Benchmarking employee supervisory processes in the chemical industry

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Benchmarking employee supervisory processes in the chemical industry

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The report details an assessment of the key inputs to and outputs from supervisory processes used in the chemical industry and the benchmarking of different forms of supervision in a crosssection of chemical companies. Discussions with representative bodies for the chemical industry and managers, supervisors and operators within a number of companies together with a literature review informed the development of a questionnaire in order to gather relevant data.

The study showed that a hierarchical style of company leadership was predominant and this was generally reflected in the use of non-working and working supervisors for both low and high risk activities. Lead operators and self-managed teams were deployed in only a small proportion of companies and were more likely to be used for low-risk activities. The choice of supervision process was affected by the size of the organisation, the level of operational risk and the competence of the management team and operators. Organisations were generally satisfied with the outputs from their current method of supervision. Although some organisations deployed self-managed teams, there was very little difference in the level of operator responsibility across the methods of supervision. Compliance with legislation and the ability to demonstrate effective risk control were perceived to be the most important factors affecting an organisation's choice of supervision process.

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EXECUTIVE SUMMARY

There is limited evidence available about the costs and benefits associated with different types of supervisory process, particularly in respect of health and safety performance. There are, however, examples of where more autonomous approaches to supervision have contributed to accidents involving multiple fatalities, such as the fire at the Hickson & Welch plant in 1992. On the other hand, statistics from those industries that have undergone significant management changes, such as the utility and petrochemical sectors, do not indicate a general decline in health and safety performance. However, a reduction in the rate of lost-time injuries is not a reliable indicator of how well major hazards are being managed. Therefore, it is important to develop other indicators of the management processes in relation to how hazard are managed.

The main aim of the study was to assess the key inputs to and outputs from supervisory processes used within the chemical sector. Specific objectives were to benchmark the styles of supervision employed for low and high-risk activities as functions of organisational size and status as defined by the Control of Major Accident Hazard (COMAH) Regulations 1999 and to identify whether specific issues influenced the choice of supervision adopted by organisations. A framework of potential inputs and outputs from the supervisory processes used within the chemical industry were structured in terms of personal, organisational and societal factors within a health and safety management structure containing the elements of policy, organisation, planning, implementation, measurement, audit and review.

A questionnaire was employed to gather data on methods of supervision, inputs to and outputs from supervision processes, changes in the supervision process that had taken place in the past 5 years and considerations on the use of self-managed teams. The questionnaire development involved six stages; namely, a review of the literature to assess the role and impact of supervisory processes on health and safety performance; the development of a framework model of the inputs and outputs of the supervisory processes for discussion with representatives of the chemical sector; a discussion of the inputs and outputs of the supervisory processes with a range of representatives of the chemical sector; the development of a draft questionnaire; a pilot study of the draft questionnaire and the preparation of the final questionnaire. The questionnaire was distributed to approximately 400 small, medium and large organisations in the chemical sector with the support of three major bodies representing the chemical sector; namely: British Association for Chemical Specialities (BACS), British Chemical Distributors & Traders Association (BCDTA) and Chemical Industries Association (CIA).

Of the 400 small, medium and large companies in the chemical sector receiving the questionnaire, 88 (22%) were returned of which 84 provided information that could be used. The distribution of locations of responding organisations was representative of the UK chemical industry. The main function of the majority of responding organisations was chemical production with over half the responding organisations producing speciality chemicals. The majority of the responding large organisations was upper-tier COMAH sites, while the majority of the responding small organisations was non-COMAH sites. In the case of medium sized responding companies, there was a more even distribution across non-COMAH, lower-tier COMAH and upper-tier COMAH sites.

A hierarchical style of company leadership predominated across the chemical industry, irrespective of company size or COMAH category. At most, companies allowed operators freedom of action to work within defined limits; however, this approach was almost twice as likely within large companies. Small companies were twice as likely to operate with a hierarchical leadership style than medium or large companies. Upper-tier COMAH sites were found to be less likely to operate a hierarchical style of leadership than lower-tier and non-COMAH sites.

The hierarchical approach to leadership was generally reflected in the supervisory processes, as organisations deployed working or 'non-working' supervisors for both low and high-risk activities. Lead operators and self-managed teams were used in a small proportion of companies but typically only for low-risk activities. The supervisory process deployed was dependent on the size of the organisation, the level of operational risk and the competence of the management team and operators. With the exception of on-the-job-control of daily work activities, the responsibility for most activities was very much more with management than with operators. Compliance with legislation and the ability to demonstrate effective risk control were perceived to be the most important factors affecting an organisation's choice of supervision process.

Organisations generally acknowledged the importance of operator attributes in the supervision process and, in particular, identified the importance of a positive attitude to health and safety. Self-motivation and problem-solving and decision-making capabilities of operators were considered more important in large companies. Organisations also considered that a high level of organisational support was required in order to achieve the desired organisational outputs. The provision of mentors/coaches and plant automation were considered more important in large organisations. Provision of time-management skills for operators was considered to be the least important factor included in the survey.

While some organisations considered that their supervision method was that of self-management, there was very little difference in the level of responsibility and decision-making by operators across the different forms of supervision. Organisations that did not currently operate self-managed teams indicated that they would be more likely to consider such an approach for low rather than high-risk activities. The most common reasons provided by organisations that were not prepared to consider the use of self-managed teams were concerns about responsibility/accountability and competence.

Organisations were generally satisfied with the outputs from their current method of supervision. There was no evidence, however, that improved health and safety performance was associated with an organisation's size, COMAH category or method of supervision.

The key points raised by this small-scale study of supervisory methods in the chemical sector are:

- There is no evidence to suggest that there is a causal relationship between health and safety performance and methods of supervision.
- The main factors influencing the choice of supervisory method are compliance with health, safety and environmental legislation and the demonstration of effective risk control.
- Hierarchical methods of supervision involving 'non-working' and working supervisors predominate, irrespective of the size of organisation or the activities undertaken.
- Operational responsibilities remain strongly with management and there is little evidence to suggest that responsibilities are delegated to operators, irrespective of the form of supervision.
- Self-managed teams are used by only a small proportion of organisations and where they are used they are more likely to be used for the control of low risk activities.
- All organisations consider operator attributes to be important factors in the choice of supervision and there is a trend for the level of importance assigned to these to increase with operational size.

- The provision of organisational support is considered to be an important input to the supervisory process by all organisations but there is a trend for the level of importance to increase with organisational size.
- Organisations are generally satisfied that their current methods of supervision achieve the desired outputs.

1.0 INTRODUCTION

1.1 BACKGROUND

While chemicals bring significant benefits to the population, the chemical sector is regarded as a high-risk industry that must be carefully regulated and controlled. Public concern about this industry sector is rooted in multiple fatality events, such as those at Flixborough and Bhopal. Within the UK, the introduction of the Control of Major Accident Hazards (COMAH) Regulations in 1999 required that greater information about the control of major accident hazards should be made available to the public. Within the UK, the incidence of lost-time accidents for employees and contractors in the chemical sector almost halved over the period 1991 to 2002 (Health and Safety Executive, 2004). However, a reduction in the rate of lost-time injuries is not a reliable indicator of how well major hazards are being managed. Therefore, it is important to gain insights and to develop indicators of the management processes in relation to the control of major hazards.

Since the 1970s, businesses have continuously reorganised in order to cut costs, improve productivity and remain competitive (Fuller, 2000a). Since organisations could not indefinitely rely on downsizing to achieve these improvements, the changes also involved moving to new ways of working, which incorporated greater employee flexibility. As a result, there has been a proliferation of management delayering, which aimed to move responsibilities to those people carrying out the operations and focused management control on team working. Teams can be managed in different ways; for example, with a supervisor, team leader or self-managed.

There is limited evidence available about the costs and benefits associated with the more autonomous working patterns, particularly in respect of health and safety performance. There are, however, examples of where reorganisation, which involved delayering, has contributed to major accidents involving multiple fatalities, such as the fire at the Hickson & Welch plant in 1992 (Health and Safety Executive, 1994). Loss of skills and knowledge, changes to roles and responsibilities, flexible working and multi-skilling, control of contractors and systems of work have been identified as common areas of deficiency amongst organisations introducing delayering in the major hazard industries (Gall, 1994). On the other hand, statistics in those industries that have undergone radical management changes, such as the utility and petrochemical sectors, do not indicate a general decline in health and safety performance. However, a cause-effect relationship between delayering and health and safety performance, as indicated by accident statistics, has not been established due to the presence of confounding variables, such as changes in regulation.

Gaining an improved understanding of the implications of various forms of employee supervision on safety culture and health and safety performance in the chemical industry would assist organisations in making decisions on supervision methods and the Health and Safety Executive in providing guidance in this area of major hazard management. Benchmarking health and safety management systems offers the opportunity for organisations to identify and implement best practice processes that lead to superior health and safety performance (Fuller, 1999, 2000b). In particular, benchmarking both management practices and metrics enables organisations to identify those issues that lead to improved performance. Benchmarking aspects of health and safety management for different forms of supervisory process in the chemical industry would therefore provide the opportunity to identify best practices in this industry.

1.2 AIMS AND OBJECTIVES

In support of the HSC/E's priority of preventing accidents in the chemical industry, this project aimed to benchmark supervisory processes in small, medium and large companies in the chemical industry. In particular, the project objectives were to:

- benchmark the health and safety performance of different forms of supervisory process employed for low and high-risk activities as a function of organisational size and COMAH status in a cross-section of chemical companies;
- define performance indicators/measures for assessing the impact of different forms of supervisory process on health and safety performance in the chemical industry; and
- identify best practice supervisory processes in the chemical industry.

It is anticipated that the results from the project could enable guidance to be developed that will assist organisations to better understand the implications of various forms of employee supervision on safety culture and health and safety performance in the chemical industry.

1.3 OVERALL APPROACH

The investigation was located within the chemical and on-shore petrochemical industry in the UK and involved a cross-section of small, medium and large organisations within this industry sector. The project was implemented in three stages. Stage 1 involved discussion with a range of personnel in a cross-section of small and medium sized enterprises (SMEs) and large sized chemical companies, which use a range of supervisory processes, in order to obtain information regarding the management processes employed and, in particular, the inputs and the outputs of the supervisory processes employed. This information was used to develop a set of indicators/measures of the supervisory process, which then formed the basis of a questionnaire that was circulated to a larger sample of chemical companies. Following initial discussions with three major bodies representing the chemical industry, namely; British Association for Chemical Specialities (BACS), British Chemical Distributors & Traders Association (BCDTA) and Chemical Industries Association (CIA), these bodies agreed to support the project by distributing the questionnaire to their member companies.

During Stage 2, the questionnaire was subjected to a pilot study prior to distribution to health and safety managers in the larger sample of SMEs and large chemical companies. Data from the large-scale study was coded, recorded and analysed. The analysis included assessments of the types of supervision, leadership styles, management and operator responsibilities and inputs, outputs and outcomes of the supervision processes in order to identify those management practices that can impact on health and safety performance. Finally Stage 3 of the project identified those sub-groups within the overall sample population, such as small, medium and large companies, that were operating to the best practices.

1.4 REPORT STRUCTURE

Following this introduction, Section 2 of the report considers approaches to leadership and management in organisations and in particular the requirements of effective team working. In addition, evidence on the safety outcomes of different types of management and supervision processes and the inputs required to deliver these outcomes are discussed. Section 3 details the development of the questionnaire, the sample population and the data analysis procedures. Section 4 presents the results and Section 5 discusses these findings. Finally, Section 6 presents the conclusions and key issues identified from the investigation.

2.0 BACKGROUND INFORMATION

This section of the report considers background information relevant to the overall aim of the study, which was to assess the inputs and outputs of supervisory processes used in the chemical industry. Initially, approaches to leadership and management in organisations are considered and particular consideration is given to the requirements of effective team working. Secondly, evidence on the safety outcomes of different types of management and supervision processes and the inputs required to deliver these outcomes is discussed.

2.1 GENERAL MANAGEMENT AND LEADERSHIP

While this project is primarily concerned with the supervision of front-line workers in the chemical industry, supervision takes place at several levels within an organisation from the chief executive officer through to the first line supervisor. Leadership is at the heart of all managerial and supervisory activities (Pettinger, 2002). Leadership behaviour can be divided into two dimensions: concern for people and concern for production or service (Stogdill and Coons, 1957). Depending on the relative levels of these concerns, a range of leadership/management styles can be defined (Blake and Moulton, 1985); five combinations of people concern and task concern have been presented, which result in five extreme leadership/management styles:

- *Country club management* is focussed on concern for people and production is incidental. Leadership will focus on getting agreement and cooperation of the workforce.
- *Impoverished management* does not provide any kind of positive leadership but adopts a 'laissez faire' style in the belief that yesterday's practices will still be relevant tomorrow.
- *Authoritarian management* is task-oriented with concern for people limited to their production effectiveness.
- *Middle-of-the-road management* results in a moderate amount of concern in both dimensions.
- *Team management* achieves an equivalent high level of concern for people and for production.

Ideally, concern for the task and concern for people should grow together rather than one aspect being considered at the expense of the other. Within some organisations, some staff prefer to be directed and find situations where they are required to participate very difficult, while other staff who are used to participation and engagement find difficulties where these aspects are not present. The overall leadership approach will influence the organisational approach to operational supervision.

The leadership approach adopted within an organisation will be dependent upon the individual leaders or managers in the organisation. Effective leadership is dependent on a number of factors, such as personality, management style, corporate culture and the nature of the activities in the organisation. Tannenbaum and Schmidt (1973) concluded that there were three key areas of influence over the leadership style adopted:

- personal attributes, such as experience and views on leadership;
- characteristics of subordinates, such as attitudes to responsibility and decision-making; and
- environmental factors, such as corporate business philosophy, other styles of work, nature of the work and time constraints.

As a result, a leadership continuum exists, which may range from autocratic, in which the manager makes the decision without any involvement of subordinates, through to a totally democratic or laissez-faire approach in which subordinates have complete freedom of choice. Positive employees' reactions to a management style may lead managers to feel that the appropriate approach has been adopted. For example, if the workers are perceived to be low-level performers the manager may adopt an autocratic style, which may demoralise the workers further and actually make them perform at a low level. However, adopting a slightly less authoritative approach and allowing some scope for discretion may enhance the morale and subsequently the performance of workers (Hannagan, 2002).

Bass (1985) suggested that there were two broad types of leadership: transactional and transformational. The former type focussed on enabling subordinates to achieve individual and organisational goals, while the latter, in contrast, focussed on motivating subordinates to perform better than expectations by increasing the importance of the individuals' contribution within the organisation. Hersey and Blanchard (1982) considered that the leadership approach adopted by an organisation's management was dependent on the maturity of their subordinates and that, as subordinates' maturity would evolve with time served, the relationship between leaders and subordinates also moved through a number of phases as maturity increased. At the outset the subordinate would need a more directional approach (telling) but as the subordinate became familiar with systems and procedures a more employee-oriented approach could be adopted (selling). As subordinates sought more involvement and responsibility a more participatory approach could be used (participating). Finally, a point may be reached in the evolution where the leader could delegate some aspects of decision-making to the subordinate (delegating).

Leadership style is also shaped by the corporate culture of the organisation and the expectations of its peers. In some organisational settings, working methods may be reasonably relaxed as long as the organisational objectives are achieved. A leader in this setting may therefore not be overly concerned about how and when employees work. However, in other organisational settings, where an organisation wants to have strict accountability at all stages of its operation, close supervision of workers by the leaders is more likely to be adopted.

A key influence on the management approach and the subsequent style of first-line supervision has been the pressures on business to cut costs and to improve productivity while remaining competitive. Although this need has not changed significantly in recent decades, the approaches adopted for achieving these outcomes have evolved (Wright, 1996a). Initially, organisations reduced costs through staffing levels, by contracting out non-core services and restructuring. Having realised that it was not possible to continuously rely on downsizing to achieve these improvements, organisations then focused on responding to these demands by moving from the traditional 'command and control' approaches to management to new management philosophies of attention to work design, communications, workforce participation and cultural issues as a means of maintaining competitive edge. As a result there has been a proliferation of management delayering in order to move responsibility to those people carrying out the operations and to focus on team working.

Teams can be managed in different ways; for example, by using supervisors and team-leaders, or being self-managed. A supervisor, who is considered to be the accountable manager of the team, is responsible for the planning, organising and controlling aspects of the group but will often not undertake any work within the group (Evans, 1992). Key supervisor responsibilities are in the areas of training, health and safety, conduct of performance appraisals and the handling of grievances. However, supervisors rarely make the final decision in issues of recruitment, pay and dismissal (Cully et al., 1999). In contrast, a team leader is normally not accountable for the work but relies on leadership skills to motivate and coordinate the work of others and facilitates their self-development. A team leader is often a working member of the group. Where a group has no team leader, the team becomes self-managed or autonomous (Vassie and Lucas, 2001).

Cully et al. (1999) indicated that in 65% of workplaces most employees worked in formally designated teams. However, in 54% of workplaces team members often worked with each other and had responsibility for a product or service. Adding a third criterion of 'jointly deciding how the work is to be done' reduced the proportion of workplaces using team working to 35% (semi-autonomous). Finally, adding the fourth criterion of 'appoint their own team leaders' showed that only 3% of workplaces operated fully autonomous team working. The survey (Cully et al., 1999) also found that the type of team working adopted in an organisation varied with the nature of the dominant occupational group. For example, only a fifth of workplaces in which craft and related workers were the dominant occupational groups adopted semi-autonomous team working compared with almost three-fifths of workplaces where professionals were the dominant occupational grouping.

While there is variation in the type of work organisation, there is, unfortunately, also variation in the terms used to describe each type of work organisation, as has been illustrated by the use of the term 'team working', which has caused confusion. For example, Roy (2003) used the term 'Self Directed Work Team (SDWT)' to mean:

> *work organization mode where employee groups are permanently and collectively in charge of a complete sequence of work in the production process of a good or service intended for internal or external clients. The teams are accountable for their results and the team members have, within certain limits and in addition to their production tasks, certain management responsibilities.*
>
> Roy (2003): p360

However, the terms self-managing teams (SMT), empowered teams and objective–oriented groups are also found in the literature. Susman (1979) identified three levels of decision-making amongst self-managing teams, which reflected increasing autonomy:

- decisions concerning control of work production processes;
- decisions concerning team independence; and
- decisions concerning the internal management of the team.

While labelling various types of work organisation poses difficulties in definition and within one definition there appears to be some variance, the various formats of work organisation could be considered to be on a continuum with, at one extreme, total management control through non-working first line supervisors through to fully autonomous team working where the team has the highest level of decision-making. The role of leadership in the context of self-managed teams has been the subject of continued debate. While teams may take on increasing levels of decision-making and value their independence, they also feel the need for guidance and assistance, as appropriate. As a result, a self-managed team often adopts a rotating team leadership position (Wingfield, 1992). Lardner (1999) highlighted that a self-managed team required a careful and active management and that the term self-managed may be a misnomer.

Team working was associated with the automotive industry in the 1970s. Murakami (1997) assessed the level of autonomy in teams in 19 automotive manufacturing plants across Europe and Japan by measuring the level of team input in nine areas of decision-making, previously identified by Gulowsen (1979). The nine areas were:

- team leader selection;
- new team members;
- work distribution;
- time flexibility;
- acceptance of additional work;
- representation outside the team;
- production methods;
- production goals (output); and
- production goals (quality).

Within each area the study determined the level of input by the team using a four-point scale:

1. *No participation by the team members*. Decision-making is a managerial function and teams operationalise decisions made by management.
2. *Team participates in decisions*. Teams may make suggestions and request discussion of issues with management, which may be acted upon.
3. *Co-decision making*. Decision-making is shared equally between the team and management.
4. *Autonomous team decisions*. Decision-making rests solely with the team. Teams are accepted by management as equal partners and are trusted.

The study revealed that in none of the 9 areas did the teams have full autonomy; however, the highest levels of autonomy were seen in team leader selection, representation outside the team, work distribution and quality. Murakami (1997) concluded that teamwork in the automotive industry had not moved the locus of control away from management. Hackman (1994) identified five key inputs to the development of autonomous team working: achieving coalescence in the team, identifying boundaries, clear objectives, organisational support and competence.

Effective team working is a complex issue and the demands placed upon members of a team depend upon the environment in which they operate. A number of important inputs to effective team working have been identified. Establishment of clear team boundaries was essential in order for team members to share accountability and responsibility for the team's outcomes and team members should be involved in the definition of what had to be achieved. By implication, team members, therefore, need to be willing to share accountability and responsibility. Acceptance of accountability and responsibility also leads to an expectation of willingness to engage in performance monitoring. Providing support to groups to enable them to perform effectively as a team was considered essential to the development and improvement of interpersonal relationships within the team (Hackman, 1977; Howell and Gomez, 1993). In addition, team effectiveness is influenced by the team's ability to deal with the diversity among its members such as differences of opinion, language and culture (Gardenwartz, 1995).

Several companies at the forefront of their industrial sectors have adopted more autonomous styles of working and have associated their leading position within their sectors with a number of improvements in work organisation and performance resultant from these styles of working. While companies implementing these approaches have experienced some clear advantages, drawbacks associated with the approach have rarely been reported in the literature (Roy, 2003). Amongst the reported advantages are greater freedom, reduction in unnecessary bureaucracy and control over the work environment (e.g. Fisher, 2000), while, team work difficulties, stress associated with increased responsibility and limitations on the actual latitude and discretion permitted are cited as the downside of this approach (e.g. Liebowitz and Holden, 1995). Pearce and Ravlin (1987) identified three preconditions for the successful use of self-managed teams, namely, the tasks undertaken must be appropriate in order to realise the benefits of autonomous work design, the organisational conditions in terms of management support and expectations must be available and the workers must consider increased autonomy and responsibility as desirable outcomes. Cotton (1993) estimated that 10-20% of workers would not aspire to these outcomes.

2.2 HEALTH AND SAFETY MANAGEMENT AND LEADERSHIP

Having senior managers who take a proactive interest in establishing a safety culture has been considered to be a key influence on organisational health and safety performance (Health and Safety Executive, 1999). Further, the primary reasons presented for health and safety failures in organisations are poor management and ignorance of good practice (Health and Safety Commission, 2000). Compliance with government regulation and the avoidance of legal liability have been identified as important motivational factors among UK companies to manage health and safety risks (Ashby and Diacon, 1996). Other evidence revealed that senior directors in UK companies viewed occupational health and safety as a significant determinant of company performance and integral to business competitiveness and profitability (Smallman and John, 2001). However, the determination of whether an association existed between directors' attitudes to safety and decision-making in relation to health and safety issues was not explored. As to whether a particular leadership style in relation to safety issues is associated with a certain health and safety culture and level of health and safety performance has received limited attention. A preliminary study found that two elements of transformational leadership and one element of transactional leadership had significant associations with lower accident rates. In addition, the charismatic component of transformational leadership has been associated with improved worker perceptions of management commitment (O'Dea and Flin, 2003).

2.3 HEALTH AND SAFETY MANAGEMENT AND SUPERVISION

In the context of health and safety management, the supervision process/work organisation process should fulfil the requirements of the health and safety management system in place, which in turn should ensure that the employer achieves at least their minimum legal duties. While the detail of individual management systems will vary across organisations within the chemical industry, they will contain the critical elements of any management process; namely, policy, organisation, planning, monitoring, audit and review.

Heinrich (1959) considered that the supervisor was pivotal to industrial accident prevention and that the application of the '*art of supervision*' to worker performance was the key factor in accident prevention. However, the role of supervisor both generally and specifically in relation to safety management has been influenced by the way in which work is organised. Studies concerned with establishing the contribution of supervisors to organisational health and safety performance have focussed in general on the nature of the relationship between employees and supervisors and the influence this has on employee behaviours, attitudes and motivation.

High quality, open, two-way and frequent communication between employees and supervisors was significantly associated with employee safety commitment and lower accident rates (Hofmann and Morgeson, 1999). A supportive style of leadership/supervision was associated with effective supervisors (Niskanen, 1994) and worker's self-reported safety motivation and safety compliance (Griffin and Neal, 2000). In general, the combined involvement of workers and supervisors on health and safety matters, such as safety inspections and accident investigations, has been associated with more positive health and safety outcomes. Fleming et al. (1996) found that more effective supervisors placed emphasis on the importance of team work, the value of the work group and the value of safety, whereas less effective supervisors did not display these values, trust the workforce or adopt a participatory style but instead policed the workforce. Similarly, Simard and Marchand (1994) found that a participatory style by the supervisor promoted cooperation between the workforce and the supervisor, which was positively associated with compliant safety behaviour. However, the participatory style was highly correlated with the development of the organisations' health and safety programmes, which may be explained by a simultaneous development of supervisor activity and organisational attention to health and safety. Devolvement of some decision-making power to supervisors in relation to safety matters that affect their workgroups has also been reported to increase compliance (Simard and Marchand, 1995, 1997).

While both transformational and transactional leadership are hypothesised to be influencing factors in health and safety management (Zohar, 2000), studies have produced equivocal findings. For example, transformational leadership styles were not able to successfully differentiate between different levels of supervisor effectiveness in the offshore oil industry. On the other hand, exploration of team leaders' leadership style and employee health and safety behaviour in the chemical industry found that transformational leadership could augment organisational interventions concerned with safety promotion and role orientation. Although most studies have not assessed supervisor's transactional leadership, it may be that transactional leadership behaviours are more relevant to the supervisory level and transformational leadership behaviours more relevant to the strategic role of senior management (O'Dea and Flin, 2003).

Overall, the studies considered are indicative of the importance of the role of the supervisor in promoting positive health and safety performance. In particular, two-way communication, supportive approaches, involvement of the supervisor with the team on health and safety issues and decentralised decision-making in relation to health and safety have positive contributions to health and safety performance. Given the reported importance of supervision, it is interesting to explore the evidence for the health and safety outcomes associated with the use of self-managed teams. Lardner (1999) considered the implications for the elements of a health and safety management system of implementing self-managed teams. While the results of this analysis, did not preclude any form of supervision, the key issue was:

> *how to allocate responsibility for specific health and safety responsibilities and activities to team members, whilst retaining ultimate management responsibility for policy, supervision, control, audit and review.*
>
> Lardner (1999): p9

Wright (1996b), in considering work organisation and the management of health and safety risks, identified that a three-way balance was required between: the level of management control, competence of individuals and the inherent operational risk. For example, in circumstances where there is a greater dependence on worker competence and less managerial control there should be a proportionate increase in the weight placed on ensuring that adequate competence and self-management are achieved. At the same time, the organisation must consider the level of risk associated with the task/work for which the increased competence is required and whether it can confidently devolve decision-making for this level of risk. Thus the level of competence and the inherent risk are key inputs in shaping the type of supervision/management control that can be used. Specifically in relation to the hazardous industries, such as chemical, nuclear, offshore and aviation, Wright et al. (2003) identified that the supervision of safety critical tasks required: knowledge of the hazards, processes, equipment and operating rules, a combination of the skills of decision-making, prioritisation, communication, work distribution and delegation and behaviours such as safety leadership, coaching and consistency of behaviour.

Competence has been identified as an important requirement in enabling individuals to perform effectively and safely. In particular, Wright (1996a and 1996b) has identified competence as a key contribution to facilitating organisational change to delayered structures. Where workers are re-assigned responsibilities or new roles it is essential that they are competent to fulfil those responsibilities/roles. Health and safety competences, such as the ability to perform risk assessment, and technical/operational and management competences, are equally important. Changes in the style or process of supervision have implications for the skill requirements for those with supervisory health and safety responsibilities. For example, the transition from a supervisor having technical competence and a directional management style to a team leader having no authority or technical leadership but who utilises leadership skills to motivate and coordinate the team requires a different skill-set. The findings of a survey of US organisations (Wellins and George, 1991) revealed that insufficient training was the most significant barrier to successful implementation of the more autonomous styles of working and, as a result, advocated that training should comprise team and interactive skills in addition to job skills. Other works have identified that members of self-managed teams required the following skill-set in order to be an effective member of the team: planning of work, setting priorities in order to achieve performance targets, coordinating with peers and other groups, resolving technical, administrative and interpersonal issues, cross-training team members and learning from team members (Wingfield, 1992 and Metlay and Kaplan, 1992). Therefore training should cover technical, administrative and interpersonal skills. Howard and Thomas (1993) concurred with the view of a broad range of training inputs, including conflict management.

Addressing competence requirements and the subsequent implementation of training programmes has been a key feature in the implementation of changes in supervisory practices to more autonomous styles (Lardner, 1999). At BP’s site at Baglan Bay, training needs were identified in safety control issues such as accident/emergency response, handover and permit-to-work and in cross-training of process and craft personnel (Lardner, 1999). With the exception of a short course on team skills for team leaders, the training input was mainly of a technical nature, in contrast to most guidance that suggests the need for team and self-management skills in members of the team.

In contrast, the training used in the implementation of empowered team working in Shell UK Exploration CADA platforms focussed on the attitudes and behaviours for effective teamwork and involved all platform personnel and was later added to with coaching in the less-visible aspects of the supervisor’s role, such as planning, prioritisation and risk assessment (Lardner, 1999). The organisation of emergency response was regarded as an area where strong and effective leadership and control were essential and remained outside of the self-managing concept. Visible and ongoing senior management support for the work organisation process and changes to it together with specific support for managers and supervisors were also considered important factors.

When an industrial chemicals organisation (Lardner, 1999) moved to product-focused, self-managing teams, responsibilities previously held by shift managers for health, safety and environment issues and problem-solving were transferred to work-station managers and manufacturing technicians. As a result, all manufacturing technicians were trained in problem-solving techniques and some were selected to be trained as a SHE Incident Office, who, in the event of an incident, would liaise with the on-site SHE team. A number of further training inputs were identified in order to effect this type of supervision: capabilities to handle process deviations and/or know when and how to seek advice; administrative skills; improved understanding of the manufacturing processes; planning and organising skills; capabilities to manage workload and further business and product knowledge. Formal discipline and long-term modifications to plant and process were not delegated to the teams and therefore support for these issues needed to be provided outside the team.

Studies on the impact of self-managed teams on health and safety performance are limited and contradictory (Roy, 2003). For example, a number of studies reported that the implementation of self-managed teams resulted in lower rates of absenteeism, accidents and work-related stress, while other authors associated this type of work with negative impacts on health and safety, such as stress (Metlay and Kaplan, 1992). Cohen and Ledford (1991) found that the implementation of self-managed teams did not automatically lead to improvements in safety performance. Further, they considered that positive safety outcomes reported with the implementation of self-managed teams might have been mediated by specific focus on health and safety issues and the subsequent introduction of preventative measures during the change process. Vassie and Lucas (2001) reported that in organisations in the manufacturing sector using self-managed teams or team leaders there was evidence of a greater participatory approach of workers and managers in health and safety management and more two-way communication.

A study in the onshore petrochemical industry (Ondrack and Evans, 1986) explored the quality of working life associated with a petrochemical plant utilising semi-autonomous teams and a participatory management style, a traditionally organised petrochemical plant and a traditionally organised non-petrochemical plant. The study found no significant differences in the employees' job satisfaction including safety and motivation with the three styles of work organisation, whereas it was expected that there would be a greater level of job satisfaction and motivation where semi-autonomous work teams were used.

2.4 MODELLING THE SUPERVISION PROCESS

The preceding discussion has identified a number of factors that shape the choice of first-line supervision within an organisation. In addition, for a given type of supervision there are a number of requirements or inputs needed in order for the supervision process to be effectively implemented; for example, competence, training, communication and involvement. The presence and quality of these inputs influences the outputs of the supervision process, such as productivity, quality, accident rates and worker development. Metlay and Kaplan (1992) considered the work group as an open system, which had four main components: input, process, output and feedback. In addition, each component was considered at four levels related to the task, the individual member, the group and the environment or the organisational setting. The model was used to identify the organisational practices that supported (inputs) and the consequences of (outputs) self-managed teams. However, the concept of an input-output model can be applied to other group supervision processes. Table 2.1 lists the main inputs and outputs of supervision processes that have been identified in the preceding discussion.

Table 2.1 Inputs and outputs of the supervision process

Inputs	***Outputs***
Organisational support – training, coaching	Productivity
Responsibility/accountability	Quality
Competence	Safety behaviours
Personal characteristics	Safety compliance
Communication (two-way)	Accident/ill-health rates
Involvement/consultation	Conflicts
Safety values	Control over work

While inputs and outputs have been discussed in the literature at four levels, a fifth level can also be considered, namely the societal level. Societal inputs are considered to include issues such as legislation, standards and pressure groups and societal outputs are considered to include improvement notices, awards, impact of site neighbours and costs to society caused by accidents and ill-health.

3.0 METHOD

The main aim of the study was to assess the key inputs to and outputs from supervisory processes used within the chemical and on-shore oil industries. Specific objectives were to benchmark the styles of supervision used for low and high-risk activities as functions of organisational size and COMAH status and to identify whether specific issues influenced the choice of supervision adopted by organisations.

3.1 QUESTIONNAIRE

The questionnaire deployed in the study was developed through a six-stage process, which involved:

- a review of the literature to assess the role and impact of supervisory processes on health and safety performance;
- the development of a framework model of inputs to and outputs from supervisory processes for discussion with representatives of the chemical sector;
- a discussion of the inputs to and outputs from the supervisory process with representatives of a range of companies in the chemical sector;
- the development of a draft questionnaire;
- a pilot study of the draft questionnaire; and
- the preparation of the final questionnaire.

3.1.1 Review of the literature

The main themes and issues related to supervisory style that were reviewed during the preliminary stages in the development of the questionnaire have been presented and discussed in Section 2.0.

Universally acceptable criteria for defining high and low-risk activities are difficult to derive as individuals and organisations have a diversity of understanding and perception of the concepts associated with risk. Therefore an approach advocated by Slovic (1992), which has been used previously by the authors (Fuller and Myerscough, 2001), was adopted within the study. In this approach, the term ‘risk’ is not specifically defined in order that respondents incorporate their own subjective and objective criteria and opinions of risk within their responses.

The definitions for small, medium and large organisations were based solely on the number of employees and the values used corresponded with the criteria given in Section 247 of the Companies Act 1985; namely:

Small:	organisations with not more than 50 employees;
Medium:	organisations with between 51 and 250 employees; and
Large:	organisations with 251 or more employees.

3.1.2 Framework Model of Inputs and Outputs from Health and Safety Supervision

Potential inputs and outputs from the supervisory processes used within the chemical industry were structured in terms of personal, organisational and societal factors within a health and safety management structure containing the elements of policy, organisation, planning, implementation, measurement, audit and review (Fuller and Vassie, 2004). The resultant framework, which is shown in Figure 3.1, was employed as a basis for the identification of key issues during the preliminary discussions with representatives from the chemical sector.

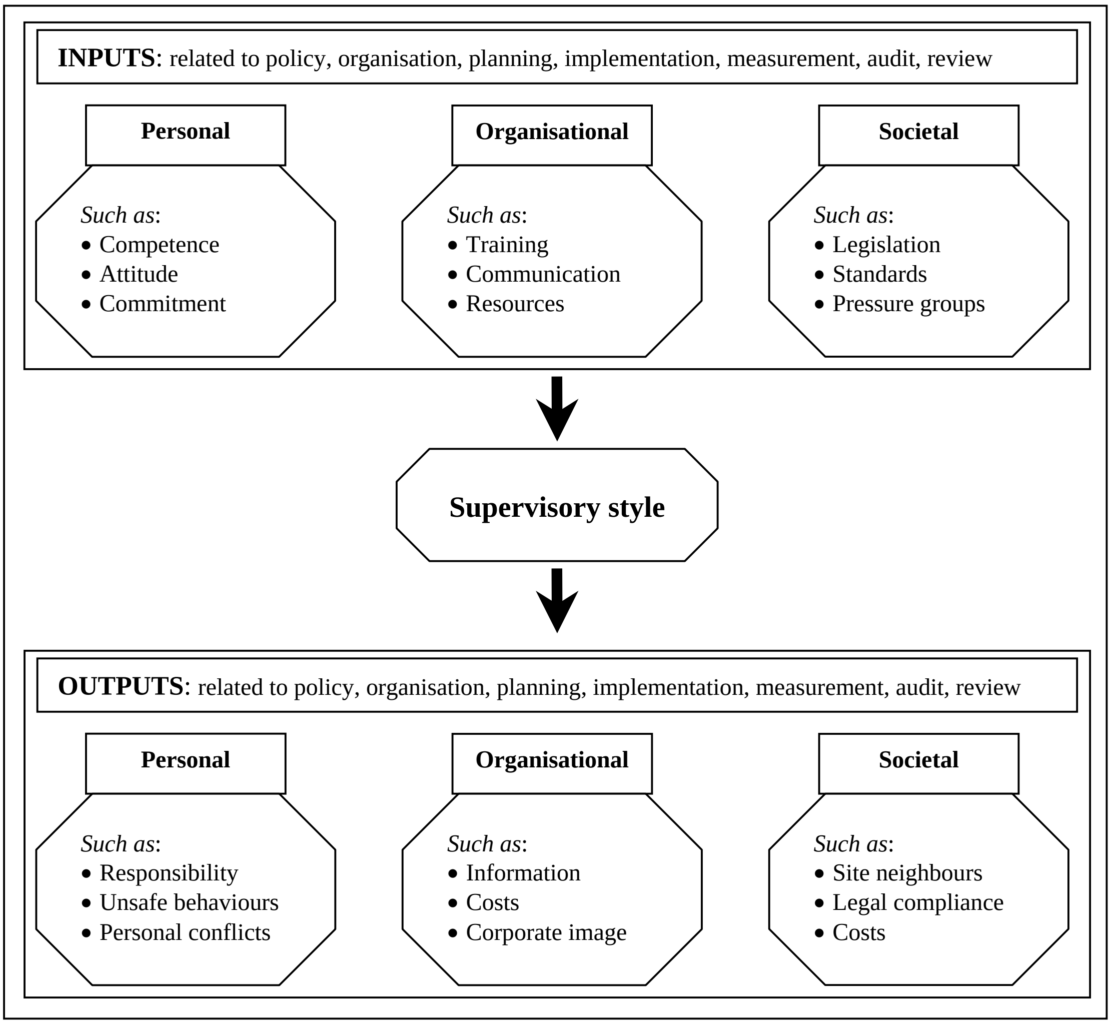

INPUTS: related to policy, organisation, planning, implementation, measurement, audit, review
Personal
Such as:
• Competence
• Attitude
• Commitment
Organisational
Such as:
• Training
• Communication
• Resources
Societal
Such as:
• Legislation
• Standards
• Pressure groups
Supervisory style
OUTPUTS: related to policy, organisation, planning, implementation, measurement, audit, review
Personal
Such as:
• Responsibility
• Unsafe behaviours
• Personal conflicts
Organisational
Such as:
• Information
• Costs
• Corporate image
Societal
Such as:
• Site neighbours
• Legal compliance
• Costs

Figure 3.1 Framework of inputs to and outputs from supervisory processes

3.1.3 Discussion of the inputs to and outputs from the supervisory process

The framework of inputs to and outputs from the supervisory process (Figure 3.1) was discussed with three companies based in the North West of England, four companies based in the North East of England and two companies based in Central Scotland. These companies undertook production, storage and distribution activities in the chemical industry. Discussions were held at each company with a range of personnel that included the person with responsibility for the organisation's health and safety management system, a production and/or maintenance manager, an operational supervisor where appropriate and plant operators.

The advantages and disadvantages of different styles of supervision for the control of the work of employees and contractors were discussed at each of the nine organisations in the context of high and low-risk activities in order to appreciate current management methods employed within the chemical industry. The experiences of and ideas about different forms of supervision were also investigated at each organisation and the comments and views of management, supervisors and operators on the different forms of supervision were sought in order to further inform the content of the questionnaire.

3.1.4 Draft questionnaire

The design of the draft questionnaire was based on the framework presented in Figure 3.1 and the discussions held with the nine organisations. The number and style of the questions were, however, constrained by several factors:

- The need to limit the burden of the survey on the chemical industry as a whole and on small and medium sized organisations in particular. In order to comply with government requirements, the questionnaire was limited in size so that it should take no more than 20 minutes to complete.
- The requirement that the questionnaire should be equally applicable to small, medium and large organisations.
- The requirement that the questionnaire should be equally applicable to non-COMAH organisations as well as to organisations designated as lower and upper-tier COMAH sites.
- The need for the questionnaire to be applicable to organisations where the activities included production, storage and distribution.

3.1.5 Pilot study

The draft questionnaire was distributed to the managers responsible for health and safety at each of the nine organisations that took part in the consultation process and to representatives of BACS, BCDTA and CIA (see Section 3.2) for critical comments. Three of the companies and two of the industry's representative bodies proposed minor changes to the questionnaire in order to clarify some questions.

3.1.6 Final questionnaire used in the survey

A copy of the final questionnaire used in the survey is presented in Appendix 1.

The questionnaire was divided into a number of sections each of which was designed to elicit specific information:

- Demographic data, as defined by:
  (a) location;
  (b) main activity;
  (c) COMAH registration;
  (d) workforce size;
  (e) accident and incident reporting;
  (f) RIDDOR reportable incidents.

- Methods of supervision as defined by:
  (a) the organisation's declared method of supervision for employees and contractors for high and low-risk activities;
  (b) the distribution of responsibilities between management and operators for various planning and operational issues; and
  (c) the organisation's general leadership style.

- Inputs to the organisation's current supervisory processes, as defined by:

  (a) operator attributes required to ensure the success of the current method of supervision;
  (b) management support provided to supervisors, lead operators or self-managed teams;
  (c) issues affecting an organisation’s choice of supervisory processes; and
  (d) the frequency of formal health and safety communication meetings with operators.

- Outputs from the organisation’s current supervisory processes, as defined by:
  (a) operator parameters;
  (b) organisational parameters; and
  (c) societal parameters.

Responses to the questions in the above sections were requested in the form of categorical data or as values based on a 5-point scale.

- Organisations were asked to state whether they had changed their method of supervision in the previous 5 years and if they had to provide free-text responses as to the main reasons for any change.

- Organisations were finally asked whether they would consider using self-managed teams for the control of their core activities, if they did not at present use them, and if they would not consider using them to provide free-text responses as to the main reasons for this decision.

3.2 SAMPLE POPULATION

The intention was to include companies within the sample population that were involved in the full range of activities associated with the chemical and on-shore oil industries together with the inclusion of small, medium and large sized organisations. In order to ensure the widest coverage within these terms of reference, discussions were held with three major bodies representing the chemical industry; namely, British Association for Chemical Specialities (BACS), British Chemical Distributors & Traders Association (BCDTA) and Chemical Industries Association (CIA). The aims and objectives of the study were presented to a representative of these three bodies, who discussed the aims and objectives of the project within their organisations. All three organisations agreed to cooperate with the project and to facilitate the distribution of the questionnaire to their member companies.

Two of the organisations undertook to distribute questionnaires together with an accompanying letter of explanation to their members. The authors undertook the distribution of questionnaires to members of the third organisation. The exact number of relevant companies to whom the questionnaire was distributed could not be identified precisely for a number of reasons. For example, some organisations belonged to more than one of the representative bodies and therefore these organisations would receive more than one copy of the questionnaire. Two of the organisations (BACS and CIA) estimated that the great majority of their affiliated companies were actively involved in the production, storage or distribution of chemicals, whilst the remaining organisation (BCDTA) estimated that around 50% of its affiliated companies were office-based companies and therefore the questionnaire would not be relevant to these companies and they would therefore not respond. Based on information from the three organisations, the best estimate available for the number of relevant organisations receiving the questionnaire was around 400.

Respondents to the questionnaire were guaranteed anonymity and this extended also to not identifying to which industry bodies the respondents' organisations were affiliated.

3.3 DATA ANALYSIS

The individual responses within each questionnaire were coded and the data points recorded on a Microsoft Excel spreadsheet. The resultant data were summarised using frequency and average analyses. A chi-square test was used to determine whether differences in the numbers of respondents in different categories, as functions of organisational size and COMAH category, were significant ($p \leq 0.05$). The numbers in some categories in some tests were below the recommended minimum value of 5 for a chi-square test (Cohen and Holliday, 1996).

In small-scale studies, such as the present research, it is important to consider the power of a statistical test as this reflects the probability of correctly accepting or rejecting a null hypothesis. Statistical power provides an understanding of the difference between statistical significance and practical significance. A sample size of ≥ 30 is required in order to detect a statistically significant ($p \leq 0.05$), medium effect ($r=0.5$) with 80% confidence (Burns, 2000). In general, postal questionnaires are reported to produce response rates of 30-40% (Oppenheim, 1992); however, in surveys of small and medium-sized enterprises (SMEs) response rates have been found to be around 10-15% (Storey, 1994).

4.0 RESULTS

4.1 RESPONSE TO QUESTIONNAIRE

The total number of questionnaires returned was 88, of which 84 questionnaires provided information that could be used for analysis. Whilst it was not possible to define the exact number of questionnaires distributed, the response rate was 22% based on the estimated distribution to 400 organisations. This response rate was comparable with response rates reportedfor other postal questionnaires (Oppenhiem 1992; Storey, 1994). The sample population was adequate to give validity to the results in identifying a significant medium strength effect.

4.2 DEMOGRAPHIC INFORMATION

The following information defined the characteristics of the sample population in terms of the location, main activity, COMAH category and numbers of employees and contractors employed by responding organisations.

4.2.1 Location

The distribution of responding organisations (n=82) as a function of location is shown in Figure 4.1.

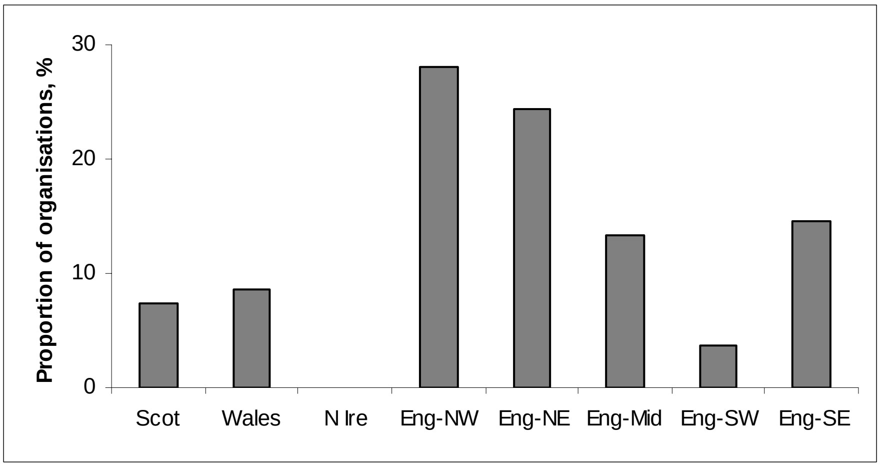


Figure 4.1 Distribution of responding organisations as a function of location

There was a significant difference in the number of respondents from each geographic area (p<0.001).

4.2.2 Main activity

The distribution of responding organisations (n=83) as a function of their main activity is shown in Figure 4.2.

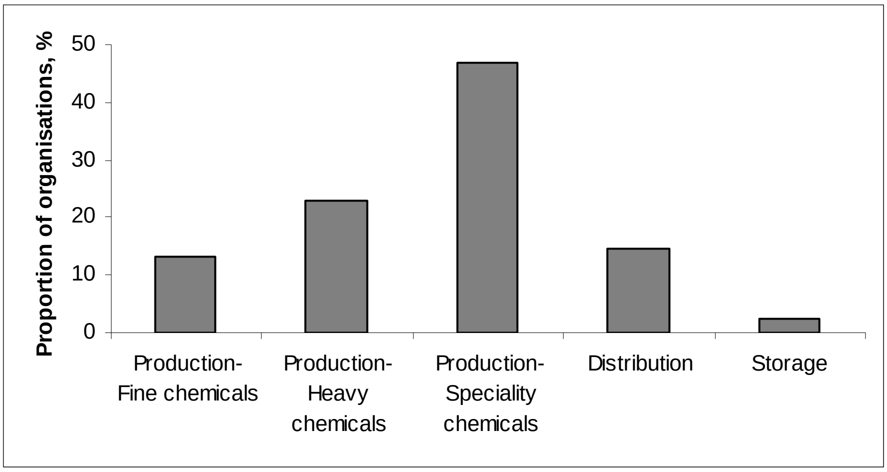


Figure 4.2 Distribution of responding organisations as a function of main activity

There was a significant difference in the number of respondents working within each group ($p<0.001$).

4.2.3 Size

The distribution of responding organisations (n=78) as a function of the number of employees is shown in Figure 4.3.

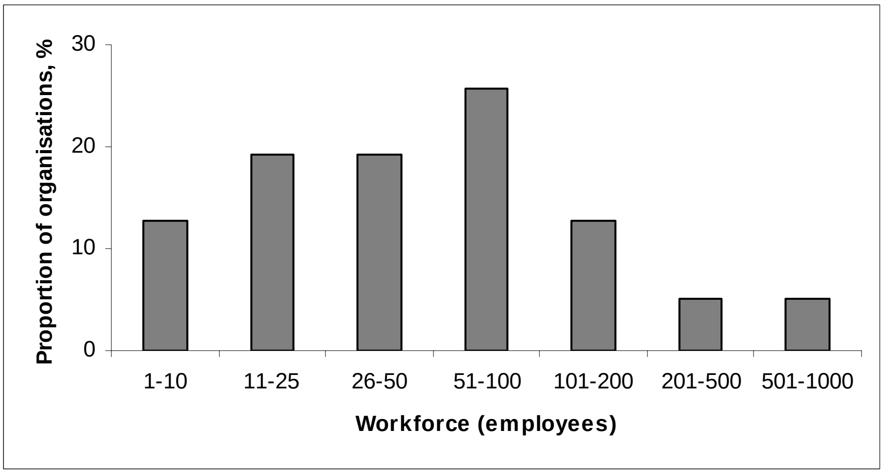


Figure 4.3 Distribution of responding organisations as a function of the number of employees

There was a significant difference in the number of respondents within each group ($p=0.004$).

The distribution of responding organisations (n=78) as a function of the size of the organisation (small, medium, large) is shown in Figure 4.4.

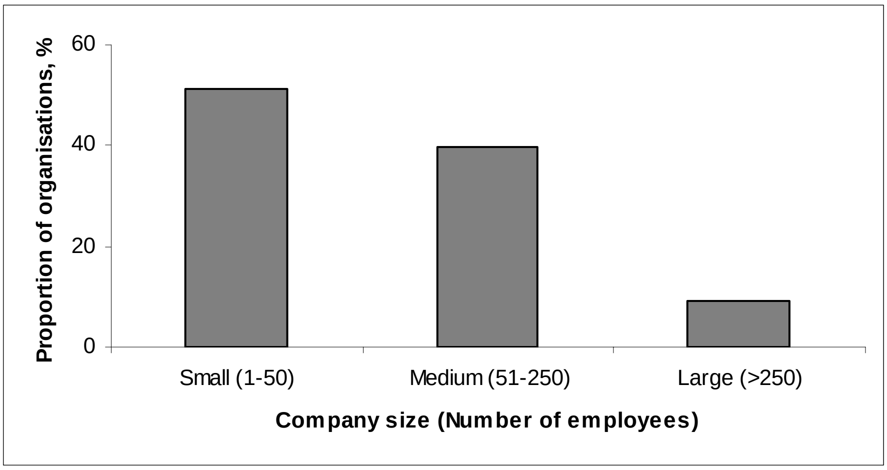


Figure 4.4 Distribution of responding organisations as a function of size

There was a significant difference in the number of respondents within each group ($p<0.001$).

The distribution of responding organisations (n=78) as a function of the number of long-term contractors employed is shown in Figures 4.5.

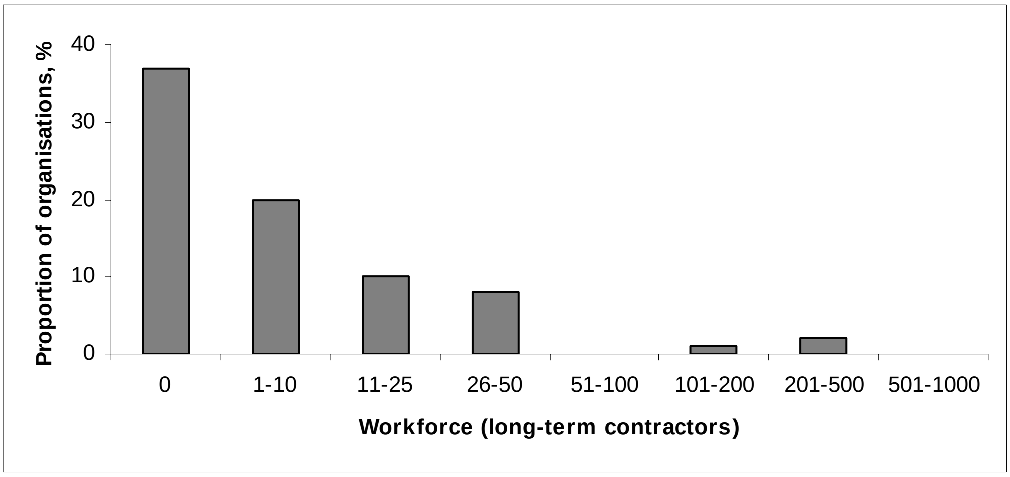


Figure 4.5 Distribution of responding organisations as a function of the number of long-term contractors employed

There was a significant difference in the number of respondents within each group ($p<0.001$).

The distribution of responding organisations (n=78) as a function of the number of short-term contractors employed is shown in Figures 4.6.

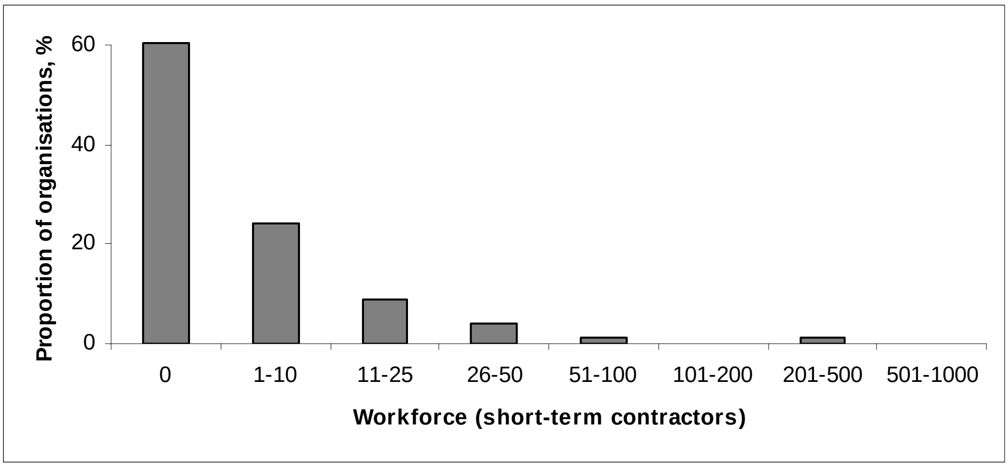


Figure 4.6 Distribution of responding organisations as a function of the number of short-term contractors employed

There was a significant difference in the number of respondents within each group ($p<0.001$).

4.2.4 COMAH category

The distribution of responding organisations (n=82) as a function of their COMAH category is shown in Figure 4.7.

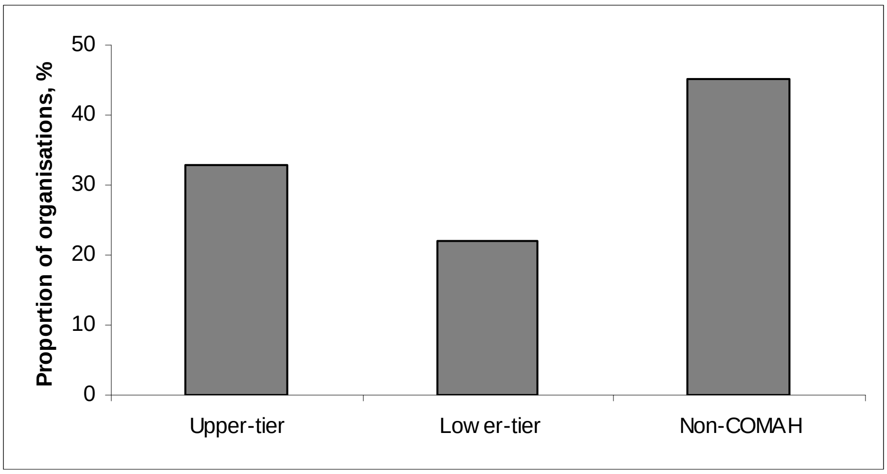


Figure 4.7 Distribution of responding organisations as a function of the COMAH category

There was a significant difference in the number of respondents within each group ($p=0.04$).

4.2.5 Main activity and COMAH category as functions of organisational size

The distribution of the main activities of responding organisations (n=78) as a function of organisational size is shown in Figure 4.8.

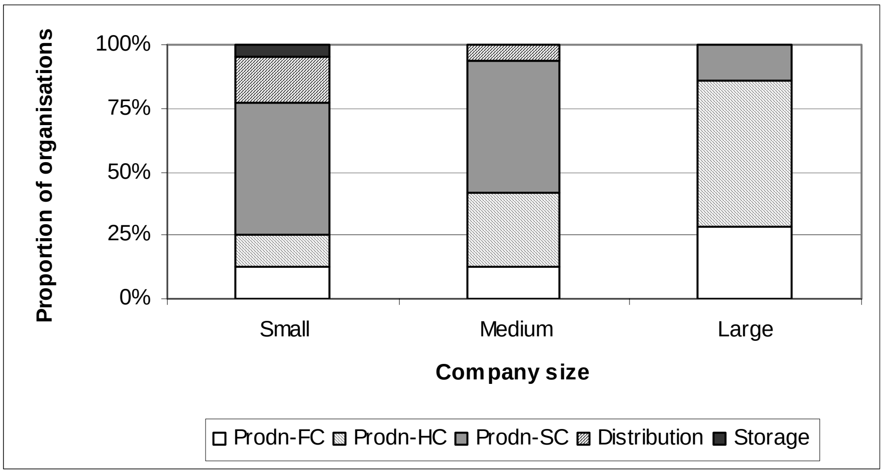


Figure 4.8 Distribution of the main activity of responding organisations as a function of organisational size

There was no significant difference in the number of respondents within each group as a function of organisational size.

The distribution of the COMAH category of the responding organisations (n=78) as a function of organisational size is shown in Figure 4.9.

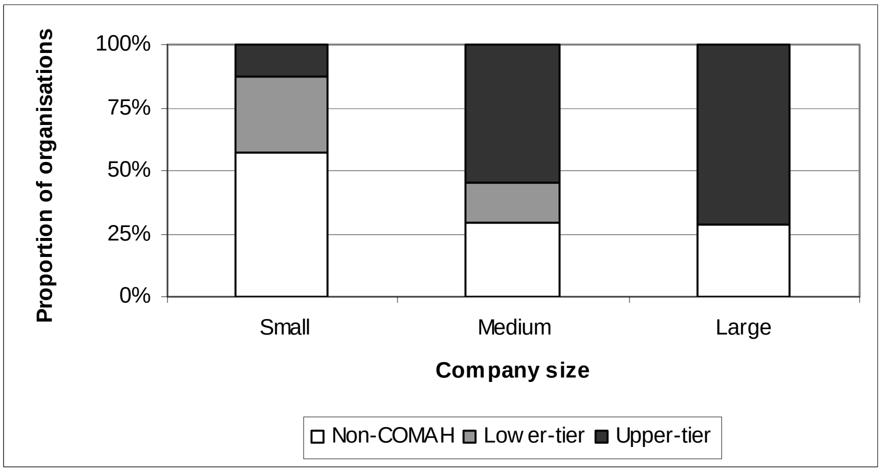


Figure 4.9 Distribution of the COMAH category of responding organisations as a function of organisational size

There was a significant difference in the number of respondents within each group as a function of organisational size ($p<0.001$).

4.3 INCIDENCE OF RIDDOR REPORTABLE INCIDENTS

The incidences of RIDDOR reportable incidents (per 1000 employees) for responding organisations (n=78) as a function of organisational size are presented in Table 4.1.

Table 4.1 Annual incidences of RIDDOR reportable incidents as a function of organisational size

Incidence (per 1000 employees)	*Size of organisation*			
	Small	*Medium*	*Large*	*All*
0-24	25	26	7	58
24- 49	10	2	0	12
50-74	2	2	0	4
75-99	3	1	0	4
Total	40	31	7	78

The incidences of RIDDOR reportable incidents (per 1000 employees) for responding organisations (n=78) as a function of an organisation's COMAH category are presented in Table 4.2.

Table 4.2 Annual incidences of RIDDOR reportable incidents as a function of an organisation's COMAH category

Incidence (per 1000 employees)	*COMAH category*			
	Non-COMAH	*Lower-tier*	*Upper-tier*	*All*
0-24	26	11	21	58
24- 49	6	4	2	12
50-74	0	1	3	4
75-99	2	1	1	4
Total	34	17	27	78

There were no significant differences in the numbers of organisations within each group as a function of organisational size or COMAH category.

The incidences of RIDDOR reportable incidents (per 1000 employees) for responding organisations (n=49) as a function of method of supervision for high-risk activities are presented in Table 4.3.

Table 4.3 Annual incidences of RIDDOR reportable incidents as a function of method of supervision for high-risk activities

Incidence (per 1000 employees)	*Method of supervision*			
	Non-working supervisor	*Working supervisor*	*Lead operator*	*Self-managed team*
0-24	9	13	6	3
24- 49	1	9	0	1
50-74	3	1	0	0
75-99	2	1	0	0
Total	15	24	6	4

The incidences of RIDDOR reportable incidents (per 1000 employees) for responding organisations (n=57) as a function of method of supervision for low-risk activities are presented in Table 4.4.

Table 4.4 Annual incidences of RIDDOR reportable incidents as a function of method of supervision for low-risk activities

Incidence (per 1000 employees)	*Method of supervision*			
	Non-working supervisor	*Working supervisor*	*Lead operator*	*Self-managed team*
0-24	8	22	3	10
24- 49	2	4	0	1
50-74	1	1	0	1
75-99	1	1	2	0
Total	12	28	5	12

There were no significant differences in the numbers of organisations within each group as a function of supervisory method for either high-risk or low-risk activities.

4.4 METHODS OF SUPERVISION

Styles of supervision used within organisations were analysed in terms of organisational size and COMAH category for high and low-risk activities. The total percentages within each organisational size and COMAH category exceed 100% in several cases as some organisations employed more than one form of supervision within their activities.

4.4.1 Employee supervision as a function of organisational size

The distributions of the styles of employee supervision for responding organisations operating high (n=49) and low-risk (n=57) activities as a function of organisational size are shown in Appendices 2A and 2B. Some small and medium size organisations used more than one form of supervision for high-risk (small: 10%; medium: 10%) and low-risk (small: 23%; medium: 16%) activities.

There were no significant differences in the numbers of organisations using the various styles of supervision for either high-risk or low-risk activities as a function of organisational size. The most common forms of employee supervision for high-risk activities were working supervisors (76%) for small; non-working and working supervisors (39%) for medium; and non-working supervisors (60%) for large organisations. For low-risk activities, a working supervisor was the most common form of supervision for all organisations (small: 62%; medium: 60%; large: 33%).

4.4.2 Contractor supervision as a function of organisational size

The distributions of the styles of contractor supervision for responding organisations operating high (n=46) and low-risk (n=55) activities as a function of organisational size are shown in Appendices 3A and 3B.

There were no significant differences in the numbers of organisations using the various styles of supervision for either high-risk or low-risk activities as a function of organisational size. The most common form of contractor supervision for high-risk activities was a manager/supervisor in small (77%) and medium (73%) size organisations and a contractor in large organisations (60%). For low-risk activities, a manager/supervisor was the preferred method of contractor supervision in all organisations (small: 48%; medium: 64%; large: 67%).

4.4.3 Employee supervision as a function of COMAH category

The distributions of the styles of employee supervision for responding organisations operating high (n=50) and low-risk (n=60) activities as a function of the organisation’s COMAH category are shown in Appendices 4A and 4B.

There were no significant differences in the numbers of organisations using the various styles of supervision for either high or low-risk activities as a function of an organisation’s COMAH category. The most common form of employee supervision for high-risk activities was a working supervisor in non-COMAH (70%) and lower-tier COMAH (67%) sites and a non-working supervisor in upper-tier COMAH sites (44%). For low-risk activities, the most common form of employee supervision was a working supervisor for all categories (non-COMAH: 66%; lower-tier COMAH: 62%; upper-tier COMAH: 33%).

4.4.4 Contractor supervision as a function of COMAH category

The distribution of the styles of contractor supervision for responding organisations operating high (n=45) and low-risk activities (n=58) as a function of the organisation’s COMAH category are shown in Appendices 5A and 5B.

There was no significant difference in the number of organisations using the various styles of supervision for high-risk activities but a significant difference (p=0.05) for low-risk activities as a function of an organisation’s COMAH category. The most common forms of contractor supervision for high-risk activities was a manager/supervisor in all organisations (non-COMAH: 67%; lower-tier COMAH: 92%; upper-tier COMAH: 61%). For low-risk activities, a manager/supervisor was used most often in non-COMAH (62%) and lower-tier COMAH (69%) sites and a contractor in upper-tier COMAH sites (58%).

4.5 LEADERSHIP STYLES

Styles of company leadership were analysed in terms of organisational size and COMAH category. The option of ‘*management allow operators complete freedom of action*’ was excluded from the statistical tests, as no organisation indicated that they operated this style of leadership.

The distribution of the styles of company leadership for responding organisations (n=77) as a function of organisational size is shown in Figure 4.10.

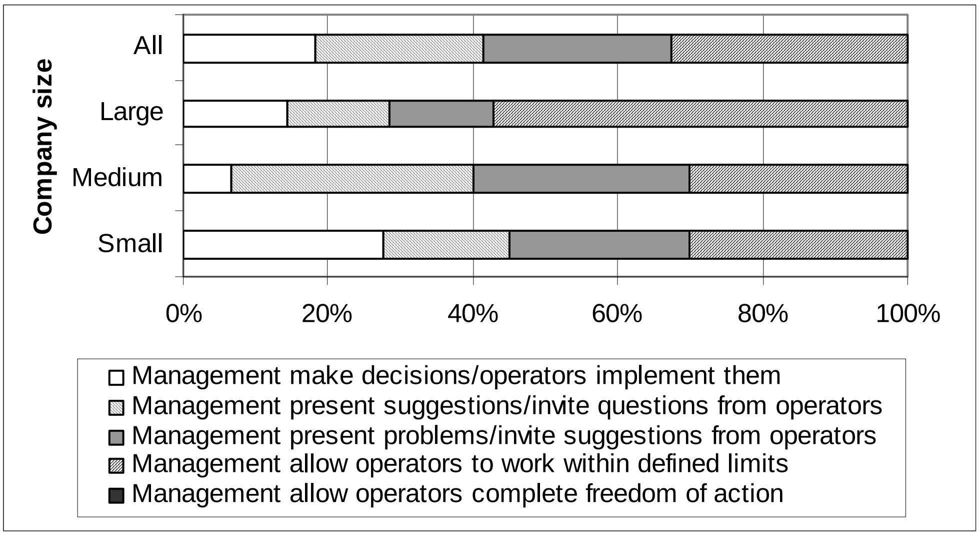


Figure 4.10 Distribution of company leadership style as a function of organisational size

The distribution of the styles of company leadership for responding organisations (n=80) as a function of an organisation's COMAH category is shown in Figure 4.11.

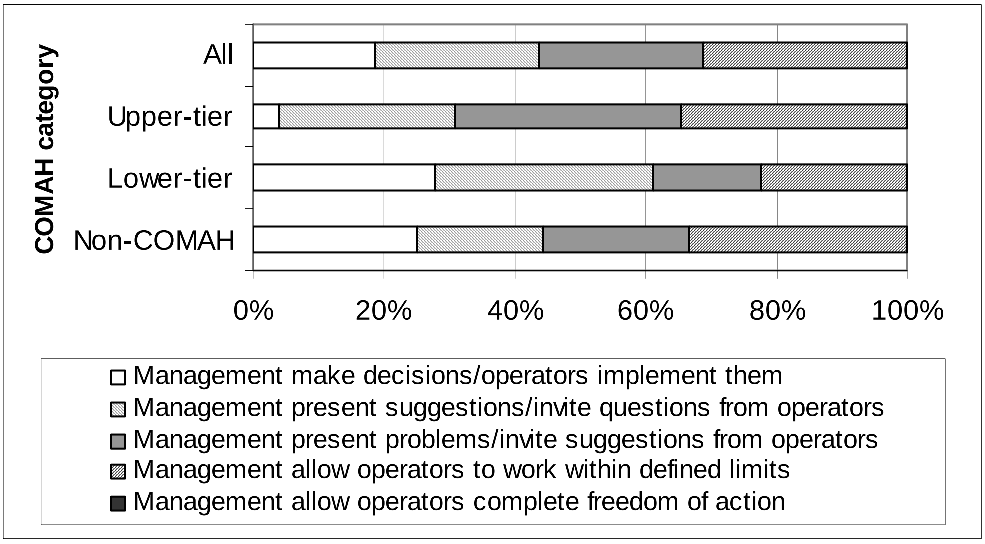


Figure 4.11 Distribution of company leadership style as a function of an organisation's COMAH category

There were no significant differences in the numbers of organisations using the various styles of leadership as a function of an organisation's size or COMAH category.

4.6 LEADERSHIP STYLE AND METHOD OF SUPERVISION

The distribution of supervisory processes for high-risk activities for responding organisations (n=49) as a function of the leadership style is shown in Figure 4.12.

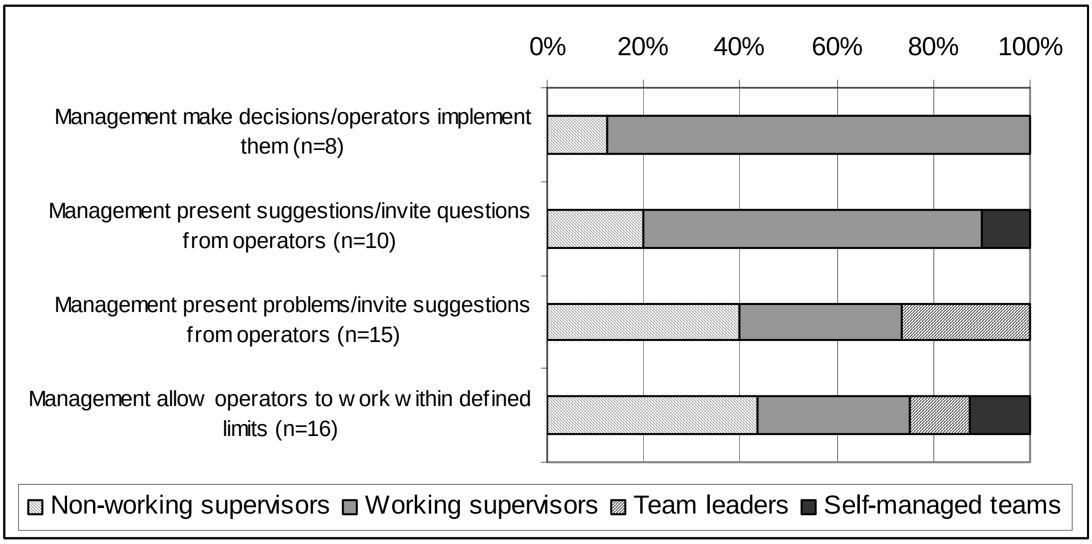


Figure 4.12 Distribution of supervisory processes for high-risk activities as a function of leadership style

The distribution of supervisory processes as a function of the leadership style for low-risk activities in responding organisations (n=59) is shown in Figure 4.13.

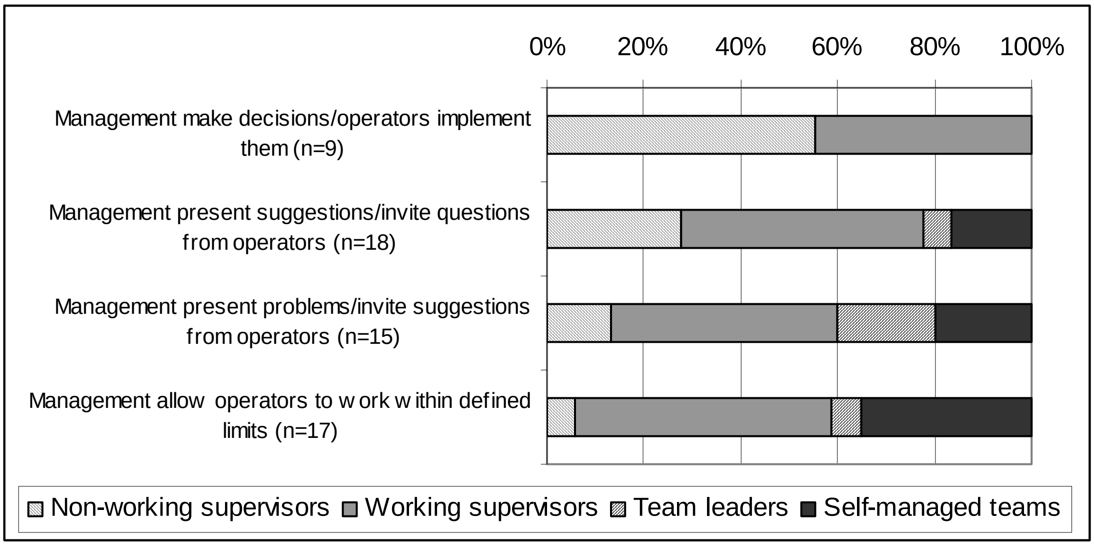


Figure 4.13 Distribution of supervisory processes for low-risk activities as a function of leadership style

There were no significant differences in the numbers of organisations using each method of supervision as a function of leadership style for either low-risk or high-risk activities.

4.7 MANAGEMENT AND OPERATOR RESPONSIBILITIES

The average scores defining the distribution of management and operator responsibilities within the responding organisations as a function of organisational size (n=78) and COMAH category (n=81) are shown in Appendices 6A and 6B. A score of 1 indicates that the responsibility for an activity lies entirely with the management/supervisor, whilst a score of 5 indicates that the responsibility lies entirely with the operators. Apart from the responsibility for *on-the-job control of daily work activities*, responsibilities for all issues were very strongly with management rather than with operators.

There were no significant differences in the average scores for the ten responsibility issues as a function of organisational size and COMAH category (Table 4.5).

Table 4.5 Average responsibility scores as a function of organisational size and COMAH category (management responsibility: 1; operator responsibility: 5)

COMAH category	*Size of organisation*		
	Small	*Medium*	*Large*
Non-COMAH	2.1	1.9	2.0
Lower-tier	2.1	1.8	-
Upper-tier	1.8	2.2	2.1

4.8 INPUTS TO AN ORGANISATION'S SUPERVISORY SYSTEM

The relationships between the perceived importance of inputs to an organisation's supervisory system were analysed in terms of organisational size and COMAH category. A score of 1 indicates that an organisation does not consider the input to be important, whilst a score of 5 indicates that the input is perceived to be very important.

The average scores defining the perceived importance of operator attributes and management support for an organisation's supervisory system for responding organisations as a function of organisational size (n=78) and COMAH category (n=81) are shown in Appendices 7A and 7B. A positive attitude towards health and safety was perceived to be very important irrespective of organisational size or COMAH category. The provision of training in time management skills was only perceived to be fairly important irrespective of organisational size or COMAH category.

The average perception scores for the importance of the six operator attributes are summarised in Table 4.6 as a function of organisational size and COMAH category.

Table 4.6 Perceived importance of operator attributes as a function of organisational size and COMAH category (not important: 1; very important: 5)

COMAH category	*Size of organisation*		
	Small	*Medium*	*Large*
Non-COMAH	4.1	4.3	4.8
Lower-tier	4.1	4.3	-
Upper-tier	4.1	4.2	4.5

There was a trend for the perceived importance of operator attributes to increase with increasing size of organisation.

The average perception scores for the importance of the six organisational support factors are summarised in Table 4.7 as a function of organisational size and COMAH category.

Table 4.7 Perceived importance of management support factors as a function of organisational size and COMAH category (not important: 1; very important: 5)

COMAH category	*Size of organisation*		
	Small	*Medium*	*Large*
Non-COMAH	3.4	3.8	4.0
Lower-tier	3.3	3.9	-
Upper-tier	3.5	3.6	4.0

There was a trend for the perceived importance of providing organisational support factors to increase with increasing size of organisation.

The average scores defining the perceived importance of a range of internal and external influencing factors on the choice of an organisation's supervisory system for responding organisations as a function of organisational size (n=77) and COMAH category (n=80) are shown in Appendices 8A and 8B.

Apart from the views of industry pressure groups, organisations perceived all of the issues to be at least fairly important. The average perception scores for the ten influencing factors as a function of organisational size and COMAH category are shown in Table 4.8.

Table 4.8 Perceived importance of influencing factors on an organisation's choice of supervisory style as a function of organisational size and COMAH category (not important: 1; very important: 5)

COMAH category	*Size of organisation*		
	Small	*Medium*	*Large*
Non-COMAH	4.3	4.4	3.9
Lower-tier	3.8	4.5	-
Upper-tier	4.0	4.2	4.5

Apart from the responses from large non-COMAH sites, there was a trend for the perceived importance of influencing factors to increase with increasing size of organisation.

The frequencies of formal health and safety communication meetings between managers/ supervisors and operators are shown as a function of organisational size (n=78) and COMAH category (n=81) in Figures 4.14 and 4.15, respectively.

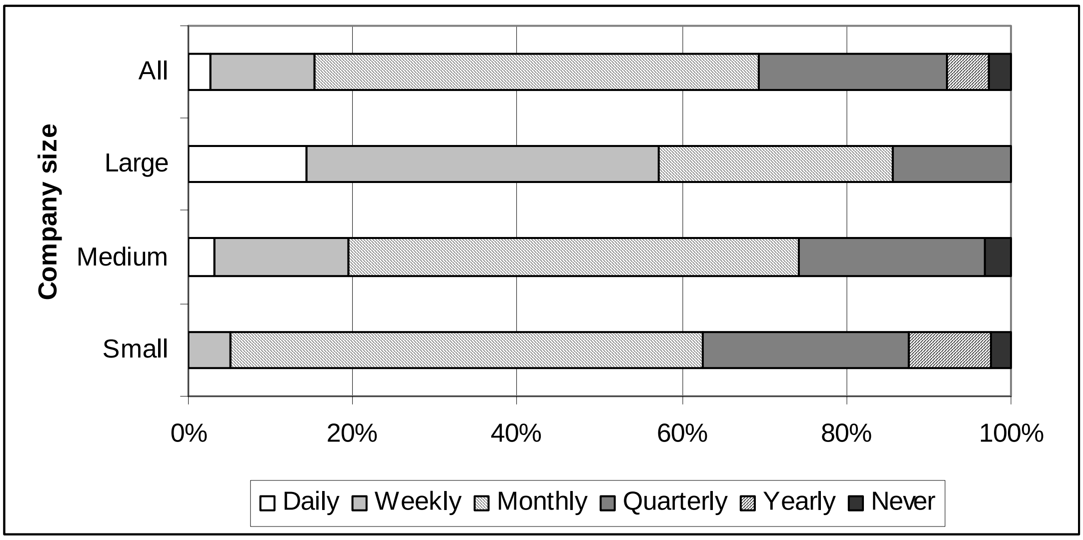


Figure 4.14 Frequency of formal health and safety meetings as a function of organisational size

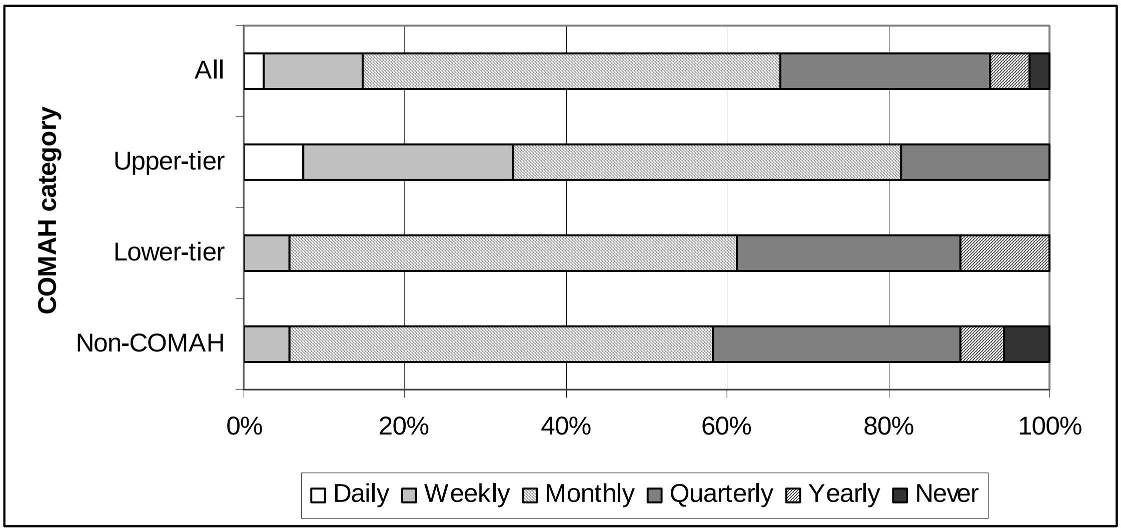


Figure 4.15 Frequency of formal health and safety meetings as a function of an organisation's COMAH category

Although the differences in the frequencies of formal health and safety meetings were not significant as a function of size or COMAH category, there was a trend for the frequency of meetings to be greater as the size of the organisation and the COMAH category increased.

4.9 OUTPUTS FROM AN ORGANISATION'S SUPERVISORY SYSTEM

The average scores defining the perceived level of achievement of outputs from an organisation's supervisory system for responding organisations as a function of organisational size (n=77) and COMAH category (n=80) are shown in Appendices 9A and 9B. A score of 1 indicates that an organisation considers that their current supervisory style achieves an output very well, whilst a score of 5 indicates that it achieves an output very badly.

Apart from improving operators' *career development* and *motivation*, organisations perceived that their current methods of supervision achieved their desired outputs well. The average perception scores for the fifteen output factors as a function of organisational size and COMAH category are shown in Table 4.9.

Table 4.9 Perceived achievement of outputs as a function of organisational size and COMAH category (very well: 1; very badly: 5)

COMAH category	***Size of organisation***		
	Small	***Medium***	***Large***
Non-COMAH	2.1	2.2	1.9
Lower-tier	2.3	2.1	-
Upper-tier	2.3	2.4	1.7

Larger organisations generally perceived that they achieved their desired outputs better than small and medium size organisations.

4.10 CHANGES OF SUPERVISORY SYSTEM

A significant proportion of responding companies (30%) indicated that they had changed their method of supervision for either low or high-risk activities within the previous 5 years. The proportions of companies changing their method of supervision as a function of company size and COMAH category are shown in Table 4.10. The differences were not significant as a function of company size or COMAH category.

Table 4.10 Proportion of companies changing their method of supervision over the previous 5 years as a function of company size and COMAH category

	Proportion of companies in category; %
Small	28
Medium	40
Large	14
Non-COMAH	31
Lower-tier	39
Upper-tier	27

The changes in supervision style that were reported are summarised in Table 4.11.

Table 4.11 Changes in supervisory style over the last 5 years

Current form of supervision	***Previous method of supervision***			
	Non-working supervisor	Working supervisor	Lead operator	Self-managed team
Non-working supervisor	–	2	0	1
Working supervisor	8	–	4	4
Lead operator	4	5	–	1
Self-managed teams	4	4	0	–

The most frequently reported reasons for changing an organisation’s method of supervision were to reduce costs (20%), improve productivity/efficiency (16%) and increase operator responsibility (14%).

When organisations that did not currently use self-managed teams were asked whether they would consider using them, only 40% indicated that they would consider them for high-risk activities, whereas 68% indicated they would consider using them for low-risk activities. For those organisations that indicated that they would not consider using self-managed teams, the most common reasons given were related to responsibility and accountability (20%) and the competence of staff available (13%).

5.0 DISCUSSION

The distribution of the responding organisations, in terms of location, activity and size, reflected the UK chemical sector. The largest numbers of respondents were from organisations with less than 100 employees, located in the North West and North East of England and producing speciality chemicals. Responding organisations were fairly evenly spread between non-COMAH, lower-tier and upper-tier COMAH sites. The majority of large organisations were upper-tier COMAH sites producing heavy chemicals and the majority of small organisations were non-COMAH sites producing speciality chemicals. Medium size companies were more evenly split between non-COMAH, lower-tier and upper-tier COMAH sites and between the production of heavy and speciality chemicals.

Although the results were not statistically significant, there was a trend for larger organisations to perform better than medium and small organisations and for medium organisations to perform better than small organisations, in terms of RIDDOR reportable incidents.

The results presented in Section 4.0 are discussed here in respect of the issues related to organisational leadership styles and supervision processes that were identified in Section 2.0 and in the context of organisational size and COMAH category.

5.1 LEADERSHIP STYLE

The styles of leadership were not determined by the size or the COMAH category of the organisations, although small companies were at least twice as likely to operate with a hierarchical leadership style as medium and large companies. None of the responding organisations reported that they operated a ‘laissez-faire’ style of management, whereby managers afforded complete freedom of action to operators. However, large organisations were nearly twice as likely to allow their operators some freedom of action to work within defined operating limits as small or medium size organisations.

Because large companies are more likely on average to be mature organisations than small companies, these results reflected the idea proposed by Hersey and Blanchard (1982) that organisational leadership styles would progress from ‘telling’ through ‘selling’ and ‘participating’ to ‘delegating’ as organisations matured. These trends in supervisory style were not apparent when the results were analysed by COMAH category, as upper-tier companies were much less likely to operate a hierarchical style of leadership than lower-tier and non-COMAH companies.

Tannenbaum and Schmidt (1973) reported that employees’ characteristics, such as attitudes to responsibility and decision-making skills, were important in defining an organisation’s leadership style whilst Hackman (1977) and Howell and Gomez (1993) reported that it was necessary to provide groups with adequate support to enable them to perform effectively. In this study, organisations generally acknowledged the importance of operator attributes, in particular a positive attitude towards health and safety and a willingness to take responsibility and be accountable for their actions. There was a general trend for operator attributes to be considered more important as organisations increased in size. This was particularly noticeable with the attributes of self-motivation and problem-solving and decision-making skills. The importance placed on operator attributes will affect the skill level and experience expected of operators working within the chemical sector and this will have a strong influence on organisational recruitment policies.

Organisations generally considered that a very high level of support was provided in the issues surveyed in order to achieve the desired organisational outputs. The provision of a communication route for resolving issues and day-to-day and emergency management support were considered to be particularly important by all organisations. There was a general trend for the provision of support to be considered to be more important as organisations increased in size. This was particularly noticeable for the provision of mentors/coaches and a high level of plant automation. Although skills in prioritisation have been identified (Wingfield, 1992; Metlay and Kaplan, 1992; Wright et al., 2003) as an important ability for operators working in hazardous work environments and self-managed teams, the issue of providing time-management skills was considered to be the least important factor in the present survey.

Hofmann and Morgeson (1999) reported that high quality and frequent communication between employees and supervisors was associated with employee safety commitment and lower accident rates. The frequency with which management held formal health and safety meetings with operators was generally high and the frequency of meetings also increased with the size and COMAH category of the companies. However, there was no evidence that improved health and safety performance was associated with an organisation's size, COMAH category or method of supervision. This result, however, supports the view of Cohen and Ledford (1991) that organisations operating with self-managed teams did not necessarily achieve lower accidents rates.

Whilst management delayering has been claimed to shift responsibility and accountability to those people carrying out the operations (Wright, 1996a), apart from on-the-job control of daily work activities, the responsibilities for most activities were considered to be very much with management rather than with operators. Although there were no significant differences in the responses as a function of either an organisation's size or its COMAH category, there was a trend in large organisations to allow operators greater freedom of action to work within defined operational limits. These responses confirmed that organisations were on the whole management driven and that operators were afforded little opportunity to take responsibility for their actions even though this was perceived by organisations to be an important attribute for operators. This confirmed the view of Cully et al. (1999), who reported that true autonomous working systems were rare.

5.2 METHODS OF SUPERVISION

Almost all issues that might influence the choice of supervisory process were considered to be important by organisations but compliance with health, safety and environmental legislation and the ability to demonstrate effective risk control were perceived to be the most important. A noticeable exception, however, was the limited influence that pressure groups appeared to exert. This may, however, simply indicate that pressure groups are not particularly active in the chemical sector. Wright (1996a) claimed that reducing costs was a driving force for an organisation's choice of supervision but, although this issue was considered important by organisations, compliance issues were considered to be more important.

Wright (1996b) identified the level of operational risk as one of the key parameters in determining work organisation and this is reflected in the results from this project. Some companies employed more than one method of supervision to control employees working on their high and low-risk activities but hierarchical, rather than participatory, supervisory methods prevailed irrespective of company size or COMAH category. Large and upper-tier COMAH companies were more likely to use 'non-working' supervisors to control high-risk activities, whereas small, non-COMAH and lower-tier COMAH companies were more likely to employ working supervisors than other methods. Small, medium, non-COMAH and lower-tier COMAH companies, however, were more likely to use working supervisors to control their low-risk activities. Few organisations used lead operators and even fewer used self-managed teams to control their high-risk activities, although more organisations used lead operators or self-managed teams for controlling some areas of their low-risk activities.

The hierarchical methods of supervision employed by most organisations were confirmed by the strong alignment of responsibilities for all issues with management rather than with operators. In particular, front-line discipline was placed strongly within the management domain, irrespective of organisational size, COMAH category and method of supervision. Lardner (1999) previously identified this as an issue. This strong focus of responsibilities on management rather than operators extended to organisations purporting to operate with self-managed teams, which mirrors the results reported by Murakami (1997) in the automotive industry. The lack of responsibility afforded to operators in self-managed teams also supports the contention by Lardner (1999) that self-managed teams require careful, active management and therefore the term ‘self-managed team’ may be a misnomer in this context.

This issue can be illustrated further by analysing how the allocation of responsibilities for longer-term planning (Appendix 1: questions B1, B3, B5, B8, B10) and shorter-term control (Appendix 1: questions B2, B4, B6, B7, B9) issues varies as a function of the organisation’s defined method of supervision; see Figure 5.1. In an organisation operating with a purely hierarchical management style, one would expect that both long-term planning and short-term control responsibilities would be with management and average values would be close to 1 and therefore appear in the lower-left quadrant of the diagram. However, in organisations where operators took overall responsibility for planning and control, values would be between 3 and 5 and appear in the upper-right quadrant.

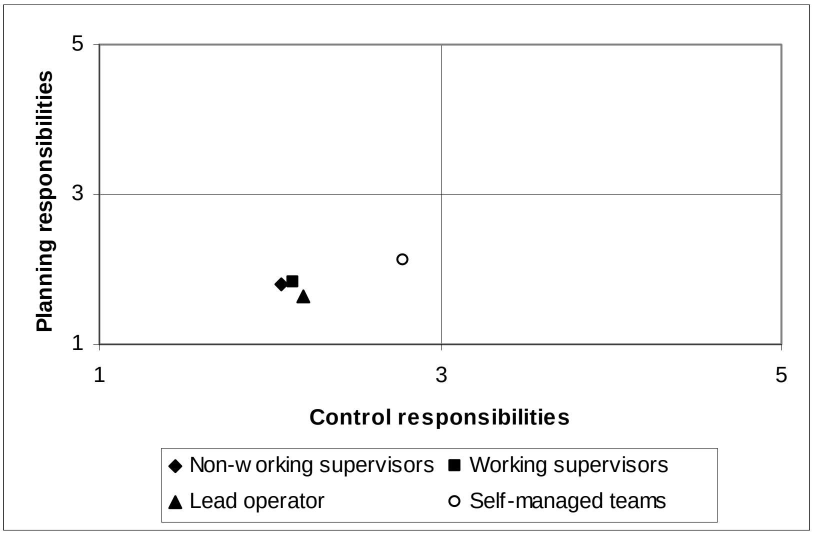


Figure 5.1 Distribution of average planning and control responsibilities as a function of method of supervision (solely management responsibility: score = 1; solely operator responsibility: score = 5)

Irrespective of the declared method of supervision, all planning/control values fell within the lower-left quadrant, which defines a management-controlled regime. There is very little difference in the average values obtained for ‘non-working’ supervisors, working supervisors and lead operators. The values for self-managed teams, however, do tend towards the lower-right quadrant, where management systems that allowed operators to take greater responsibility for short-term control issues, whilst management retained responsibility for longer-term planning issues, would be placed. These results support the contention that even in self-managed teams, there is only minimal additional autonomy or responsibility for actions for either long-term or short-term issues compared with other methods of supervision. Therefore, the level of responsibility afforded to operators in working groups designated as self-managed teams means that they do not fit any of the three levels of decision-making amongst self-managed teams identified by Susman (1979). The results also support the view that self-managed teams still require leadership and careful management control (Wingfield, 1992).

Despite the differences in supervisory methods, most organisations were strongly of the opinion that their current method of supervision met their needs and achieved the desired outcomes. This finding is similar to that reported by Ondrack and Evans (1986), who reported that employee motivation and job satisfaction did not vary significantly across different styles of supervision.

A number of organisations indicated that they had changed their method of supervision at some time in the previous 5 years. Medium size and lower-tier COMAH organisations were more likely and large and upper-tier less likely to have changed their method of supervision. The largest changes in methods of supervision involved organisations moving from hierarchical methods of supervision (‘non-working’ and working supervisors) to less autocratic methods of control. However, it is necessary to take into account that the use of working supervisors was the most common form of supervision reported for high and low-risk activities and when this factor is taken into account, the most significant changes related to organisations moving away from the use of ‘non-working’ supervisors to the use of working supervisors, lead operators and self-managed teams.

A number of organisations had also changed from the use of self-managed teams back to more conventional methods of supervision and in particular to the use of working supervisors. This change is particularly important because the overall proportion of organisations in the study that were using self-managed teams was small: this indicates, therefore, that a high proportion of organisations that had used self-managed teams in the chemical industry were not satisfied with the outputs from this supervisory process. Pearce and Ravlin (1987) reported that to achieve successful outcomes from self-managed teams they should be used where there were appropriate tasks, organisational conditions and operator expectations: it may be the case that these conditions were not present in these companies.

Organisations that did not currently use self-managed teams indicated that they would be prepared to consider their use but they were more likely to use them for low-risk than high-risk activities. This supports Wright’s (1996b) view that a lower level of management control can be considered in lower risk work environments. The most common reasons given by organisations not prepared to consider the use of self-managed teams were related to issues of responsibility/accountability and the competence of existing employees. Competence has been identified previously (Wellins and George, 1991) as an important factor for implementing self-managed teams and competence in technical, administrative and interpersonal skills were also required (Lardner, 1999).

The most common method of supervising contractors for both high and low-risk activities was through the use of a manager or supervisor. A high proportion of large companies used a contractor to control contractors, whilst a small proportion of companies allowed their own operators to control contractors involved with high-risk activities. For low-risk activities, medium, large, non-COMAH and lower-tier COMAH companies were all more likely to use one of their own managers or supervisors to control the work of contractors. A significant proportion of all companies, however, relied on operators or contractors to control low-risk contractor work activities.

6.0 CONCLUSIONS

The study has benchmarked operator and contractor supervisory processes in small, medium and large organisations and across non-COMAH and lower-tier and upper-tier COMAH activities in the chemical and on-shore petrochemical industries. The project identified and assessed a range of input and output indicators that may influence the choice of and reflect the performance of supervisory methods.

The results show that in all sectors of the chemical industry, a hierarchical style of company leadership predominated. Organisations generally carried the hierarchical leadership style through to their methods of operator supervision as, for both low and high-risk activities, the use of working or non-working supervisors prevailed. In small and medium size organisations working supervisors were used more, whereas non-working supervisors were more common in large organisations. Lead operators and self-managed teams were utilised by a small proportion of organisations but more for the control of low-risk than high-risk activities. Although those organisations that claimed to operate with self-managed teams apportioned more responsibilities to their operators, the differences between this method of supervision and the other approaches were very small indicating that there was only limited autonomy amongst operators.

Contractors were predominately controlled by managers or supervisors from within the employing organisation, although large companies were more likely to use contractors for the control of contracted high-risk activities.

Operator attributes were regarded as an important issue in the choice of supervisory style, irrespective of organisational size or type of activity. Organisations generally provided a very high level of support to their supervisory process in order to achieve the desired organisational outputs. The provision of a communication route for resolving issues and day-to-day and emergency management support were considered to be the most important issues by all organisations. However, organisations did not consider the provision of training in time management skills to operators to be particularly important. Front-line discipline remained strongly within the management domain, irrespective of organisational size, COMAH category and method of supervision.

Organisations were generally satisfied with the outputs from their current method of supervision and this confirms that although the use of working supervisors was the most common form of control, different supervisory methods may be appropriate in different circumstances. The choice of supervision was affected by the size of the organisation and the level of risk within the operations together with the competence of the management team and operators. There was no evidence, however, to suggest that improved health and safety performance was associated with an organisation’s size, COMAH category or method of supervision.

Compliance with health and safety and environmental legislation and an organisation’s ability to demonstrate effective risk control were perceived to be the most important factors that affected the choice of an organisation’s method of supervision.

The key points raised by this small scale study of supervisory methods in the chemical sector are:

- There is no evidence to suggest that there is a causal relationship between health and safety performance and methods of supervision.
- The main factors influencing the choice of supervisory method are compliance with health, safety and environmental legislation and the demonstration of effective risk control.
- Hierarchical methods of supervision involving ‘non-working’ and working supervisors predominate, irrespective of the size of organisation or the activities undertaken.
- Operational responsibilities remain strongly with management and there is little evidence to suggest that responsibilities are delegated to operators, irrespective of the form of supervision.
- Self-managed teams are used by only a small proportion of organisations and where they are used they are more likely to be used for the control of low risk activities.
- All organisations consider operator attributes to be important factors in the choice of supervision and there is a trend for the level of importance assigned to these to increase with operational size.
- The provision of organisational support is considered to be an important input to the supervisory process by all organisations but there is a trend for the level of importance to increase with organisational size.
- Organisations are generally satisfied that their current methods of supervision achieve the desired outputs.

APPENDICES

APPENDIX 1: Questionnaire

Health and Safety Research Group

Supervisory Practices in the Chemical Industry

Health and Safety Questionnaire

Project funded by the Health and Safety Executive

In cooperation with:
British Association for Chemical Specialities,
British Chemical Distributors & Traders Association,
Chemical Industries Association

University of Leicester

Supervision in the Chemical Industry

As part of the overall aim to improve health and safety performance in UK industry, the Health and Safety Executive, through the Health and Safety Research Group at the University of Leicester, is assessing health and safety issues related to styles of supervision in the chemical industry. The aim is to benchmark the inputs to and the outputs from supervisory processes in order to identify best practices, which will then be disseminated within the industry.

Following discussions with a range of companies within the chemical sector, a questionnaire has been developed that will define the styles of supervision employed within the chemical industry. In addition, the questionnaire aims to identify organisational inputs required to support and outputs obtained from these supervisory models.

The questionnaire should take no more than 20 minutes to complete so please take this opportunity to provide an input into the continuous improvement of health and safety management within the chemical sector.

All questionnaires should be returned for analysis to the Health and Safety Research Group at the University of Leicester, where replies will be treated confidentially. It is against the Group's Code of Practice for individual responses to be identified or made available to any organisation.

Notes for Completion of the Questionnaire

1. Please respond to each question/statement as it affects your work location.

2. If you feel that you do not have the knowledge to respond to a particular question/statement, please feel free to consult your colleagues for information.

3. If you do not understand a question/statement or the question/statement is not appropriate to your organisation then leave the response to that particular question/statement blank.

4. When responding to questions/statements, insert a tick in each case against the response(s) that most closely represents the situation in your organisation. Consider ALL aspects of an issue when responding.

5. The term 'operator' is used in the questionnaire to describe all non-management employees who work in a front-line production/maintenance function.

The British Association for Chemical Specialities, the British Chemical Distributors & Traders Association and the Chemical Industries Association are supporting the distribution of this questionnaire.

A. Company Information

1. Location:

Scotland: [ ]   Wales: [ ]   Northern Ireland: [ ]

England - NW: [ ]   England - NE: [ ]   England - Midlands: [ ]

England - SW: [ ]   England - SE: [ ]

2. Main activity:

Production – fine chemicals: [ ]   Production – heavy chemicals: [ ]

Distribution: [ ]   Storage:- [ ]   Production – speciality chemicals: [ ]

3. COMAH site:

Upper-tier site: [ ]   Lower-tier site: [ ]   Non-COMAH site: [ ]

4. Current workforce: *(Please indicate the numbers in each category)*

Permanent operators: ……………..........   Long-term contractors: ……………..........

Short-term contractors: ……………..........

5. RIDDOR reportable incidents: *(Please provide numbers for all categories)*

	during 2002	during 2003
Operators:	…………………………..............	…………………………..............
Contractors:	…………………………..............	…………………………..............

6. Method of supervision: *(Please indicate the description that most closely describes the day-to-day method of supervision of employees **and** contractors for **both** types of activity)*

	Type of activity	
Operators:	High risk	Low risk
Groups of operators with 'non-working' supervisors:	[ ]	[ ]
Groups of operators with working supervisors:	[ ]	[ ]
Groups of operators with lead operators:	[ ]	[ ]
Groups of self-managed operators:	[ ]	[ ]
Other: (specify) ………………………………..	[ ]	[ ]
Contractors:		
Supervised by a company manager/supervisor:	[ ]	[ ]
Supervised by a company operator:	[ ]	[ ]
Supervised solely by contractor:	[ ]	[ ]

B. Distribution of Responsibilities

Please indicate in the appropriate column where the responsibility for each of the following issues rests within your organisation (Management refers to managers and/or supervisors):

Responsibility for issue rests:

Issue	Entirely with management	More with management	Management and operators equally	More with operators	Entirely with operators
1 Defining overall operator workloads.					
2 Allocation of manpower for daily tasks.					
3 Definition of work patterns/shift rotas.					
4 On-the-job control of daily work activities.					
5 Competence requirements for work tasks.					
6 Assessment of operator training needs.					
7 Allocation of day-to-day work priorities.					
8 Implementation of first-level discipline.					
9 Communication of operational information.					
10 Measurement of operational performance.					

C. Company Leadership Style

Please consider the following statements and then indicate which description most closely describes your organisation's style of management for operators (Management refers to managers and/or supervisors):

Management make decisions and operators implement them	Management present suggestions and invite questions from operators	Management present problems and invite suggestions from operators	Management allow operators to work within defined operational limits	Management allow operators complete freedom of action

D. Inputs to Supervision Process

Please indicate the level of importance your organisation assigns to the following issues ***in order to ensure that its current method of supervision is successful.***

Issue	Not important	Slightly important	Fairly important	Reasonably important	Very important
***Operator** attributes:*					
1 Problem-solving skills					
2 Willingness to take responsibility for work					
3 Self-motivation					
4 Decision-making capabilities					
5 Positive attitude towards health and safety					
6 Willingness to be accountable for actions					
Support provided to supervisors/lead operators/self-managed teams:					
1 Provision of time-management training					
2 Communication route for resolving issues					
3 Day-to-day management support					
4 Provision of mentor or coach					
5 High level of plant automation					
6 On-call manager for emergencies					

E. Frequency of Health and Safety Meetings

Indicate the frequency with which *formal* health and safety communication meetings take place between managers/supervisors and operators:

Daily:-	[ ]	Weekly:-	[ ]	Monthly:-	[ ]
Quarterly:-	[ ]	Yearly:-	[ ]	Never:-	[ ]

F. Outputs from Supervision Process

Please indicate how well your organisation feels that it achieves the following outputs ***with its current method of supervision***.

Outputs	Very well	Well	Neither/nor	Badly	Very badly
1 Improved operator capabilities					
2 Increased motivation of operators					
3 Improved career development for operators					
4 Increased level of safe behaviour by operators					
5 Reduced level of conflict between operators					
6 Improved control of organisational risks					
7 Higher productivity levels					
8 Improved health and safety performance					
9 Improved level of accountability					
10 Increased flexibility of operations					
11 Improved control for emergency situations					
12 Reduced complaints from near neighbours					
13 Reduced concern over operation by regulator					
14 Reduced likelihood of major incident					
15 Improved customer satisfaction					

G. Accident and Incident Reporting

Please indicate all of the following reporting systems that you have in place

RIDDOR reportable [ ]

All accidents/ill-health [ ]

All abnormal situations [ ]

Other (please specify):

H. Changes in Method of Supervision

Has the method of supervision of operators in your organisation changed in the last 5 years?	YES: ☐	NO: ☐

If you responded **YES** to the above question, please indicate the previous method of supervision:

	Type of activity	
Operators:	High risk	Low risk
Groups of operators with non-working supervisors:	☐	☐
Groups of operators with working supervisors:	☐	☐
Groups of operators with lead operators:	☐	☐
Groups of self-managed operators:	☐	☐
Other: (specify) ……………………………………	☐	☐

If you responded **YES**, please also indicate below the three most important reasons for making the change to your present system of supervision:

1. ……………………………………………………………………………………………………

2. ……………………………………………………………………………………………………

3. ……………………………………………………………………………………………………

I. Use of Self-Managed Teams

	Activity		
If your organisation does not currently use self-managed teams would they consider their use for the control of core activities?	High risk:	YES: ☐	NO: ☐
	Low risk:	YES: ☐	NO: ☐

If you responded **NO** to either of the risk options, please list the three most important reasons why not?

1. ……………………………………………………………………………………………………

2. ……………………………………………………………………………………………………

3. ……………………………………………………………………………………………………

J. Issues Influencing Method of Supervision

Please indicate how important your organisation considers each of the following issues to be when deciding on the method of supervision used for operational activities.

Issue	Not important	Slightly important	Fairly important	Reasonably important	Very important
1 Compliance with health and safety legislation					
2 Ability to demonstrate effective risk control					
3 Competence of available operators					
4 Views of industry pressure groups					
5 Corporate image of organisation					
6 Operational costs					
7 Compliance with industry standards					
8 Competence of managers/supervisors					
9 Compliance with environmental legislation					
10 Impact of operations on near neighbours					

Thank you for the time you have taken to complete this questionnaire; please return your completed questionnaire to:

Dr Colin Fuller / Dr Luise Vassie

Health and Safety Research Group

University of Leicester

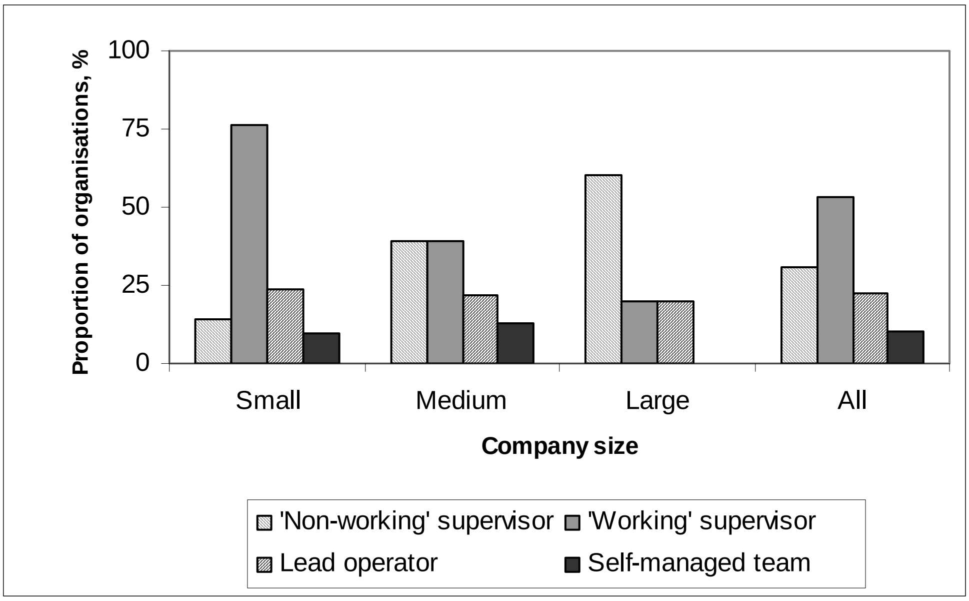
154 Upper New Walk

LEICESTER

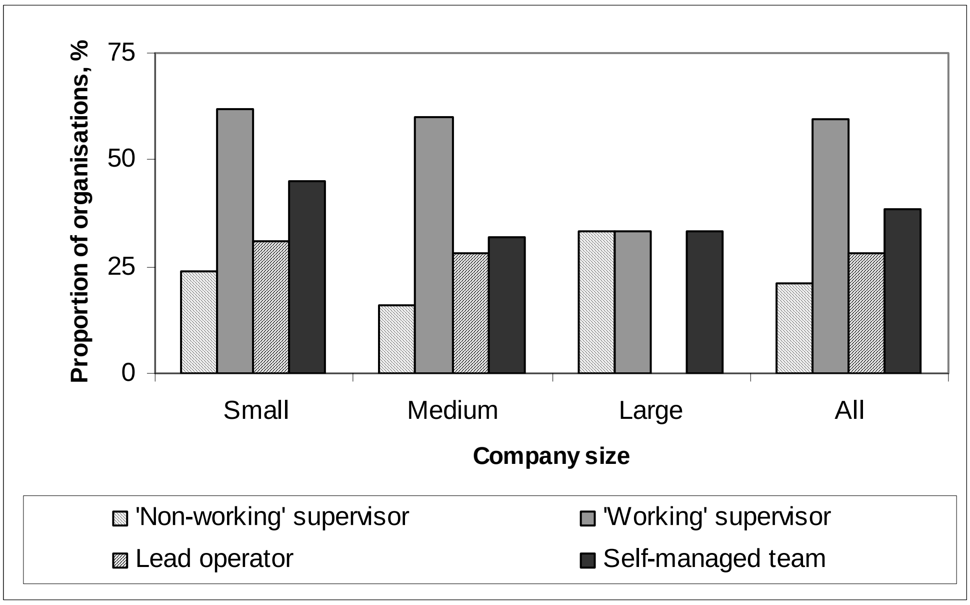
LE1 7QA

APPENDIX 2: Employee supervisory styles as a function of organisational size

2A: High-risk activities:

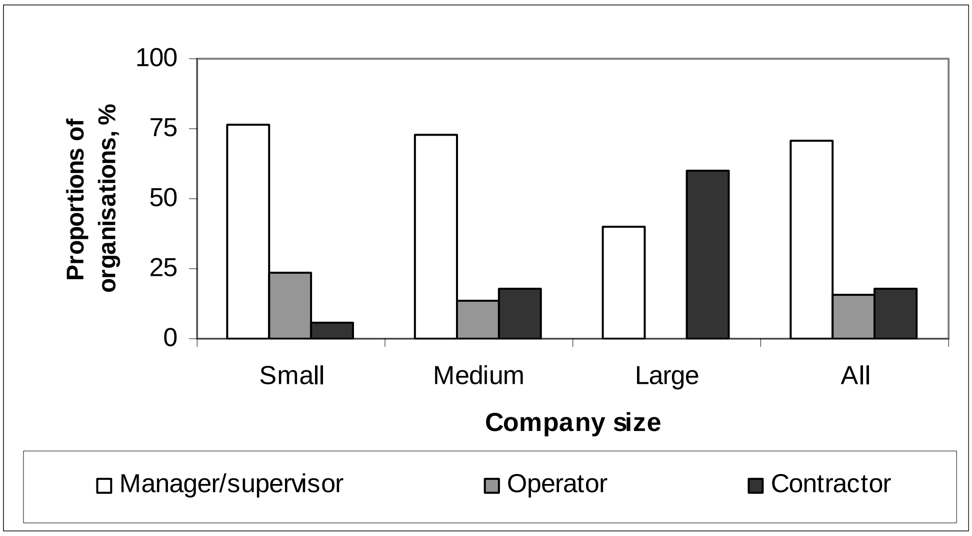


2B: Low-risk activities:

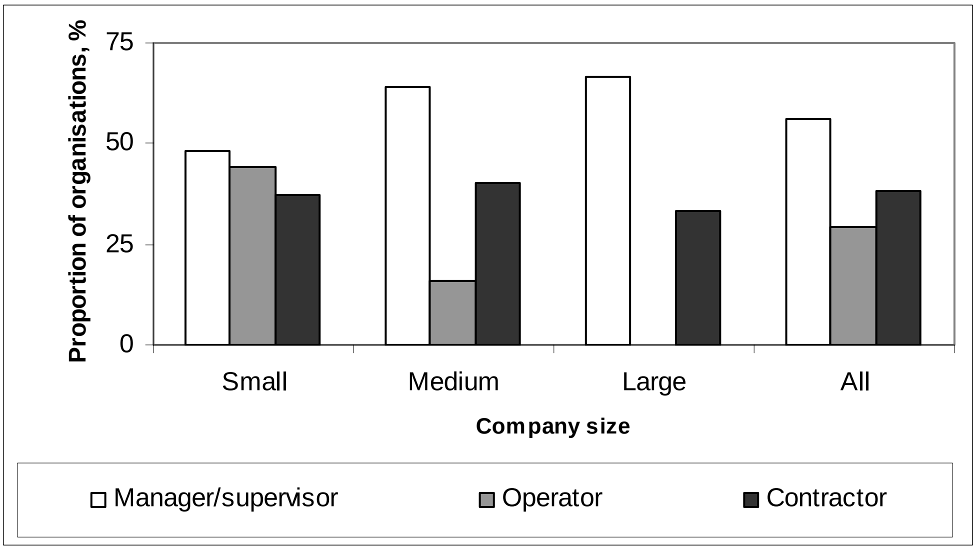


APPENDIX 3: Contractor supervisory styles as a function of organisational size

3A: High-risk activities:

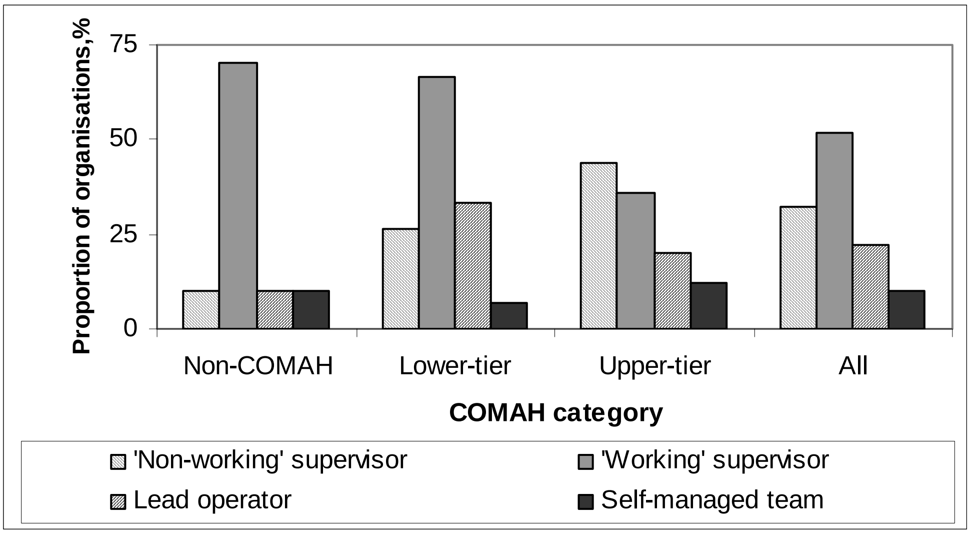


3B: Low-risk activities:

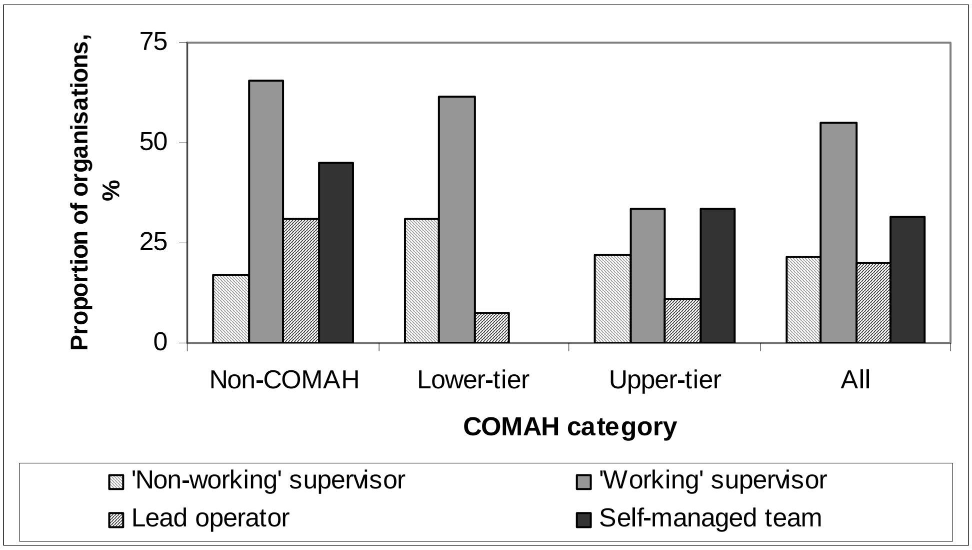


APPENDIX 4: Employee supervisory styles as a function of COMAH category

4A: High-risk activities:

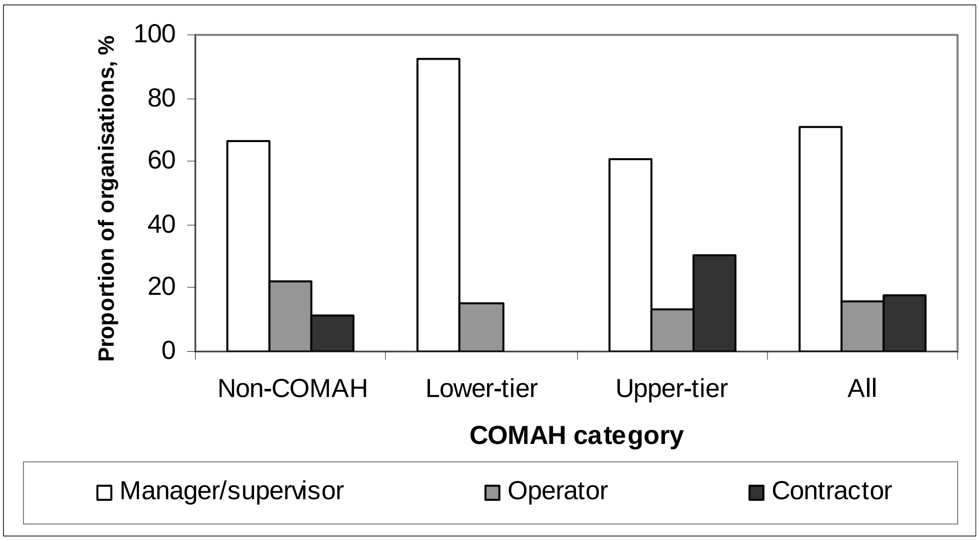


4B: Low-risk activities:

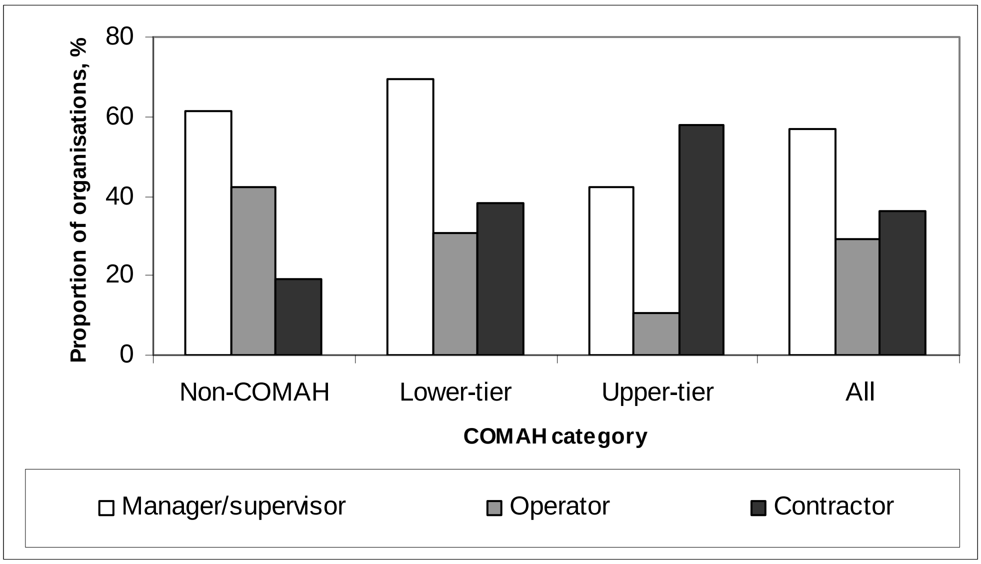


APPENDIX 5: Contractor supervisory styles as a function of COMAH category

5A: High-risk activities:

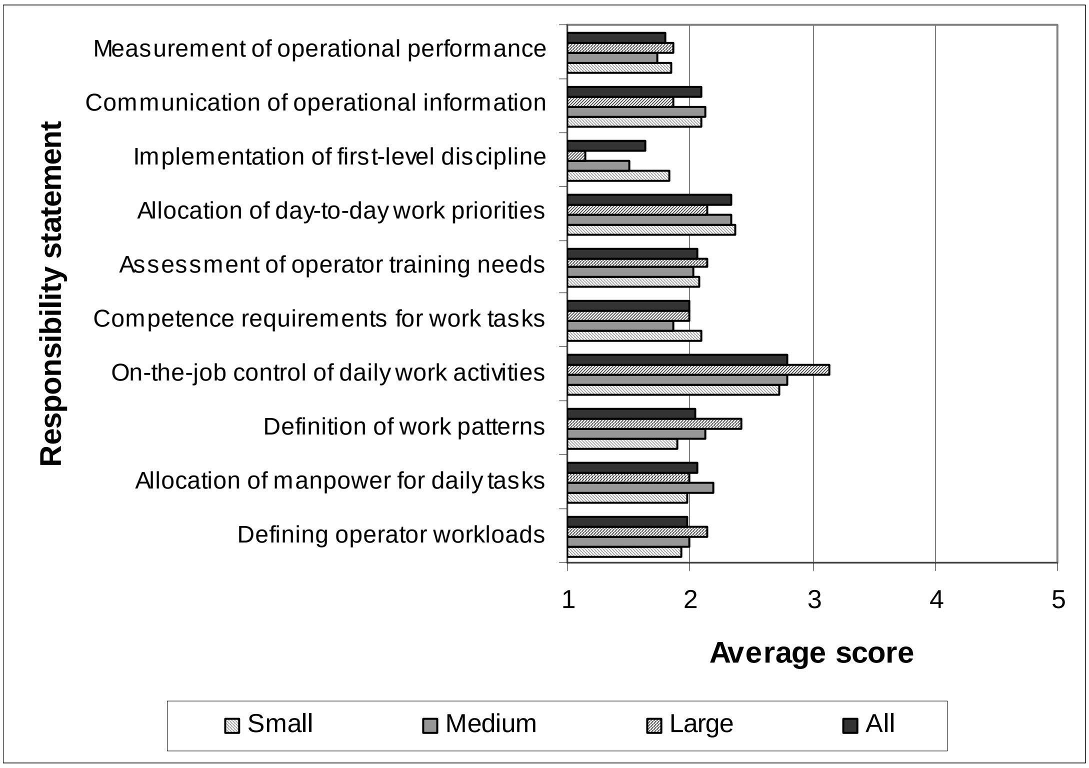


5B: Low-risk activities:

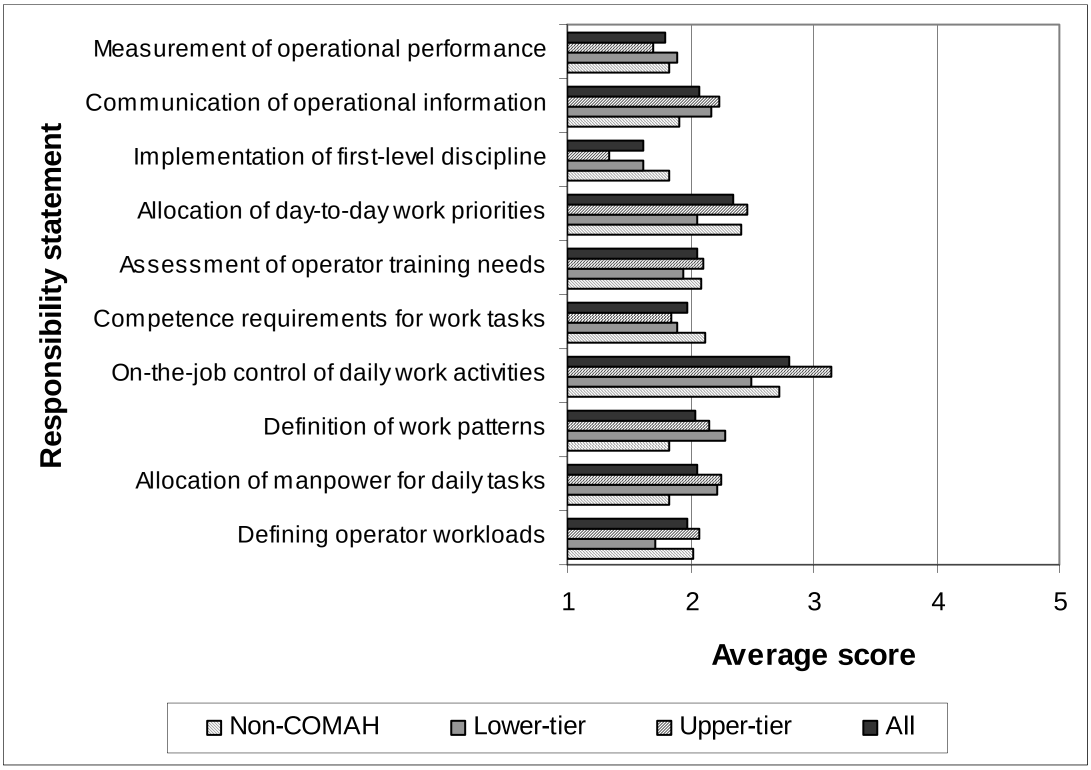


APPENDIX 6: Management / operator responsibilities

6A: Organisational size:

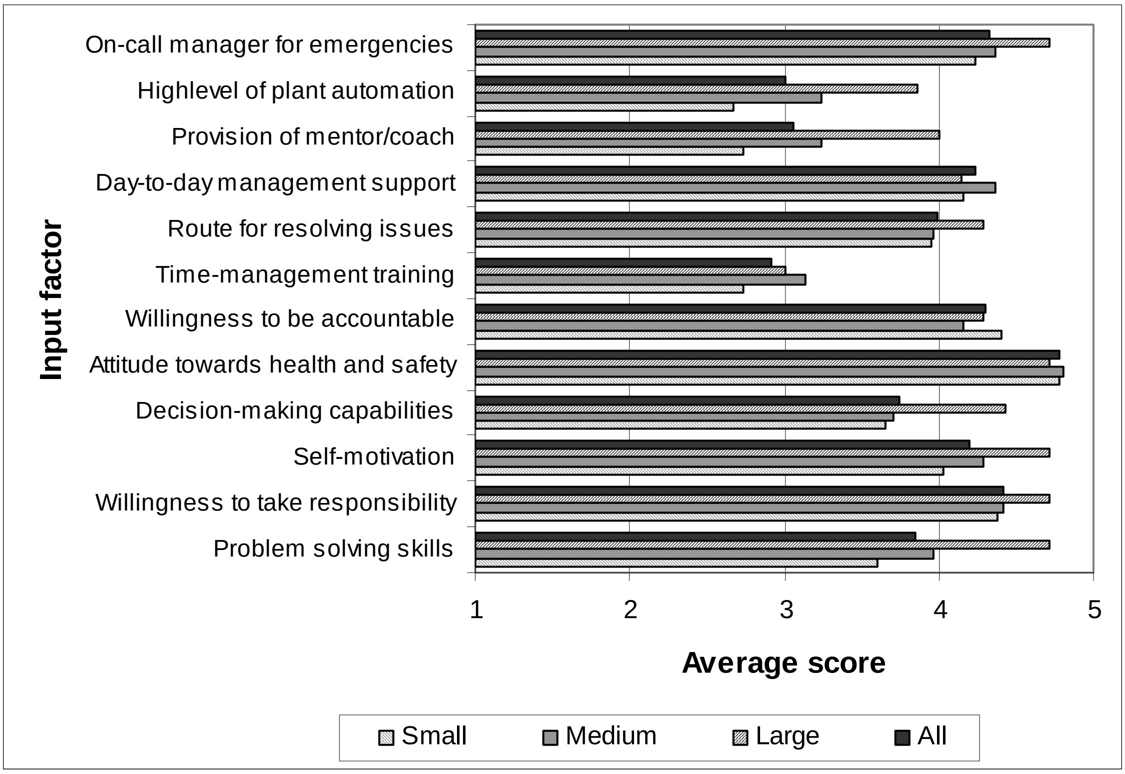


6B: COMAH category:

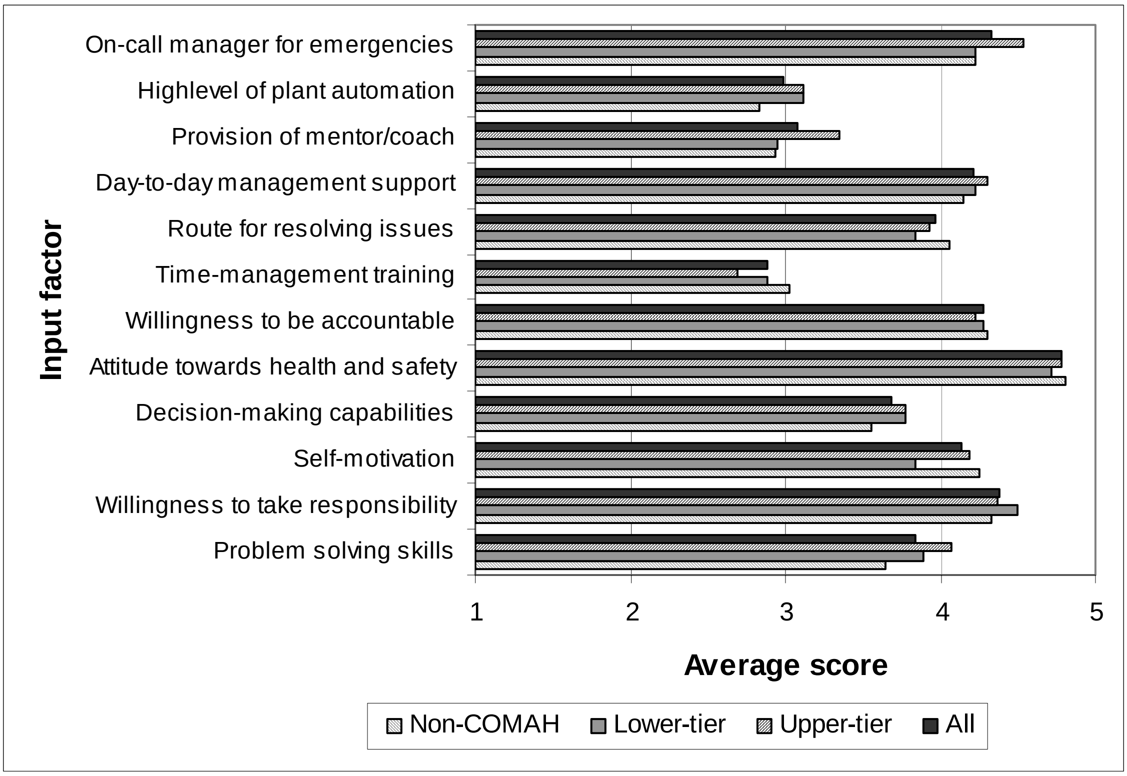


APPENDIX 7: Perceived importance of inputs

7A: Organisational size:

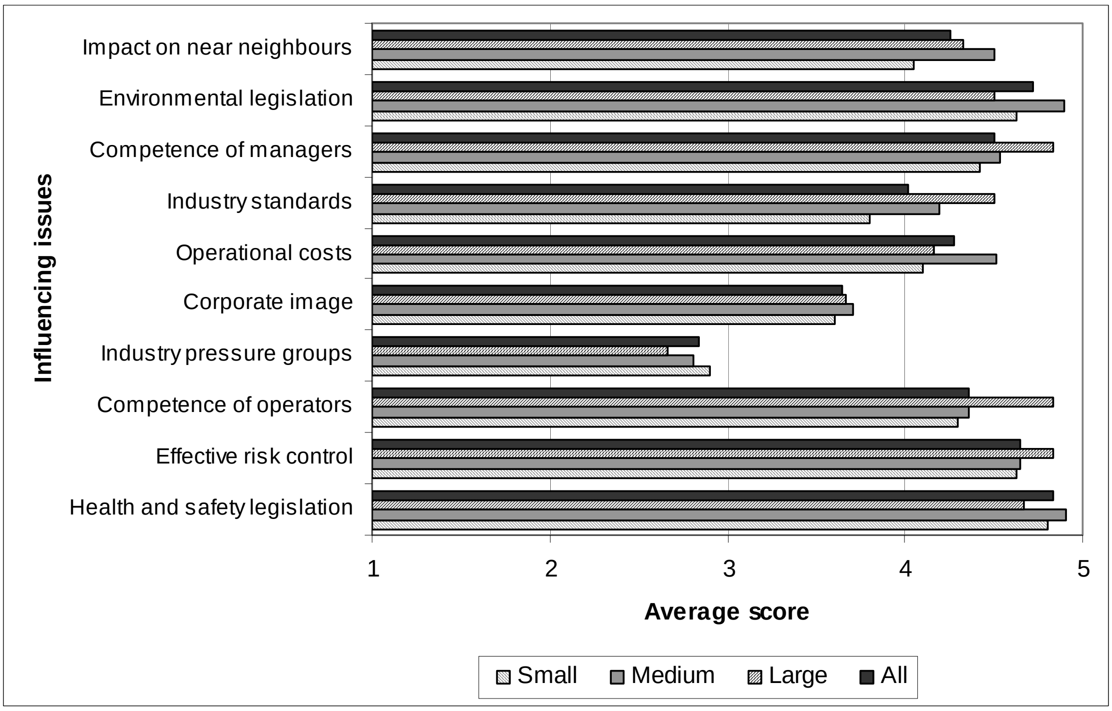


7B: COMAH category:

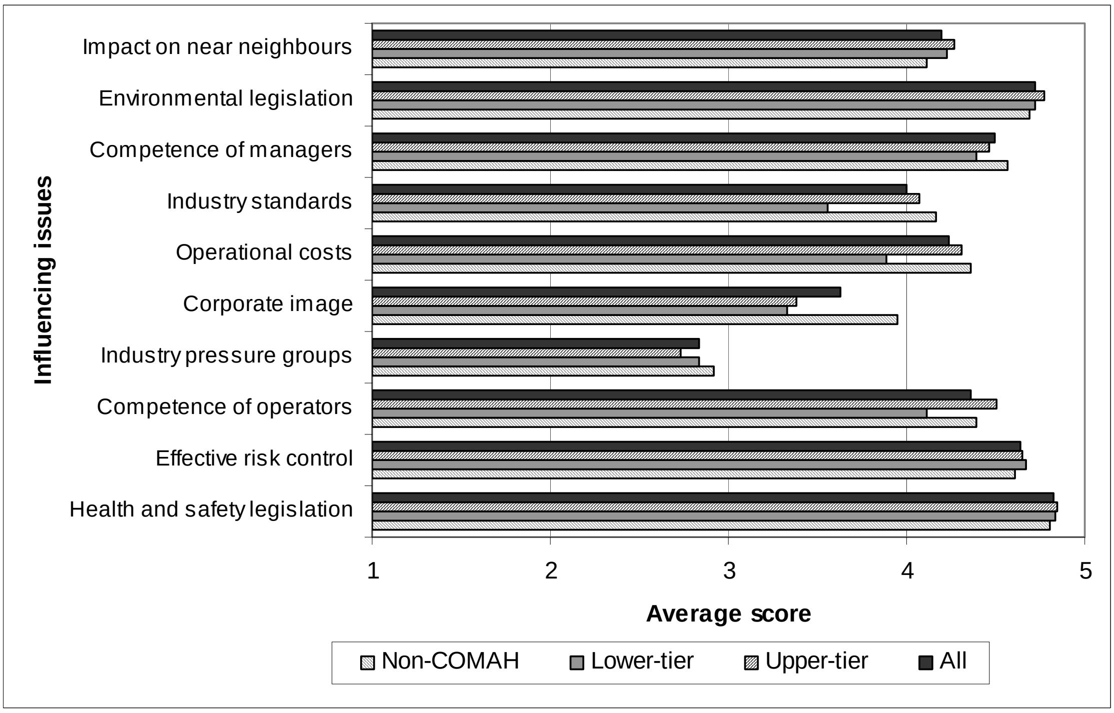


APPENDIX 8: Perceived importance of influencing factors

8A: Organisational size:

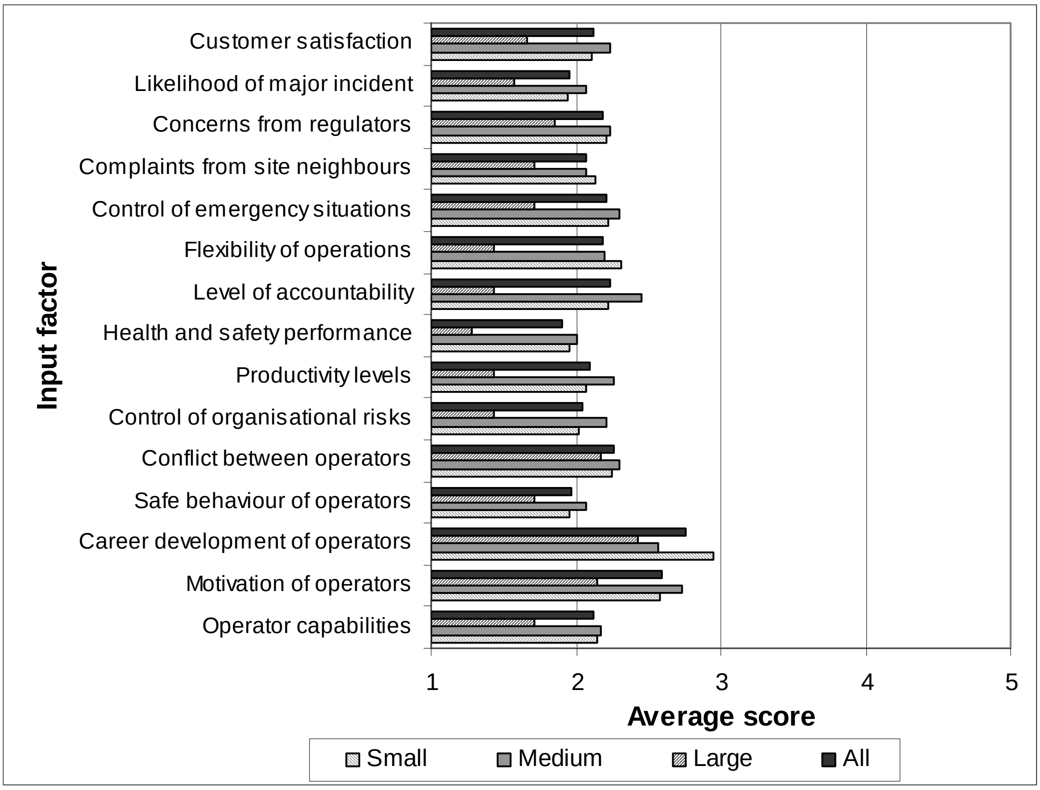


8B: COMAH category:

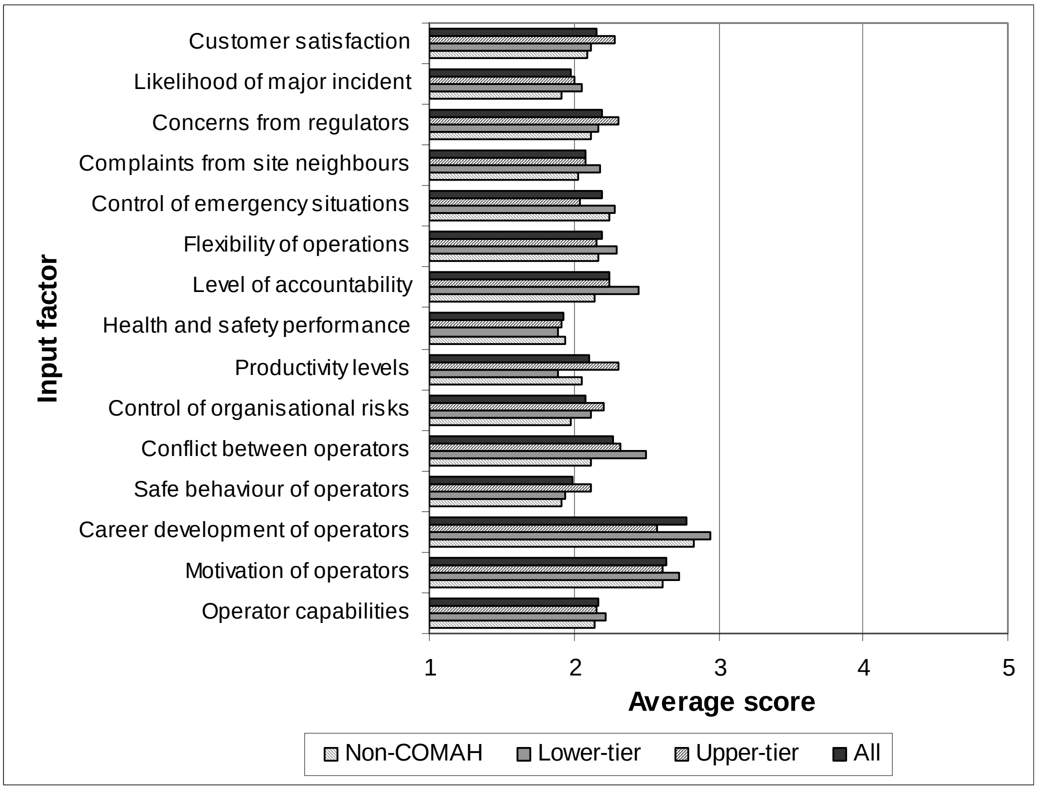


APPENDIX 9: Perceived level of achievement of outputs

9A: Organisational size:



9B: COMAH category:



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