



Management of occupational safety and health

**An Analysis of the findings of the European Survey
of Enterprises on New and Emerging Risks
(ESENER)**

**European Risk Observatory
Report**

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Report

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Contents

Foreword	7
Abbreviations and acronyms	9
Executive summary	11
1. Introduction	13
1.1. Description of ESENER	13
1.2. The aim of this report	13
2. Understanding the importance of the management of occupational safety and health	14
2.1. Management of occupational safety and health	14
2.1.1. Work-related risks to health and safety	14
2.1.2. Costs of poor health and safety at work	16
2.1.3. European action to tackle health and safety risks at work	16
2.1.4. More recent approaches to occupational safety and health management	16
2.1.5. The effectiveness of occupational safety and health management	17
2.2. Occupational safety and health management systems	18
2.2.1. Characteristics of occupational safety and health management systems	18
2.2.2. Mandatory and voluntary occupational safety and health management systems	19
2.2.3. Effectiveness of voluntary and mandatory occupational safety and health management systems	20
2.3. Factors associated with the effectiveness of occupational safety and health management systems	21
2.3.1. Cultural, managerial, and operational factors and performance of occupational safety and health management systems	21
2.3.2. Barriers to effective occupational safety and health management systems	21
2.3.3. Enterprise characteristics and occupational safety and health management systems	23
2.4. Summary	27
3. Towards a conceptual framework for managing occupational safety and health	28
3.1. A conceptual framework for occupational safety and health management	28
3.2. The conceptual framework and the empirical analysis of the ESENER data	30
3.3. Summary	32
4. Analysing the ESENER data on managing occupational safety and health	32
4.1. The empirical approach	32
4.1.1. The conceptual framework and empirical analysis	33
4.1.2. An index of occupational safety and health management	33

4.2. Characteristics of the establishment and their relationship to the occupational safety and health index	34
4.2.1. Country context, size, industry and the management of occupational safety and health	34
4.2.2. The size of the establishment and occupational safety and health management	35
4.2.3. Industries and occupational safety and health management	35
4.2.4. Reporting of aspects of occupational safety and health management and country context	36
4.2.5. Independent establishments relative to those part of a larger establishment	37
4.2.6. Private establishments and occupational safety and health management measures	37
4.2.7. Demographics of establishments and reporting of occupational safety and health management measures	38
4.2.8. Looking at combinations of factors	40
4.2.9. Looking in more detail at components of the index	41
4.3. Additional findings	44
4.3.1. The management of occupational safety and health compared to the management of psychosocial risks	44
4.3.2. The employee's and manager's perspectives in ESENER	44
4.4. Summary	48
5. Discussion of what the survey can tell us	49
5.1. Inherent limitations of the survey	49
5.1.1. Weaknesses common to surveys like ESENER and the empirical analysis undertaken	49
5.1.2. The coverage in the survey of questions on the management of OSH	49
5.1.3. Outcome information in ESENER	50
5.1.4. ESENER and informal procedures and organisational culture	50
5.2. Summary	50
6. Towards policy recommendations	51
6.1. Main findings	51
6.1.1. The empirical analysis and the use of OSH management systems	51
6.1.2. Frequency of OSH practice	51
6.1.3. Size	51
6.1.4. Practice in industry	52
6.1.5. The country context	52
6.1.6. Other variables	54
6.1.7. An index for managing occupational health and safety and outcomes in ESENER	54
6.1.8. ESENER and the perspectives of employee representatives and managers	55
6.2. Summary	55
7. References	56

Lists of figures and tables

Figure 1: Number of serious accidents at work per 100 000 persons in employment	14
Figure 2: Number of fatal accidents at work per 100 000 persons in employment	15
Figure 3: Gallagher's typology of OSHMSs	24
Figure 4: Drais' typology of OSHMSs	25
Figure 5: A conceptual framework for implementation	29
Figure 6: OSH composite score	33
Figure 7: Size and OSH composite score	35
Figure 8: Industry and OSH composite score	36
Figure 9: Country and OSH composite score	36
Figure 10: Status of establishment and OSH composite score	37
Figure 11: Sector and OSH composite score	38
Figure 12: Gender composition and OSH composite score	38
Figure 13: Non-nationals in an establishment and OSH composite score	39
Figure 14: Age composition and OSH composite score	39
Figure 15: OSH management measures reported by size of establishments in a selection of countries	41
Table 1: Facilitators and barriers to effective OSHMSs	22
Table 2: Different approaches to OSHMSs	27
Table 3: Linking ESENER questions to aspects of the conceptual framework	30
Table 4: Quantification of the impact of single predictors (Model 4, all establishments)	34
Table 5: Predicted OSH scores by country, industry and size	40
Table 6: Frequency of components of OSH index per size of establishment	42
Table 7: Frequency of components of OSH index per specific country	42
Table 8: Frequency of components of the OSH index per size of establishments in Sweden	43
Table 9: Frequency of components of OSH index per size of establishments in Germany	43
Table 10: Frequency of components of OSH index per size of establishments in Greece	44
Table 11: Comparison of MM and ER perspectives	45
Table 12: Comparison of MM and ER perspectives: MM155 v ER200	45

Table 13: Comparison of MM and ER perspectives: MM156 v ER202	46
Table 14: Comparison of MM and ER perspectives: MM161 v ER207	47
Table 15: Comparison of MM and ER perspectives: MM159 v ER214	47
Table 16: OSH scores compared outcome information in EWCS 2010	54
Box 1: Main principles of the 1989 EU Framework Directive (89/391/EEC)	17
Box 2: Structure of a universal OSHMS	18
Box 3: OSH control strategies and OSH management styles	23

Foreword

Successful management of occupational safety and health (OSH) starts with a general assessment of the risks involved. The 1989 Framework Directive (89/391/EEC) placed this responsibility clearly on the shoulders of the employer as they know and control the work processes and are, therefore, best placed to identify and tackle workplace hazards. However, risk assessment is only the starting point and it needs to be embedded in an organisational context that involves genuine commitment from top-level management and effective involvement of employees, along with appropriate policies, procedures, preventive measures and resources. The approach at workplace level is, in turn, influenced by the wider context that includes OSH regulations, access to specialist expertise, knowledge of new and emerging risks, industrial relations, etc. EU-OSHA's 2009 workplace survey (ESENER) set out to investigate these aspects of health and safety management with the aim of comparing the approaches across Europe and of identifying ways in which OSH management can be improved. In addition to its focus on the management of health and safety in general, ESENER also examined worker participation and the management of psychosocial risks.



This report exploits the rich data that ESENER collected through its 36 000 telephone interviews with managers and worker representatives in establishments with 10 or more employees across 31 countries. Following up on the initial descriptive overview of results published in 2010, this report is based on a more focused in-depth investigation of the data and comprises one of four 'secondary analysis' reports that are being published together with a summary available in 24 languages.

The findings of the authors of this report show that workplaces across Europe generally take a coherent, systems-based approach to OSH management, in line with the goal of the Framework Directive. As expected, however, the level of preventive action varies according to a number of factors, the most important of which is the size of the establishment. Of interest, particularly to policymakers and researchers, is how, in some countries, even the smallest workplaces have a high level of preventive action, whereas, in others, the level tails off very rapidly with decrease in size. The report highlights the importance of high-level management commitment, as well as the involvement of line managers and all other employees (particularly through representatives) and these issues form the basis of our 2012–13 Healthy Workplaces Campaign — Working together for risk prevention.

Christa Sedlatschek

Director
European Agency for Safety and Health at Work (EU-OSHA)

Abbreviations and acronyms

EC	European Commission
EMS	Environmental Management System
ESAW	European Statistics on Accidents at Work
ESENER	European Survey of Enterprises on New and Emerging Risks
EWCS	European Working Conditions Survey
EU	European Union
EU-OSHA	European Agency for Safety and Health at Work
Eurofound	European Foundation for the Improvement of Living and Working Conditions
H&S	Health and Safety
HSE	Health and Safety Executive
ILO	International Labour Organisation
INRS	Institut National de Recherche et de Sécurité
ISRS	International Safety Rating System
JHSC	Joint Health and Safety Committee
MASE	Manuel d'Amélioration Sécurité des Entreprises
OSH	Occupational Safety and Health
OSHAS	Occupational Safety and Health Assessment Series
OSHM	Occupational Safety and Health Management
OSHMS	Occupational Safety and Health Management System
QAMS	Quality Assurance Management System
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences
SMEs	small and medium-sized enterprises



Executive summary

The European Agency for Safety and Health at Work (EU-OSHA) commissioned RAND Europe to conduct an empirical analysis of the findings collected in the European Survey of Enterprises on New and Emerging Risks (ESENER) managed by EU-OSHA on the factors associated with the effective management of occupational safety and health (OSH).

There were five main research goals guiding the work presented in this report:

- to identify sets of practices from ESENER data that are associated with effective management of OSH;
- to define a typology for establishments according to their characteristics (country, size, age, sector or industry);
- to draw on scientific knowledge and information on the regulatory and business environment to explain the ‘context features’ that have greatest influence on establishments’ commitment to effective management of OSH;
- to understand the similarities or differences between the employers’ and employee representatives’ perspectives; and
- to discuss the policy implications arising from the empirical analysis.

The analysis included a literature review and modelling of the ESENER data. The literature review aimed to identify relationships between variables that could be tested in the modelling phase and to propose a conceptual framework to guide the analysis, while the modelling, which took the form of factor analysis, was to understand associations between relevant aspects of the management of OSH. These aspects of OSH were identified by mapping the ESENER questions on our conceptual framework. Knowledge of the associations informs the development of an index of OSH management, against which we can test a range of independent variables such as the size of establishment, country, demographic variables and industry sector. Our empirical findings were based on the analysis of these relationships. The modelling had some limitations inherent to large-scale survey analysis, such as non-response and attributing causality. Another issue was the absence of outcome measures from ESENER. As such, we can comment on reported OSH management practices, but cannot comment on the extent of their implementation or on their effectiveness.

Our literature review discussed the underlying and perceived problem of occupational health and safety in the workplace and developments in the area of OSH management.

The following were the main findings.

- Rates of injuries and ill health have decreased over the last few decades. Nonetheless, workers report persistent and emerging work-related risks to health and safety in the workplace. Poor health and safety, in addition to physical and emotional harm, has cost implications for the individual, the workplace and wider society;
- Initiatives have focused on promoting more effective OSH management approaches. These approaches have shifted markedly from traditional regulatory approaches to approaches focusing on employers and employees taking more ownership of OSH and incorporating it into the management of an establishment. These approaches can loosely be grouped as OSH management systems.
- Despite the increasing popularity of the concepts of OSH management and OSH management systems among stakeholders of OSH — principally regulators, employers, workers, and health and safety agencies — there is a lack of robust scientific evidence on its effectiveness in terms on OSH and other outcomes.
- The literature has, nevertheless, identified some factors associated with effective management of OSH.

Our analysis took the basic steps of an OSH management system as a starting point. These steps include: policy development; organisational development; planning and implementation; measuring and assessing the main risks to the organisation; and measuring the effectiveness of OSH interventions. This framework informed the development of the empirical analysis.

The following were the main findings of the empirical analysis.

- The empirical analysis shows that, on the whole, establishments appear to be taking systems-based approaches to the management of OSH.
- The most frequently reported components of the index are the implementation of an OSH policy, discussion of OSH in high-level management meetings, the involvement of line managers in OSH management and regularly carrying out risk assessment. The least frequent are the use of health and safety services (e.g. ergonomic support); the analysis of reasons for absence; whether health and safety information is used to inform or improve OSH management; and the existence of a health and safety representative.
- The reported management of general OSH in European establishments appears to be better than the management of psychosocial risks.

- The size of establishment, industry and location (country) are the variables most strongly associated with a broader scope of OSH management. As might be expected, smaller establishments clearly report fewer OSH management measures compared to larger establishments (Figure 2). However, it is important to note that the number of measures decreases with establishment size at a much faster rate with less than 100 employees.
- OSH management indicators are more widely reported in industries such as construction, mining and health and social work, as opposed to public administration and real estate. A more detailed analysis reveals the country context as the most significant factor in determining the presence of preventive measures.
- In particular, countries with better OSH management practice tend to have smaller differences in reported OSH practice between smaller and larger establishments than countries reporting less OSH practice, and show much higher rates of reporting of OSH practice on less frequently reported practice in the overall ESENER sample across size ranges.
- From our more detailed analysis, there are pockets of minimal presence of OSH management in specific countries and at small establishment sizes.
- The status of an establishment is less important but still significant, with independent establishments reporting fewer OSH management measures compared to those that are part of a larger entity.
- Other demographic variables are less significant in explaining differences in reporting of OSH management measures.
- From these empirical findings, we can derive a number of policy implications.
- ESENER indicates that when firms address OSH they tend to do so using a coherent, systems-based approach, rather than picking and choosing specific measures; this provides support for the effectiveness of the goal-setting regulatory approach set out in the 1989 Framework Directive (89/391/EEC). While ESENER indicates generally high levels of OSH management across Europe, the very rapid fall-off with decreasing establishment size and the significant variation between countries needs to be addressed.
- The empirically visible differences in OSH scores between countries appear to reflect differences in the scope of OSH management. Basic management would include formal compliance with regulatory requirements to undertake risk assessment, discussing and drafting an OSH policy, and line managers' involvement in OSH management. More active or involved management would include the use internal and external services for the provision of health and safety services, support for the return to work after sickness, analysis of absenteeism data, and the use of external information to inform OSH policy.
- The evidence shows that in some countries and sectors even the smallest establishments report high levels of OSH management practice, which suggests that if a sufficiently 'favourable' environment can be created, the extent of OSH management among smaller establishments (especially those with fewer than 100 employees) could be substantially increased. However, nationally comparable research is needed to identify the key conditions that contribute to this 'favourable' environment.
- OSH management practice appears to follow the traditional perceptions of risks and technological innovation, with establishments in traditionally 'high risk' industries and those in technology-intensive industries reporting higher levels of OSH practice. However, particularly in light of emergent or growing problems, such as musculoskeletal disorders, stress, violence and harassment, the comparatively low levels of OSH management in certain (particularly service-oriented) sectors needs to be addressed.
- Policymakers intent on promoting a wider uptake of OSH management practice across establishments in Europe need specifically to target small, independent establishments in particular countries that operate in industries traditionally not at risk of health and safety problems. Those organisations are at highest risk of not having developed OSH practice.
- Targeting these establishments requires a solid understanding of the most significant country-specific factors explaining differences between establishments. These include the nature of inspections, the availability of public support and training, the provision of information, and wider economic conditions, industrial relations, and organisational culture.

1. Introduction

1.1. Description of ESENER

In June 2009, fieldwork was completed on EU-OSHA's establishment survey on health and safety at the workplace in the EU-27 and four other countries — Croatia, Norway, Switzerland and Turkey. The European Survey of Enterprises on New and Emerging Risks (ESENER) aims to assist workplaces to deal more effectively with health and safety and to promote the health and well-being of employees by providing policymakers and wider stakeholders, such as employee representatives and employers, with cross-nationally comparable information relevant for the design and implementation of new policies.

ESENER consists of two surveys: the first aimed at the most senior managers involved in the management of occupational safety and health; and the second aimed at employee representatives dealing with occupational safety and health. The survey asks managers and workers' representatives about the way that health and safety risks are managed at their workplace. In asking questions directly to managers and employee representatives, ESENER aims to identify important success factors and to highlight the principal obstacles to effective prevention. As well as investigating what enterprises do in practice to manage occupational safety and health (OSH), the survey examines what the main reasons are for taking action and what further support is needed.

ESENER consists of computer-assisted telephone interviews with 28 649 managers and 7 226 employees across 31 countries, the EU-27 and Croatia, Norway, Switzerland, and Turkey. It covers private and public sector organisations with more than 10 employees. The statistical unit of analysis is the individual establishment, rather than overarching company structures such as holding companies. The organisations span all sectors of economic activity except for agriculture, forestry and fishing.

EU-OSHA's aim in conducting the ESENER survey was to ⁽¹⁾:

- inform OSH strategies at national and EU level by creating a snapshot in time of where effective management seems to take place and where not;
- improve the effectiveness of policymaking by understanding the hurdles and barriers to effective management;
- provide better and more targeted support for enterprises by associating specific issues in OSH management to specific characteristics of organisations such as size and sector;
- ensure more efficient communication through the better targeting of information provision.

⁽¹⁾ Taken and adapted from EU-OSHA presentation delivered by Eusebio Rial González in Bilbao, 17 November 2010.

1.2. The aim of this report

This report provides an analysis of the findings collected in ESENER on the management of occupational safety and health. The data analysis is informed by a literature review on the issue of OSH management and effective ways of managing OSH. The latter produced a conceptual framework on how to manage OSH systematically and more effectively. This framework was used to design the empirical analysis.

The analysis in this report had five goals:

- to identify sets of practices from ESENER data that are associated with effective management of OSH;
- to define a typology for establishments according to their characteristics (country, size, age, sector or industry);
- to draw on expert knowledge to explain the context features that have greatest influence on establishments' commitment to effective management of OSH;
- to understand the similarities or differences between the employers' and employee representatives' perspectives; and
- to discuss the policy implications arising from the analysis.

This report, as such, does not reflect on how the survey instrument was designed, the sampling, response rates, representativeness, and the way the data was collected. These aspects are described in a report ⁽²⁾ by TNS Infratest Sozialforschung, Germany, the organisation that managed the design, sampling, and implementation of the survey across 31 countries on behalf of EU-OSHA.

This report has four substantive sections: Chapter 2 contains the literature review; Chapter 3 introduces the conceptual framework used to inform the empirical analysis; Chapter 4 presents the main findings from the empirical analysis; and Chapter 5 offers conclusions and discusses policy implications arising from the results. The research approach used for this report is outlined in Appendix A (http://osha.europa.eu/en/publications/reports/esener_management_annexes/view), the technical note on the empirical analysis. Appendix B describes how the literature review was conducted.

The report is a sister report to the report produced by RAND Europe 'Psychosocial risk management — analysis of data from the European Survey of Enterprises on New and Emerging Risks (ESENER)'. It used a similar research approach to derive findings. As such, this report shares the same structure and certain sections are similar, including the introduction, the sections on research approach, and the section outlining the limitations of ESENER.

⁽²⁾ Available online (<http://www.esener.eu>).

2. Understanding the importance of the management of occupational safety and health

This chapter provides an overview of the literature on occupational safety and health management. It first highlights the main drivers of the development of systematic occupational safety and health management in industrialised countries over the past decades. It then explores the main characteristics of the concept of an ‘occupational safety and health management system’, which has gained increasing attention among the main stakeholders of occupational safety and health. The chapter then finally discusses the implementation of occupational safety and health management systems at the enterprise level.

2.1. Management of occupational safety and health

2.1.1. Work-related risks to health and safety

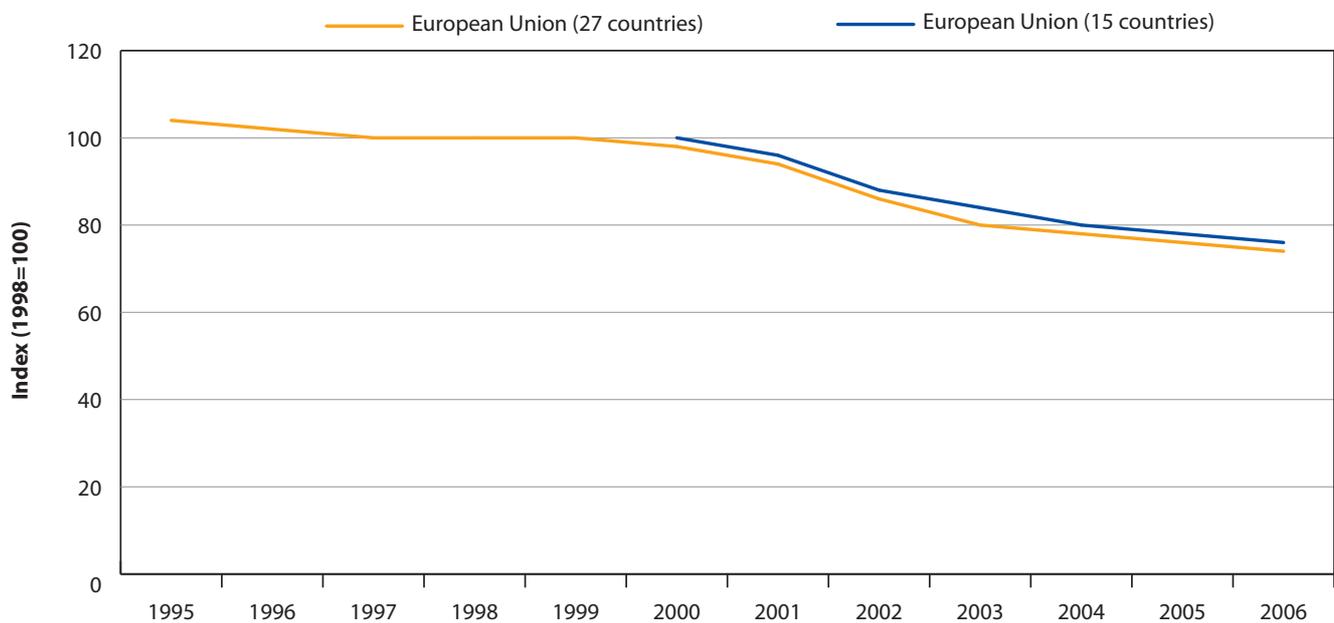
Over the past three decades, growing public concern over the rise of unemployment in many industrialised countries has overshadowed the debate on the ‘quality’ of jobs. Increasing the quantity of jobs was seen as the main priority. In addition, it

could be said that the transition of modern economies towards a post-Fordist productivity model characterised by automation and the rapid rise of services was perceived by many as an evolution towards the end of physical jobs that presented many health and safety hazards and risks (Askenazy, 2004). Statistics on serious and fatal accidents at work at the level of the European Union corroborate these perceptions. They have both followed a downward trend over years in the European Union (Figures 1 and 2).

Although downward trends in fatal and non-fatal accidents at work in many industrialised countries reinforce the perceptions that ‘tough jobs’ are declining, job quality has increasingly gained the attention of policymakers, employers, workers, and other stakeholders over recent years, particularly in the European Union (European Commission, 2008; Hassan et al., 2009; EC, 2008).

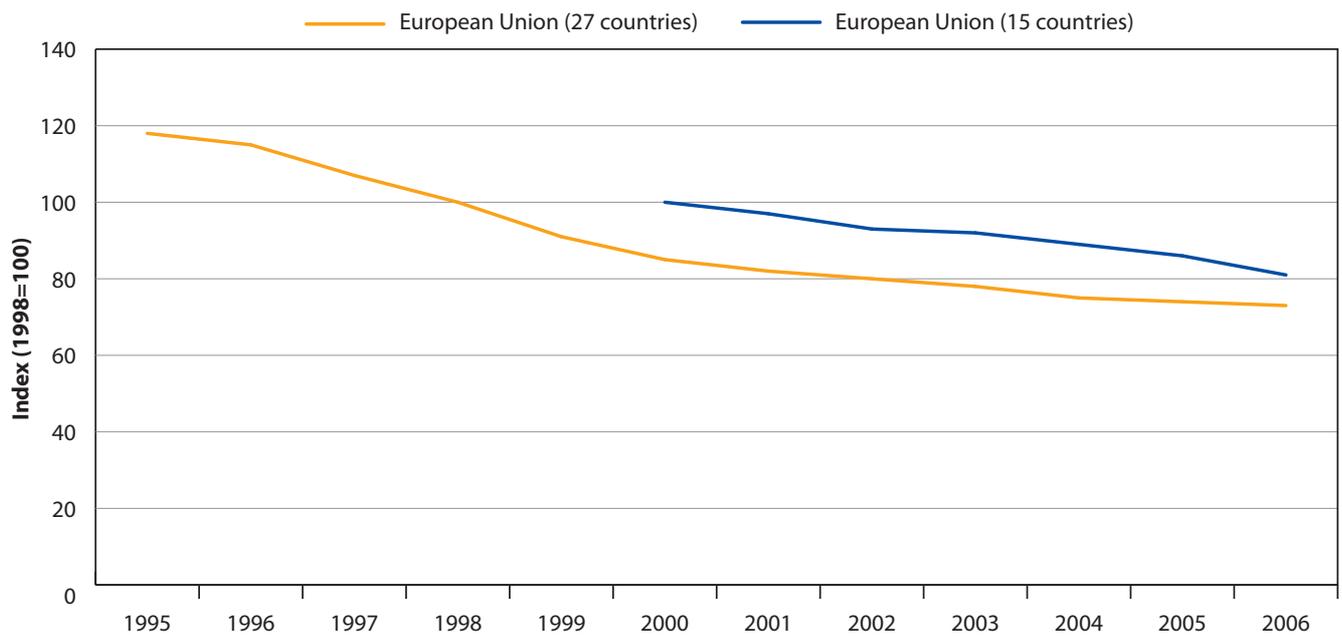
Recent changes in the world of work — including shifting demographic patterns, economic globalisation, and the emergence and diffusion of new technologies — have indeed caused general public concern about the apparent deterioration in job quality in industrialised countries over recent decades (EC, 2008; Karoly and Panis, 2004; EU-OSHA, 2009) and their negative consequences on occupational safety and health (EU-OSHA, 2009; Leka et al., 2008; EU-OSHA, 2002a; EU-OSHA, 2007).

Figure 1: Number of serious accidents at work per 100 000 persons in employment



Source: Eurostat

Figure 2: Number of fatal accidents at work per 100 000 persons in employment



Source: Eurostat

Moreover, many workers across EU Member States still consider that their jobs pose a threat to their health and safety.

Such perceptions are reflected in the results of the fourth and fifth European Working Conditions Surveys (EWCS). These results show that some physical risks such as exposure to vibrations and noise are still prevalent despite a decline in the proportion of the workforce employed in traditional, physically demanding sectors such as manufacturing and agriculture. More generally, these results reveal that physical risks persist across industries: 62–63% (respectively the fourth and fifth EWCS) of European workers report using repetitive hand or arm movements in their work while 46% (consistent results across the fourth and fifth EWCS) feel that they work in painful or tiring positions a quarter or more of the time. One in five workers is exposed to breathing in smoke, powder or fumes and one in three workers reports working at least a quarter of the time in a noisy work environment (Parent-Thirion et al., 2007; taken from EWCS 2010). The initial findings of the fifth European Working Conditions Survey suggest that fewer workers feel that their health and safety is at risk compared to 2005. However, the extent to which they perceive themselves to be at risk of physical hazards is unchanged (Eurofound, 2010).

The exposure to risk factors at work causes real harm to the health and safety of workers in the European Union, as shown by a report of the European Commission presenting a statistical portrait of health and safety in Europe from 1999 to 2007 (EC, 2010).

According to the EU Labour Force Survey 2007 ad hoc module on health and safety at work, 3.2% of workers aged 15–64 had an accident at work in the past 12 months in the European Union. This corresponds to approximately 6.9 million persons in

the European Union. Data from the European Statistics on Accidents at Work (ESAW) showed that 2.9% of workers had an accident at work with more than three days of sickness absence in 2007. In addition, 5 580 workers died in a fatal accident in 2007.

Furthermore, several national working conditions surveys as well as European surveys have highlighted a trend towards the increasing incidence of psychosocial risks at work including stress, bullying or harassment, and violence. Results from the fourth and fifth European Working Conditions Surveys, respectively, show that 4–5% of workers reported having experienced some form of violence, bullying, or harassment in the workplace in the previous 12-month period (Parent-Thirion et al., 2007; taken from EWCS 2010). Finally, according to the fourth European Working Conditions Survey, 22% of those workers who reported that their work affected their health reported that they experienced stress. The increasing importance of psychosocial risks at work, alongside physical risks, has also been underlined by EU-OSHA (EU-OSHA, 2007). For example, the results of a Delphi exercise performed by EU-OSHA in 2003 and 2004 provide interesting insights on the most important emerging psychosocial hazards according to a sample of experts in the field (EU-OSHA, 2007). Most of these hazards are related to new forms of employment contracts and job insecurity, the ageing workforce, work intensification, high emotional demands at work, and poor work-life balance. The mitigation of such risks at work has, therefore, become a key challenge for policymakers and other stakeholders in Europe in order to promote health and well-being at work and increase job quality.

In the European Union, 8.6% of persons aged 15–64 that work, or worked previously, reported a work-related health problem in the

preceding 12 months, according to the EU Labour Force Survey ad hoc module 2007. This corresponds to approximately 23 million persons. In total, 2.1 % of the persons had two or more work-related health problems. Musculoskeletal problems were most often reported as the main work-related health problem (60 %), followed by stress, depression or anxiety (14 %).

2.1.2. *Costs of poor health and safety at work*

Although there is no available estimation of the entire cost to individuals, employers, and society as a whole of poor health and safety at the level of the European Union, statistics on sick leave provide an idea of the magnitude of the problem. According to the EU Labour Force Survey ad hoc module 2007, 73% of accidents at work resulted in sick leave of at least one day and 22 % resulted in sick leave of at least one month. It was estimated that accidents at work resulted in a minimum of 83 million calendar days of sick leave in 2007. This still does not include those workers that expect never to work again and workers that were still on sick leave (EC, 2010). Moreover, work-related health problems resulted in sick leave of at least one day in the past 12 months of 62 % of persons with a work-related health problem, and in sick leave of at least one month of 22 % of persons, as shown by the same survey. It was estimated that work-related health problems resulted in a minimum of 367 million calendar days of sick leave in 2007. This still does not include persons that expect never to work again because of their work-related health problem (EC, 2010).

Detailed estimations of the costs of poor health and safety at work are available in some EU Member States. For example, the Health and Safety Executive estimated the costs to individuals of workplace accidents and work-related ill health to be between GBP 10.1 and GBP 14.7 billion (approximately EUR 11.5 to EUR 16.7 billion) in Great Britain (HSE, 2004; Hassan et al., 2009). These costs include loss of income, extra expenditure in dealing with injury or ill health, and subjective costs of pain, grief and suffering. The consequences of poor health and safety at work are also costly to employers. The Health and Safety Executive estimates the costs to employers of workplace accidents and work-related ill health to be between GBP 3.9 and GBP 7.8 billion (approximately EUR 4.4 to EUR 8.9 billion) in Great Britain. These costs include sick pay, administrative costs, damage from injuries and non-injuries, recruitment costs, and compensation and insurance costs. In addition to the individual and organisational consequences of health and safety issues at work, there are substantial consequences for society as a whole. The Health and Safety Executive estimates the costs to society of workplace accidents and work-related ill health to be between GBP 20 and GBP 31.8 billion (approximately EUR 22.7 to EUR 36.1 billion) in Great Britain. These costs comprise loss of output, medical costs, costs of the Department for Work and Pensions in administering benefit payments, and Health and Safety Executive and local authority investigation costs.

2.1.3. *European action to tackle health and safety risks at work*

EU action on health and safety at work has its legal basis in Article 137 of the Treaty on the Functioning of the European Union

(ex Article 137 TEC). The improvement in health and safety at work started in 1952 under the European Coal and Steel Community, since which several legal measures covering many risks have been adopted. Furthermore, Community action is not restricted to legislation. The European Commission has expanded its activities with European agencies such as the European Agency for Safety and Health at Work and the European Foundation for the Improvement of Living and Working Conditions, in the areas of information, guidance, research, and promotion of OSH.

The Commission's communication *Improving quality and productivity at work: Community strategy 2007–12 on health and safety at work* sets out proposals for further action to improve health and safety at work in Europe. The strategy for 2007–12 aims to achieve a sustained reduction of occupational injuries and illness in the European Union. It sets a target of 25 % reduction of injuries at work through a series of initiatives at both European and national levels in the following main areas (EC, 2007):

- improving current legislation and its practical implementation through non-binding actions, such as exchange of good practices, awareness-raising campaigns and better information and training;
- defining and implementing national strategies tailored to specific national contexts, targeting the sectors and enterprises that are the most affected by occupational injuries and illness and fixing national objectives for reducing the latter;
- the mainstreaming of occupational safety and health in other policy areas such as education, public health, and research and identifying new synergies;
- identifying and assessing potential new risks more effectively.

This policy agenda of the European Commission forms a part of the changes that have influenced OSH strategies in industrialised countries over the past decades.

2.1.4. *More recent approaches to occupational safety and health management*

In the 1970s and early 1980s, several industrialised countries introduced detailed OSH regulatory initiatives aiming to dramatically reduce workplace injuries and work-related ill health, which remained notable despite the rise in standards of living. These initiatives had at least three main principles of government intervention (Frick and Wren, 2000). Firstly, they put an emphasis on the responsibility of employers for OSH policy. Secondly, these initiatives introduced better standards and comprehensive legislation, which were still fragmented in many countries, to improve health and safety at work and to better enforce regulation. Thirdly, they promoted workers' participation in OSH policy.

The traditional OSH strategy of the 1970s and early 1980s, nevertheless, proved to be unsuccessful and inefficient in reducing

workplace injuries and work-related ill health⁽³⁾, because it was mainly a passive and fragmented strategy towards workplace health and safety⁽⁴⁾. Such a traditional strategy, where regulations from government authorities dictate to employers what should be done to reduce workplace injuries and work-related ill health, was replaced in the late 1980s and the 1990s by a new strategy towards the promotion of occupational safety and health management (OSHM), which emphasised how workplace hazards should be identified and tackled from a managerial standpoint (Frick and Wren, 2000; Bluff, 2003). Such a new strategy also represented a shift from prescriptive legislation to a goal-setting philosophy, which is based on the premise that employers (and employees) are best placed to identify hazards and tackle the associated risks.

The new strategy towards OSH management encourages employers (and workers) to take an active and comprehensive responsibility for OSH quality, through a systematic managerial process to tackle workplace injuries and work-related ill health (Frick et al., 2000a; Frick and Wren, 2000; Saksvik and Quinlan, 2003; Walters et al., 2002). Such a process is important in the new strategy towards the promotion of OSHM since it highlights the necessity of having a better integrated and incorporated OSH policy in the management of enterprises.

As from the late 1980s, the concepts of systematic occupational safety and health management (OSHM) and an occupational safety and health management system (OSHMS) — emblematic of the new OSH strategy — gained increased popularity among the main stakeholders of OSH, principally regulators, employers, workers, and health and safety agencies (INRS, 2004a; INRS, 2004b; HSE, 2004; Frick et al., 2000b; Walters, 2002c; Saksvik et al., 2003; Saksvik and Quinlan, 2003).

The development of the new strategy towards OSH management across industrialised countries can be explained by several inter-related strands (Frick et al., 2000a). Firstly, many private consultancies and public authorities have encouraged employers to introduce voluntary OSHM systems to promote health and safety at work. Secondly, there has been an increasing debate at the international level on standards, guidelines, and audits for OSHM systems. Finally, a growing number of countries have introduced mandatory OSHM strategies (Walters and Jensen, 2000; Walters, 2002b; Walters, 2002c). An example of this at European Union level is the publication of the 1989 Framework Directive (89/391/EEC), which defines the key principles for the successful management of health and safety at work, including measures obliging employers to undertake risk assessment and to use preventive services and social dialogue with employees (Box 1). An example of a cross-national approach is ILO's C187 Promotional Frame-

work for Occupational Safety and Health Convention, 2006, which stipulates arrangements for a national system and components of national programmes to manage OSH⁽⁵⁾.

Box 1: Main principles of the 1989 EU Framework Directive (89/391/EEC)

The key principles relating to the prevention and protection of the health and safety of workers are defined in the 1989 Framework Directive (89/391/EEC). It constitutes the basis for all subsequent individual directives in the field of health and safety. The basic objective of the Framework Directive is to encourage improvements in occupational safety and health and it covers all sectors of activity, both public and private. It establishes the principle that the employer has a duty to ensure the safety and health of workers in every aspect related to their work. The employer is obliged to develop an overall health and safety policy, namely by:

- assessing the safety and health risks which cannot be avoided, updating these assessments in the light of changing circumstances, and taking the appropriate preventive and protective measures;
- making a record of the risk assessment and of the list of accidents at work;
- informing workers and/or their representatives about potential risks and preventative measures taken;
- consulting workers and/or their representatives on all health and safety matters and ensuring their participation;
- providing job-specific health and safety training;
- designating workers to carry out activities related to the prevention of occupational risks;
- implementing measures on first aid, firefighting and the evacuation of workers.

The worker, on the other hand, also has several obligations to, inter alia, follow employers' health and safety instructions or to report potential dangers.

The Framework Directive also promotes the workers' right to make proposals relating to health and safety, to appeal to the competent authority and to halt work in the event of serious danger, as part of the participative approach laid down by the Directive.

Source: <http://ec.europa.eu/social/main.jsp?catId=710&langId=en>

2.1.5. The effectiveness of occupational safety and health management

Although OSH management has gained considerable attention among the different stakeholders in OSH in industrialised countries over the past decades, possible positive effects on OSH and

⁽³⁾ As mentioned by Walters et al. (Walters et al., 2002), 'improvement in health and safety performance has reached a plateau in many countries and traditional regulatory approaches towards preventing occupational injuries and ill-health are no longer perceived as primary contributors to further improvement.'

⁽⁴⁾ As stated by Frick and Wren (Frick and Wren, 2000) 'Employers and their managers did not control OSH quality but, at best, waited to be told what to do about each hazard.'

⁽⁵⁾ Available online (<http://www.ilo.org/ilolex/cgi-lex/convde.pl?C187>) (accessed July 2011).

economic outcomes are still controversial among scholars and health and safety experts (Frick et al., 2000a; Karageorgiou et al., 2000; Robson et al., 2005; Robson et al., 2007).

Some see OSH management as a solution to make OSH more transparent and preventive, by enhancing workers' participation in its definition and implementation and, ultimately, by improving the work environment. Others have a more sceptical view of the purpose of OSH management, perceiving OSH management as a constraint that introduces more bureaucracy into OSH and moves the latter away 'from the shop floor reality of occupational hazards' (Karageorgiou et al., 2000). Furthermore, OSH management is sometimes criticised on the grounds that it introduces deregulation in the field of OSH and, consequently, less enforcement of standards. Finally, there is a lack of literature on the application of OSH management systems in SMEs as well as micro-businesses.

This section discussed the shift from traditional OSH towards OSH management in industrialised countries over past decades. The next section explores in more detail the characteristics of OSH management through the concept of occupational safety and health management systems (OSHMSs).

2.2. Occupational safety and health management systems

2.2.1. Characteristics of occupational safety and health management systems

The concept of an 'occupational safety and health management system' (OSHMS) has become increasingly popular among the different stakeholders of OSH over the years. However, much confusion remains about the definition and characteristics of this concept (Frick et al., 2000a; Gallagher et al., 2001; Robson et al., 2005; Nielsen, 2000; Robson et al., 2007; Redinger and Levine, 1998; Bottani et al., 2009; Fernández-Muñiz et al., 2009; EU-OSHA, 2002b).

This confusion can be explained by the fact that the concept is often vaguely or broadly defined. This is the case, for example, in the definition of an OSHMS by the International Labour Organisation (ILO): according to the ILO, an OSHMS is 'a set of interrelated or interacting elements to establish OSH policy and objectives and to achieve those objectives' (ILO, 2001) ⁽⁶⁾. This confusion is exacerbated by the use of the concept of 'occupational safety and health management systems' by scholars under different meanings (Frick et al., 2000a) ⁽⁷⁾.

In their seminal article on OSHMS, Redinger and Levine review several OSHMS, environmental management systems (EMSs), and quality assurance management systems (QAMSs), which were publicly available in the 1990s, in order to identify the common characteristics of a universal OSHMS (Redinger and Levine, 1998). Based on their review, they describe the structure of a universal OSHMS as containing five main categories:

- initiation (OSH inputs);
- formulation (OSH process);
- implementation/operations (OSH process);
- evaluation (feedback);
- improvement/integration (open system elements).

Each category contains several elements. Gallagher et al. and EU-OSHA also describe OSHMSs in a similar manner (Gallagher et al., 2001; EU-OSHA, 2002).

Box 2: Structure of a universal OSHMS

Initiation (OSH Inputs)

- 1.0 Management commitment and resources
 - 1.1 Regulatory compliance and system conformance
 - 1.2 Accountability, responsibility, and authority
- 2.0 Employee participation

Formulation (OSH process)

- 3.0 Occupational safety and health policy
- 4.0 Goals and objectives
- 5.0 Performance measures
- 6.0 System planning and development
 - 6.1 Baseline evaluation and hazard/risk assessment
- 7.0 OSHMS manual and procedures

Implementation/operations (OSH process)

- 8.0 Training system
 - 8.1 Technical expertise and personnel qualifications
- 9.0 Hazard control system
 - 9.1 Process design
 - 9.2 Emergency preparedness and response system
 - 9.3 Hazardous agent management system
- 10.0 Preventive and corrective action system
- 11.0 Procurement and contracting

Evaluation (Feedback)

- 12.0 Communication system
 - 12.1 Document and record management system
- 13.0 Evaluation system
 - 13.1 Auditing and self-inspection
 - 13.2 Incident investigation and root cause analysis
 - 13.3 Medical programme and surveillance

Improvement/integration (Open system elements)

- 14.0 Continual improvement
- 15.0 Integration
- 16.0 Management review

Source: Redinger and Levine (1998)

⁽⁶⁾ Cited by Robson et al. (2005).

⁽⁷⁾ See Section 2.2.2.

After having reviewed the literature on the topic, particularly Redinger and Levine's work, Robson et al. (Robson et al., 2005) propose the following definition of an OSHMS in their systematic review: 'an OSHMS is an integrated set of organisational elements involved in the continuous cycle of planning, implementation, evaluation, and continual improvement, directed toward the abatement of occupational hazards in the workplace. Such elements include, but are not limited to, organisations' OSH-relevant policies, goals and objectives, decision-making structures and practices, technical resources, accountability structures and practices, communication practices, hazard identification practices, training practices, hazard controls, quality assurance practices, evaluation practices, and organisational learning practices' (Robson et al., 2005). As underscored by these authors, such a definition of an OSHMS is clearly in opposition to the concept of traditional OSH because it views OSH policy as being proactive, oriented towards continual improvement and also better integrated and incorporated into the management strategy of enterprises.

Although the differences between traditional OSH and an OSHMS are apparent, it is not clear what distinguishes the concept of OSHMSs from the concept of systematic OSHM. Nonetheless, some scholars still make a distinction between both concepts (Frick et al., 2000a; Gallagher et al., 2001; Saksvik and Quinlan, 2003) and indeed some clarification arises when discussing mandatory and voluntary OSHMSs.

2.2.2. *Mandatory and voluntary occupational safety and health management systems*

The literature on OSHMSs often distinguishes mandatory OSHMSs from voluntary systems (Frick et al., 2000a; Gallagher et al., 2001; Robson et al., 2005; Frick and Wren, 2000; Robson et al., 2007).

Mandatory OSHMSs

Mandatory OSHMSs ⁽⁸⁾ arise from government legislation and dictate a limited set of core principles for the management of OSH to be implemented by employers. Their use is then enforced through inspections, fines and other corrective measures. A good example of a mandatory OSHMS is Framework Directive 89/391/EEC (Karageorgiou et al., 2000; Walters, 2002c). Directive 89/391/EEC defines employers' responsibilities in the management of OSH. It obliges employers to evaluate the risks to the health and safety of workers and to implement subsequent preventive measures and then to integrate those measures into all of the activities carried out by enterprises at all hierarchical levels. Finally, the Directive also requires workers and their representatives to be informed and consulted, and requires employers to either establish preventive services themselves or to use external organisations to do so.

Mandatory OSHMSs are often less complex than voluntary ones. According to Frick and Wren, several factors explain the relative

simplicity of mandatory OSHMSs (Frick and Wren, 2000): the trend towards deregulation in industrialised countries and the wish of government authorities not to burden enterprises with complex regulatory requirements; the need to make the regulations applicable to all types of enterprise; and finally, the unfeasibility for governments and other public authorities to control the implementation of detailed regulations.

Voluntary OSHMSs

Voluntary OSHMSs are not state-regulated. These systems were first promoted by commercial organisations, large corporations and associations (e.g. industry associations). Voluntary OSHMSs have tended to be more complex than regulatory systems, and more formalised in terms of specifications. According to Frick and Wren (Frick and Wren, 2000), the detailed specification of these systems helps ensure the good integration of OSH policy into the management processes of enterprises. However, these authors also perceive a commercial strategy on the part of promoters of voluntary OSHMSs in this detailed specification. OSH managers frequently require the intervention of consultants to implement such complex systems and they may also pay for additional training. Furthermore, large enterprises are often willing to invest in both the implementation of these complex systems and the associated certification costs for corporate social responsibility purposes.

Although voluntary OSHMSs marketed by commercial organisations are often directed towards large enterprises, simpler voluntary OSHMSs promoted by public authorities have also emerged to target not only large enterprises but also small set-ups, or those with little experience in OSH. Indeed, supporting SMEs in managing OSH has been a priority of many health and safety agencies (Vassie et al., 2000; HSE, 2007). This can be explained by both their importance in national economies, as measured by their employment share in total employment, and their poor performance in terms of health and safety if compared with larger enterprises (Tait and Walker, 2000; Micheli and Cagno, 2010). According to some scholars, both the lack of human, economic, and technological resources and the inadequate OSH standards and guidelines, mainly targeted at large firms, can explain the generally low commitment of SMEs towards OSH management (Champoux and Brun, 2003; Micheli and Cagno, 2010). Others argue that the low incidence of accidents and injuries that SMEs can experience leads to a low perception of risk on the part of management and, therefore, also to low commitment to OSH management (Hasle et al., 2009; Borley, 1997).

Voluntary OSHMSs are generally in the form of standards or guidelines, providing requirements for certification or giving simple guidance on good management practice for OSH. These standards or guidelines are international (e.g. ILO-OSH 2001), national (e.g. BS 8800 or OSHAS 18001:2007), and sectoral (e.g. MASE, DT 78) (INRS, 2004a; Drais et al., 2002). They can also be either public or private (e.g. ISRS).

⁽⁸⁾ Mandatory OSHMSs are also referred to as 'regulatory OSHMSs.'

The difference in the level of complexity between mandatory and voluntary OSHMSs has led some authors to ‘distinguish between the (principally simple) regulation of *systematic* management of OSH from the voluntary and (usually) highly specified (i.e. formalised and documented) OSHM systems (Frick et al., 2000a).’ In the remainder of the report, the term ‘mandatory OSHMS’ will be used to refer to systematic OSHMS for the purposes of simplicity.

This section discussed the concepts of mandatory and voluntary OSHMSs, which have become increasingly popular among the stakeholders of OSH. The next section investigates the effectiveness of such systems in terms of OSH and economic outcomes.

2.2.3. Effectiveness of voluntary and mandatory occupational safety and health management systems

Although OSHMSs have gained increasing interest among the different stakeholders in OSH, there is a lack of systematic reviews on their effects on worker health and safety and associated socioeconomic and health-related outcomes. In their systematic review of the effectiveness of mandatory and voluntary OSHMSs, Robson et al. (Robson et al., 2007) examine the effects of interventions aiming at developing an OSHMS in at least one establishment. To be included in their systematic review, the study has to include two or more characteristics of Redinger and Levine’s universal OSHMS — one at least being a characteristic related to management (Redinger and Levine, 1998). The authors respectively selected 14 and nine studies on voluntary and mandatory OSHMSs. They then distinguished between four outcomes: implementation (i.e. change in workplace OSHMS), intermediate outcomes (e.g. safety climate), final OSH outcomes (e.g. injury or illness rates), and socioeconomic outcomes (e.g. firm insurance premiums or workplace productivity).

It should, however, be noted that the scholarly literature has used a wide variety of outcome measures and research designs to assess the socioeconomic and health-related outcomes of OSHMSs and, more generally, OSH management and OSH interventions, which make the comparison of findings difficult (Tompa et al., 2010). Moreover, some outcomes have been measured using objective (i.e. reports from records) and subjective (i.e. self-report) measures. Finally, many studies do not precisely take into account the time horizon when analysing the impact of OSHMSs and OSH management in general (Verbeek et al., 2009).

Effectiveness of voluntary OSHMSs

Regarding the effectiveness of voluntary OSHMS interventions, most studies, including those in the systematic review, show positive effects:

- implementation: increased implementation of the OSHMS over time;
- intermediate outcomes: better safety climate, increased hazard reporting by workers, and changes in working conditions to tackle OSH issues;

- final OSH outcomes: decline in the rates of work-related injury;
- economic outcomes: decrease in costs related to disability such as workers’ compensation costs or short and long-term disability costs.

Subsequent individual studies on voluntary OSHMSs also show that enterprises that implement OSHMSs show a higher performance than others in areas such as the definition of OSH goals and their communication to workers, risk data updating and risk analysis, identification of risks and definition of corrective measures, and workers’ training (Bottani et al., 2009). These studies show positive OSH and socioeconomic and health-related outcomes too, such as reduced accident rates, increased motivation of workers, decreased absenteeism, improved reputation of the enterprise, higher productivity, sales, and profits (Fernández-Muñoz et al., 2007).

Effectiveness of mandatory OSHMSs

The majority of the selected studies in the systematic review also suggest positive effects following mandatory OSHMS interventions:

- implementation: increased implementation of the OSHMS over time;
- intermediate outcomes: increased OSH awareness in enterprises, better perception of workers of the physical and psychosocial work environment, and increased involvement of workers in OSH;
- final OSH outcomes: reduction in working hours lost as a result of lower injury rates;
- economic outcomes: rise in workplace productivity.

Despite these positive results on the effectiveness of voluntary and mandatory OSHMSs, Robson et al. (Robson et al., 2007) mention important caveats in their systematic review. Firstly, the scholarly literature on this topic is scarce. Secondly, most existing studies are not sufficiently methodologically rigorous.

Their findings nevertheless tend to corroborate those of Gallagher et al. in their comprehensive report on OSHMSs published a few years earlier (Gallagher et al., 2001). Based on their own research and consultations with experts, Gallagher et al. suggest that OSHMSs can deliver more healthy and safe workplaces, but only under the right circumstances. Nevertheless, they also underline the limited volume and quality of direct research on the effectiveness of OSHMSs. Similarly, in a series of 11 case studies conducted at enterprise level across Europe, the European Agency for Safety and Health at Work (EU-OSHA, 2002b) also finds that the implementation of OSHMSs can lead

to positive effects such as a reduction in accidents and a rise in workers' motivation ⁽⁹⁾. In their case studies on French enterprises, Drais et al., however, reveal more contrasted results on the effectiveness of OSHMSs (Drais et al., 2002). Only enterprises with the longest experiences with OSHMSs reveal positive feedbacks in terms of OSH and economic outcomes.

This section explored the main characteristics of OSHMSs and their effectiveness in terms of OSH and economic outcomes. Though limited, existing studies tend to show that their implementation can be beneficial for enterprises under certain circumstances. The next section discusses the implementation of OSHMSs per se, identifying the facilitators and barriers to implementation as well as the different approaches in the management of OSH.

2.3. Factors associated with the effectiveness of occupational safety and health management systems

2.3.1. Cultural, managerial, and operational factors and performance of occupational safety and health management systems

A number of key management principles for the implementation of OSHMS are reflected by the EU-OSHA in its case studies conducted on the topic at enterprise level, and by Gallagher et al. in the context of their expert consultations (Gallagher et al., 2001).

More generally, these key management principles are consistent with the findings from the scholarly literature on the managerial and organisational factors associated with better OSH performance (Shannon et al., 1997; Geldart et al., 2010). Workforce empowerment, encouragement of long-term commitment by the workforce, good relations between management and workers, and lower turnover are deemed essential because each of these factors is found to correlate with lower injury rates. However, there is limited scientific evidence on the relationships between these factors and ill health. Factors specifically pertaining to OSH are also related to better OSH performance across enterprises. Such factors include: the delegation of safety activities; an active role of top management in OSH; the inclusion of workers in decision-making; the presence of Joint Health and Safety Committees (JHSCs); the safety training of workers; the evaluation of occupational safety hazards and the use of internal safety audits (Shannon et al., 1996; Shannon et al., 1997; Mearns et al., 2003; Zohar, 2002; O'Dea and Flin, 2001; Havlovic and McShane, 2000).

It should be stressed that many cultural, managerial, and operational factors contributing to better OSH performance are affected by the size of the enterprise. For example, in a recent empirical study, Micheli and Cagno (Micheli and Cagno, 2010) identified several OSH factors as dependant on the size of the enterprise. These factors include:

- management involved in personnel OSH-training;
- provision of financial resources by management to promote OSH;
- willingness of management to invest in OSH;
- periodic controls using data from the accident register;
- presence of systematic and standard risk analyses;
- deficiency in the safety training of personnel;
- excessive legislative provisions;
- upgrading of installations in compliance with safety standards over last years;
- introduction of safer production technologies over last year;
- willingness to improve information and training activities for personnel.

Micheli and Cagno further examined the relevance of these different OSH factors among micro, small, and medium-sized enterprises. They showed that the management of medium-sized enterprises typically has greater commitment and invests more resources in OSH issues. Within medium-sized enterprises, operational techniques for periodic controlling and systematic risk analysis are used much more than in micro and small-sized enterprises. Finally, the management of medium-sized enterprises is much more sensitive to the relevance of the issue of OSH training. In another respect, the authors found that micro and small-sized enterprises feel that OSH legislation is excessive. In general, however, there is little research on OSH practice in micro-businesses.

2.3.2. Barriers to effective occupational safety and health management systems

In their comprehensive study on OSHMSs, Gallagher et al. (Gallagher et al., 2001) also underscore several factors impeding the implementation of effective OSHMSs. Barriers to effective OSHMSs relate to the type of system chosen by enterprises, internal organisational factors (such as management commitment, the integration of OSHMSs into management systems, worker involvement), workforce characteristics, the nature of the organisation, contractor relations, and audit processes and tools (Table 1).

⁽⁹⁾ These case studies also reveal some good practice examples of the possible ways OSHMSs are being implemented in enterprises in the European Member States.

Table 1: **Facilitators and barriers to effective OSHMSs**

Facilitators to effective OSHMSs	Barriers to effective OSHMSs
Type of system	
Customised to the organisation's needs	Off-the-shelf system imposed without modification
Developed with support and involvement of all organisation stakeholders	Imposed by senior management without consultation
Safe place/innovative system	Safe person/traditional system
Internal organisational factors	
(i) Management commitment	
Strong senior management involvement	Delegation of OSH responsibility to line and OSH management positions
OSHMS introduced to improve OSH	Introduced and supported for non-OSH reasons
Provision of adequate resources	Inadequate resources
OSH integral to management performance appraisals	Limited accountability mechanisms
Leading by example	Words unsupported by practice
(ii) Integration into management systems	
All organisational functions incorporate OSH	OSHMS activities marginalised
(iii) Employee involvement	
All employees encouraged and capable of participation	OSH restricted to 'technical' experts Inadequate training of employees in OSH and in consultation
Independent representation of employees encouraged and supported	Selective employee involvement at management's discretion
(iv) Workforce characteristics	
Stable workforce	High labour turnover, extensive casual and part-time workforce Reliance on and exclusion of labour hire employees from OSHMS
Nature of organisation	
Larger organisation familiar with systems and with adequate resources	Small business, with limited resources and unfamiliar with systems concept
Stable workplace	Labour hire company with employees working between multiple client sites Disorganisation of work associated with presence of labour hire employees and contractors

Facilitators to effective OSHMSs	Barriers to effective OSHMSs
Contractor relations	
Principal contractor works with subcontractor to develop a compatible OSHMS	Principal contractor simply requires subcontractor to have an OSHMS Principal contractor simply imposes their OSHMS on subcontractor Sub-contractor's OSHMS inconsistent with principal's OSHMS
Audits and audit tools	
Appropriately used audits can verify and validate an OSHMS and facilitate continuous improvement	Inappropriately used audits encourage 'paper systems' and an instrumentalist approach to an OSHMS
Adequate audit tools are tailored to organisational needs and reflect key OSHMS success factors	Inadequate audit tools support mediocre OSHMSs
Audit processes are robust and auditors are technically competent	Quality-style audit processes and inadequate auditor skills limit audit comprehensiveness
Audits are integrated within a comprehensive approach to measurement	Use of audits as the primary measurement tool

Source: Gallagher et al. (2001)

2.3.3. Enterprise characteristics and occupational safety and health management systems

Despite the normative approaches of health and safety agencies regarding the key management principles to follow for implementing effective OSHMSs, there are a variety of managerial and organisational practices associated with these systems. Such variety derives from different institutional contexts, enterprise and corporate cultures, work environments, and economic activities (Drais et al., 2002; Gallagher et al., 2001; Walters, 2002c; Gallagher, 1997).

Having reviewed the literature on the origins of OSHMSs and their integration into broader management systems within enterprises, Gallagher identifies two key dimensions for a typology of system type reflecting different approaches regarding OSHMSs: OSH control strategy ('safe person control strategy' versus 'safe place control strategy') and OSH management style ('innovative management' versus 'traditional management') (Gallagher, 1997). Each dimension is further described in Box 3.

Box 3: OSH control strategies and OSH management styles

Different OSH control strategies and management styles characterise OSHMSs.

OSH control strategies

- *Safe person control strategy*: the prevention strategy focused on the control of employee behaviour.
- *Safe place control strategy*: the prevention strategy focused on the control of hazards at source through attention at the design stage and application of hazard identification, assessment and control principles.

OSH management styles

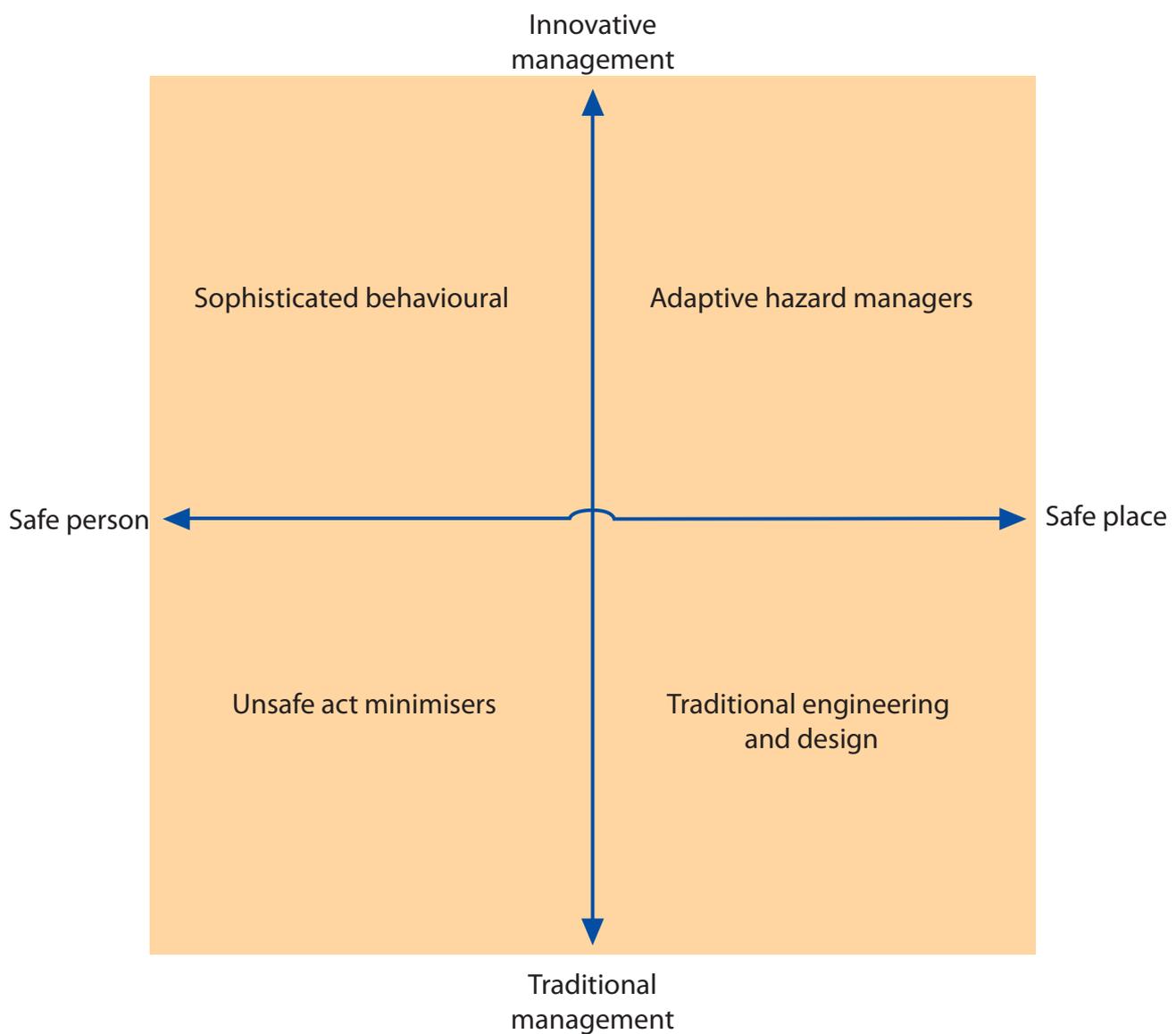
- *Traditional management*: the key persons in health and safety are the supervisor and/or any OSH specialist. There is a low level of integration of health and safety into broader management systems and practices (e.g. integration of OSH within general procedures or inter-functional activities). Employees may be involved in OSH policy, but their involvement is not viewed as critical for the operation of the OSHMS, or alternatively a traditional health and safety committee is in place.
- *Innovative Management*: senior and line managers have the key role in health and safety. A high level of integration of health and safety into broader management systems and practices (which connect OSH to business planning, or quality/best practice management initiatives). Employee involvement is viewed as critical to system operation and there are mechanisms in place to give effect to a high level of involvement.

Source: Gallagher et al. (2001); Gallagher (1997)

Based on these two dimensions, Gallagher identifies four types of OSHMSs (Figure 3).

- *Sophisticated behavioural*: such a system adopts a dominant safe person perspective focusing on high levels of worker involvement and upstream prevention activity to influence employee behaviour and attitudes, together with a high level of integration into broader management systems.
- *Adaptive hazard managers*: this system combines a safe place strategy with an innovative approach to OSH management, characterised by a high level of integration and a strong focus on employee involvement.
- *Traditional engineering and design*: this system combines a safe place perspective with a more traditional OSH management focus and with health and safety consultative arrangements less important than in the former group.
- *Unsafe act minimisers*: this system is characterised by a safe person strategy and more reactive responses to unsafe acts by workers, but may be supported by an emphasis on supervision of worker behaviour and rules to limit worker risk taking.

Figure 3: Gallagher's typology of OSHMSs



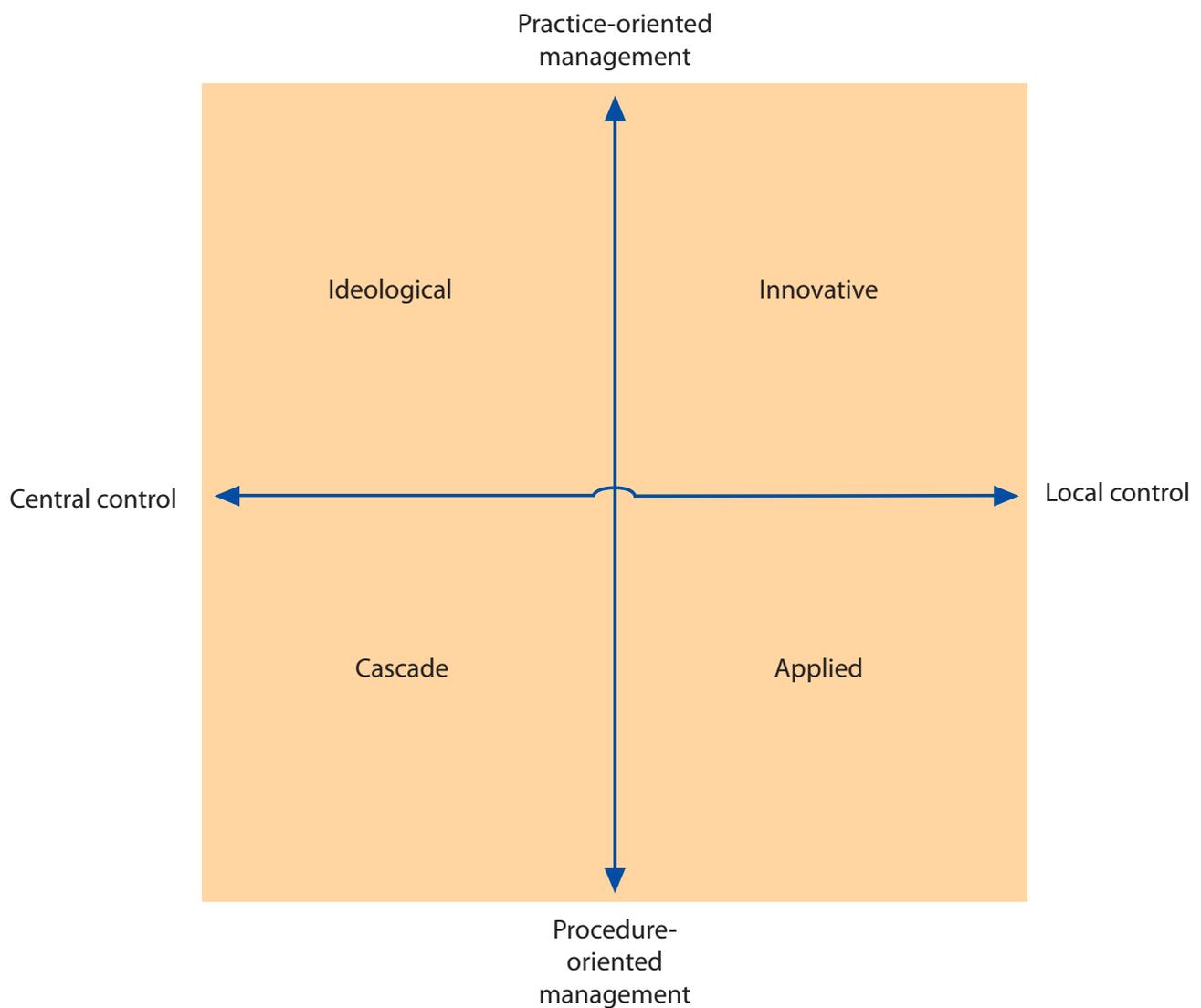
Source: Gallagher et al. (2001)

Gallagher then examines the effectiveness of these different approaches to OSHMSs in terms of OSH outcomes through a series of case studies at enterprise level conducted in Australia. The results of the case studies show that the enterprises adopting the 'adaptive hazard managers' approach tend to perform better than those adopting other types of OSHMSs (Gallagher, 1997).

In a similar vein, INRS is conducting a study with the aim of better understanding and evaluating practises in the implementation of

OSHMSs in French enterprises. The first phase of the study, which was conducted by means of a questionnaire, enabled researchers to identify the main characteristics of 165 companies' proceedings. The second phase aims to analyse the manner in which these proceedings unfold on the ground, in a dozen different companies (Drais et al., 2002; Drais 2005) ⁽¹⁰⁾.

Figure 4: Drais' typology of OSHMSs



Source: Drais et al. (2002)

⁽¹⁰⁾ Further resources from the INRS on OSHMS are available online (http://en.inrs.fr/safety/frame_constr_gb.html?frame=%2Finrs-pub%2Finrs01.nsf%2FIntranetObject-accesParIntranetID%2FOM%3ARubrique%3AC12E51C30BECFB43C1256E530039EE5E%2F%24FILE%2FVisu.html) (accessed August 2011).

Examining these cases, it seems that the implementation of OSHMSs is highly constrained and determined by the enterprise's context (e.g. structure, size, activity, technology) and objectives. The enterprises examined presented variable results in terms of OSH management. It appears, in particular, that the benefits of an OSHMS in terms of OSH outcomes depend less on guidelines or standards (e.g. OSHAS 18001, DT 78, MASE, and BS 8800) followed to implement OSHMSs, and more on the manner in which they are implemented. Approaches to OSH management do not, therefore, follow a model, but four main organisational tendencies that are more or less typical depending on the enterprise and its context. These approaches depend on the types of control (central control versus local control) and management (practice-oriented management versus procedure-oriented management) in the enterprise (Figure 4 and Table 2).

- *Cascade*: this approach refers to subsidiary companies affiliated to large groups or major clients and that present strategies in terms of OSH policy. These strategies impose guidelines and often an OSH certification, which is up to the subsidiary company to implement. Developed by senior management for implementation across the group, the *cascade* approach entails overarching safety measures, the responsibility for which is distributed throughout the hierarchy. Without appropriate local adjustments, this type of approach produces standard measures for the most commonly encountered risks. It is perceived as a bureaucratic imposition, and is often implemented in a merely formal or superficial fashion. It delivers minimal benefits for the safety and health of workers.
- *Innovative*: this approach is found in enterprises that want to have a well-defined OSH policy, in which certain employees (in particular at supervisory level management) will take charge and redefine management devices in an original manner. An *innovative* approach stems from an existing policy, but analyses afresh the definition and organisation

of health and safety-related aspects. This process is often an opportunity to completely rethink the enterprise's jobs and activities using rules that merge the demands of quality, environment and OSHMSs within a genuinely integrated management system. Its only drawback is the risk of loss of momentum because of the investments required and the demands of the system, especially if management support declines.

- *Applied*: such an approach has been observed in enterprises that have a safety line management structure, and view OSH as a professional imperative. The *applied* approach is led by safety line managers that scrupulously apply the guidelines to their enterprise, mostly drawing on an effective risk analysis. This approach requires the safety line managers to have a minimum level of status and qualifications in order to assert the approach in the company's strategic procedures. If their status and/or skills are inadequate, there is the risk that this will remain a technical process (workstation design, hygiene rules, etc.) and will have little impact on practices. In any event, the OSH outcomes are often limited.
- *Ideological*: this approach is found in enterprises whose awareness of OSH issues is driven by moral values as opposed to technical or managerial considerations. With the focus on staff empowerment, the OSH management system is perceived as a means of changing employee attitudes and behaviour, and even uniting them along a 'common safety culture'. Often, an *ideological* model is overlaid on an existing set of strict general safety procedures (e.g. integration of new employees, accident analysis, wearing PPE). The technical know-how of the staff in charge of safety is indisputable and the overall OSH outcomes are positive. This normative approach works well in a stable environment but bears contextual limitations, proving ineffective when the enterprise organisation is modified and maladjusted.

Table 2: Different approaches to OSHMSs

Modalities	Cascade	Innovative	Applied	Ideological
Origin of decision	Senior management	Supervisory level management	QHSE dept. (quality, health, safety, environment)	Senior management
Expected goal	Integration of OSH into local policies	Integration of OSH into practices	Formalisation of OSH management	Integration of OSH into individual's behaviour
Leaders and partners	National (or regional) management and safety line managers	Supervisory level management and staff together with safety line managers	Supervisory level management and safety line managers	Senior and supervisory level management
Method of dissemination	Information and awareness-raising meetings	Working groups with staff	Supervisory level management meetings	Human resources and individual assessments
Resources provided	Limited	Negotiable	Limited	Extensive
Employee involvement	Low	High to start with	Limited	High at the end
Link with CHSCT*	Information	Participation and validation	Consultation	Information

NB: CHSCT: French Health, Safety and Working Conditions Committee

Source: Based Drais et al. (2002)

This section discussed the implementation of occupational safety and health management systems in enterprises. Though limited, both the scholarly and grey literature has underlined factors that are associated with the effective management of OSH. Nevertheless, there are some disparities in the implementation of OSH management. These disparities reflect different managerial approaches to OSH management as well as firm and sectoral specificities.

2.4. Summary

This chapter has reviewed the literature on the factors associated with effective management of OSH and concludes the following.

- In the 1970s and early 1980s, many industrialised countries launched detailed OSH regulations to decrease the number of injuries and ill health at work, which remained significant despite the rise in living standards.
- This traditional OSH strategy, where regulations from governments prescribe to employers *what* should be done to reduce workplace injuries and work-related ill health, has not appeared to be effective in further decreasing work-related injuries and illnesses.
- It has been replaced by a new strategy towards the promotion of OSHM which underlines *how* workplace hazards

should be tackled from a managerial standpoint. The new OSH strategy encourages employers (and workers) to take an active role and comprehensive responsibility for OSH quality, by better incorporating OSH policy in the management of their enterprises. The 1989 Framework Directive (89/391/EEC) is emblematic of this new strategy.

- Despite the increasing popularity of the concepts of OSH management and OSH management systems among the stakeholders of OSH — principally regulators, employers, workers, and health and safety agencies — there is a lack of robust scientific evidence on its effectiveness in terms on OSH and economic outcomes.
- Though not yet robust, the literature has, nevertheless, identified some factors associated with effective management of OSH. Health and safety agencies and other organisations, such as international organisations and consultancies, have also identified some good management principles for the implementation of effective OSH management.

It seems, nevertheless, that these management principles are applied differently across enterprises depending on their contexts and objectives. Moreover, the relevance of these principles varies according to the size of enterprises.

3. Towards a conceptual framework for managing occupational safety and health

The previous chapter introduced the concept of an occupational safety and health management system. Despite an absence of comprehensive and robust evidence on the effectiveness of occupational safety and health management systems, the literature mentions several factors contributing to the effective management of occupational safety and health management. In this chapter, we build on the insights of the previous chapter and consider what a risk management approach would look like. We then explore how it can inform the empirical analysis of the ESENER data. Firstly, we look at the components of a conceptual framework to manage occupational safety and health. Secondly, we identify the questions from the surveys that map on to this conceptual framework. Linking questions in ESENER to the conceptual framework will give us a clear indication of what aspects of ESENER can tell us about the effective management of occupational safety and health.

3.1. A conceptual framework for occupational safety and health management

Public stakeholders such as international organisations and health and safety agencies in Europe have promoted the implementation of occupational safety and health management systems in all types of enterprises through similar guidelines and good practice examples. For example, the Health and Safety Executive (HSE) in the United Kingdom and the Institut National de Recherche et de Sécurité (INRS) in France depict a conceptual framework that emphasises key common management principles for a successful implementation of an OSHMS (HSE, 1998; HSE, 1997; INRS, 2004a) including:

- policy development;
- organisational development;
- planning and implementing;
- measuring performance;
- reviewing performance and auditing.

These frameworks present a normative approach. However, the key management principles outlined in these approaches are also identified as factors contributing to the effective management of

occupational safety and health in the literature reviewed in Chapter 2. We, therefore, have some confidence in promoting a conceptual framework consisting of the stages introduced above, and discussed in more detail later.

Policy development

Defining an OSH policy sets a framework for the management system. It must be driven by a genuine desire of the most senior executives to commit to the process and to continually take the enterprise forward. It requires the introduction of the following elements: defining objectives consistent with other enterprise policies; determining management responsibilities; committing resources; defining the ways and means for consulting and involving workers and their representatives; choosing guidelines or standard systems; defining a set of indicators for measuring progress achieved; and reporting on objectives.

An effective policy is one that results in OSH being integrated across the enterprise and that gets staff **involved and committed**. **Such a policy is often referred to as a ‘positive health and safety culture’** (HSE, 1998). All departments are involved and have to manage this issue just like any other factor affecting their unit. The enterprise’s OSH policy should be set out in a policy statement that should be communicated and made readily accessible to staff.

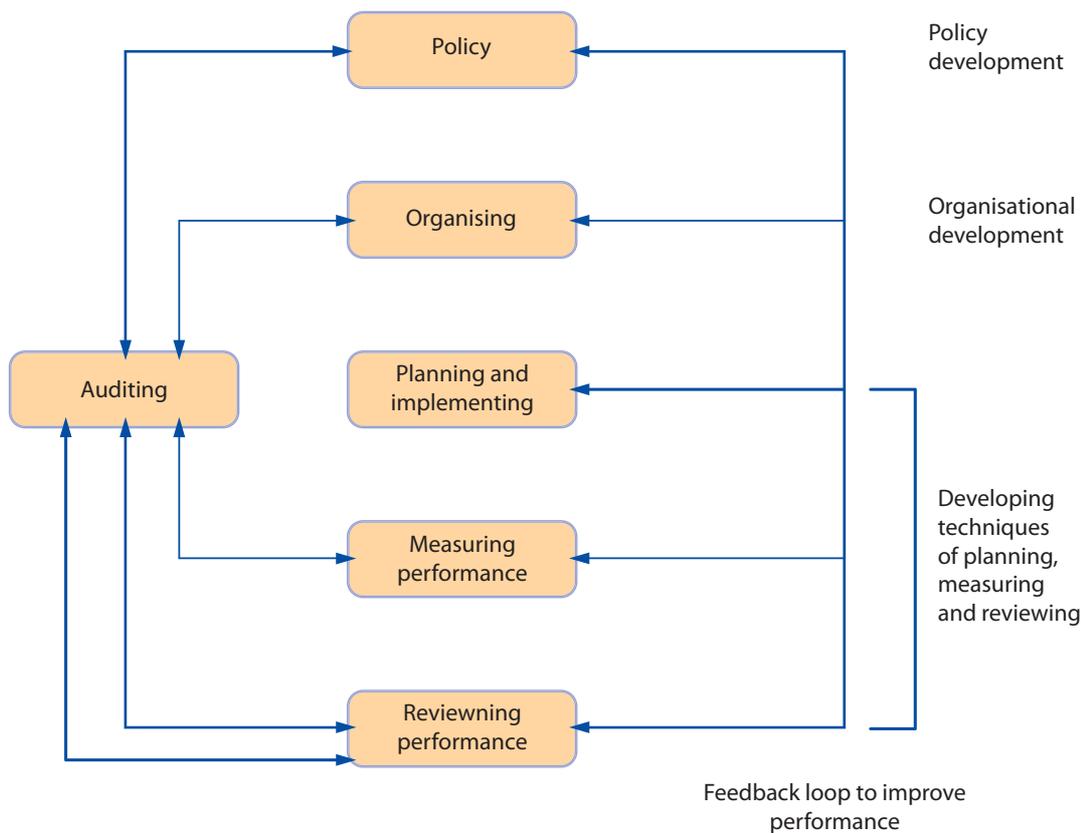
Organisational development

The role of those with OSH responsibilities in the enterprise must be specified in delivering the policy: their assignments, responsibilities, obligations, powers and connections, etc. Employees and their representatives must be consulted, informed, and trained so that they take ownership of the process. This requires that documentation, a training programme, and internal communication procedures are set up.

A senior manager has to be appointed and accept responsibility for the implementation process. A second key appointment is to select someone responsible for the design and architecture of the management system itself. It may be the same senior manager or someone else.

Many enterprises, particularly larger ones, set up a steering committee including other senior line managers to organise the process. This is a key feature in transferring ‘ownership’ of health and safety from its traditional position with the health and safety adviser to the direct line function. Typically, the role of the steering group is to draw up the implementation plan, allocate responsibilities, and monitor progress.

Figure 5: A conceptual framework for implementation



Source: HSE (1998)

Planning and implementing

One of the essential drivers of continual improvement in OSH is the assessment of occupational risks. The relevance of the analysis to real working situations will largely determine how successful this process will be.

Risk assessment findings should give rise to an action plan defining the appropriate preventive measures for the risks identified. The action plan is a key output from the steering committee or the person responsible for the design and architecture of the management system. Key milestones for implementation and success criteria should be determined, set, and regularly reviewed by the management. Multidisciplinary approaches (technical, human and organisational) are necessary both for the enterprise as a whole, and for the detailed study of workstations. Regulatory developments must also be monitored.

The action plan must be systemically implemented in a way that is compatible with professional rules and practices as well as with existing procedures through effective OSHM. This presupposes close cooperation with all the workers concerned: participatory schemes based on an analysis of the activities and workers' freedom to seek innovative solutions. This, in turn, requires a training programme, social dialogue, communication, documentation, and anticipation of emergencies. A system for regular status reporting must also be introduced.

Measuring performance

A set of quantitative and qualitative OSH indicators should be used: risk indicators, resource indicators and outcome indicators. The indicators traditionally used (e.g. frequency and severity of occupational accidents, contribution rate to the occupational accidents and diseases insurance scheme, absenteeism rate) are lagging indicators and are of limited use.

Reviewing performance and auditing

The effectiveness of the system implemented must be checked and if a new risk or hazard factor is identified, there must be a response. Audits must be systematically carried out and analysed in order to select corrective actions. Audits include an analysis of occupational accidents and diseases that have occurred, without restriction to immediate and directly perceivable causes. A more comprehensive approach will seek to identify root causes to ensure greater effectiveness of preventive measures. This analysis must address not only accidents which take place either at the workplace, while travelling between work and home and/or during business-related trips, but also any near misses which occur in these circumstances. Similarly, it is a mistake to wait until a work-related disease has been identified before assessing possible causes.

3.2. The conceptual framework and the empirical analysis of the ESENER data

In Section 3.1, we introduced the main aspects of the conceptual framework. The conceptual model on the management of OSH can inform the empirical analysis of ESENER data. We can map the stages of the conceptual framework on the questions asked in ESENER. There are two main stages to mapping the questions and understanding their significance: selecting the questions that are substantively associated with the stages of the conceptual framework; and understanding whether the subject of the questions is statistically associated with the effective management of OSH.

Firstly, we use the conceptual framework to identify those questions in ESENER associated according to the literature with the effective management of OSH. We first consider how the questions map onto the conceptual framework ⁽¹⁾. For this purpose, we label each stage of the conceptual framework: (a) policy development; (b) organisational development, such as the existence and operation of decision-making, accountability and communication structures in relation to OSH; (c) planning

and implementation, such as the allocation of technical and financial resources specifically for OSH management; (d) measuring performance through the use of risk indicators; and (e) monitoring of OSH outcomes.

In total, we identified 11 questions in ESENER MM. It is important to note that ESENER contained more questions that could have been considered for analysis; however, our modelling required questions that were asked across all establishments. Several questions were not asked of all establishments due to filtering and how they were presented. For example, the ER module contained interesting questions that could not be included because not all establishments in the sample had employee representatives.

Table 3 shows that the ESENER questionnaire provides fair coverage of the aspects of the conceptual framework. Four out of the five aspects listed above (a, b, c and d) are covered by 10 questions: (a) and (b) are covered by three questions each; (c) and (d) covered by two questions each; and the remaining aspect (e) is covered by a single question.

Table 3: Linking ESENER questions to aspects of the conceptual framework

Question number (MM questionnaire)	Question content	Element of conceptual framework
MM150 (service_use)	<p>What health and safety services do you use, be it in-house or contacted externally?</p> <p>Response options:</p> <p>1. An occupational health doctor (Response options: 1. Yes, 2. No, 3. NA)</p> <p>2. A safety expert (Response options: 1. Yes, 2. No, 3. NA)</p> <p>3. A psychologist (Response options: 1. Yes, 2. No, 3. NA)</p> <p>4. An ergonomics expert, dealing with the set-up of workstations (Response options: 1. Yes, 2. No, 3. NA)</p> <p>5. A general health and safety consultancy (Response options: 1. Yes, 2. No, 3. NA)</p>	(c) planning and implementation
MM152 (absence_analysis)	<p>Does your establishment routinely analyse the causes of sickness absence?</p> <p>Response options: 1. Yes, 2. No, 3. No answer</p>	(d) measuring performance
MM153 (supporting_return)	<p>Do you take measures to support employees' return to work following a long-term sickness absence?</p> <p>Response options: 1. Yes, 2. No, 3. No answer</p>	(c) planning and implementation
MM154 (monitoring_health)	<p>Is the health of employees monitored through regular medical examinations?</p> <p>Response options: 1. Yes, 2. No, 3. No answer</p>	(d) measuring performance

⁽¹⁾ The questions were taken from the management questionnaire (MM).

Question number (MM questionnaire)	Question content	Element of conceptual framework
MM155 (OSH_policy)	Is there a documented policy, established management system or action plan on health and safety in your establishment? Response options: 1. Yes, 2. No, 3. No answer	(a) policy development
MM158 (OSH_discussed)	Are health and safety issues raised in high-level management meetings regularly, occasionally or practically never? Response options: 1. Regularly, 2. Occasionally, 3. Practically never, 4. No answer	(b) organisational development
MM159 (managers_involvement)	Overall, how would you rate the degree of involvement of the line managers and supervisors in the management of health and safety? Is it very high, quite high, quite low or very low? Response options: 1. Very high, 2. Quite high, 3. Quite low, 4. Very low, 5. No answer	(b) organisational development
MM161 (risk_assesment)	Are workplaces in your establishment regularly checked for safety and health as part of a risk assessment or similar measure? Response options: 1. Yes, 2. No, 3. No answer	(e) monitoring of outcomes
MM173 (info_used)	Has your establishment used health and safety information from any of the following bodies or institutions? Response options: 1. Official institutes for health and safety at work (Response options: 1. Yes, 2. No, 3. NA) 2. The European Agency for Safety and Health at Work (Response options: 1. Yes, 2. No, 3. NA) 3. In-house health and safety services (Response options: 1. Yes, 2. No, 3. NA) 4. The labour inspectorate (Response options: 1. Yes, 2. No, 3. NA) 5. Employers' organisations (Response options: 1. Yes, 2. No, 3. NA) 6. Trade unions (Response options: 1. Yes, 2. No, 3. NA) 7. Contracted health and safety experts (Response options: 1. Yes, 2. No, 3. NA) 8. Insurance providers (Response options: 1. Yes, 2. No, 3. NA)	(a) policy development
MM175 (European_week)	Are you aware of the European Week for Safety and Health at Work? Response options: 1. Yes, 2. No, 3. No answer	policy development
HSR_exist: combined information from MM355 and MM358 (HRS_exist)	Does your establishment have an internal health and safety representative? Response options: 1. Yes, 2. No	(b) organisational development

Coverage of relevant aspects of management is an important constraint in any study of this nature. Ideally, researchers want to improve the coverage of relevant elements. Concretely, from our analysis we can conclude that elements (d) and (e) may be enhanced by including an additional question for each (see Chapter 5 for further discussion on some limitations inherent in undertaking a survey of this nature).

The literature discussed in Chapter 2, and the conceptual framework, are not clear on the relative importance of individual aspects of the conceptual framework. As such, our analysis weights each relevant aspect or question that we included for analysis as equal. It could be the case that certain types of practice are more characteristic of a specific establishment. For example, smaller establishments could exhibit different practices than larger ones. We expand on this in Chapter 4.

3.3. Summary

This chapter has introduced a conceptual framework for the effective management of OSH. The framework can be used

4. Analysing the ESENER data on managing occupational safety and health

In this chapter, we present the findings of the factor analysis performed on the ESENER data. The empirical analysis consists of two main stages: understanding the relationships between the factors associated with the effective management of occupational safety and health risks to create an index of correlated aspects of effective management; and understanding the relationships between the characteristics of establishments with the index developed earlier. The findings show which establishments have a majority of the factors associated with effective management in place. Having this knowledge allows policymakers to target policy instruments and interventions more effectively. This chapter presents the main information and findings. A full sequential overview of the modelling work is given in Appendix A. ESENER consists of two surveys: a managers' survey (MM) and a survey aimed at employee representatives (ER). Most of the empirical analysis used the MM survey, but we provide some cross-comparison with results from the ER survey in this chapter.

4.1. The empirical approach

The previous chapter introduced the conceptual framework for the management of OSH. The empirical analysis builds on this framework and selected the 11 questions in ESENER relating to

to select the questions from ESENER to be included in our empirical analysis. The following are the main findings.

- More systematic approaches are being put forward for the management of occupational safety and health. These approaches often involve a number of stages including: policy development; organisational development; planning and implementation; measuring and assessing the main risks to the organisation; and measuring the effectiveness of OSH interventions.
- The conceptual framework informs the selection of questions from ESENER to be included in the empirical analysis by highlighting aspects of effective practice as perceived by the policy community. The questions in ESENER appear to map the stages of the conceptual framework reasonably well.

various aspects of management of OSH. These questions related to a set of processes and procedures perceived by the community of policymakers as desirable features in the area of management of risks.

Consequently, the first stage of our analysis was to establish whether the 11 aspects of OSH management covered by ESENER tend to coexist in establishments or, on the contrary, whether these aspects were, in fact, disparate features of OSH management. Confirmation of the coexistence of these elements in the ESENER dataset has an immediate analytical value as it indicates the empirical, rather than normative, presence of a management *system* of OSH. It also allows efficient characterisation of establishments in terms of scope of management of risks along a *single* dimension, instead of laborious characterisation along multiple dimensions.

We approached this task using factor analysis. Rephrasing Kim and Mueller (Kim and Mueller, 1978, p. 9), factor analysis is defined as a technique aiming at representing a set of variables in terms of a smaller set of variables. Factor analysis is implemented precisely when the direct measurement of a phenomenon of interest (e.g. scope of OSH management) is not possible or is difficult due to definitional vagueness, imprecision, or to the difficulty or diversity of constituting aspects. Firstly, factor analysis examines correlations between various aspects of management of risks. Secondly, on the basis of the observed correlations between variables relating to aspects of OSH management, it attempts to reduce the information contained in these variables to a smaller set of variables.

4.1.1. The conceptual framework and empirical analysis

Possession of an OSH policy document and carrying out risk assessments, as well as the use of external services to give advice on management of risks, are the most widely adopted measures for management of risks. These measures are implemented by 67–88 % of establishments. On the other hand, measures such as using ergonomics experts and involving line managers in the management of risks are the least common, with 20–27 % of establishments reporting implementing them. This is not surprising as such approaches are less likely to exist in establishments of the smallest size.

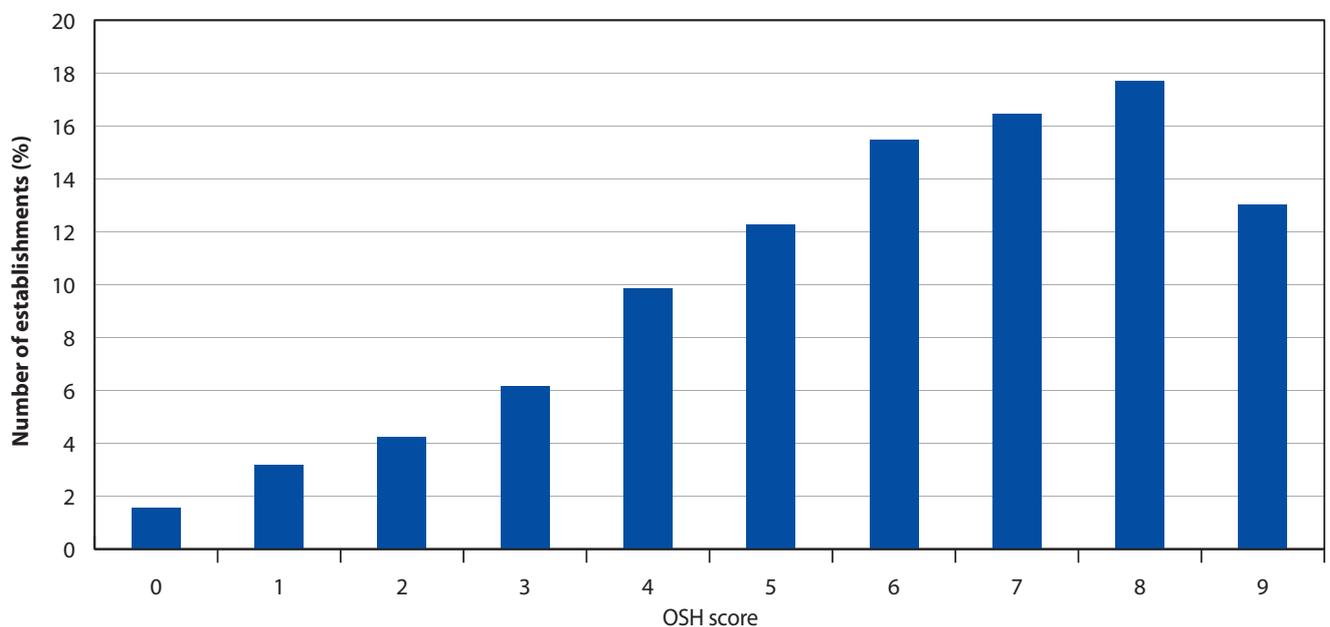
In applying factor analysis, we found that all 11 factors or variables considered were strongly correlated with each other (more detailed information is available in Tables 2 to 4 in Appendix A). Establishments reporting that they have implemented one aspect of management tend to report other aspects as well. This finding led to the conclusion that establishments, on the whole, appear to be adopting management system approaches for managing OSH and, as such, the concept of a *system* of management of OSH risks is empirically justifiable. Furthermore, factor analysis indicated that it was possible to construct a single variable expressing the scope of management of OSH risks. Thus, information contained in spe-

cific questions on the management of risks in the ESENER questionnaire was used to generate a *single* indicator of the scope of management of risks and characterised establishments on a continuum of this indicator. This indicator consisted of nine variables; the questions with the weakest correlations (a question on awareness of the European Week for Safety and Health at Work and a question on monitoring health through regular medical examinations) were omitted. As previously stated, each variable in the index was given a similar weight as the literature does not clearly identify the relative importance of variables in a systemic OSH approach.

4.1.2. An index of occupational safety and health management

On the basis of the insights provided by factor analysis, a composite score of the scope of management of risks was derived (hereafter the 'OSH composite score' or simply 'OSH score'/'OSH variable'). This was done by summing across all variables subjected to factor analysis. The resultant OSH composite score is a single indicator of the scope of the management of risks with nine as a maximum value indicating that a given establishment reports all possible identified aspects of management of risks and zero as a minimum value, indicating that it reports none of the aspects. Figure 6 presents an overview of the OSH composite score across all establishments in ESENER.

Figure 6: OSH composite score



NB: The results are weighted: N = 2 717 234 (82 % of the original weighted sample).

Source: RAND Europe calculations

About half of all establishments across Europe implement at least seven elements of the OSH index and around 13 % implement all nine elements. Establishments not implementing any elements of OSH are a very small minority (less than 2 %), and establishments implementing just one or two elements of OSH constitute 7 % of the total. Therefore, we can be confident that the majority of establishments are implementing a good number of OSH measures.

4.2. Characteristics of the establishment and their relationship to the occupational safety and health index

Having constructed the composite score of the scope of management of risks, we were in a position to launch an investigation into its significant determinants. To establish the significant determinants of management of risks, we implemented conventional multivariate modelling. In line with previous research on the determinants of risks (literature review and bivariate analysis, see Appendix A for full details), the following variables were treated as predictors of OSH composite score (independent variables):

1. size of establishment;
2. whether the establishment is a part of a larger entity (company, firm);
3. sector (public or private);
4. gender composition of establishment’s workforce;
5. age composition of establishment’s workforce;
6. proportion of foreigners in establishment’s workforce;
7. industry;
8. country.

We used linear regression to model the relationship between the OSH score and the predictors. The basic purpose of multivariate models is to answer the question of whether various factors or characteristics of establishments (called collectively independent variables) exert independent influence on the behaviour of the variable of interest (dependent variable, here, the OSH score). To understand the effect of one predictor or independent variable, the other variables must be controlled. In our application, we sought to establish, for example, whether the size of the establishment had an effect on management of OSH, with other things (sector, being part of a larger firm, etc.) being held constant (i.e. whether it had an *independent* effect). The results of our analyses are presented in the following sections.

4.2.1. Country context, size, industry and the management of occupational safety and health

The main finding of the multivariate analysis is that out of the eight independent variables examined, size, industry, being part of a larger establishment, and country context were the most significant variables explaining the scope of OSH management.

To arrive at this conclusion we ran four models (see Appendix A for full details). We took establishment size, establishment being part of a large company, sector and industry as ‘basic’ establishment characteristic predictors. These variables appear in our Model 1. Relationships between these variables and the management of OSH are reasonably well documented in the literature. In Model 2, we add ‘employee demographics in the establishment’, which is a less well explored area in the literature. In Model 3, we add ‘country’ as a way to control for differences in cultural and social background, as well as in regulatory environment. Finally, in Model 4, we introduce: (i) reported presence of risks; (ii) whether or not visits are paid to the establishment by the labour inspectorate; and (iii) perceived presence of different types of external (e.g. labour inspectorate) and internal (e.g. employees’) pressures towards dealing with OSH risks. The introduction of (i) and (ii) represents an attempt to control, to some extent, for ‘objective’ circumstances (i.e. the presence or absence of real risks) and management perception of the problem of risks, and (iii) is perceived as able to capture some of the regulatory characteristics.

The findings of Model 4 are presented in Table 4 which shows the proportion of variance explained by a sequence of models from which single predictors were removed in turn, with all other predictors retained. It helps to identify the most influential predictors. The most influential background variables are, therefore: country; size of the establishment; industry; and being part of a larger establishment. Exclusion of country and size of establishment from the model removes 13 % and 7 %, respectively, from the total of explained variance.

We now consider the findings for the specific categories in turn.

Table 4: Quantification of the impact of single predictors (Model 4, all establishments)

R ² with variable excluded	Full model (Model 4)	Loss of R ² relative to full model
0,286	0,414	0,128
0,344	0,414	0,070
0,372	0,414	0,042
0,401	0,414	0,013
0,408	0,414	0,006
0,409	0,414	0,005
0,410	0,414	0,004
0,413	0,414	0,001
0,413	0,414	0,001
0,413	0,414	0,001
0,414	0,414	0,000

NB: N = 21 856 (82 % of the unweighted sample).

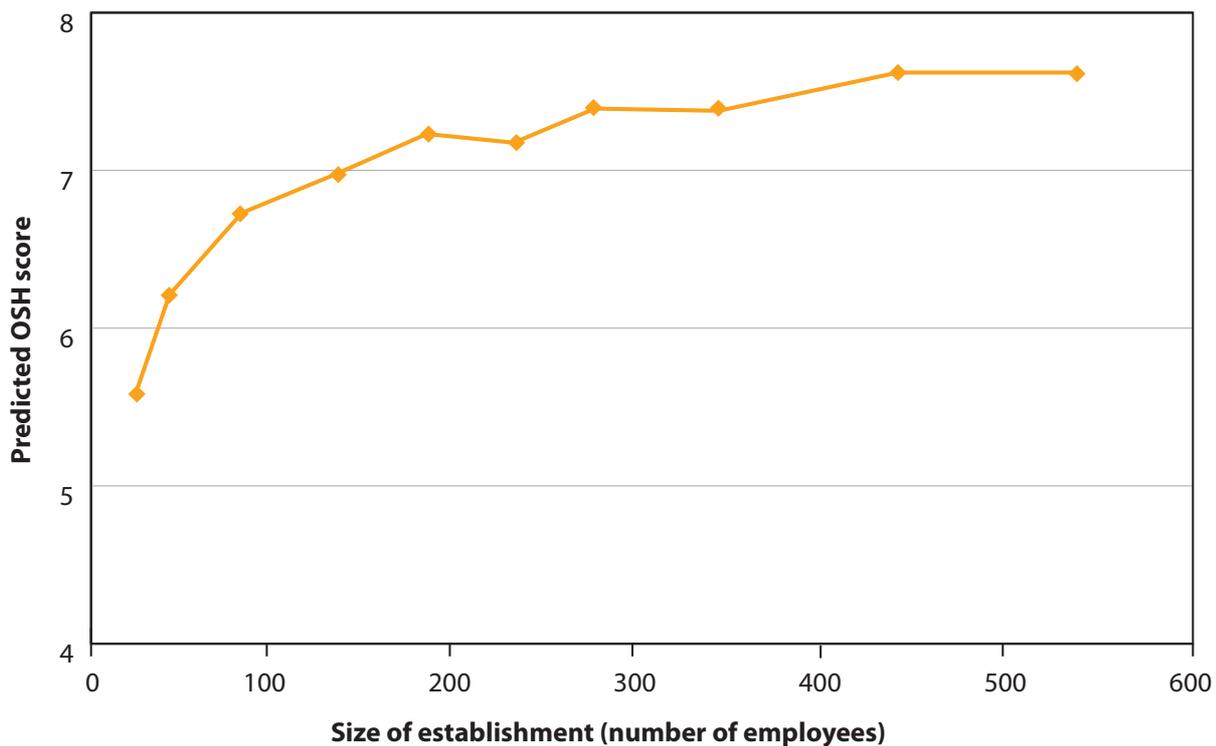
Source: RAND Europe calculations

4.2.2. *The size of the establishment and occupational safety and health management*

A large size of establishment is associated with better management of OSH. This relationship is illustrated in Figure 7 which presents the OSH score predicted on the basis of the multivariate model. The OSH score presented here expresses an average number of aspects of OSH management reported by establishments in each size category, with all other predictors of OSH management held constant, at their mean values.

The number of aspects of OSH management increases rapidly with establishment size up to 100 employees and more gradually thereafter. Smaller establishments report 5–6 aspects of OSH management, whereas the largest establishments report 7–8 aspects. The described relationship is statistically significant, and is in line with what can be expected on the basis of the literature on the determinants of OSH management.

Figure 7: **Size and OSH composite score**



NB: N = 21 856 (82 % of the unweighted sample).

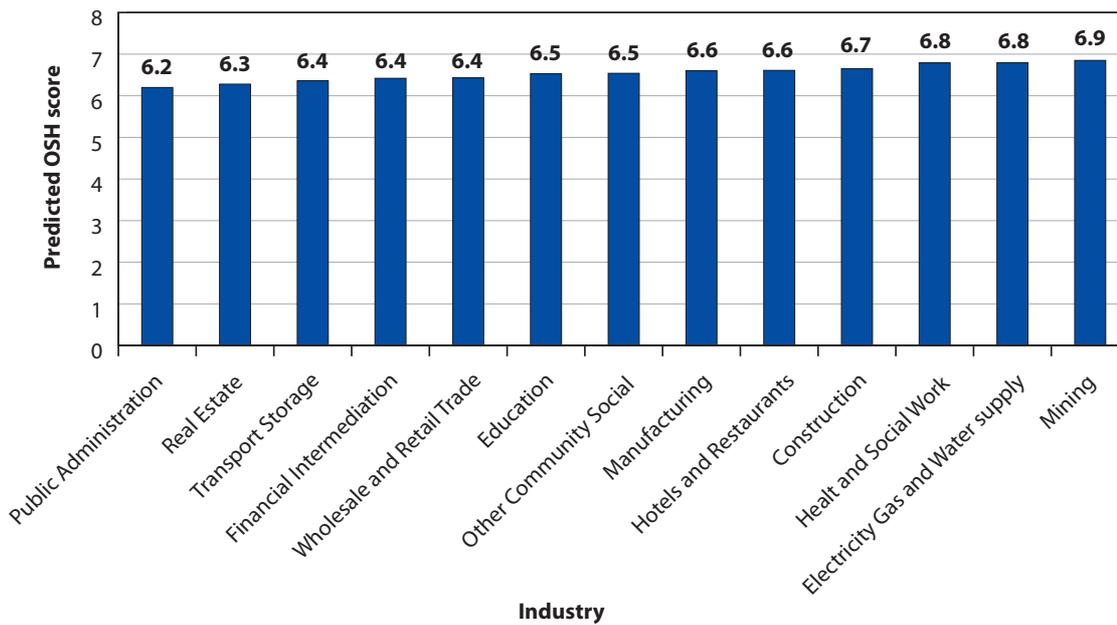
Source: RAND Europe calculations

4.2.3. *Industries and occupational safety and health management*

The scope of the management of risks is associated with the industry to which an establishment belongs. This relationship is described in Figure 8.

Again, we present the OSH score predicted on the basis of the multivariate model. The OSH score presented here expresses an average number of aspects of management of risks reported by establishments in each industry, with all other predictors of OSH management held at their means.

Figure 8: Industry and OSH composite score



NB: N = 21 856 (82 % of the unweighted sample).

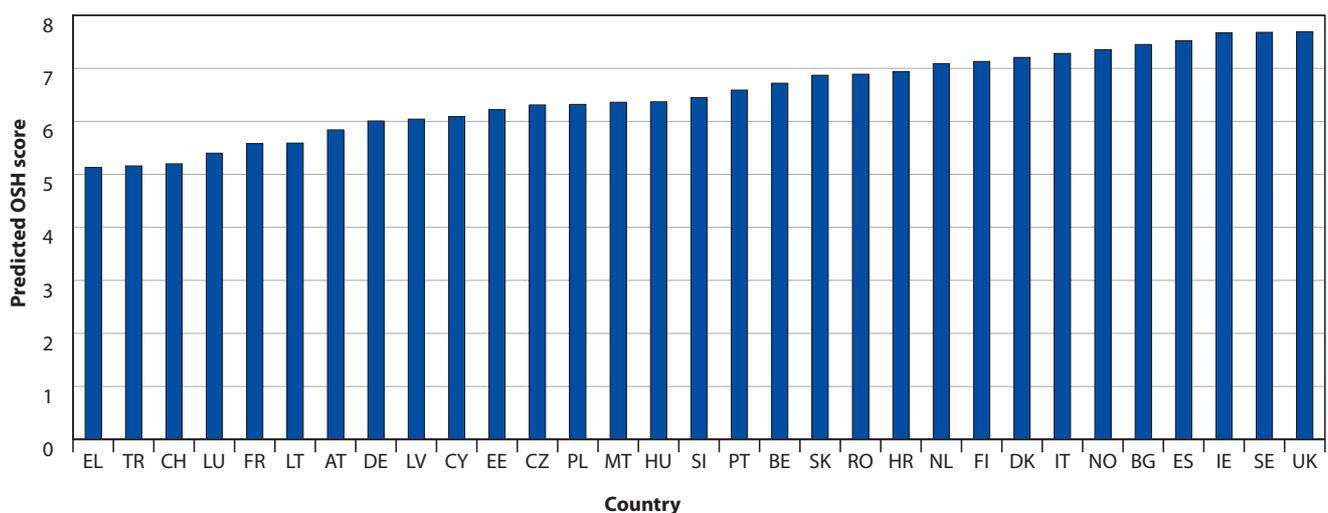
Source: RAND Europe calculations

The number of aspects of management of risks is lowest in public administration and real estate (six aspects) and mining, electricity and water supply and health and social work (around seven aspects). There is not a single industry that, as a whole, implements all aspects of OSH management, all other things being equal.

4.2.4. Reporting of aspects of occupational safety and health management and country context

The scope of management of risks is also associated with the country in which an establishment operates. This relationship is described by Figure 9.

Figure 9: Country and OSH composite score



NB: N = 21 856 (82 % of the unweighted sample).

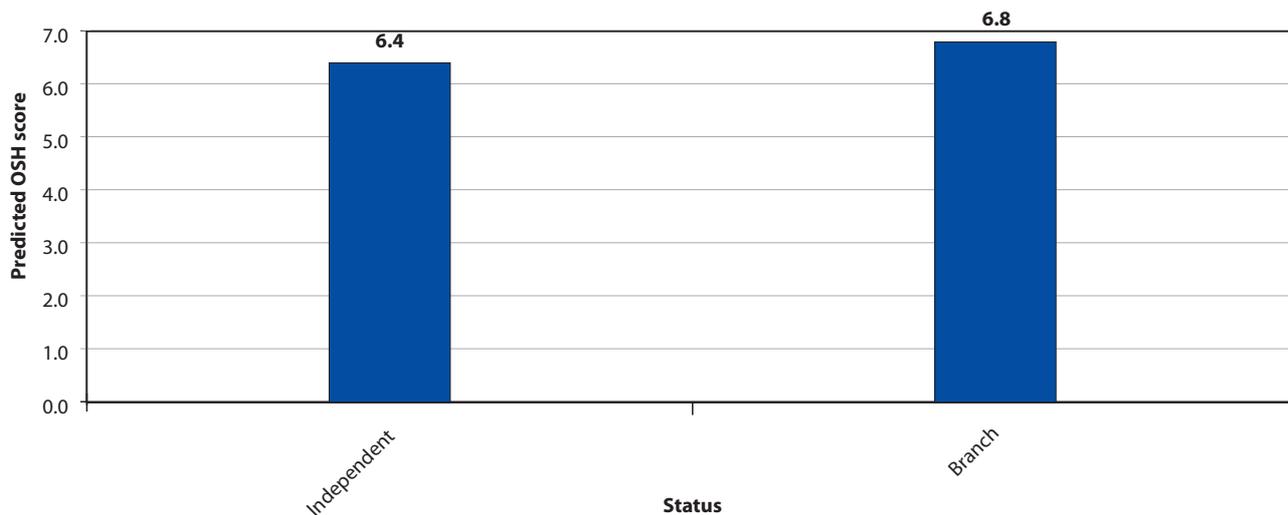
Source: RAND Europe calculations

All other things being equal, establishments in selected countries such as Greece, Switzerland and Turkey appear to be reporting the lowest number of OSH management practices: in these countries, around five aspects of management are reported. Establishments in selected countries of northern Europe show the highest number of OSH management measures: in Sweden and the United Kingdom around eight aspects are reported.

4.2.5. Independent establishments relative to those part of a larger establishment

Being part of a larger establishment (as opposed to being an independent establishment) is associated with somewhat better management of risks (Figure 10): all other things being equal, the difference in OSH scores between independent and non-independent establishments is about 0.4.

Figure 10: Status of establishment and OSH composite score



NB: N = 21 856 (82 % of the unweighted sample).

Source: RAND Europe calculations

So far, we have discussed the most important determinants of risks. The conclusion on their principal importance originates from a number of tests that were run. Firstly, we compared the standardised coefficients of all determinants and found that standardised coefficients of size, industry and country had the largest values. Secondly, we ran a sequence of 'reduced' multivariate models. In these models, we removed each determinant in turn and compared the proportion of variance explained by the model to the proportion of variance explained by the full model (i.e. the model with all determinants present).

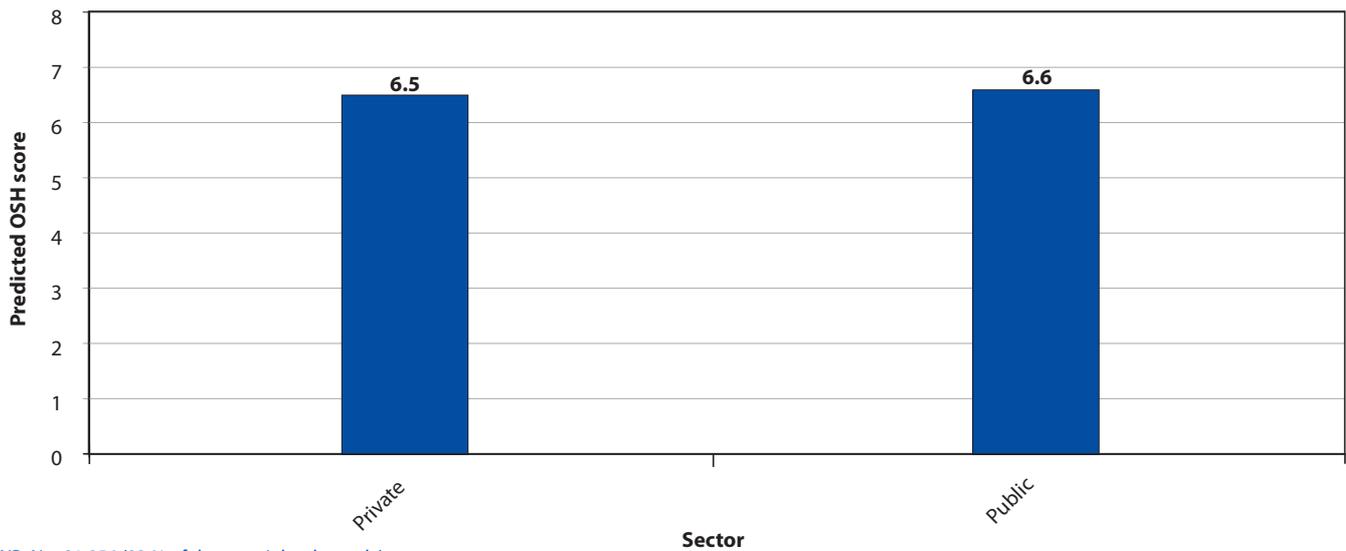
In the next section, we present some additional associations between selected determinants and the OSH score. We present

these associations in order of their importance. All determinants of management of risks shown in subsequent sections are less influential than size, industry, country, or being part of larger establishment.

4.2.6. Private establishments and occupational safety and health management measures

Private establishments are slightly worse at managing OSH than public establishments: the OSH score of private establishment is 0.1 point lower than in public establishments (Figure 11).

Figure 11: Sector and OSH composite score



NB: N = 21 856 (82 % of the unweighted sample).

Source: RAND Europe calculations

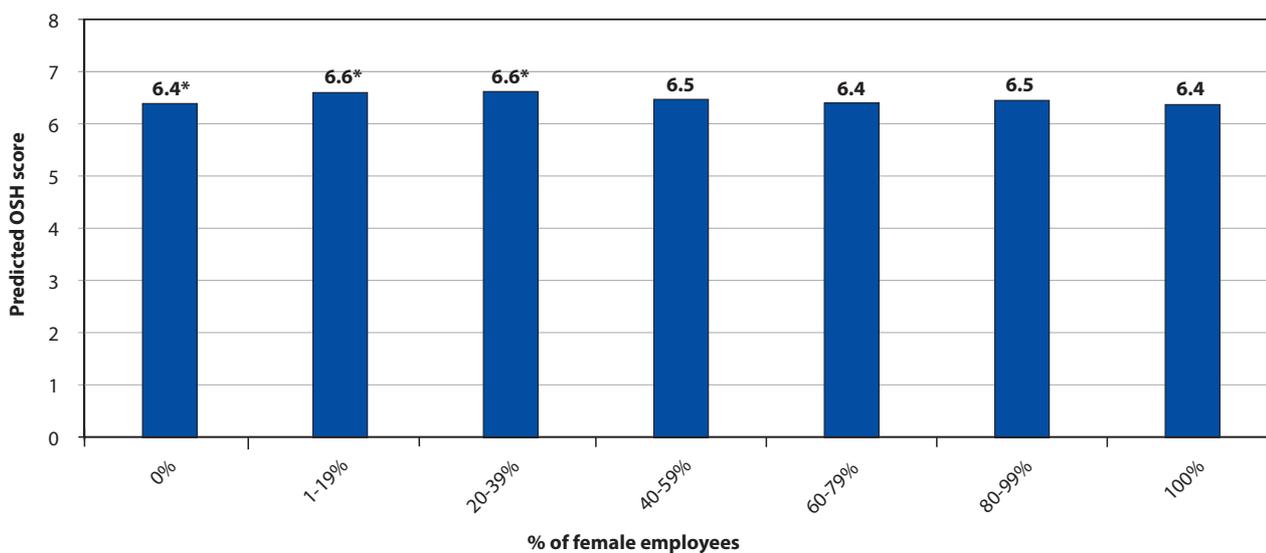
4.2.7. Demographics of establishments and reporting of occupational safety and health management measures

The demographic features of an establishment (i.e. the composition of its workforce by age, gender and origin) are the least influential determinants of the scope of management of risks.

The reporting of OSH management practice increases somewhat with an increase in the proportion of female employees. However, both male-exclusive and female-exclusive establishments

do worse in terms of OSH management than establishments with a more balanced gender composition. The OSH score of establishments with up to 40 % females in their workforce is 0.2 units higher than the score of establishment with no females at all. The OSH scores of female-exclusive and male-exclusive establishments are not significantly different from each other (Figure 12).

Figure 12: Gender composition and OSH composite score

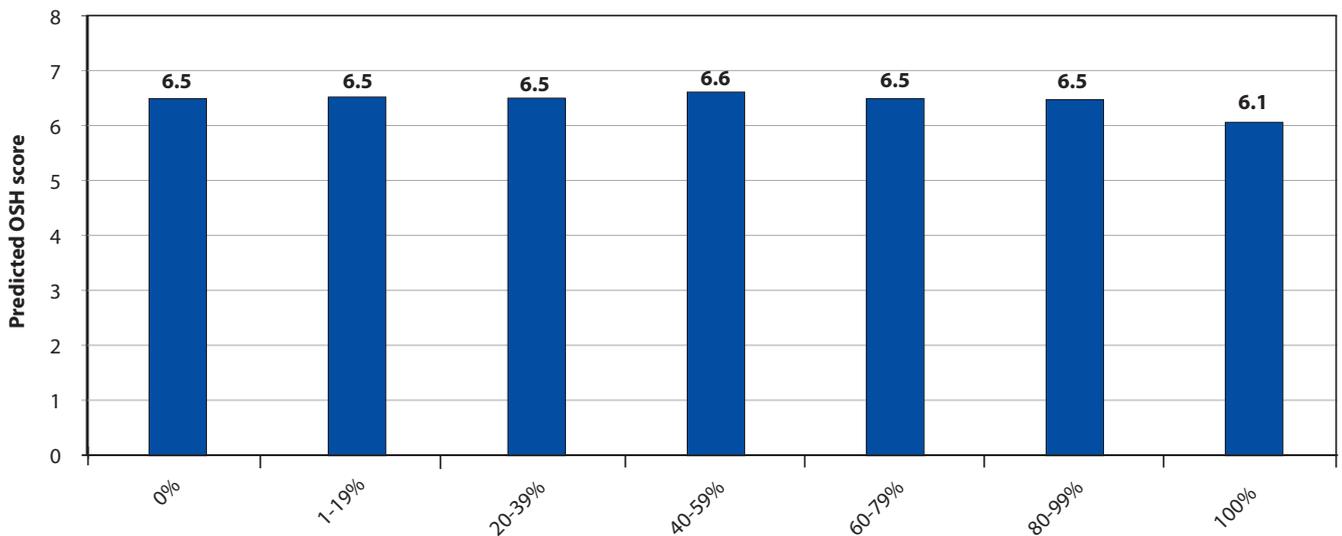


NB: N = 21 856 (82 % of the unweighted sample). Statistically significant relationships are marked with asterisks

Source: RAND Europe calculations

The proportion of non-nationals in an establishment’s workforce does not seem to have a perceptible impact on the scope of management of risk (Figure 13).

Figure 13: Non-nationals in an establishment and OSH composite score



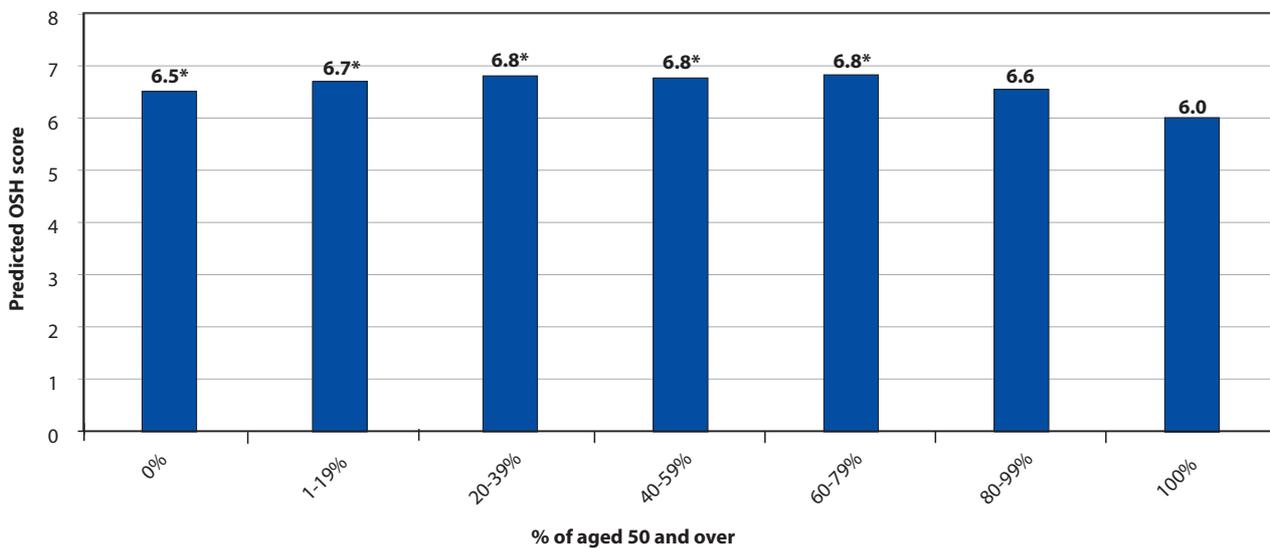
NB: N = 21 856 (82 % of the unweighted sample). Statistically significant relationships are marked with asterisks.

Source: RAND Europe calculations

The reported number of OSH management measures increases with the increase in the proportion of employees aged 50 years and over. The OSH score of establishments with 20–80 % of employees aged 50 years and over in their workforce is 0.3 units

higher than the score of establishment with no employees in this age group at all. The OSH scores of establishments relying exclusively on workers aged 50 years and above are at the same level as in establishments with no such workers.

Figure 14: Age composition and OSH composite score



NB: N = 21 856 (82 % of the unweighted sample). Statistically significant relationships are marked with asterisks.

Source: RAND Europe calculations

4.2.8. Looking at combinations of factors

This section presents predicted scores for combinations of industry and size, by country (Table 5). For this type of presentation, we chose to focus on two selected industries (construction and public administration — among the best and the worst in

terms of management of OSH risks, respectively) and on three categories of size. Countries have been selected to represent the highest (Spain, Sweden and the United Kingdom), the lowest (Greece and France) and the intermediate (Germany) levels of reported OSH management and to provide good coverage to principal European economies.

Table 5: Predicted OSH scores by country, industry and size

	Up to 50 employees	100–399 employees	400+ employees	Up to 50 employees	100–399 employees	400+ employees
Sweden	7.2	8.5	8.9	6.8	8.0	8.4
United Kingdom	7.2	8.3	8.9	6.8	8.1	8.4
Germany	5.5	6.8	7.2	5.1	6.4	6.7
Spain	7.1	8.3	8.7	6.6	6.0	8.3
France	5.1	6.4	6.8	4.7	5.9	6.3
Greece	4.7	6.0	6.3	4.2	5.5	5.9

NB: N = 21 856 (82 % of the unweighted sample).

Source: RAND Europe calculations

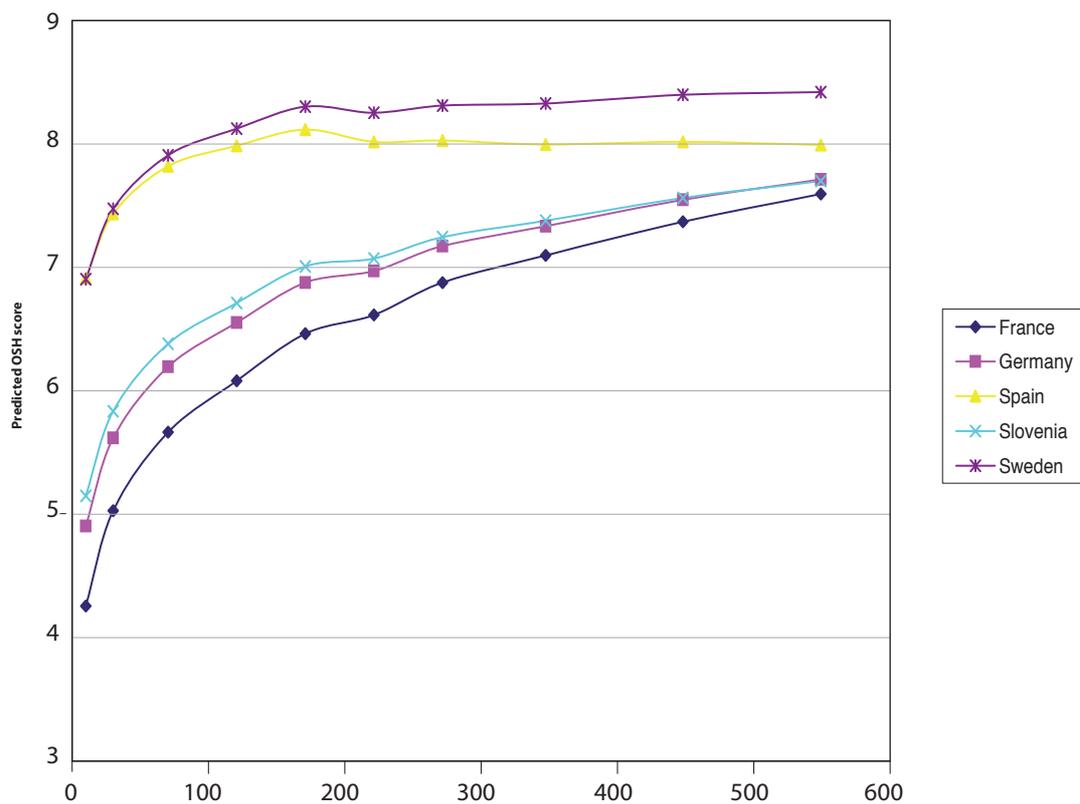
There are a number of key conclusions that can be derived from these results. Although establishment size matters (with a difference of just less than 1.7 units in OSH score between absolute size categories) it does not determine fully an establishments' course of action. Even at small company sizes, there is a possibility of having a rather decent coverage of OSH management aspects in certain regulatory contexts: in a range of 7–8 (out of a possible 9) in Spain, Sweden and the United Kingdom in both 'best' performing (construction) and 'worst' performing industries. Greece and Sweden show a difference of 2–3 units of OSH management aspects even at the largest establishment size. The differences between 'best' and 'worst' industries are the order of magnitude of half a unit of OSH score.

Country-specific economic, cultural and regulatory context matters the most. The difference between the 'best' and the 'worst' performing countries is about 2.5 units of OSH score which is significantly above the impacts of size and industry. Unfortunately, 'country context' is a non-specific entity in the context of this study and can include a variety of country characteristics. It is difficult to interpret it without an in-depth analysis of regulatory practices and social and cultural environments

in which OSH management is taking place. There are pockets of minimal presence of reported OSH management in Greece and France at small and medium establishment sizes in the public administration.

Size and country context interact strongly. When we look at the OSH score (reported practice) by establishments in a number of countries with differing profiles of OSH reporting (France with low reporting of OSH measures; Germany and Slovenia with medium reporting; and Spain and Sweden with high reporting), we see that differences in reporting in smaller establishments tend to be larger than in larger establishments (Figure 15). The difference between France and Sweden in average OSH reporting of management measures is about 2.1 units on the OSH index; it is about 2.7 units in the category 10–19 employees; 2.48 units in the category 20–49 employees; and less than 1 unit in establishments with 400 and more employees. This analysis strongly suggests that approaches to OSH management in the smaller and smallest establishments may vary significantly by country. In fact, differences in average OSH scores may be less if the reporting of management measures in smaller establishments can be improved.

Figure 15: OSH management measures reported by size of establishments in a selection of countries



Source: RAND Europe calculations

4.2.9. Looking in more detail at components of the index

The previous section highlighted the importance of country context and the size of establishments as factors in determining the extent of OSH management practice in establishments. This section looks in more detail at the frequency of components of the index in establishments of various sizes in some of the specific countries selected above (Germany, Spain, Greece, France, Sweden and the United Kingdom). These are countries with differing overall reported OSH management practices. The aim of this section is to see which components of the index are specific to country and size of establishment.

In Tables 6 to 10, the left column indicates the variables or components of the index; the overall frequency of measures is the average across all establishments included in ESENER; and N refers to the number of establishments included in each table or the sample. Frequency, here, refers to the percentage of establishments in the sample denoted by N reporting a specific practice.

Table 6 shows the frequency of OSH measures per size of establishment. As expected, it shows an overall decrease in measures as the size of an establishment decreases. However, the decrease is most pronounced for OSH management practice related to the use of health and safety services (e.g. ergonomic support); the analysis of reasons for absence; whether health and safety information is used to inform or improve OSH management; and the existence of a health and safety representative. The difference in frequency for this OSH practice between small and very large establishments is 47, 36, 42, and 42 respectively and between medium-sized and very large 22, 14, 19, and 13 (with larger establishments reporting more OSH practice). Other practices such as the presence of OSH policy, whether OSH is discussed, the presence of risk assessment, and the involvement of managers show a less substantial decrease in frequency across size ranges: respectively 21, 18, 13 and 13 between small and very large establishments and 6, 5, 4 and 4 between medium and very large establishments respectively (with large establishments reporting more OSH practice).

Table 6: Frequency of components of OSH index per size of establishment

Variable (questionnaire)	Abbreviated name	Frequency overall	Size of establishment				
			10–19 employees	20–49 employees	50–249 employees	250–499 employees	500+ employees
MM150	Service_use	55	36	47	61	76	83
MM152	Absence_analysis	59	43	54	65	76	79
MM153	Supporting_return	72	59	68	76	84	88
MM155	OSH_policy	80	70	77	85	89	91
MM158	OSH_discussed	89	79	87	92	97	97
MM159	Managers_involved	79	72	77	81	84	85
MM161	Risk_assessment	90	84	89	93	97	97
MM173	Info_used	58	41	51	64	78	83
HSR_exist	HSR_exist	72	52	65	81	91	94
N =		21 574	5 233	5 831	6 397	2 263	1 850

Source: RAND Europe calculations

When we look at frequency of components in specific countries, we notice, as before, the importance of country context (Table 7). However, differences in frequency are more pronounced for certain components of the OSH index than others across countries. For example, establishments in Greece report fewer OSH measures across the size ranges than in Sweden but they do report a higher use of risk assessment practice. The differences in frequency between countries seem less pronounced for OSH practice related to whether OSH is discussed at a high level, the involvement of line managers, and the use of risk assessment: with, respectively, differences of 14, 13,

and – 2 between Greece and Sweden; and, respectively, differences of 9, 18 and 16 between France and Sweden (with establishments in Sweden reporting more OSH practice). The other components of the index show wider differences in frequency. The widest difference in frequency between those reporting the most and the least OSH practice relate to the use of health and safety services and the existence of a health and safety representative with, for example, differences in frequency of 53 and 64 respectively between Greece and Sweden and 42 and 32 between France and Sweden (with establishments in Sweden reporting more OSH practice).

Table 7: Frequency of components of OSH index per specific country

Variable (questionnaire)	Abbreviated name	Frequency overall	Sweden	United Kingdom	Germany	Spain	France	Greece
MM150	Service_use	55	81	53	61	79	39	28
MM152	Absence_analysis	59	87	77	48	82	53	39
MM153	Supporting_return	72	97	95	80	86	72	56
MM155	OSH_policy	80	95	99	63	98	72	53
MM158	OSH_discussed	89	96	95	87	91	87	82
MM159	Managers_involved	79	90	86	64	84	72	77
MM161	Risk_assessment	90	92	99	86	97	76	94
MM173	Info_used	58	67	77	52	70	45	38
HSR_exist	HSR_exist	72	91	92	85	82	59	27
N =		21 574	696	1 172	1 211	1 164	1 260	834

Source: RAND Europe calculations

When highlighting these differences, it is useful to look at specific countries. Tables 8 to 10 look at the presence of OSH management practices across the size range of establishments in Germany, Greece and Sweden. When looking at a less commonly reported component of the OSH management practice index, such as the use of health and safety services, there is a difference in frequency between small and very large of 43 in Sweden; 55 in Germany; and 55 in Greece (with larger establishments reporting more OSH practice). However, small establishments in Sweden report the same frequency as the average of establishments included in ESENER while, in Germany, this difference is 19 and, in Greece, 45 (with smaller establishments reporting less than the overall average for establishments included in ESENER). When looking at a relatively commonly reported practice of OSH management such as whether OSH policy

is discussed, there is a difference in frequency between small and very large of 10 in Sweden; 18 in Germany; and 24 in Greece (with larger establishments reporting more OSH practice). Small establishments in Sweden report about the same frequency as the average of establishments included in ESENER while, in Germany, this difference is 11 and, in Greece, 15 (with smaller establishments reporting less than the overall average for establishments included in ESENER).

Part of the explanation for the differences in reporting in OSH management practice across countries appears to be that establishments in countries reporting more OSH practice have smaller differences in OSH practice between smaller and larger enterprises and show higher rates of reporting of OSH practice on less frequently reported practices across size ranges and, in particular, in smaller establishments.

Table 8: Frequency of components of the OSH index per size of establishments in Sweden

Variable (questionnaire)	Abbreviated name	Frequency overall	Size of establishment				
			10–19 employees	20–49 employees	50–249 employees	250–499 employees	500+ employees
MM150	Service_use	55	55	80	87	97	98
MM152	Absence_analysis	59	69	85	93	97	99
MM153	Supporting_return	72	92	97	99	100	100
MM155	OSH_policy	80	89	95	98	99	100
MM158	OSH_discussed	89	90	97	98	97	100
MM159	Managers_involved	79	85	92	89	90	97
MM161	Risk_assessment	90	82	92	96	96	100
MM173	Info_used	58	44	63	70	87	92
HSR_exist	HSR_exist	72	79	87	97	97	100
N =		696	143	191	206	68	88

Source: RAND Europe calculations

Table 9: Frequency of components of OSH index per size of establishments in Germany

Variable (questionnaire)	Abbreviated name	Frequency overall	Size of establishment				
			10–19 employees	20–49 employees	50–249 employees	250–499 employees	500+ employees
MM150	Service_use	55	36	51	67	80	91
MM152	Absence_analysis	59	27	34	56	63	78
MM153	Supporting_return	72	63	70	86	94	100
MM155	OSH_policy	80	47	58	69	69	80
MM158	OSH_discussed	89	78	80	90	95	96
MM159	Managers_involved	79	52	61	69	70	78
MM161	Risk_assessment	90	72	83	91	96	96
MM173	Info_used	58	30	42	56	69	81
HSR_exist	HSR_exist	72	62	80	93	99	100
N =		696	1 211	262	296	346	138

Source: RAND Europe calculations

Table 10: Frequency of components of OSH index per size of establishments in Greece

Variable (questionnaire)	Abbreviated name	Frequency overall	Size of establishment				
			10–19 employees	20–49 employees	50–249 employees	250–499 employees	500+ employees
MM150	Service_use	55	10	16	44	58	65
MM152	Absence_analysis	59	27	35	42	63	78
MM153	Supporting_return	72	45	52	63	71	83
MM155	OSH_policy	80	36	44	64	82	95
MM158	OSH_discussed	89	74	79	87	94	98
MM159	Managers_involved	79	75	73	77	88	93
MM161	Risk_assessment	90	91	92	96	100	98
MM173	Info_used	58	23	30	46	69	78
HSR_exist	HSR_exist	72	12	21	30	61	70
N =		834	242	241	239	72	40

Source: RAND Europe calculations

4.3. Additional findings

4.3.1. The management of occupational safety and health compared to the management of psychosocial risks

The percentages on the adoption of risk management measures outlined in 4.1.2 (about half of all establishments across Europe report at least seven aspects of the management system for general OSH risks; around 13 % of establishments report all nine aspects; and only 2 % report not implementing any aspects at all) stand in contrast to the management of psychosocial risks reported in an accompanying report on factors associated with effective management of psychosocial risks published by EU-OSHA. Around 3 % of all establishments report implementing all six aspects of management of psychosocial risks, while establishments not implementing any aspects form a sizable minority of around 12 %. Thus, the management of psychosocial risks appears to be a relatively problematic aspect of OSH management, seeming to be less well addressed at an organisational level than general risks. Consequently, these risks appear deserving of special attention by policymakers in the area of OSH ⁽¹²⁾.

4.3.2. The employee's and manager's perspectives in ESENER

ESENER asked for both managerial (MM) and employee representatives' (ER) perspective on selected questions. Of course, not all establishments included in ESENER had employee representatives, nor was it possible to carry out ER interviews in all establishments where they were present. As such, the section following is based on a subset of establishments. In relation to OSH risks, ESENER included four identical questions for manager and employee representatives: (i) a question on the presence of a documented policy, management system or action plan on OSH; (ii) a question on the impact that this policy, system or action plan has in their establishment; (iii) a question on presence of regular checks as part of the risk assessment procedure; and (iv) a question on the degree of involvement of line managers and supervisors in management of OSH.

Table 11 shows that responses to the same questions are very significantly correlated for some questions (on the presence of documented policy and risk assessments) and are less so on other questions (the impact that the policy has, and the degree of involvement of managers in OSH management).

⁽¹²⁾ This recommendation holds under the normative assumption that systemic management of psychosocial risks is needed in all establishments.

Table 11: Comparison of MM and ER perspectives

	MM155 v ER200 (%)	MM156 v ER202 (%)	MM161 v ER207 (%)	MM159 v ER214 (%)
MM yes AND ER yes	82	—	85	—
MM no AND ER no	3	—	2	—
MM yes AND ER no	7	—	9	—
MM no and ER yes	8	—	4	—
'Agreeing' fraction	85	51	87	49
'Disagreeing' fraction	15	49	13	51

MM155 v ER200: Is there a documented policy, established management system or action plan on health and safety in your establishment?

MM156 v ER202: In practice, how much of an impact does this policy, management system or action plan have on health and safety in your establishment? Does it have a large impact, some impact or practically no impact?

MM161 v ER207: Are workplaces in your establishment regularly checked for safety and health as part of a risk assessment or similar measure?

MM159 v ER214: Overall, how would you rate the degree of involvement of the line managers and supervisors in the management of health and safety? Is it very high, quite high or very low?

NB: Questions MM156/ER202 and MM159/ER214 have a non-binary response scheme; hence, for simplicity, only 'agreeing' and 'disagreeing' fractions are reported here.
Source: RAND Europe calculations

In relation to the rather objective questions on the presence of documented policy and risk assessments, MM and ER answers are identical in 85 % of cases. In relation to the more subjective questions on the impact of policy and degree of involvement of managers in OSH management, the answers are identical in 50 % of

cases, with employees generally more sceptical than managers. The greater agreement shown by the questions on the presence of documented policy and risk assessment could be partly related to the use of binary (Yes/No) responses to these questions.

Table 12: Comparison of MM and ER perspectives: MM155 v ER200

Panel A: Absolute figures				
MM155	ER200			
	Is there a documented policy, established management system or action plan on health and safety in your establishment?			
Is there a documented policy, established management system or action plan on health and safety in your establishment?	1. Yes	2. No	3. NA	Total
1. Yes	5 702	493	194	6 389
2. No	26	200	54	780
3. NA	49	7	1	57
Total	6 277	700	249	7 226

Panel B: Percentages

		ER200			
		Is there a documented policy, established management system or action plan on health and safety in your establishment?			
		1. Yes	2. No	3. NA	Total
MM155					
Is there a documented policy, established management system or action plan on health and safety in your establishment?		89.2	7.7	3.0	100.0
	1. Yes				
	2. No	67.4	25.6	6.9	100.0
	3. NA	86.0	12.3	1.8	100.0
	Total	86.9	9.7	3.4	100.0

Source: RAND Europe calculations

Table 13: Comparison of MM and ER perspectives: MM156 v ER202

Panel A: Absolute figures

		ER200				
		In practice, how much of an impact does this policy, management system or action plan have on health and safety in your establishment?				
		1. Large impact	2. Some impact	3. Practically no impact	4. NA	Total
MM156						
In practice, how much of an impact does this policy, management system or action plan have on health and safety in your establishment?		1 144	1 186	141	46	2 517
	1. Large impact					
	2. Some impact	868	1 603	249	55	2 775
	3. Practically no impact	82	188	46	5	321
	4.NA	31	44	11	3	89
	Total	2 125	3 021	447	109	5 702

Panel B: Percentages

		ER200				
		In practice, how much of an impact does this policy, management system or action plan have on health and safety in your establishment?				
		1. Large impact	2. Some impact	3. Practically no impact	4. NA	Total
MM156						
In practice, how much of an impact does this policy, management system or action plan have on health and safety in your establishment?		45.5	47.1	5.6	1.8	100.0
	1. Large impact					
	2. Some impact	31.3	57.8	9.0	2.0	100.0
	3. Practically no impact	25.5	58.6	14.3	1.6	100.0
	4. NA	34.8	49.4	12.4	3.4	100.0
	Total	37.3	53.0	7.8	1.9	100.0

Source: RAND Europe calculations

Table 14: Comparison of MM and ER perspectives: MM161 v ER207

Panel A: Absolute figures						
		ER207				
		Are workplaces in your establishment regularly checked for safety and health as part of a risk assessment or similar measure?				
		1. Yes	2. No	3. NA	Total	
MM161						
	Are workplaces in your establishment regularly checked for safety and health as part of a risk assessment or similar measure?	1. Yes	6 058	653	88	6 799
		2. No	273	114	12	399
		3. NA	23	5	0	28
		Total	6 354	772	100	7 226
Panel B: Percentages						
		ER207				
		Are workplaces in your establishment regularly checked for safety and health as part of a risk assessment or similar measure??				
		1. Yes	2. No	3. NA	Total	
MM161						
	Are workplaces in your establishment regularly checked for safety and health as part of a risk assessment or similar measure?	1. Yes	89.1	9.6	1.3	100.0
		2. No	68.4	28.6	3.0	100.0
		3. NA	82.1	17.9	0.0	100.0
		Total	87.9	10.7	1.4	100.0

Source: RAND Europe calculations

Table 15: Comparison of MM and ER perspectives: MM159 v ER214

Panel A: Absolute figures								
		ER124						
		Overall, how would you rate the degree of involvement of the line managers and supervisors in the management of health and safety? It is very high, quite high, quite low or very low?						
		1. Very high	2. Quite high	3. Quite low	4. Very low	5. NA	Total	
MM159								
	Overall, how would you rate the degree of involvement of the line managers and supervisors in the management of health and safety? It is very high, quite high, quite low or very low?	1. Very high	440	958	179	35	47	1 659
		2. Quite high	650	2 669	703	130	108	4 260
		3. Quite low	106	562	255	59	27	1 009
		4. Very low	16	79	38	9	5	147
		5. NA	18	73	21	3	36	151
		Total	1 230	4 341	1 196	236	223	7 226

Panel B: Percentages

ER124

Overall, how would you rate the degree of involvement of the line managers and supervisors in the management of health and safety? It is very high, quite high, quite low or very low?

MM159

Overall, how would you rate the degree of involvement of the line managers and supervisors in the management of health and safety? It is very high, quite high, quite low or very low?

	1. Very high	2. Quite high	3. Quite low	4. Very low	5. NA	Total
1. Very high	26.5	57.7	10.8	2.1	2.8	100.0
2. Quite high	15.3	62.7	16.5	3.1	2.5	100.0
3. Quite low	10.5	55.7	25.3	5.8	2.7	100.0
4. Very low	10.9	53.7	25.9	6.1	3.4	100.0
5. NA	11.9	48.3	13.9	2.0	23.8	100.0
Total	17.0	60.1	16.6	3.3	3.1	100.0

Source: RAND Europe calculations

To further assess the difference between the MM and ER perspectives we replaced MM-based questions with ER-based questions in factor analysis (see Table 13 in Appendix A for more information (http://osha.europa.eu/en/publications/reports/esener_management_annexes/view)). The results showed that ER responses are weakly correlated with the underlying pattern of MM responses and that they form their own distinct factor. Thus, ideally, one should measure management of risks with the help of two sets of responses, covering MM and ER perspectives.

In terms of what can be said after the replacement of specific ER variables in the MM model, it appears that, rather consistently, the size of the establishment has a greater impact on the reported MM measures relative to ER measures. There may be a number of explanations for this: we can only speculate. Firstly, one could point to the fact that the association between size and management of OSH is well documented in the literature. This may suggest that MM-based measures of OSH are somewhat more objective than ER measures. However, it is clear that employee representation is not consistent across all establishments. As such, it may also capture the fact that where there is employee representation in an establishment, OSH management is likely to be better developed as well. Furthermore, the reported OSH score may not increase in size as much in the ER survey as in the MM survey. Clearly, more research is required to understand such differences in the reporting between ER and MM surveys.

4.4. Summary

This chapter has given an overview of the main findings of the empirical analysis of ESENER data. Appendix A (http://osha.europa.eu/en/publications/reports/esener_management_annexes/view) gives specific details on the factor analysis and multivariate modelling. The following were the main findings.

- Applying factor analysis showed that nine out of the 11 factors or variables considered for inclusion in the OSH management index were strongly correlated with each other. This enables the devel-

opment of a composite OSH index and leads to the conclusion that establishments, on the whole, appear to be taking systemic approaches to the management of OSH. The application of a systemic approach to the management of OSH approach appears empirically justifiable.

- The size of establishment, industry and country are the strongest determinants of the scope of OSH management in establishments.
- Smaller establishments report fewer OSH management measures compared to large establishments.
- Industries differ significantly in relation to the scope of management of OSH. Aspects of management of OSH are typically reported more in industries such as construction, mining and health and social work relative to public administration and real estate.
- The host of cultural, economic and regulatory realities captured in this study by a 'country' variable are strong determinants of management of OSH. A more detailed analysis reveals the country context to be the most significant factor in determining the presence of preventative measures.
- From our more detailed analysis, there are pockets of minimal presence of OSH management in specific countries at small establishment sizes in the public administration sector. This observation confirms that size, country context and industry interact strongly in explaining the presence of OSH management measures in establishments.
- Independent establishments report fewer OSH management measures compared to those that form part of a larger entity.
- Other demographic variables are less significant in explaining differences in reporting of OSH management measures.

- The most frequently reported components of the index are the implementation of an OSH policy, discussion of OSH in high-level management meetings, the involvement of line managers in OSH management and regularly carrying out risk assessment. Least frequent are the use of health and safety services (e.g. ergonomic supports); analysis of reasons for absence; having used health and safety information to inform or improve OSH management; and the existence of a health and safety representative.
- Countries with better OSH management practice particularly tend to have smaller differences in reported OSH practice between smaller and larger establishments than countries reporting less OSH practice and show much higher rates of reporting of OSH practice on overall less frequently reported OSH practice across size ranges.
- The reported management of general OSH in European establishments appears to be better than the management of psychosocial risks.
- The empirical analysis shows that the employee representatives' and managers' perspectives are correlated.

5. Discussion of what the survey can tell us

Understanding the limitations of ESENER is necessary as it affects what we can say on the basis of the empirical analysis. However, it is important to note that, despite some inherent limitations, some clear policy recommendations can be identified (see Chapter 6).

5.1. Inherent limitations of the survey

5.1.1. Weaknesses common to surveys like ESENER and the empirical analysis undertaken

This chapter does not aim to give an overview of the specific methodology used to deploy ESENER and so does not reflect on how the survey instrument was designed, the sampling, response rates, representativeness, or the way the data was collected. These processes are described in a report by TNS Infratest Sozialforschung, Germany, available from EU-OSHA ⁽¹³⁾: TNS Infratest is the organisation that managed the design, sampling, and implementation of the survey across the 31 countries on behalf of EU-OSHA. Rather, this section points to some general issues.

Telephone surveys such as ESENER typically have a low response rate compared with those administered face-to-face (but higher than postal or Internet-based surveys). A cross-European survey also has different response rates by country, which is a characteristic of many surveys including the European Company Survey managed by the European Foundation for the Improvement of Living and Working Conditions. Upfront, it is hard to say how issues related to response rate affect the survey. One would need to build up a profile of the establishments not taking part in the survey to understand if any bias is introduced in the results.

We investigated the impact of question non-response in the analysis by assigning a separate code to categories with missing information and using it as an additional category in regression analysis. In most cases, the coefficients of 'missing' categories were not statistically

significant. On the basis of these findings, there was no reason to suspect that 'missing' categories could be informative.

Aside from data quality issues, the most important limitations to an empirical analysis of this kind relate to the inability to identify the direction of impact and causality. For example, in establishing the index of OSH management, it is not always clear how the variables in the index relate to each other: training may impact the procedure on how to deal with violence and harassment and vice versa. The empirical research can tell us little about the direction of causality. In fact, this observation shows the importance of a thorough review of the literature. At the same time, gaps in the literature limit what we can say about interdependencies. From an empirical point of view, two strategies could help in determining the direction of causality: a repeat survey covering as many of the establishments who replied in the first survey as possible, which would significantly enhance understanding of causality; and qualitative research with establishments to understand the context of their responses and their view on relationships.

Finally, a survey like ESENER relies on individuals to give accurate responses. There may be a variety of reasons why respondents give less than accurate responses in a survey. For example, they may try to respond in a manner that will be viewed favourably by others (social desirability bias). In this report, we do not speculate on different biases that affect responses to the questions. As such, we took the answers in the survey as a given.

5.1.2. The coverage in the survey of questions on the management of OSH

A further limitation linked to the first is the uneven coverage within the questions of the conceptual framework proposed in Chapter 3. The survey contained questions which were asked of all establishments (unfiltered) and questions which were asked of a subset of establishments (filtered). The unfiltered questions focus particularly on common interventions and how common risk factors are dealt with in an organisation. As such, there are few unfiltered questions on how interventions are evaluated and how information on risks is gathered, analysed and translated into action. Ideally, more aspects of the risk management approach would be included as unfiltered questions in the survey; this would allow us to test the prevalence of various other measures aimed

⁽¹³⁾ <http://www.esener.eu>

at the effective management of OSH and see how they relate to other aspects that were included in the index developed in Chapter 4.

This low coverage and the way questions are asked are linked to how we could use factor analysis in this project. Factor analysis builds an index of associated measures and excludes less significant variables. In addition, factor analysis looks at questions asked across establishments rather than filtered questions. As such, having questions using different modalities and asking questions that cover part of a systemic approach limit what we can say using factor analysis about components that empirically constitute an index.

5.1.3. Outcome information in ESENER

ESENER focuses on reported practice and, as such, does not ask about the quality of implementation or the impact of such implementation. There are some good reasons for not including outcome questions:

- self-reported information from establishments on impacts may be unreliable;
- such questions cause some overlaps with others surveys such as the European Working Conditions Survey;
- surveys have a space restriction on the number of questions that can be included (particularly telephone surveys);
- telephone surveys can only ask respondents for information that is easily available to them.

Nonetheless, the absence of information on the quality of implementation and impact may introduce a bias in the analysis, for example towards establishments that use a 'tick the boxes' approach to OSH management, with less concern for quality. It is important to note that ESENER did ask follow-up questions to try to understand the various aspects of OSH management. For example, it asked whether establishments use in-house risk assessment or outsourced risk assessment; however, the filtered results do not lend themselves easily to factor analysis.

In future surveys, EU-OSHA could consider collecting selected 'objective' measures of health and safety, such as the rate of accidents and sickness at the workplace, in addition to questions on the management of OSH that are already being collected. The collection of such measures would allow the correlation of patterns of management of OSH to the actual experiences of OSH at an establishment level. Coupled with a longitudinal design (see above), it could inform on the extent to which patterns of OSH practice affect the actual OSH outcomes. A major downside of taking this approach is that, typically, respondents estimate outcome measures that are often inconsistent with official data held on an establishment, or — more importantly — with reality.

As an alternative to making the survey longer and more cumbersome, in follow-up work, EU-OSHA could consider the linkage of specific survey data to administrative sources of information (e.g. business registries and databases containing information on accidents at workplaces). Typically, such sources contain rich information on workplace accidents and some measures of businesses performance. For example, the Health

and Safety Executive in the United Kingdom maintains a company-level database on fatal and non-fatal injuries, occupational diseases, and dangerous occurrences (RIDDOR), and the Office for National Statistics maintains the Inter-Departmental Business Register containing data on companies' turnover, employees, goods and services traded. Data linkage could be a laborious undertaking but it would also represent a shortcut towards the collection of 'objective' data, which is harder to obtain through surveys. Moreover, such data derived from administrative sources could be of better quality, and time series of data could be obtained. However, access to such data is a problem, data is likely to be available at company level (not at establishment level) and such data is not harmonised across Europe. As such, this approach could not be undertaken systematically in ESENER, but may be feasible more discretely as an accompanying piece of research.

5.1.4. ESENER and informal procedures and organisational culture

ESENER rightly focuses on procedures and processes that are in place. However, informal processes and organisational culture may contribute quite significantly, in a number of establishments, to the effective management of OSH. This may particularly be the case in countries with soft regulatory approaches or with a large proportion of small-sized enterprises, allowing less well-documented OSH management practices. ESENER tries to capture informal processes to some extent by, for example, referring to workplace checks rather than formal documented risk assessment.

5.2. Summary

This chapter provided an overview of some of the limitations of ESENER as they affect what we can conclude. We then discussed some policy implications. The following are the main findings.

- The analysis of ESENER presents similar challenges to other large-scale international surveys. ESENER has similar issues regarding the management of non-response, an inevitable issue in most large-scale surveys. The empirical analysis is not affected by missing information. However, the direction of impact and causality are difficult to establish. To assist in determining the direction of causality, two approaches could be used: a repeat survey covering as many of the establishments who replied in the first survey as possible, which would significantly enhance understanding of causality; and qualitative research with establishments to understand the context of their responses and their view on relationships.
- The questions in ESENER cover the aspects of the conceptual framework but somewhat unevenly in places. The questions also vary between the employee representatives' and managers' surveys making strict comparative analysis difficult. Future surveys could benefit from a more conceptual approach that lends itself better to factor analysis.
- ESENER does not readily include outcome information, making it difficult to assess the quality of implementation and impacts. ESENER could explore the possibility of linkage to existing sources of administrative data on impacts.

6. Towards policy recommendations

In this chapter, we discuss some of the policy implications from the empirical analysis. Some interesting policy implications arise. In each section, we outline the main finding and the specific need for further research. Further research could take the form of further development of the ESENER instrument, qualitative and follow-up research sponsored by EU-OSHA, and independent academic work.

6.1. Main findings

6.1.1. *The empirical analysis and the use of OSH management systems*

Chapter 2 concludes that systemic approaches to OSH are increasingly put forward as more effective ways of managing OSH. Though the evidence is not robust and comprehensive, the literature identifies a range of characteristics associated with the effective use of OSH management. On this basis, Chapter 3 introduced a conceptual framework, broadly based on approaches used by wider health and safety stakeholders (HSE, 1998; HSE, 1997; INRS, 2004a).

In the first instance, we examined how well the questions in ESENER covered the conceptual framework.

Secondly, we analysed whether specific establishment characteristics are associated with the scope of OSH management reporting. Gaining this understanding can lead to more effective targeting of policy interventions.

Main finding

Our empirical analysis showed that those aspects that we expected to be part of a common approach on the basis of our understanding of the conceptual framework, indeed, proved to be closely related. So, an important result of the empirical analysis is that it finds that the use of systemic approaches is useful to guide the empirical analysis, not just from a normative point of view or based on the existing literature. The analysis also shows that reported uptake of OSH management is comparatively better than the reported uptake of measures aimed at psychosocial risks. This finding appears to reflect the emergent nature of psychosocial risks compared to the longer history of OSH management in the workplace.

Further research

In the empirical analysis using factor analysis, we could only look at certain aspects of an OSH management system — those that were covered across all establishments in ESENER. Further research is required to test which further aspects of management could be part of the index as well as what their respective weights are in the index.

6.1.2. *Frequency of OSH practice*

Our analysis in Chapter 4 showed that the most frequent components of the OSH index are the presence of an OSH policy; whether OSH is discussed at high level; the involvement of line managers; support for the return to work; and risk assessment. Less frequent are the use of health and safety services (e.g. ergonomic support); the analysis of reasons for absence; whether health and safety information has been accessed to

inform or improve OSH management; support for the return to work after sickness absence; and the existence of a health and safety representative.

There are differences between countries in the frequency of OSH management practice, mainly accounted for by the frequency of reporting among smaller establishments. In countries with a high frequency of reported practices, there is a smaller difference between large and small enterprises than in countries where the overall frequency is low.

Main finding

The empirically visible differences in OSH scores appear to reflect a distinction between 'basic' and 'involved' management of OSH. Basic management would include formal compliance with a regulatory requirement to undertake risk assessment, discussing and drafting an OSH policy, and line managers' involvement in OSH management. More active or involved management would include the use of internal and external services for the provision of health and safety services, active support for the return to work after sickness, analysis of absenteeism data, and the use of external information to inform OSH policy. This seems to imply that a distinction can be made between establishments that only adopt an OSH policy and undertake basic organisation development, and establishments that, in addition, actively plan and implement OSH policy and measure and monitor the performance of their OSH initiatives.

This empirical finding seems to suggest that the main principles of European regulation in the area (1989 Framework Directive (89/391/EEC)) appear relatively well embedded in OSH practice. However, wider measures to support OSH policy more systematically in terms of supporting implementation and monitoring of OSH initiatives seem to be more variable across establishments and countries.

Some of the main drivers in explaining these differences are now discussed.

6.1.3. *Size*

Several studies point to the importance of the size of establishments in explaining how comprehensive an approach they take to OSH management. However, we can draw two seemingly contradictory conclusions on size from the empirical analysis in Chapter 4: smaller establishments report fewer OSH management measures; and there are small establishments in specific industries and countries that report high numbers of OSH management measures. It is important to consider the effect of size, as structural changes in the EU-27 mean that SMEs are an increasingly important employer and will remain a driver for job growth going forward (EC, 2009).

The first conclusion would underline the importance of size in determining the approach to OSH management highlighted in the literature. The literature focuses on the limited capacity of smaller establishments to formalise approaches and procedures (e.g. Valued Research Ltd, 2007). For example, it may not make sense for small establishments to analyse the reasons for absenteeism formally or to appoint a health and safety representative. Hasle et al. (2009) suggest that smaller and medium-sized companies take a less systematic approach to risk management and focus less on preventative measures (see also Arocena and Nuñez, 2010). Many of these establishments may have informal approaches and limited resources and expertise (see also EU-OSHA, 2010; Walters,

2001; Baldock et al., 2006). An analysis of the ESENER data undertaken by EU-OSHA of all establishments participating in the survey suggests that a lack of resources such as time, staff or money (36 % of all establishments), a lack of expertise (24 % of all establishments), and the culture within the establishment (24 % of all establishments) are some of the main barriers to the uptake of OSH management reported by the respondents (EU-OSHA, 2010). Furthermore, establishments may have differing perceptions of what constitutes OSH management. Analysis from EU-OSHA (2010) highlights that larger establishments typically find regulatory compliance and employee feedback more important drivers for the adoption of OSH management measures than smaller establishments. Our empirical analysis seems to confirm that employee feedback and legal compliance are significant factors in explaining the differences between establishments overall, meaning, logically, that an establishment which finds regulatory compliance and employee feedback less important has a lower uptake of OSH management. A further reason suggested by EU-OSHA for a lower uptake of OSH management in smaller establishments is the higher frequency of inspections and contact with authorities in larger establishments, a point we revisit later. These reasons could all contribute to the low reporting of formal OSH management practice in small establishments ⁽¹⁴⁾.

However, this conclusion does not hold for all establishments. As Chapter 4 found, there are a substantial number of small establishments that report high levels of OSH management measures. Indeed, a finding from the empirical analysis was that the countries with an overall higher score on the OSH index appear to have smaller differences in reported practice between very large and small establishments. As such, size matters in explaining the overall differences in OSH practice (our empirical analysis shows that size explains about 7 % of the overall variance), but not as much in every context. From an organisational culture point of view, smaller organisations may be in a better position than larger establishments to adopt OSH management practice (EU-OSHA, 2010). Smaller establishments often have a closer relationship with their employees and, as such, good quality employee relations. Baldock et al. (2006) comment that, in Spain, smaller establishments are often more open to client feedback. EU-OSHA (2010) shows that the openness of industry or an establishment to feedback from employees and clients is a main driver for the adoption of OSH management, with 76 % of all establishments reporting employee feedback as a reason to adopt a policy; and 67 % reporting client feedback and concerns about reputation.

These findings are interesting for policymakers as they suggest that providing the correct environment (regulatory, but especially support and guidance) can result in small establishments adopting a good level of OSH management.

⁽¹⁴⁾ ESENER took these observations on the tendency of small establishments to rely on 'informal' measures into account. Firstly, ESENER asked about the general existing workplace checks rather than asking about the existence of a formal documented risk assessment. The resulting high incidence of workplace checks can be seen as evidence of the informal approach in smaller establishments. Unfortunately, the follow-up questions exploring the nature of workplace checks were hard to operationalise in the empirical analysis due to them being filtered. Secondly, ESENER tried to mitigate for differences in perceptions by asking specifically about the existence or not of policies and practices and keeping subjective assessments to a minimum. As such, ESENER reduced the impact of these characteristics.

Main finding

The inherent characteristic of being small does not predetermine the approach adopted by the establishment with regards to OSH management. However, there are significant hurdles in terms of resources and expertise to overcome as well as factors to take into account such as organisational culture, the nature of industry, and country factors (see following sections).

6.1.4. Practice in industry

One such factor is the industry variable. Our empirical analysis shows that various industries differ significantly in the scope of OSH management reported. It seems that OSH management systems develop over time to address the needs of a sector. However, we need to recognise that regulatory interventions often target industries at higher risk of significant health and safety problems. Arocena and Nuñez (2010) show that, in the Navarre region of Spain, several industry-related factors affect how comprehensive an approach to OSH management establishments take. Jobs of a physical nature tend to imply a higher organisational emphasis on OSH management. Technology-intensive establishments tend to update their OSH management procedures more frequently. In contrast, establishments in a highly price-competitive market tend to cut investment in OSH management. Degrees of unionisation in an industry also affect OSH management, with higher degrees of unionisation leading to higher uptake of OSH management practice. Analysis by EU-OSHA (2010) shows that economic considerations and business performance can also be a significant driver for the adoption of OSH measures, reported by 52 % of all establishments surveyed in ESENER.

On the one hand, these findings may be reassuring to policymakers as they imply that those sectors traditionally at greater risk of health and safety problems are among the better performers in terms of reported OSH management. Moreover, a focus in industry on technology also leads to regular updating of OSH procedures. On the other hand, it could imply that approaches may still be based on traditional perceptions of risk. As we know from Chapter 2, fatality and accident rates have been decreasing over time and new risks have emerged, such as those giving rise to musculoskeletal or psychosocial disorders, which may impact a wider group of workers across establishments. Also, OSH management could be influenced by economic factors, whether negatively in price-competitive sectors or positively where OSH management and staff retention are seen as prioritised.

Main finding

It appears that industries that have traditionally had comparatively higher rates of fatalities and accidents at work, such as the construction and mining industries, establishments in the health and social sector, technology-intensive industries and utilities (Hassan et al., 2009) also report more measures of OSH management. Nonetheless, the empirical analysis shows that the industry variable is not the most significant factor in ESENER in explaining differences in OSH management between establishments, accounting for about 1 % of the variance.

6.1.5. The country context

Clearly, the host of cultural, economic and regulatory realities captured in this study by the 'country' variable are strong determinants of the

management of OSH. Together, they explain a very significant 17 % of the difference in OSH management between establishments in our model. However, the country context presents a difficulty for policy-makers, as it is not always easy to identify clear policy levers from the 'country' variable.

The literature, empirical analysis and descriptive statistics give some indication of what is important in the country context. In first place are national regulatory incentives. Regulation and regulatory oversight are obvious policy levers to promote the adoption of OSH practice. EU-OSHA (2010) shows that some of the main drivers for the uptake of OSH management in a majority of establishments are: the fulfilment of legal obligations (90 % of all establishments); and pressure from the labour inspectorate (57 % of all establishments). Our empirical analysis of ESENER shows that several reasons for promoting OSH management in an establishment, from fulfilling legal requirements to economic reasons, are significant factors in explaining differences between establishments, and account for about 4 % of the total variance in our model. Compliance with legal requirements is one of the more significant explanatory factors among the reasons. The empirical analysis also shows that visits by the labour inspectorate are a small, but still significant, contributing factor in explaining the difference in OSH management between establishments, accounting for about 1 % of the overall variance in our model. However, the nature of the inspection is important (Mendeloff et al., 2006). Inspection regimes in countries with relatively well-developed OSH practice in establishments such as Sweden and the United Kingdom are increasingly risk-based (e.g. the United Kingdom has reduced proactive inspections), follow consistent guidelines, and have a consultative dimension to assist establishments in developing OSH policy and promoting its implementation. Specific national regulation can also play a role. Rigby and Lawlor (2001) outline the importance of a provision in Spanish law to allow establishments to choose between in-house and external provision of prevention services. They find that establishments choosing external services are less likely to implement advanced OSH systems. This finding is particularly relevant for smaller and medium-sized establishments, which often outsource provision if allowed.

Secondly, Arocena and Nuñez (2010) highlight the importance of good access to public support and training activities in establishments adopting more comprehensive OSH management systems. Similarly, EU-OSHA (2010) confirms the importance of training and access to expertise in order to overcome the capacity-related barriers to effective OSH management that are common in smaller-sized enterprises. This factor also seems relevant in the empirical analysis of ESENER. The low frequency in the use of support measures (both in-house and external) indicates the limited resources used in many establishments for OSH measures. This can imply: limited public support for establishments to implement OSH management; the lack of suitable external expertise and resources; or limited awareness in establishments about public support.

Thirdly, and following from the last paragraph, the absence of information on OSH management is important. A lack of awareness was cited by 26 % of all establishments in ESENER as a difficulty in dealing with health and safety (see also EU-OSHA, 2010). This observation stands in contrast to reporting on the barriers to psychosocial risk management and suggests that most establishments have either put more OSH management practice in place; are more aware of the issues around OSH management; or have a longer history of engaging with OSH management. In the

empirical analysis presented in this report, the use of information on OSH is one of the least frequently reported measures in the OSH scores across establishments. This finding indicates that: the information may not be available; establishments are not aware of it; or establishments choose not to use it. The empirical analysis also showed an interesting difference in use of information between larger and smaller establishments.

Finally, several factors mentioned previously are not necessarily always industry-specific or related to the size of an establishment. They can also have a national dimension. Three such factors are the nature of industrial relations, organisational culture, and economic conditions. It seems logical to assume that given there are national differences that such differences will, in turn, affect the uptake of OSH management. For example, in Sweden, 76.8 % of workers in 2003 were unionised compared to 15.6 % in France (Schnabel and Wagner, 2005) ⁽¹⁵⁾. A significant part of the variance between establishments is not explained by the model in this report and it seems logical to assume that some of these are significant explanatory factors (see also the accompanying report 'Worker representation and consultation on health and safety — An analysis of the findings of the European Survey of Enterprises of New and Emerging Risks (ESENER)', published by EU-OSHA).

Such national differences are visible in the empirical analysis presented here. The analysis shows that establishments in certain countries such as Spain and Sweden report more OSH management measures than in others such as Germany, Greece and France. In particular, Spain and Sweden report smaller differences in OSH practice between smaller and larger enterprises and show much higher rates of reporting of OSH practice on overall less frequently reported practice, such as the use of OSH information and OSH service provision. Looking at the descriptive statistics on barriers to the uptake of OSH practice, these are most widely cited in Cyprus, Greece, Portugal, Romania and Turkey. In contrast, barriers to the implementation of OSH measures are least widely reported in Croatia, the Czech Republic, Finland and Slovakia (EU-OSHA, 2010).

Main finding

The country variable is the most significant variable explaining the difference in the level of OSH management among establishments. We can make two conclusions. Firstly, given the differences in the reported OSH management measures, there would appear to be a great opportunity for European Member States to exchange information and learn from each other. This could raise the overall practice of OSH management across Europe and lead to an increased understanding of the specific facilitators and barriers to the use of more comprehensive OSH approaches. Secondly, the empirical analysis should help policymakers to target their interventions more effectively. The 'country' variable combined with size makes a powerful predictor for determining those establishments with fewer OSH management measures. For example, we know that smaller (less than 100 employees) and the smallest (less than 50) establishments in certain countries report significantly fewer OSH management measures than in others. Policy targeting can be further enhanced by considering further significant variables such as 'industry' and 'status' of establishments.

⁽¹⁵⁾ It is important to consider contributing factors carefully when explaining national differences. While unionisation may seem a significant factor explaining the difference in the uptake of OSH management between France and Sweden, the same data set shows unionisation in Spain at about 11 %. Spain is one of the better performers in terms of OSH management.

Further research

The analysis shows that size combined with the country context explains a significant part of the differences in OSH management practice between establishments. 'Industry' and 'status' of establishments add additional explanatory significance. Further research could focus, in particular, on which contributory factors in industry and the country context play a role. It is likely that organisational culture and tradition next to the actual prevalence of the problem plays a role in how industries approach OSH management. There is also a certain need for more research to unravel the country variable further into its constituent parts and to understand the relationship between the regulatory environment, the provision of public services such as information, training and aid, economy and culture, and what makes some countries 'good' or 'poor' performers in terms of OSH management.

6.1.6. Other variables

There are some indications that risks identified in the literature may not always align with reported practice. In this study, we found that the demographics of an establishment are nowhere near as influential as size, industry and country context in determining the scope of management of OSH management. The literature clearly sees demographics as a factor in the changing nature of OSH risks (Pouliakas and Theodossiou, 2010, p. 24). However, the demographic composition of an establishment as seen through ESENER does not seem to have a significant impact on OSH management practice. This may imply that practice does not follow the OSH risks described in the literature associated with having a diverse workforce. Our empirical analysis also shows that there are sectors, such as real estate and public administration, where OSH management is reported less widely.

So, policymakers need to ensure that interventions evolve with new assessments of risks to health and safety. As a consequence, they should pay particular attention to industries with low reported levels of practice. They should understand the levels of OSH risks in this sector and encourage the uptake of more systemic approaches to OSH management if appropriate.

Finally, the status of an establishment (whether it is a public or private entity) is also significantly related to the reporting of OSH management measures.

Main finding

If policymakers are interested in promoting a more systemic approach to OSH management across the whole spectrum of establishments in Europe, they need to target small, independent establishments in specific countries that operate in sectors traditionally not at risk of health and safety problems.

6.1.7. An index for managing occupational health and safety and outcomes in ESENER

Establishing associations between outcome data and the index of occupational health and safety management is not straightforward. In the literature review, we stated that there is developing literature focused on establishing a link between the adoption of more advanced OSH management or OSH management systems and positive outcomes such as reduced accident and fatalities. For example, Arocena and Nuñez (2010) highlight empirically the positive relationship between advanced OSH management in small to medium-sized enterprises and a reduction in accidents and fatalities. However, it is not always clear from these studies what the causal direction is. Linking outcomes to OSH management is even more difficult when using perceptions data. As stated before, the ESENER survey did not include questions on outcome measures and comparing results of this type across national surveys is difficult given the differences in the underlying sample.

Nonetheless, we can give some indications from other surveys. If we look at country-level outcome data from the 2010 European Working Conditions Survey (EWCS), a face-to-face survey of European workers, and see how it corresponds to country-level data in our analysis, we can try to identify some patterns. In Table 16, we present a number of outcome questions from the EWCS and the overall average OSH scores for all establishments from our analysis of a sample of countries: Sweden, the United Kingdom, Spain, Germany, France and Greece.

Table 16: OSH scores compared outcome information in EWCS 2010

Country	Average OSH score	Workers feeling their health and safety is at risk (EWCS 2010) (%)	Workers feeling their health is affected negatively (EWCS 2010) (%)	No sickness absence over the last year, (EWCS 2010) (%)
Sweden	7.98	41.3	25.4	43.5
United Kingdom	7.73	17.6	14.4	53.1
Spain	7.69	32.9	28.4	69.4
Germany	6.26	19.1	21.9	38.1
France	5.73	24.6	25.6	62.9
Greece	4.94	39.2	40.8	75.2

Source: RAND Europe calculations and EWCS 2010

Table 16 shows that it is not straightforward to draw causal inferences from this data. Sweden is the best performer in our OSH management index, but shows the highest level of workers feeling their health and safety at work is at risk in this sample. Greece shows relatively high levels of concern over health at work but little sickness absence. The United Kingdom and Germany seem to have the most positive outcomes in terms of the EWCS data. There may be a variety of reasons which make establishing a causal inference between OSH score and outcome data difficult: the OSH index may be a relatively crude measure unable to capture all aspects that influence a worker's perception of health and safety risk; awareness of health and safety risks may increase with experience and knowledge of OSH management (as such, awareness may mean that workers become more sensitive to the potential risks to health and safety); regulatory frameworks may vary (e.g. stipulations governing sickness absence); perceptions do not always offer an accurate picture.

Main finding

There are emergent indications that the adoption of OSH management systems may be accompanied by positive outcomes such as a reduction in injuries and fatalities. However, establishing causal links between the empirical analysis in this report and other recent surveys is not straightforward.

Further research

Further research could focus on establishing a link between the extent of OSH practice and perceptions of the risk to health and safety in the workplace.

6.1.8. ESENER and the perspectives of employee representatives and managers

ESENER consists of two modules: the MM survey directed at 'the most senior manager who coordinates safety and health activities'; and the ER survey directed at the health and safety representative. It is not always clear, however, who, at organisational level, is the appropriate respondent to various questions concerning OSH management. Some types of information may be known better to one party depending on the arrangements in place for managing OSH. For example, managers may have a better view of training in OSH management issues offered to employees as they are the principal organisers of such training activities and incur the costs. Employees, on the other hand, may be better positioned to answer questions pertaining to the presence of tension and conflicts at the workplace.

Main finding

On the basis of the analysis of the limited comparative questions contained in the MM and ER surveys, the perspectives of employers and employees in ESENER are associated with some indications that the managers' perspective offers an overview of practice that better represents practice associated with establishments of a certain size in a sector.

Further research

Understanding the differences between the two modules (ER and MM) of the survey is of interest. Quite clearly, despite the rosy picture of worker involvement (consultation, participation and training) arising

from the analysis of ESENER (see also the accompanying report 'Worker representation and consultation on health and safety — An analysis of the findings of the European Survey of Enterprises of New and Emerging Risks (ESENER)', published by EU-OSHA), there is some evidence that employees are less positive about the policies of an organisation than management. This difference can increase the further removed from management processes the employees are (see, for example, the Boorman review (2009) on health employees in the United Kingdom). Employee representatives may sometimes be less informed than management about policies in the establishment, but are likely to have a better idea of how OSH measures are applied in practice, albeit in their part of the enterprise. These factors may be worth further investigation in ESENER follow-up work. In addition, further work could take place to understand how accurate the answers in ESENER really are, by triangulating responses with other data on actual practice and outcomes.

6.2. Summary

In this chapter, we discussed some policy implications from our empirical analysis. The following are the main findings.

- If the objective of policymakers is to promote more systemic approaches to OSH management across establishments in Europe, the empirical analysis confirms that the components in ESENER that represent a systemic approach to OSH management are related.
- The empirically visible differences in OSH scores between countries appear to reflect a distinction between a more basic compared with a more involved management of OSH. Basic management would include formal compliance with requirements to undertake risk assessment, discussing and drafting an OSH policy, and line managers' involvement in OSH management. More active or involved management would include the use of internal and external services for the provision of health and safety services, support for the return to work after sickness, analysis of absenteeism data, and the use of external information.
- The size of the establishment is often seen as the main hurdle to the wider adoption of OSH management. Our analysis shows that size is a significant factor, but does not necessarily determine the fate of an organisation with regards to risk management.
- A range of factors are closely associated with levels of reported OSH management. They include country context, size, industry and status of the establishment. Of these, country context is the most significant and, at the same time, the most difficult to capture. The regulatory environment, provision of public support, organisational culture, and economic conditions all contribute to the differences in OSH scores between countries.
- OSH management practice appears to follow traditional perceptions of risks and technological innovation, with establishments in traditionally 'high risk' industries and those in technology-intensive industries reporting higher levels of OSH practice. However, particularly in light of emergent or growing problems, such as musculoskeletal disorders, stress, violence and harassment, the comparatively low levels of OSH management in certain (particularly service-oriented) sectors needs to be addressed.

- Policymakers intent on promoting a wider uptake of OSH management practice across the whole range of establishments in Europe need to target small independent establishments in specific countries that operate in sectors traditionally not at risk of health and safety problems.
- Targeting these establishments requires a solid understanding of the most significant country-specific factors explaining the dif-

ferences between establishments. These include the nature of inspections, the availability of public aid and training, information provision, and wider economic conditions, industrial relations, and organisational culture.

7. References

Arocena, P. and Nunez, I. (2010), 'An empirical analysis of the effectiveness of occupational health and safety management systems in SMEs', *International Small Business Journal*, 28(4): 398–419.

Askenazy, P. (2004), *Les désordres du travail — Enquête sur le nouveau productivisme*, La République des Idées-Seuil, Paris.

Baldock, R., Smallbone, J. P. and Vickers, I. (2006), 'Influences on small firm compliance-related behaviour: the case of workplace health and safety', *Environment and Planning C: Government and Policy*, 24(6): 827–846.

Bluff, L. (2003), *Systematic Management of Occupational Health and Safety*, Working Paper 20, National Research Centre for Occupational Health and Safety Regulation, Regulatory Institutions Network, Research School of Social Sciences, Australian National University.

Boorman, S., *NHS Health and Well-being*, Final Report, Department of Health, London, November 2009.

Borley, J. (1997), 'A health and safety system which works for small firms', *Journal of the Royal Society for Health*, 117, 211–215.

Bottani, E., Monica, L. and Vignali, G. (2009), 'Safety management systems: performance differences between adopters and non-adopters', *Safety Science*, 47, 155–162.

Champoux, D. and Brun, J.-P. (2003), 'Occupational health and safety management in small size enterprises: an overview of the situation and avenues for intervention and research', *Safety Science*, 41, 301–318.

Drais, E., Favaro, M. and Aubertin, G. (2002), *Les systèmes de management santé-sécurité en entreprise: caractéristiques et conditions de mise en oeuvre*, Institut National de la Recherche et de la Sécurité, Paris.

Drais, E. (2005), 'Management de la sécurité, L'usage des référentiels: Résultats d'une étude nationale', Communication IAP (INRS Actualités en Prévention), Marseille, June 2005, pp. 90–97.

Eurofound (2010), *Changes over time — First findings from the fifth European Working Conditions Survey*, European Foundation for the Improvement of Living and Working Conditions, Dublin.

European Commission (2007), *Improving quality and productivity at work: Community strategy 2007–12 on health and safety at work*, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2007) 62 final, Brussels.

European Commission (2008), *Employment in Europe Report*, Office for Official Publications of the European Communities, Luxembourg.

European Commission (2009), *European SMEs under Pressure: Annual report on EU small and medium-sized enterprises 2009*, Directorate-General for Enterprise and Industry, European Commission.

European Commission (2010), *Health and safety at work in Europe (1999–2007): A statistical portrait*, Publications Office of the European Union, Luxembourg.

EU-OSHA – European Agency for Safety and Health at Work (2002a), *Research on changing world of work*, Office for Official Publications of the European Communities, Luxembourg.

EU-OSHA – European Agency for Safety and Health at Work (2002b), *The Use of Occupational Safety and Health Management Systems in the Member States of the European Union — Experiences at company level*, Office for Official Publications of the European Communities, Luxembourg.

EU-OSHA – European Agency for Safety and Health at Work (2007), *Expert forecast on emerging psychosocial risks related to occupational safety and health*, Office for Official Publications of the European Communities, Luxembourg.

EU-OSHA – European Agency for Safety and Health at Work (2009), *New and emerging risks in occupational safety and health*, Office for Official Publications of the European Communities, Luxembourg.

EU-OSHA – European Agency for Safety and Health at Work (2010), *European Survey of Enterprises on New and Emerging Risks — Managing safety and health at work*, European Risk Observatory Report.

Fernández-Muñiz, B., Montes-Peón, J. M. and Vázquez-Ordás, C. J. (2007), 'Safety management system: Development and validation of a multidimensional scale', *Journal of Loss Prevention in the Process Industries*, 20, 52–68.

- Fernández-Muñoz, B., Montes-Peón, J. M. and Vázquez-Ordás, C. J. (2009), 'Relation between occupational safety management and firm performance', *Safety Science*, 47, 980–991.
- Frick, K., Jensen, P. L., Quinlan, M. and Wilthagen, T. (2000a), 'Systematic occupational safety and health management: an introduction to a new strategy for occupational safety, health and well-being', Frick, K., Jensen, P. L., Quinlan, M. and Wilthagen, T. (eds), *Systematic occupational safety and health management: perspectives on an international development*, Emerald Group Publishing Limited, Bingley.
- Frick, K., Jensen, P. L., Quinlan, M. and Wilthagen, T. (eds) (2000b), *Systematic occupational safety and health management: perspectives on an international development*, Emerald Group Publishing Limited, Bingley.
- Frick, K. and Wren, J. (2000), 'Reviewing occupational safety and health management: multiple roots, diverse perspectives and ambiguous outcomes', Frick, K., Jensen, P. L., Quinlan, M. and Wilthagen, T. (eds), *Systematic occupational safety and health management: perspectives on an international development*, Emerald Group Publishing Limited, Bingley.
- Gallagher, C. (1997), *Health and Safety Management Systems — An Analysis of System Types and Effectiveness*, National Key Centre in Industrial Relations, Monash University, Melbourne, Australia.
- Gallagher, C., Underhill, E. and Rimmer, M. (2001), *Occupational Health and Safety Management Systems: A Review of their Effectiveness in Securing Healthy and Safe Workplaces*, report prepared for the National Occupational Health and Safety Commission.
- Geldart, S., Smith, C. A., Shannon, H. S. and Lohfeld, L. (2010), 'Organizational practices and workplace health and safety: A cross-sectional study in manufacturing companies', *Safety Science*, 48, 562–569.
- Hasle, P., Kines, P. and Andersen, L. P. (2009), 'Small enterprise owners' accident causation attribution and prevention', *Safety Science*, 47, 9–19.
- Hassan, E., Austin, C., Celia, C., Disley, E., Hunt, P., Marjanovic, S., Shehabl, A., Villalba-Van-Dijk, L. and Van Stolk, C. (2009), *Health and Wellbeing at Work in the United Kingdom*, RAND Technical Report, TR-758-DH, RAND Europe.
- Havlovic, J. and McShane, S. L. (2000), 'The effectiveness of joint health and safety committees (JHSCs) and safety training in reducing fatalities and injuries in British Columbia forest product mills', *Workplace Gazette*, 3, 94–114.
- HSE (1997), *Successful health and safety management*, Health and Safety Executive, Sudbury, United Kingdom.
- HSE (1998), *Managing health and safety — Five steps to success*, Health and Safety Executive, Sudbury, United Kingdom.
- HSE (2004), Interim update of the costs to Britain of workplace accidents and work-related ill-health, press release by HSE's Economic Advisors' Unit.
- HSE (2007), *Health and safety in the small to medium-sized enterprise — Psychosocial opportunities for intervention*, Health and Safety Executive, Sudbury, United Kingdom.
- ILO (2001), *Final Report — Meeting of Experts on ILO Guidelines on Occupational Safety and Health Management Systems*, International Labour Organisation, 19–27 April 2001, Geneva.
- INRS (2004a), *De l'évaluation des risques au management de la santé et de la sécurité au travail*, Institut National de Recherche et de Santé, Paris.
- INRS (2004b), *Vers le management de la santé et de la sécurité au travail*, Institut National de Recherche et de Santé, Paris.
- Karageorgiou, A., Jensen, P. L., Walters, D. and Wilthagen, T. (2000), 'Risk assessment in four Member States of the European Union', Frick, K., Jensen, P. L., Quinlan, M. and Wilthagen, T. (eds), *Systematic occupational safety and health management: perspectives on an international development*, Emerald Group Publishing Limited, Bingley.
- Karoly, L. A and Panis, C. (2004), *The 21st century at work — Forces shaping the future workforce and workplace in the United States*, RAND MG-164-DOL, the RAND Corporation.
- Kim, J-O. and Mueller, C. (1978), *Introduction to Factor Analysis — What It is and How to Use It*, Sage University Paper Series on Quantitative Application in Social Sciences, 07-013, Sage, Newbury Park, CA.
- Leka, S., Hassard, J., Jain, A., Makrinov, N., Cox, T., Kortum, E., Ertel, M., Hallsten, L., Iavicoli, S., Lindstrom, K. and Zwetsloot, G. (2008), *Towards the Development of a European Framework for Psychosocial Risk Management at the Workplace*, I-WHO Publications, Nottingham.
- Mearns, K., Whitaker, S. M. and Flin, R. (2003), 'Safety climate, safety management practice and safety performance in offshore environments', *Safety Science*, 41, 641–680.
- Mendeloff, J., Nelson, C., Ko, K. and Haviland, A. M. (2006), *Small Businesses and Workplace Fatality Risk — An Exploratory Analysis*, TR-371-ICJ.
- Micheli, G. J. L. and Cagno, E. (2010), 'Dealing with SMEs as a whole in OSH issues: Warnings from empirical evidence', *Safety Science*, 48, 729–733.
- Nielsen, K. T. (2000), 'Organization theories implicit in various approaches to OSH management', Frick, K., Jensen, P. L., Quinlan, M. and Wilthagen, T. (eds), *Systematic occupational safety and health management: perspectives on an international development*, Emerald Group Publishing Limited, Bingley.

- O'Dea, A. and Flin, R. (2001), 'Site managers and safety leadership in the offshore oil and gas industry', *Safety Science*, 37, 39–57.
- Parent-Thirion, A., Fernández Macías, E., Hurley, J. and Vermeulen, G. (2007), *Fourth European Working Conditions Survey*, Office for Official Publications of the European Communities, Luxembourg.
- Pouliakas, K. and Theodossiou, I. (2010), *An Inquiry Into the Theory, Causes and Consequences of Monitoring Indicators of Health and Safety At Work*, MPRA Paper 20336 (<http://mpa.ub.uni-muenchen.de/20336/>).
- Redinger, C. F. and Levine, S. P. (1998), 'Development and evaluation of the Michigan occupational safety and health management system assessment instrument: a universal OSHMS performance measurement tool', *American Industrial Hygiene Association Journal*, 59, 572 — 581.
- Rigby, M. and Lawlor, T. (2001), 'Health and Safety in Small Firms with Particular Reference to Spain', *International Small Business Journal*, 19(2): 31–48.
- Robson, L., Clarke, J., Cullen, K., Bielecky, A., Severin, C., Bigelow, P., Irvin, E., Culyer, A. and Mahood, Q. (2005), *The effectiveness of occupational safety and health management systems: A systematic review*, Institute for Work & Health, Toronto.
- Robson, L. S., Clarke, J. A., Cullen, K., Bielecky, A., Severin, C., Bigelow, P. L., Irvin, E., Culyer, A. and Mahood, Q. (2007), 'The effectiveness of occupational safety and health management system interventions: A systematic review', *Safety Science*, 45, 329–353.
- Saksvik, P. Ø. and Quinlan, M. (2003), 'Regulating Systematic Occupational Health and Safety Management: Comparing the Norwegian and Australian experience', *Relations industrielles/Industrial Relations*, 58, 33–59.
- Saksvik, P. Ø., Torvatn, H. and Nytrø, K. (2003), 'Systematic occupational health and safety work in Norway: a decade of implementation', *Safety Science*, 41, 721–738.
- Schnabel, P. and Wagner, J. (2005), *Determinants of Union Membership in 18 EU Countries: Evidence from Micro Data 2002/03*, Institute for the Study of Labor, IZA DP No 1464.
- Shannon, H. S., Mayr, J. and Haines, T. (1997), 'Overview of the relationship between organizational and workplace factors and injury rates', *Safety Science*, 26, 201–217.
- Shannon, H. S., Walters, V., Lewchuk, W., Richardson, J., Moran, L. A., Haines, T. and Verma, D. (1996), 'Workplace organisational correlates of lost-time accident rates in manufacturing', *American Journal of Industrial Medicine*, 29, 258–268.
- Tait, R. and Walker, D. (2000), 'Marketing health and safety management expertise to small enterprises', *Safety Science*, 36, 95–110.
- Tompa, E., Verbeek, J., van Tulder, M. and de Boer, A. (2010), 'Developing guidelines for good practice in the economic evaluation of occupational safety and health interventions', *Scandinavian Journal of Work, Environment & Health*, 36, 313–318.
- Valued Research Ltd (2007), *Employer Qualitative Research to Quantify the Potential of the Health and Wellbeing at Work Framework*, Final Report, December 2007.
- Vassie, L., Tomàs, J. M. and Oliver, A. (2000), 'Health and Safety Management in UK and Spanish SMEs: A Comparative Study', *Journal of Safety Research*, 31, 35–43.
- Verbeek, J., Pulliainen, M. and Kankaanpää, E. (2009), 'A systematic review of occupational safety and health business cases', *Scandinavian Journal of Work, Environment & Health*, 35, 403–412.
- Walters, D. (2001), *Health and Safety in Small Enterprises*, PIE Peter Lang, Oxford.
- Walters, D. (2002a), Conclusions 'The reception of the Framework Directive in different national systems', Walters, D. (ed.), *Regulating Health and Safety Management in the European Union — A Study of the Dynamics of Change*, Presses Interuniversitaires Européennes, Peter Lang, Brussels.
- Walters, D. (2002b), 'The Framework Directive', Walters, D. (ed.), *Regulating Health and Safety Management in the European Union — A Study of the Dynamics of Change*, Presses Interuniversitaires Européennes, Brussels.
- Walters, D. (ed.) (2002c), *Regulating Health and Safety Management in the European Union — A Study of the Dynamics of Change*, Presses Interuniversitaires Européennes, Brussels.
- Walters, D. and Jensen, P. L. (2000), 'The discourses and purposes behind the development of the EU Framework Directive 89/391/EEC', Frick, K., Jensen, P. L., Quinlan, M. and Wilthagen, T. (eds), *Systematic occupational safety and health management: perspectives on an international development*, Emerald Group Publishing Limited, Bingley.
- Walters, D., Wilthagen, T. and Jensen, P. L. (2002), Introduction 'Regulating Health and Safety Management in the European Union', Walters, D. (ed.), *Regulating Health and Safety Management in the European Union — A Study of the Dynamics of Change*, Presses Interuniversitaires Européennes, Brussels.
- Zohar, D. (2002), 'The effects of leadership dimensions, safety climate, and assigned priorities on minor injuries in work groups', *Journal of Organizational Behavior*, 23, 75–92.

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