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THE INTRODUCTION OF PROGRAMMES TO PREVENT ACCIDENTS AT WORK: A STRATEGIC ANALYSIS

David Jacobson and Ziene Mottiar*

Introduction

Every working day in Ireland there are, according to the 1993 Labour Force Survey, 62 work-related accidents, injuries or other incidents damaging to health. These have resulted, among other things, in around 3,000 people being off work for more than 60 days. In 1994, 50 people lost their lives due to accidents in the workplace.

It is likely that a large amount of the human suffering inherent in data like the above could be prevented by the introduction into firms of structures and systems designed to obviate work-related accidents and ill-health (WRAIH). Such structures and systems would also have another effect: a reduction of the substantial costs incurred, both directly and indirectly, as a result of WRAIH. In addition, obvious concern on the part of firms' owners or managers for the welfare of staff can prevent the deterioration of morale and may have a positive influence on output.

It is clear from the efforts of some firms that they are aware of the need to identify and eliminate the causes of WRAIH. But the data suggest that many decision makers are unaware of the risks or, if they are aware, believe that attempting to prevent WRAIH would cost more than it would save. This article will briefly outline the reported costs of accidents in the workplace and then, using a simple game theoretic approach, will examine the choices facing the firm when deciding whether to pursue a strategy of accident prevention¹. The object of the exercise is to contribute to our understanding of why some firms do, and others do not, adequately attempt to prevent WRAIH.

The Costs of Accidents in the Workplace

The costs of accidents in the workplace are borne by the employee or injured person, by the employer, and by the state in terms of health costs and social security payments. For the purposes of this article, however, we will be concentrating on the cost to the firm.

There is as yet little information on the costs of accidents in the workplace in Ireland². However a study undertaken by the Health and Safety Executive (HSE) in England estimated that accidents in the workplace (including those that did not involve personal injury) and work-related ill health³ cost employers between £170 and £360 per person employed, or up to £9 billion a year in total (Davies and Treasdale, 1993). These

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costs include direct expenses such as sick pay, repairs, damaged or lost product, and compensation⁴. But there is also a whole realm of indirect or hidden costs such as those incurred in employing replacement labour, paying overtime rates to make up for lost production time, spending management time investigating accidents, completing insurance forms and attending court cases, as well as immeasurable costs such as loss of corporate image and/or goodwill.

Many of these indirect costs are not insurable and are usually not included in firms' assessment of the costs of accidents. Yet the HSE report showed that they are often far more substantial than direct costs. In the four case studies undertaken by the HSE, the lowest ratio of insured costs to uninsured costs was 1:8 and the highest, 1:36. In other words, the evidence suggests that the hidden, uninsured - and probably uninsurable - costs of accidents are at least eight times greater than the direct costs. Workplace accidents have considerable cost implications for firms, therefore, and insurance policies protect firms against only a small proportion of these costs.

In light of these findings, this article is concerned with the reasons why firms do or do not implement accident prevention programmes, and the conditions under which implementation of such programmes is the optimal choice to make.

What motivates the firm to take preventive action?

Reasons why firms make the decision to pursue an accident prevention strategy include:

- legislation and the fear of the consequences of not adhering to such legislation
- awareness of the true costs of accidents to the firm and a belief that it is cheaper to act before the accident rather than reacting to it - the firm spends today to save tomorrow
- moral or ethical belief on the part of the firm's decision makers that they have an obligation to make the work environment a safe place to be; or, with similar effect, responsiveness on the part of these decision makers to union or employee representation making this an important issue
- consideration of the long-term business strategy of the firm, incorporating the possible strategies of the firm's competitors.

These reasons are not independent of each other and can often play a joint role in the decision to embark upon an accident prevention programme.

Legislative requirements

The Safety, Health and Welfare at Work Act and the Safety, Health and Welfare at Work Regulations were introduced in 1989 and 1993 respectively. The Health and Safety Authority (HSA) are responsible for ensuring that companies comply with these regulations. The sheer number of companies involved makes this difficult if not impossible to do thoroughly and regularly - in 1993 the HSA inspected 9,868 workplaces (HSA, 1993: 52), representing only a very small proportion of the firms in the economy.

The main disciplinary or enforcement procedure which the HSA uses is that of initiating prosecution. In 1993, 38 prosecutions were initiated, of which 28 were decided in favour of the Authority and resulted in an average fine per case of £459; it should be noted that ten of these cases involved fatal accidents. It thus seems that legislation and fear of prosecution from the HSA are not incentive enough for a company to take preventive action against accidents in the workplace⁵.

Cost-Benefit Analysis

It is as a result of close scrutiny of the costs of accidents in the workplace over a period of time that many firms decide that 'prevention is better than cure'. If the studies which the HSE conducted are indicative of the experience of firms in Ireland, (except in unusual situations where the costs of prevention are extremely high), the benefits would begin to out-weigh the costs from an early stage. If we take the average cost of WRAIH per year per employee as £170 (the lowest figure in the HSE study), even an initial outlay of £1,500 for accident prevention would be recouped within one year, in terms of earnings lost in a company with just ten employees. It must be noted, however, that this is based upon the cost of accidents per firm calculated by the HSE study, which analysed firms which were significantly larger than the average Irish firm.

As noted above, the HSE study shows the relative importance of uninsured and indirect costs of accidents. Thus if a firm wishes to do a cost-benefit analysis of pursuing a strategy of accident prevention, it is vital that they calculate the full - direct and indirect cost of accidents in their workplace.

Strategic, Contractual and Social Responsibility

In some companies management will have a keen interest in the issue of safety. This may be motivated by profit, by an expected consequential rise in market share, or by interest in employees; but the outcome is the same - interest on the part of decision makers puts accident prevention high up on the priority list and makes it part of the company's strategy. The role played by feelings of social responsibility as a factor in accident prevention is not likely to be fundamental, but it can be enhanced by appropriate management education. Employee representative bodies and unions can also play an important role in the decision to act pro-actively to prevent accidents in the workplace. However initiated, issues of health and safety become, in some firms, part of the management-employee relationship/contract.

The firm's business strategy - short-term or long-term

The return on an investment in the health and safety area varies from industry to industry and even from firm to firm, but will usually be better the longer the time horizon. Rather than directly creating wealth, such investments have a return in that they reduce or eliminate an expected cost at a later date. A firm which is simply surviving in the short-

run will neither see the advantage nor take the time to consider the positive long-term impact of attempting to prevent accidents. On the other hand a firm with long-term objectives will recognise the importance of reducing workplace accidents. In the short-term it may cost the company a major amount to implement the necessary changes to prevent accidents occurring, and it will take time before this investment is realised in terms of money saved from accidents which would have occurred. Our argument in this paper is that a firm which is looking to the long-term future will be more inclined to undertake a proactive WRAIH-prevention strategy than its counterpart, which is solely concerned with the short-term⁶.

A Model of Accident Prevention Expenditure

Our basic argument is that the strategic behaviour of firms differs according to whether their main concern is the short or long-term. On the basis of a few reasonable assumptions we present a simple model of this in relation to expenditure on accident prevention. We then extend this into a two-firm model in which each firm's strategy involves consideration of the choices of its competitor.

We assume that the initial costs of implementing a WRAIH-prevention programme in the firm are £1,000. In the short-run the cumulative costs of the accidents which occur do not amount to £1,000 and for simplicity we take them to be zero. In the long-run preventable accidents costing £5,000 occur if the firm has not embarked upon such a programme. The HSE study quoted earlier suggests that on average the long-run savings - in the elimination of accidents - from an initial investment of £1,000 would be much greater than £5,000, but it must be remembered that in Ireland there are many small firms and it is unlikely that the incidence or costs of accidents would be as high as in the large companies which the HSE studied.

Table 1: Costs of Chosen Strategy (£)

	<i>Preventive Action</i>	<i>No Action</i>
<i>Short-run</i>	1,000	0
<i>Long-run</i>	1,000	5,000

Table 1 shows the results of these assumptions. A firm with a short time horizon will see only the short-run costs of £1,000, with no obvious gain, and will opt for a strategy of no pro-active accident-prevention programme. A firm with a longer time horizon will see that avoiding short-run costs will result in the incurring of much greater long-run costs, and will choose the accident-prevention strategy. One explanation for these results is that an owner of a firm which is seen not to have a very good chance of survival

beyond the short-run is unlikely to invest in any programmes without immediate returns.

We turn now to the situation in which two firms are competing against one another. (With little adjustment, we could of course focus on one firm vis a vis a number of others.) In businesses where competition is intense, firms' strategies are strongly related to the strategies of their competitors. Game theory is a technique used to show how one player's move is based upon the expectation of the responses of the other player⁷. The strategic choice in our case is whether or not to introduce a WRAIH-prevention programme, and we will focus on how one firm's decision in relation to this strategic choice impacts on the decision of its competitor. If Firm A introduces accident prevention programmes, Firm B (the only other firm in the market in this analysis) has to decide what strategy to pursue. There are two choices: to introduce a similar programme, or not. Firm A decides its strategy in light of what option it thinks firm B will take.

The basic tool of game theory is the payoff matrix. We will use this tool to study the strategic choices that firms can make regarding whether to be pro-active in relation to the prevention of accidents in the short and long-run, and how these choices are inter-related. There is an initial cost of implementing such a programme: in the short-run profits will decline, but if both firms pursue a strategy of prevention, the relationship between the firms in terms of profits and market share remain constant. In the longer run profits in both firms will rise as the incidence of accidents declines.

Firm B may choose not to implement a programme on the basis that the pay-off will not be high enough, or due to primary concern with the short-run. In the short-run Firm B will gain a relative increase in profits as A bears the initial costs associated with the programmes. As the effect of reducing the level and number of accidents in Firm A becomes apparent this firm will gain in terms of higher production levels, and as the firm can now provide more guarantees of the timely completion and delivery of goods, a larger proportion of the market. Though related to the health and safety of the product to the consumers rather than of the process to the workers, the example of Honda changing its engine design to meet health and safety standards, and by so doing strengthening the product's overall market position, is analogous (Sabel, 1982, p. 201).

Table 2: Payoff Matrix — Long-term (£000)

		<i>Firm B</i>	
		<i>Preventive Action</i>	<i>No Action</i>
<i>Firm A</i>	<i>Preventive Action</i>	(2, 2)	(4, -6)
	<i>No Action</i>	(-6, 4)	(-5, -5)

Table 2 shows a payoff matrix, in which the outcomes are shown in terms of profits. (Revenues, market shares, or other variables can also be used to forecast the results of

strategic decisions.) Starting in the bottom right-hand cell, and using assumptions similar to those of Table 1, the matrix shows that if neither of the firms introduce WRAIH prevention programmes, then both will, in the long-run, experience £5,000 reductions in profit. The bottom, left-hand cell shows that if Firm A does not, but Firm B does introduce a programme, then Firm A will experience a £6,000 reduction in profit, and Firm B will have a £4,000 gain in profit — Firm A incurring the £5,000 loss arising from accidents and an additional £1,000 arising from loss of market share. If both firms decide to take preventive action profits will rise for each by £2,000 in the long-run.

The best possible outcome for Firm A is for it to introduce an accident prevention programme and for Firm B to fail to do so; similarly, it would be best for B for A not to, while B does act to prevent accidents. However, if both firms have long-run perspectives, both will see the outcomes as presented in Table 2, and both will choose the accident prevention strategy. In game theory, where there is one optimal choice of strategy for each player no matter what the other player does, this is called a dominant strategy. The accident prevention choice is clearly a dominant strategy in this case. For both firms doing nothing plainly results in a loss of profit, regardless of what the other firm does - thus the choice is between one or two firms strategically pursuing accident prevention programmes.

The benefits of introducing a prevention programme for Firm A are dependent upon what Firm B does - if firm B decides to take no action A's net gain will be £4,000, but if B does take action then the gain will be reduced to £2,000. Thus the strategy that the other firm in the market takes will determine the cost advantages of a firm implementing an accident prevention strategy. Nonetheless the preventive strategy will be pursued as the best option in either case.

The choice of this strategy can also be shown using the maximum solution to game theory. This solution involves the firm comparing the worst possible pay-offs in each of the strategies and choosing the best of these. If Firm A decides to take preventive action, the worst situation would be if firm B chose to do likewise and then the payoff for A would be £2,000 (2 in the top left-hand cell). However if A took no action the payoff in the worst situation would be -£6,000 (-6 in the bottom left-hand cell). The maximum choice will be to take preventive action because the worst possible payoff (2) is better than the worst possible payoff (-6) of the other available strategy.

A key assumption in relation to Table 2 is that both firms have long time horizons. If not, then all that the firms will see as relevant is the top row of Table 1: that accident prevention has costs but no gains. This is translated into a payoff matrix in Table 3. Here, each firm sees only the costs - and none of the long-run benefits - of accident prevention. If both A and B introduce programmes, both see only costs - reductions in profits - of £1,000 (-1, -1). If Firm A does not, and Firm B does take action, then Firm A believes that it will be able to undercut B and get increased market share. Not only will B incur the £1,000 cost of the programme, it will also incur an additional £1,000 loss arising from a reduction in its market share. This is the optimal result for A. Similarly, B will

see its optimal result as the incurring of accident-prevention costs by A, and not by B. There is again a dominant strategy — no action — which will be adopted by both firms.

Table 3: Payoff Matrix — Short-term (£000)

		Firm B	
		Preventive Action	No Action
Firm A	Preventive Action	(-1, -1)	(-2, 2)
	No Action	(2, -2)	(0, 0)

It follows from Tables 2 and 3 that if one firm has a long, and the other a short time horizon, then the firm with the long horizon - seeing the situation in terms of the data in Table 2 - will adopt the WRAIH-prevention strategy, and the firm with the short time horizon - seeing the situation in terms of the data in Table 3 - will adopt a no-action strategy.

Conclusion

This article has discussed the strategic choices which firms make regarding accidents in the workplace. While legal and social obligations may result in some firms adopting accident-prevention programmes, for many firms such action will be taken only if it is seen to pay, whether directly or in terms of competitive advantage. Analysis using simple game theory and pay-off matrices makes it evident that whether the firm is encouraged by the financial benefits it will gain per se, or by the competitive advantage it will gain in terms of profit or market share, the firm adopting a long-term strategy will be more likely to take preventive action than one with a short time horizon. In the short-term, particularly in small firms, the costs of implementing an accident prevention programme are likely to exceed the benefits. Thus small firms which have predominately short-term strategies are unlikely to undertake prevention programmes.

In conjunction with legislation and enforcing agencies, and education in business ethics, the most important incentive for firms to engage in accident prevention strategies will be provided by making decision makers aware of the full, long-run costs of accidents and the gains of preventing them, in terms of market share, competitive advantage and profits. The adoption by firms of long-run strategies will not only result in an increase in the implementation of WRAIH-prevention programmes, it will also increase the competitiveness of these firms, and of the economy as a whole.

Notes

- 1 It is noted that such an approach could be used to examine a variety of strategic choices made by firms; for example whether to introduce training programmes.
- 2 The Health and Safety Authority (HSA) have commissioned such a study, which is at present in progress.
- 3 This is the full definition of WRAIH.
- 4 A study commissioned by the European Union showed that compensation as a result of accidents in the workplace or occupational illness amounted to Ecu20 billion (Approximately Ir£25.4 billion) in 1992 (Kendall, 1993).
- 5 Enforcement notices are another compelling procedure. 1,019 such notices were issued in 1993. Firms are also aware of the costs associated with personal claims as a result of an accident. Many of these claims are based on allegations of breaches of legislation and this encourages firms to adhere to safety legislation. We thank Roy Byrne for these points.
- 6 Storey and Sisson (1993) briefly discuss the problems that 'short-termism' causes for longer-term planning in HRM.
- 7 For more on game theory, see Jacobson and Andreosso, forthcoming.

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