an accident happening.

WAIT uses two fundamental concepts: Active failures, which correspond to the immediate cause of an accident, and Latent failures/conditions, which correspond to weaknesses hidden in the organization. Besides, it comprises 2 stages. The first is a simplified investigation process in which immediate causes and circumstances are analyzed. The second stage is an “in-depth” analysis in which other possible weaknesses and conditions within the organization are also identified and analyzed. HSG245 searches for immediate, underlying and root causes. Immediate causes represent the most obvious reason for an accident occurrence, underlying causes correspond to the less obvious reason and root causes are failures from which all other causes grow. 3CA identifies significant events, failures of barriers and controls, reasons behind these failures and finally "reasons behind these reasons".

In terms of the prevention requirement, an investigation should identify those conditions such that, had they been otherwise, the accident would not have happened. WAIT and HSG245 provide through checklists meaningful recommendations whereas 3CA does not generate specific recommendations; it only specifies problem areas.

For accident research purposes, the data obtained from an accident investigation need to be complete and reliable and reports that use commonly defined and well-understood descriptive terms would be as well useful. Using checklists is therefore advisable. Accident research requires a consistent data set, so that the facts of different accidents can be compared, and the facts of similar accidents can be summarized and analysed together.

Regarding the accumulation of results across many accidents for research purposes, WAIT, HSG245 and 3CA provide classification schemes, which are useful to produce results across many results in a uniform way.

A summary of the findings from the association of the selected AIMs according to the requirements of LIs (legal, descriptive, causal, prevention and research) is shown in Table 1.

Table 1. Requirements of LIs and AIMs.

	Requirements				
Accident investigation method	Legal	Descriptive	Causal	Prevention	Research
WAIT	NO	YES	YES	YES	YES
HSG245	NO	YES	YES	YES	YES
3CA	NO	YES	YES	YES/NO	YES

AIMs are evaluated according to the following requirements: legal, descriptive, causal, prevention and research. YES means the method would fulfill the requirement, YES/NO means the method might fulfill the requirement, NO means the method cannot fulfill the requirement.

4. Specifications for a New Method

The evolution of accident investigations over time seems to show a shift from the consideration of technical factors to human factors and today organizational factors (4). LIs should therefore take into account physical and engineering hazards, human factors, and management factors and identify their relation to law violation, when performing an accident investigation.

Existing AIMs could help LIs towards this direction, although they do not fulfill the legal requirement. But as the main aim of an accident investigation, seen from a Labour Inspector's view, is to document any safety code violations and sort out legal liabilities, a method especially designed for LIs is more appropriate. At the end of a thorough investigation, after establishing the physical and engineering hazards, the human factors, and the management factors, a Labour Inspector can decide where the legal failures were.

In order to use an investigation method, the mutual dependence between causation models and investigation methods should be taken into account. The initial step for an investigator would be to select a particular model that fits him, which in turn guides him in selecting one of relevant methods. The development of a particular method should be based on a specific causation model or better on a combination of accident causation theories and accident investigation methods because this combination could provide a better and more reliable platform for the investigation and analysis of accidents.

One of the prerequisites of the new method would be to collect accurate information in order to get details about the accident, what went wrong and why. The collection of the information would help LIs identify the activity, the victim was carrying out at the moment the accident happened, the accidental mechanism (what went wrong, that made the accident happen), and the injuring mechanism, which caused the injury in the very end (14). Having knowledge of the accident event is crucial and collecting data in a uniform way is an advantage for LIs.

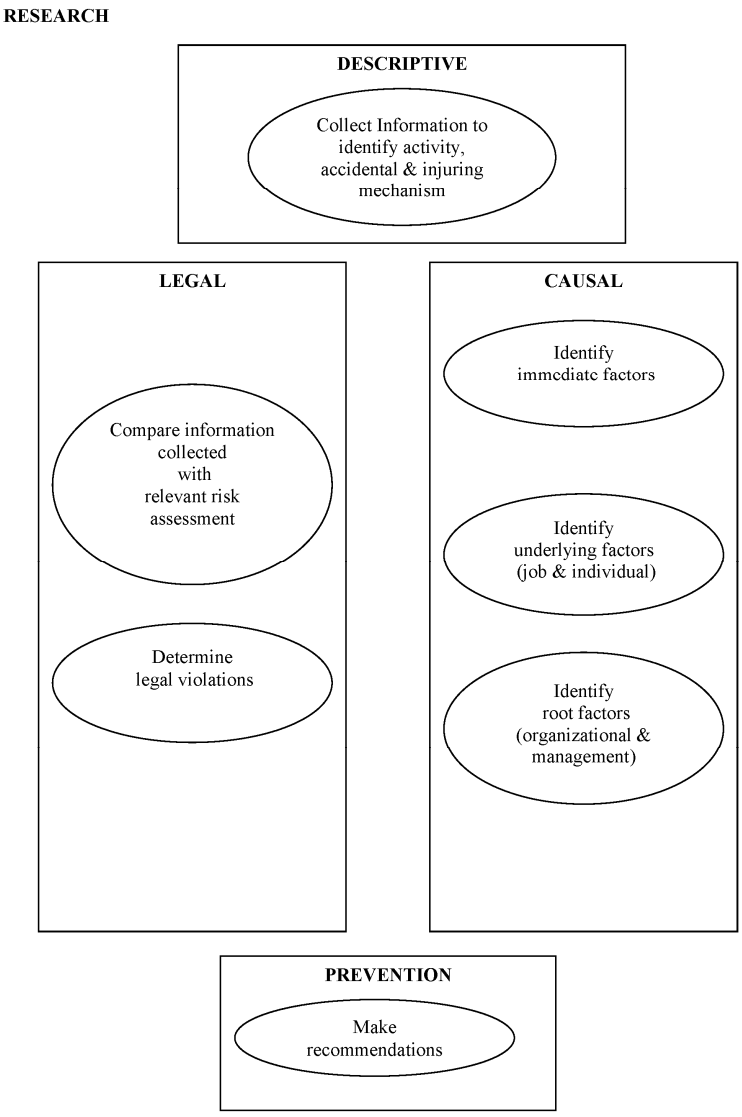

Fig. 1. Specifications of a method compatible with LIs requirements.

The method should be able to identify immediate, underlying and root factors. Immediate factors correspond to the observable elements of the accident and should help LIs describe the accident causation context. Immediate factors represent different occupational hazards, related to the conditions of the workplace, such as physical environment, job-related, equipment and tools, information and communication.

Once the observable elements have been identified, findings should be compared with the risk assessment, which includes the examination of health and safety conditions at the company, identification of risks, measures to deal with them and follow up of the measures. The absence of a risk assessment, which is a legal requirement, constitutes the first legal violation. In the case of existence, the next question is about the identification of risk. The specific risk may either be identified in theory and in writing but measures are not taken in practice or measures are inadequate or inexistent, in the work place, otherwise the accident would not have occurred or the specific risk may not be identified in the risk assessment. In both cases, the risk assessments must be reviewed in the light of a particular accident.

The method should then search for the underlying factors in order to determine "why" the accident occurred. In order to find the underlying factors, LIs should look at two main categories of factors: individual factors (that is related to the person) and job factors (that is aspects related to the task and technology). After establishing the underlying factors, the method should aim at finding the root factors, that is organizational and managerial weaknesses or insufficiencies, which may have facilitated the previous accidental occurrence.

Only after analysing the accident, LIs would be able to determine legal breaches. The identification of the specific regulations, strictly from the legal point of view, is the result of the investigation, not the starting point. Establishing the legal failures with the help of a method helps also LIs to make suggestions about what changes could be made to health and safety legislation in order to avoid the occurrence of a similar accident in the future. In addition to that, searching for legal factors (in a separate step) may be useful for the Employers who sometimes ignore the law, simply because they are not aware of its details. If an extra checklist with the legal references that apply to specific factors was provided in a method, it would also be of great assistance to companies, facilitating proactive behaviour and ensuring compliance with the legislation.

Gun concluded that management training and good management practices are most likely to prevent injuries, which are associated with the violation of Regulations (15). The quality of information provided by LIs to Management is critical and such information should include regulatory requirements and information from accident investigations carried out by LIs. At the end of the investigation, LIs have the duty of finding legal failures for prosecution, but they should also make recommendations in order to be pro-active and provide good advice as well.

The method should also take into account that it should provide recommendations. LIs should change their legalistic attitude, they should go further and learn from accidents – they should not only be able to find the guilty part and apportion blame or liability but also be competent (and pro-active) to give advice on improvement and prevention. LIs should go beyond the legal aspects: with the use of the new method, they will be able to separate practical safety advice (pro-active prevention attitude) from legal decisions (law enforcement and punishment). LIs are not only controllers; the technical counselling in the workplace should also be included in their duties.

The modern approach to Labour Inspectorate, includes not only enforcing the law and punishing infractions, but LIs should also be well-informed and competent safety advisors because Employers need help and advice from the State. A preventative approach for the reduction of occupational accidents must be linked to LIs and the readjustment of their role in the ever-changing industrial, social and technological scene.

In conclusion, this paper identifies the specifications of a method compatible with LIs requirements. LIs would benefit from an AIM, which would be based on a combination of model/method pairs, would fulfil the descriptive requirement (collection of accurate information through the identification of activity, accidental and injuring mechanism), the causal requirement (identify immediate, underlying and root factors), the legal requirement (document safety code violations), the prevention requirement (formulate recommendations) and the research requirement (accumulate results across many accidents in order to gather information for use in accident prevention programs).

A new accident investigation method, especially designed for LIs would also support the decisions and planning of the relevant Ministry of Labour in terms of policymaking, prioritisation of actions, campaigns and accident prevention programs.

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UVRŠĆIVANJE PROPISA INSPEKCIJE RADA U METOD ISTRAŽIVANJA NESREĆA

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Uprkos dostupnosti izvesnog broja Metoda istraživanja nesreća (eng. AIM), službenici u inspekciji rada (eng. LI) ne dobijaju adekvatnu podršku u vidu neke strukturisane metode. U radu su izloženi specifični zahtevi inspekcije rada i poslužili su kao osnov za poređenje nekoliko metoda. Odabrane metode ispunjavaju većinu zahteva koji su navedeni, izuzev pravog propisa. Potreba da se razvije novi metod, koji bi bio osmišljen tako da služi inspekciji rada, se je pojavila. Postojeći metodi bi mogli biti od koristi ali poseban metod, koji bi u obzir uzimao i pravne faktore bi bio mnogo prikladniji. Razvoj nove metode koja uključuje i traganje za pravnim faktorima bi mogao da bude od velike koristi kompanijama, jer bi širio svest i pospešivao proaktivno ponašanje. Novi metod istraživanja nesreća, oformljen u skladu sa radom inspekcije bi pružio podršku odlukama i planovima nadležnog Ministarstva o radu u pogledu novih zakona, određivanju prioriteta, u kampanjama i programima prevencije.

Ključne reči: *nesreće; metod istraživanja; inspekcija rada; uzroci; pravne odredbe*