Anthropotechnological analysis of industrial accidents in Brazil

M.C.P. Binder, I.M. de Almeida, & M. Monteau

The Brazilian Ministry of Labour has been attempting to modify the norms used to analyse industrial accidents in the country. For this purpose, in 1994 it tried to make compulsory use of the causal tree approach to accident analysis, an approach developed in France during the 1970s, without having previously determined whether it is suitable for use under the industrial safety conditions that prevail in most Brazilian firms. In addition, opposition from Brazilian employers has blocked the proposed changes to the norms. The present study employed anthropotechnology to analyse experimental application of the causal tree method to work-related accidents in industrial firms in the region of Botucatu, São Paulo. Three work-related accidents were examined in three industrial firms representative of local, national and multinational companies. On the basis of the accidents analysed in this study, the rationale for the use of the causal tree method in Brazil can be summarized for each type of firm as follows: the method is redundant if there is a predominance of the type of risk whose elimination or neutralization requires adoption of conventional industrial safety measures (firm representative of local enterprises); the method is worth while if the company’s specific technical risks have already largely been eliminated (firm representative of national enterprises); and the method is particularly appropriate if the firm has a good safety record and the causes of accidents are primarily related to industrial organization and management (multinational enterprise).

Keywords: accidents, occupation—epidemiology; Brazil; causality; human engineering; risk assessment; safety management.

Voir page 1014 le résumé en français. En la página 1015 figura un resumen en español.

Introduction

In 1978 the Brazilian Ministry of Labour established norms governing the analysis of industrial accidents. Based on the notion that there are few causes of such accidents, these norms are still in force today and seek to identify persons responsible for accidents, with the result that the accident victims are often blamed for having been the cause of them in the first place.

In the early 1990s use of the causal tree method for investigating industrial accidents began to gain ground in Brazil (1–3). Since 1992 the method has been used on an experimental basis in Botucatu, a city in the State of São Paulo, and since 1994 the Brazilian Ministry of Labour has been trying to introduce the method nationally for the same reasons as those that led to its development in France, namely:

– to establish, continue, or improve dialogue at all levels in the firm when problems arise related to accident prevention;
– to propose preventive measures allowing the people directly involved to increase their awareness, going beyond symptomatic measures (immediate causes of injuries).

The anthropotechnological approach

Exports to developing countries of techniques and entire production-ready units present technical, financial, economic, and cultural problems. About 20 years ago the difficulties arising from such technology transfer led to the discipline of anthropotechnology, to help adapt technology to different populations (7).

Like anthropology itself, anthropotechnology overlaps other disciplines, such as geography, sociology, economics and history (8); it also places emphasis on the need for ergonomic analysis of work (9, 10). Climate, skill levels, and the technology that is being imported can present unsuspected or underestimated difficulties in developing countries. Such difficulties apply also to the importation of modern types of working procedures (e.g. flexible working hours, just-in-time delivery, etc.). For example, the introduction of such procedures in six Brazilian car factories precipitated transition processes with

1 Professor, Public Health Department, Botucatu School of Medicine, São Paulo State University, Rubião Jr. Campus da Uneesp. 18.618-000 Botucatu, SP, Brazil. Correspondence should be addressed to Professor Binder at this address.
2 Research Scientist and Head of Safety Management Laboratory Research Centre, National Institute of Research and Safety (INRS), Vandoeuvre-les-Nancy, France.

Ref. No. 0036
incompatibilities between the new and the old models (11).

**The causal tree as a managerial tool**

According to Berry (12), managerial tools do not simply allow the decisions of decision-makers to be carried out; on the contrary, by simplifying the real situation, such tools condition behaviour at many levels, create local rationales that often conflict with reform efforts, and affect the balance of power and the coherence of an organization. In other words, in terms of its effects on an organization, there is little difference between a technical tool and a managerial tool. When these tools are applied, they can be used in such a way that they reveal differences between expected and actual performance.

In the area of safety, managerial tools are still rudimentary, especially in small and medium-sized companies: accident frequency and severity indicators are calculated, and simplified risk analysis is carried out (13). The causal tree is a managerial tool because it produces a standard set of documents (data gathering, diagrams, follow-up).

The problems arising from the transfer to and implementation in Brazil of industrial techniques, organizational models, and managerial techniques call for anthropotechnological analysis. In Brazil’s social and industrial context, the causal tree method should be assessed in terms of its contribution to a local awareness of risks and for its appropriateness to the people and organizations that could potentially use it.

**Material and methods**

In this study we used the causal tree method to investigate accidents that occurred at three industrial sites in Borucatu. Wisner typology (8) was used to select the following companies:
- a small/medium-sized business (a small sawmill) representing a local activity;
- a high-investment national company (vehicle manufacturer);
- a high-investment multinational company (manufacturer of timber panels).

The analyses were made jointly by two occupational physicians using the causal tree method (differentiating the stages of analysis into fact-gathering, causal tree, and discussion). A detailed description of the accident victim’s activity during normal working and at the time of the accident was available in each case (14). The victim, workmates, witnesses, and the supervisor concerned were all interviewed. Where there were works engineers and safety officials, they were also interviewed (the two larger enterprises).

Each accident was analysed in a clinical manner and linked to general information on the victim (age, occupation, activity at the time of the accident, experience in the activity) and the factory (number of employees, type of work, working hours). Diagrams and photographs of the accident sites were also obtained.

**Results and discussion**

**Accident in a small/medium-sized business**

The sawmill had 20 workers on the day of the accident. Work consisted of cutting logs to order for local customers.

The premises, a shed measuring approximately 40 m x 25 m, were in very poor condition. The machinery was old and had no protective guards. The hard dirt floor was littered with pieces of wood, bark, and wood shavings. People were trained on the job and supervised by a foreman. The accident victim, who was 43 years old, had been with the company for two months as an unskilled labourer. Two weeks before the accident, the foreman told him to work on the radial action saw.

The saw’s motor was located 1.5 m above ground level. The belt-driven saw was used for cutting small planks. Neither the belt nor the blade was protected, and the power switch was positioned at the same height as the motor. The victim had no previous experience of using wood saws and had been given only a brief explanation of how to operate the saw. On the day of the accident, he was cutting battens. He stood facing the saw, positioned a plank with his right hand, adjusted the saw with the same hand using the handle, and removed the cut wood with his left hand. At this point his hand came into contact with the belt, and three of his fingers were dragged in by it and severed.

This accident is typical of those that involve permanently unsafe, easily identifiable hazards. Accidents that occur under such circumstances are directly concerned with the usual activities of the operators.

The causal tree method offers no particular advantage for analysing accidents that arise under these circumstances. The structure of these accidents (their “anatomy”) is relatively simple: they result from the simultaneous occurrence of a clearly identifiable danger and a trigger event (e.g. imprecise movement, reduced concentration, or momentary disturbance). Paradoxically, in these cases, “the cause” of the accident is attributed to the operator, and is referred to as human error since all other factors remain constant. In Brazil, the social demand for safety remains low: in this instance, for example, a workmate of the victim remarked “You can always be killed at work”.

In this context, the major risks associated with using machinery are of a technical nature that require modifications to equipment, and training and information for management and supervisors, as well as operator training and control. Hence, consideration of the methodological problems that could arise from causal tree analysis of this type of
accident or of the risks involved is still premature, as are the problems inherent in establishing internal procedures to apply whatever methods might be devised.

**Accident in a high-investment national company**

This accident occurred on a bus assembly line, where chassis and engines, manufactured elsewhere, were assembled. The company had a medical service and safety unit comprising an engineer and six safety officers. The plant covered an area of 60,000 m² with a workforce of 1,700 people. Except for some auxiliary activities, such as carpentry and maintenance, the manufacturing process was a typical assembly line.

Working together with a colleague, the victim, a 40-year-old man, had been employed for the previous year to collect 200-litre cylindrical waste disposal bins from around the factory site. One month before the accident the motorized truck normally used for this task had broken down, and had been replaced with a heavy, poorly maintained, manually pulled trolley that was kept in the open. These two men decided to repair the weather-damaged edges of the wooden sides of the trolley using plastic, nails, and a hammer — all obtained from factory waste. In the morning, both men began working on the task together, but in the afternoon of the day concerned the victim's colleague did not return to help him. The victim therefore decided to continue repairing the trolley on his own and in the course of doing so, one of the nails he was hammering ricocheted into the left lens of his safety goggles. The lens broke and the shards of glass punctured his eye. Subsequent examination revealed that the goggles he had been issued with by his employer did not meet the required safety standards (Fig. 1).

Analysis revealed a large gap in the organization of the activities undertaken by the two men. It was as if they were employed as internal subcontractors who, when not engaged in their main activity of collecting bins, were essentially free to perform related activities such as maintenance. This could be viewed as a self-organized subsystem. However, it involved a series of informal tasks: finding materials, acquiring makeshift tools, recycling accessories, and so on. A lack of appropriate resources led to a situation in which accidents were likely to happen.

In general, gaps in workplace organization lead to informal activities that usually go unnoticed and are a potential source of danger. This is where the causal tree method, which could be viewed as a major intrusion into company procedure (15), can be justified, since it meticulously analyses the situation leading to an accident. Application of the causal tree method in connection with accidents that have led to absences from work of two or more weeks confirms De Keyser's observation (16) that the method does not solve all the problems raised by an accident but expresses them more clearly and in widely understood terms, using well-established concepts.

However, in 1995 a diagnosis made by Binder et al. (17) based on a causal tree analysis of 19 accidents was not readily accepted by the company concerned, which doubted the significance of the organizational factors identified. Furthermore, the company did not accept that the analysts were qualified to make statements about such factors. This attitude reveals the company's view on the nature of accidents, namely that they are mishaps mainly attributable to operators and not to the overall situation that prevails in the workplace (the systemic view).

The introduction of the causal tree method requires that the senior management of companies should be prepared to change their point of view about accidents, accepting that they are multicausal phenomena. The causal tree is a good method of demonstrating this. The role of accident investigators needs to change to include consultation and training for companies, including also the executives.

**Accident in a high-investment multinational company**

This accident happened in a unit producing processed timber panels for use in partitions for houses and other premises. The factory, located in a eucalyptus plantation that provided its raw materials, employed about 500 people working three 8-hours shifts; it had a medical centre and a safety team with an engineer. Between 80% and 90% of the company's production is exported.

The raw material is first ground before being pressed, cut to order and stored. The accident happened at the work station where grinder no. 1 was being loaded. The timber is transported to the entrance of the grinder on a conveyor belt located at the bottom of a wide gutter. The operator ensures that log jams are broken up. At 03:00 a log jam occurred locking grinder no. 1. The operator took hold of a log and managed to pull one end free so that the grinder started up again, but this made the log jump. Since the operator was still holding the log, his right hand was squashed against the side of the conveyor belt. As a result, the distal phalanx of his ring finger had to be amputated.

Analysis revealed a sequence of factors, shown in reverse order below, each more or less harmless in itself, that led to a critical situation (Fig. 2).

- First was the instruction given to the operator to work on grinder no. 1. The victim was a crane operator who normally loaded and unloaded logs before they were put in the grinder. On the night of the accident the crane broke down and the maintenance team tried in vain to repair it. At this time a batch of logs was ready for loading, grinder no. 1 was available, and the foreman sent the crane operator to its control post.
- Second was the operator's inability to regulate the log feeding because he was not familiar with the
grinder’s controls. The logs arrived fairly erratically and he was not able to prevent them from piling up in front of the grinder. In theory the conveyor belt could have been put into reverse to prevent this from happening, but grinder no. 1 was the oldest in the factory and its reverse gear did not work as well as that of newer models. The operator was unaware of this and was unable to prevent the log jam.

- Third was the failure to recover from the incident. Having failed to free the log jam at the control panel, the operator manhandled the timber and sustained an injury as a result.

In contrast to the initial version of events reported by the foreman, according to whom the accident was caused by the decrease in the operator’s level of vigilance, the analysis revealed major organizational problems regarding rules for the allocation of work, optimum staffing numbers, and the maintenance of equipment.

The analysis primarily concerned the company’s safety department which was thus provided with a means of identifying a critical situation that had remained undetected by customary inspections and checks. Consequently, the consultant analysts rose in the esteem of the safety department’s engineers and technicians, who often knew less than the analysts did about informal situations in the workplace.

This particular company would therefore be in a position to use the causal tree method, but there is practically no social demand for safety among the workforce (18) and no procedure for introducing it. The sustainability of the causal tree method depends entirely on whether decision-makers are interested in applying it.

In this case, introduction of regulations to make the application of the causal tree method compulsory could help to compensate for the lack of local demand for its use; however, social pressure to improve safety conditions is an important determining factor.

Prospects

Experimental use of the causal tree method in the three companies described above reveals contrasting situations in terms of risk, the prevailing notion of what constitutes an accident (19, 20), and the ability of companies to use the method. Table 1 indicates the factors that seem crucial in this respect.

The causal tree method is most suitable for application in settings where there is a clear perception of the need to know what is not working...
properly, if resources are available, and if there is an enlightened attitude towards the accident concerned.

- The need to understand the origin of system malfunctions increases with the complexity of the system and when the dominant risk changes from constant and visible material risk to transitory and less obvious organizational risk — the result of a combination of factors.

- Acceptance of the causal tree approach appears to be closely correlated to the technical level of the process involved and the structure of the company concerned.

In some respects the use of the causal tree method is very similar to a test. It can reveal misconceptions about accidents (regarding fatalism, simple causes, predominance of the human factor, etc.) and may reveal the gap between a company’s posture and reality. The reactions of the company then show more clearly the limits of actions open to the analyst.

In circumstances such as those that prevailed at the sawmill, the analysts are to some extent compelled to act as investigators and, especially, advisers; the role of inspector is dominant.

In the case of the vehicle assembly line, application of the method is more akin to diagnostic “action-research” (21). The aim is to change social practices by changing notions and habits, which can only be done by monitoring the company (in this case, by analysing 19 accidents and then providing a diagnosis). The analysts therefore tended to act as consultants.

In the third case, application of the causal tree approach is not essentially “action-research”, since it does not involve planning changes and is not intended to monitor them (22). In this context, social pressure has given fundamental importance to the adoption of this method. In France, the causal tree method has always been introduced and adopted with the agreement and support, or even at the request, of the national Committee on Health and Safety and Conditions at Work (CHSCT), whose purpose is to promote the health and safety of employees and obtain compliance with the regulations.

Social demand arises from both the recognition of the importance of problems and the awareness from those concerned that they can do something to alleviate them. According to Groeneweg, the acceptability of risk is influenced in an important way not only by objective reality but also by subjective perception (22). Kenny has proposed that risk is perceived as greater when it is man-made (not natural), involuntary, has effects that spread over time, involves a relatively large number of victims per
Table 1. Results of experimental use of causal tree method

<table>
<thead>
<tr>
<th>Aspect/analysis</th>
<th>Sawmill</th>
<th>Vehicle assembly line</th>
<th>Processed timber panel plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk</td>
<td>Technical (mechanical, electrical)</td>
<td>Technical (pile-ups, storage) Organizational (allocation of work, training, division of labour)</td>
<td>Technical (maintenance, unprotected areas, etc.) Organizational (allocation of work, training, etc.)</td>
</tr>
<tr>
<td>Visibility (observable during inspections or checks)</td>
<td>Total and permanent</td>
<td>Partial</td>
<td>Reduced (incident, working alone)</td>
</tr>
<tr>
<td>Dominant concept of an accident</td>
<td>Fatalism</td>
<td>Human factor/technical factor, the former predominating</td>
<td>Human factor/technical factor, but with some managerial understanding of system theory</td>
</tr>
<tr>
<td>Acceptance of results of analysis</td>
<td>Mostly passive (rarely acted upon)</td>
<td>Difficult at first, then complete acceptance</td>
<td>This type of investigation arouses interest</td>
</tr>
<tr>
<td>Role of agents</td>
<td>Investigator/adviser</td>
<td>Analyst/consultant</td>
<td>Analyst/training agent</td>
</tr>
<tr>
<td>Contribution of causal tree method to awareness of risks</td>
<td>None</td>
<td>Important</td>
<td>Essential</td>
</tr>
<tr>
<td>Prognosis for future use</td>
<td>Not in the immediate or foreseeable future</td>
<td>Uncertain</td>
<td>Good in the long run</td>
</tr>
</tbody>
</table>

accident (disaster), and is uncontrollable (23). These are the first five criteria, in decreasing order of importance, out of a total of 15 proposed by Kenny, essentially defining accidents where the risk is either nuclear, chemical or biological, and less to do with ordinary industrial accidents. In France, for example, 20% of accidents at work are simple falls. The prevention of ordinary accidents in France could be hindered by a more or less tacit acceptance of such accidents. The annual financial statistics published by the national health insurance fund are important in places where statistical data are lacking on the number of accidents, absenteeism from work, and cost. This is not the case in Brazil, however, where the following matters need to be addressed before accident statistics can be compiled.

- First of all, a census of employees is required. All labour statistics are confronted by the problem of counting the workforce, given the vast extent of casual/informal labour: undeclared, temporary, seasonal, or migrant (24).
- A census of accidents is required. In Brazil the National Institute of Social Security (INSS) of the Ministry of Social Security insures all workers in the private sector and only some workers in the public sector, and compiles official statistics which provide an inadequate picture of the accidents that occur. The extent of underreporting is difficult to estimate because of the existence of the informal labour sector and because of the nature of the reporting system itself (25). For example, between 1970 and 1985 the number of accidents resulting in absence from work was reported to have increased by almost 30% in Brazil (there were 1 869 689 accidents in 1975); a decline of 65% to 587 790 had occurred by 1991. Although a real improvement cannot be ruled out, these figures do not reflect the current state of industrial safety in the country but rather changes in legislation, whereby, for example, the first fortnight off work after an accident is now covered by the company concerned, as opposed to the pre-1976 situation when it was only the first 24 hours of coverage. Since the INSS and the Ministry of Labour do not have the resources that would allow all the necessary inspections to be made, the situation is not likely to improve greatly. Awareness among trade unions, the Ministry of Labour and employer associations is still not at a level that would make safety a national priority in Brazil.
- In Brazil, trade unions are concerned mainly with the problems of employment and poor pay. When they consider safety, it is mainly to assess the frequency and severity of accidents and to make workers aware of potentially tragic consequences. In 1994, for example, the union of metalworkers and mechanical engineering workers conducted a census that covered only the town of Osasco, a heavily industrialized part of greater São Paulo, with a population of approximately 1.5 million; 5764 accidents involving loss of work were recorded, compared to an official figure of 4221 for the whole North-East of the country, which,
although less industrialized, has 42 million inhabitants.

- The Brazilian labour code assumes that industrial accidents have few causes or single causes. The accident report form asks for “the person responsible” and “the cause” of each accident (26). This conflicts totally with the concept upon which the causal tree method is based. Separating the legal rationale (finding the guilty party) from the technical rationale (preventing the accident) (27) would call for a great deal of work in terms of the acquisition of information.

- There is inadequate organization in Brazil’s industrial sector, where small and medium-sized businesses, in particular, are practically unrepresented in employer associations.

Application of the causal tree method in Brazil, under virtually experimental conditions (same place, population, analysts, time), clearly shows that approaches and practices differ between types of company (28).

The causal tree method is superfluous when the predominant risks arise from the nonapplication of technical regulations, which can be seen in the vast majority of small and medium-sized businesses, where the market is local, the technical level is low, and the workforce has received little training. However, the method comes into its own when the specific technical risks are better controlled and accidents become the ultimate expression of organizational dysfunction and/or the result of related or secondary activities. This then is of interest to both analysts and company services.

The application of the causal tree method allows a detailed analysis of accidents and work procedures, considerably improving the understanding of risk factors, which gives credence to the investigators. In this sense there is a marketing effect that contributes to the preparation of personnel for working with safety issues, and introduces the concept of multicausality of accidents, etc.

For the company, and for its safety unit in particular, the causal tree method can help to provide information about informal work, which is probably much more widespread in Brazil than in France.

Since few operators spontaneously report the risks they are exposed to, causal tree analysis of accidents provides this opportunity. In some French companies this opportunity is not always fully taken, as it is less a matter of discovering or rediscovering risks than of asking why they are still there. However, even under the best of circumstances it would be hard to establish the causal tree method if the social demand for safety were low. Low demand prevents a safety management culture from emerging: “A management situation occurs when participants come together who must accomplish, within a given time, a collective activity leading to a result that is submitted to external judgement” (29). In France this happens, for example, when the chair of the CHSCT decides to apply a preventive measure (a decision that is communicated to the Labour Inspectorate).

Finally, application of anthropotechnology reinforces the notion of stages in the management of safety. The hypothesis of stages came out of the relationship between the different stages in management of safety and the levels of the separate stages of the sociotechnical system (30).

All these points support the hypothesis that there are three main phases to the management of safety: mastery of the technical risks, mastery of the organizational risks, and mastery of the random factors that cause a variety of malfunctions (31).

Since each of the above-mentioned phases seems to correspond to fairly standard situations in terms of safety management and results, this type of classification gives companies a strategic perspective for moving from one stage to the next. The lack of this perspective slows down progress towards prevention, with the result that there is stagnation and repetition.

Acknowledgement
This study was completed with the support from Fundunesp/DFP 483.

Résumé

Analyse anthropotechnologique des accidents industriels au Brésil


Divers chercheurs estiment que cette approche a contribué à une situation où l’ouvrier se voit accusé d’être responsable de l’accident dont il a été victime. Depuis le début de 1994, le Ministère brésilien du Travail s’efforce de réviser ces normes et envisage l’introduction obligatoire de la méthode de l’arbre des causes élaborée en France au cours des années 70. Aucune étude de faisabilité n’a cependant été entreprise jusqu’ici pour déterminer dans quelle mesure cette méthode est compatible avec les conditions de sécurité au travail dans les entreprises brésiliennes; par ailleurs, on a constaté une résistance patronale à l’introduction de la méthode.


Dans la petite entreprise, où l’élimination ou la maîtrise du risque dépend de mesures classiques de sécurité, l’introduction de la méthode de l’arbre des causes ne présente aucun intérêt particulier.
Lorsqu’on l’applique à la grande entreprise nationale qui maîtrise déjà la majorité des risques techniques spécifiques associés à ses activités, la méthode de l’arbre des causes permet de définir une vaste zone de « non-organisation ». Il semble ici que les ouvriers accidentés étaient des sous-traitants internes autonomes tenus à la seule obligation de résultat. La méthode révèle que ce type de sous-système auto-organisé favorise une cascade d’activités informelles et une situation accidentogène qui échappe à l’attention du service de sécurité de l’entreprise.

Dans la société multinationale qui présente une faible incidence d’accidents du travail et de bonnes conditions de sécurité, les facteurs liés à l’organisation du travail et à la gestion jouent un rôle important dans l’accident analysé. Selon le contremaître, l’accident est dû à une baisse de vigilance de l’ouvrier concerné.

L’application de la méthode de l’arbre des causes serait appropriée dans les entreprises de ce type au Brésil, principalement à titre préventif, car elle contribuerait à faire ressortir des risques d’accidents qui ne sont pas mis en lumière par des méthodes plus conventionnelles. L’arbre des causes offre également au service de sécurité une occasion réelle de porter les questions de sécurité à l’attention de la direction de l’entreprise.

Il apparaît que, pour tirer pleinement avantage de la méthode de l’arbre des causes, toute la hiérarchie de l’entreprise doit accepter les mesures recommandées. Au Brésil, l’absence de pressions organisées et du public en matière de sécurité du travail est à l’origine de nombreux problèmes qui doivent être résolus avant de procéder à l’introduction légale de la méthode de l’arbre des causes par le Ministère du Travail.

Resumen

Análisis antropotecnológico de los accidentes industriales en el Brasil

Desde 1978 el Ministerio de Trabajo del Brasil ha tratado de establecer normas para investigar los accidentes industriales. Dichas normas estipulan que se asigne una sola causa a cada accidente y que se identifique al individuo responsable.

Diversos investigadores consideran que este planteamiento ha contribuido a que se culpe a las propias víctimas de los accidentes de ser las primeras responsables de lo ocurrido. Desde comienzos de 1994, el Ministerio de Trabajo del Brasil ha intentado revisar estas normas y ha considerado la posibilidad de obligar a implantar el método del árbol causal, desarrollado en Francia en los años setenta. Sin embargo, no se ha llevado a cabo ningún estudio de viabilidad para determinar la compatibilidad de este método con las condiciones de seguridad laboral prevalecientes en las empresas brasileñas; además, los directivos se han resistido a introducir el método.

En el presente estudio se analizan los criterios empleados para aplicar el método del árbol causal en el Brasil, a partir de una investigación de los accidentes industriales registrados en tres comunidades radicadas en una ciudad del Estado de São Paulo: un pequeño negocio local, una gran empresa nacional y una empresa multinacional productora de artículos destinados en su mayor parte a la exportación.

En el caso del pequeño negocio, donde para eliminar o neutralizar los riesgos se recurrió a las técnicas clásicas de seguridad, la introducción del método del árbol causal no supuso ninguna mejora.

Cuando se aplicó en la gran empresa nacional, la cual ya había abordado la mayoría de los riesgos técnicos concretos asociados a sus actividades, el método del árbol causal permitió identificar un ámbito considerable de «no organización». En esa firma la situación se asemejaba a que resultaría si los trabajadores implicados en los accidentes fuesen subcontratistas internos, autónomos, de los que no se esperase otra cosa que resultados. El método puso de manifiesto que este tipo de subsistema autoorganizado engendraba prácticas negligentes no oficiales, así como un elevado riesgo potencial de accidentes que pasaba desapercibido a los oficiales de seguridad de la empresa.

En la empresa multinacional, con una baja incidencia de accidentes laborales y unas buenas condiciones de seguridad, los factores relacionados con la organización y la gestión del trabajo tenían un papel importante en el origen del accidente investigado. Sin embargo, el capataz había señalado que el accidente se había producido como consecuencia de un fallo de vigilancia del trabajador implicado. La aplicación del método del árbol causal sería una opción apropiada en este tipo de compañías en el Brasil, sobre todo como un instrumento de seguridad que ayudaría a identificar riesgos de accidente no detectados por otros métodos más convencionales. Además, el método del árbol causal brinda a los oficiales de seguridad profesionales una verdadera oportunidad para comunicar los problemas de seguridad a la administración superior.

Nuestros resultados indican que para aprovechar al máximo las ventajas del método del árbol causal es indispensable que a todos los niveles de la jerarquía empresarial se acepten las acciones recomendadas al usuario. En el Brasil, la ausencia de un movimiento organizado y público a favor de una mayor seguridad en el trabajo ha planteado numerosas cuestiones que habrá que resolver antes de que el Ministerio de Trabajo imponga por ley el método del árbol causal.

References


Policy and Practice


