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Utilising the characteristics of small enterprises to assist in managing hazardous substances in the workplace

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Abstract

Purpose – The aim of this paper is to present the literature which identifies the characteristics of small enterprises and outlines the opportunities to utilise them in working with small businesses to prevent and reduce exposures to hazardous substances.

Design/methodology/approach – A search of a variety of data sources, including Medline, PubMed, Web of Science, Google Scholar, was conducted which combined the keyword search terms "small business", "small enterprise", "management", "health and safety management", "hazardous substances", "hazardous chemicals", "management of hazardous substances". High quality studies were selected and combined with studies known to the authors.

Findings – A strong body of evidence exists which shows that the management of OSH in small enterprises has been extensively reviewed and the most recurring theme is the identification of problems and challenges. A growing body of literature also confirms that models for chemical risk management and social responsibility issues can play a key role in managing hazardous chemical exposures in small enterprises. Furthermore, studies have shown that there are certain characteristics of small business that potentially provide positive opportunities for the implementation of preventive interventions.

Originality/value – The paper identifies these characteristics and features and suggests these can be effectively utilised in the design and development of interventions to prevent and reduce exposures to hazardous substances in small enterprises. Few interventions, however, have been developed utilising these positive characteristics.

Keywords Small enterprises, Chemicals, Health and safety management, Controls, Interventions

Paper type Conceptual paper

Introduction

In New Zealand, as elsewhere in the world, the burden of disease and ill health due to chemical exposures in the workplace is extensive and excessive. Hazardous substance exposures, particularly in small enterprises, contribute substantially to this burden. It

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has been only relatively recently, that attempts have been made to work with small enterprises in reducing these exposures.

There is a growing field of research internationally on the occupational health and safety issues concerning managing hazardous substances in small enterprises (SEs). However, the literature is fragmented and the focus of the research is diverse and disparate. Only until very recently, has the research been examined to identify effective approaches to SEs and to suggest future research strategies (Mayhew, 2002; Champoux and Brun, 2003; Lamm and Walters, 2003; Hasle and Limborg, 2006). Even with this examination, conceptual frameworks for OHS and small business, particularly in relation to managing hazardous substances, are theoretically vague and empirically not well supported.

The range of hazards and exposures encountered in small business are reported to be extensive, although Lentz *et al.* (2001) suggests that many hazards are similar across businesses and industries, regardless of size; yet others may be unique to small businesses and industries that are predominated by small employers.

In considering these complex issues, what then are the features of small business that make research and in particular provision of support and services to small enterprises problematic, particularly in relation to the management of hazardous substances? Many studies have identified the characteristics of small business that highlight difficulties and challenges for owners, managers, enforcement agencies and researchers (Eakin *et al.*, 2000; Okun *et al.*, 2001; Lentz *et al.*, 2001; Oldershaw, 2002; Champoux and Brun, 2003; Barbeau *et al.*, 2004; Walters, 2006). However, few if any studies, have identified the positive features of the characteristics of small business and the opportunities these have for the promotion of occupational health and safety practice and research (Larsson, 2003).

The aim of this paper is to review the characteristics of small business and to identify not only the challenges and difficulties faced by small business owners and/or managers and employees in managing hazardous substances, but also some of the unique features of SEs that provide positive opportunities for interventions to reduce hazardous chemical exposures. The paper is structured by firstly providing an introduction and description of the methodology and analytical approach. Then the findings report on the characteristics of small businesses, barriers and challenges, models for managing hazardous substances in SEs, positive features and opportunities, and concludes with summary and conclusions.

Methodology and analytical approach

Search strategy

A systematic method of literature searching and selection was employed in the preparation of this review. The principle sources of information that were drawn on for the literature review, the database search parameters, and a summary of findings from the literature search are described.

Principal sources of information

Bibliographic databases were searched including Medline, PubMed, Web of Science, Google Scholar, Cochrane Database. In addition, 20 international web sites were interrogated.

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Search parameters
"Year:" 1996-2009; "Publication type:" Full-text; "Keywords:" Small business management, small enterprise management, health and safety management, hazardous substances, hazardous chemicals, management of hazardous substances,

Publication selection criteria
The publication inclusion criteria are by publication type (Journal articles, conference proceedings, web pages, public and private sector reports, edited books, unpublished surveys and research reports); format (primarily full text); language (primarily English, but also key publications in Danish, Norwegian and Swedish); location (primarily countries in the developed world) publication date (1996-2009). The final selection of publications was based on relevance of the content to the key words used for organising the database and whether it met the above inclusion criteria.

Limitations of the review
This review used a structured approach to identify and analyse the literature. However, there are some inherent limitations with this approach. Namely, systematic reviews are limited by the quality of the studies included and the reviews methodology. The review was limited by the restriction to primarily English and secondary Scandinavian language studies. Restriction by language may result in study bias, but the direction of this bias cannot be determined. In addition, the review has been limited to the published academic literature and has not appraised unpublished work, which may be significant. The studies were initially selected by examining the titles of the publications, therefore, it is possible that some studies were excluded prior to examination of the full text article. However where detail was lacking or titles and abstracts were ambiguous, papers were retrieved in full-text to minimise the possibility of inappropriate exclusion.

Results
In total, 96 articles were identified that met the inclusion criteria. These are listed in the reference section of the paper.

Characteristics of small business
Small enterprises are not homogeneous but there are a variety of characteristics that seem to be common to such entities. The literature supports the argument that the management structure in a business with over 20 employees becomes more formalised and the management of occupational safety and health, including chemical risk management, improves (Lamm, 2000; Gardner, 2000; Oldershaw, 2002; Lamm and Walters, 2003; Walters, 2006; Legg *et al.*, 2009). In addition, the concept of owner-management and the ability of small business owners to directly influence business decisions are acknowledged as the fundamental distinguishing characteristics of small business.

Size
Defining what is meant by a "small business" is challenging because of the diversity of such businesses and the range of factors used to define them. Qualitative definitions of small business draw attention to the characteristics that distinguish smaller from

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larger businesses. The most influential qualitative definition in the small business literature is that proposed by the *Report of the Committee of Inquiry on Small Firms* (Bolton, 1971 cited in Bacon *et al.*, 1996). According to the Committee, a small business is defined by three distinctive features. First, the business is owner-managed in a personalised way. i.e. the owner-manager plays an active role in the management and decision making of the firm in the absence of a formal, specialised management structure – share holding and management are separate. Second, the small business is independent. i.e. the owner-manager has the autonomy to make decisions independently because the business is not a subsidiary of a larger organisation or franchise. Thirdly, the small business has a relatively small market share. i.e. the business is likely to serve a small share of a market and is consequently likely to have reduced buying power and influence over prices.

However, defining small business on the basis of qualitative criteria is useful at illustrating the dynamics of such entities, but is not a practical measure to solely utilise when identifying small businesses. Cameron and Massey (1999) suggest it is especially difficult for agencies that gather data on business demography statistics to identify small businesses on the basis of qualitative terms. Consequently, the *Report of the Committee of Inquiry on Small Firms* (Bolton, 1971) suggested a range of quantitative measures to define small business that can either be used independently or in combination with the qualitative definition presented above.

Quantitative definitions of small business focus on defining businesses by numerical factors, particularly by monetary values or by the number of people employed by the business. The most popular way of quantifying a small business, which is easiest to use in surveys and research, is by the number of people employed by a business. Typically, definitions are based on the number of staff employed on a full-time equivalent (FTE) basis.

Massey (2005) argues that defining small business according to the number of staff employed by a firm is the most preferable and pragmatic approach. As it is:

- relatively easy for researchers and statistical agencies to collect data on the basis of employee numbers;
- it allows for comparisons to be made over a long-term period; and
- is the best "proxy" for the differences that occur in the way firms of different sizes operate (Massey, 2005).

Research suggests that once an organisation employs more than 20 staff it begins to operate under a more formalised management structure as opposed to a type of more informal owner-management that is typical of smaller businesses (Wilkinson, 1999; Hedal, 2002).

Larsson (2003) contends that there is no real proof that the size of an enterprise in itself is an important factor for OHS activities. He suggests that the core assumption of high risks, poor hazard management and high incidence of occupational injury and disease in small business as opposed to lower risks, better hazard management and thus low injury and disease incidence in large enterprises, seems hard to prove convincingly. However, this proposition is contradicted by a number of studies (Champoux and Brun, 2003; Eakin *et al.*, 2000; Hasle and Limborg, 2006; Lentz and Wenzl, 2006; Okun *et al.*, 2001).

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Industry sector and structural issues

The work environment in small businesses is generally shaped by the industry in which the business operates (Lentz *et al.*, 2001; Antonsson *et al.*, 2002). There are contradictory opinions and evidence on whether the work environment (exposure to hazards) and the consequences (injuries and fatalities) are worse or higher in small businesses than in larger businesses purely on the basis of size. However, Sorensen *et al.* (2007) argue that the empirical evidence for an increased risk in small businesses is weak, especially because there have been few comparisons made between small and larger enterprises.

Furthermore, exposure to different types of hazards related to size, industry and sector was analysed in a Danish study, (Hasle *et al.*, 2005) which showed a correlation between business size and the following factors in the work environment in private sector businesses: postures, physical loads, exposure to chemicals and the physical environment. A later study (Sorensen *et al.*, 2007, p. 1044) confirmed that "the ergonomic, physical and chemical work environment is more hazardous in small enterprises than in large ones", but the authors added that the psychosocial work environment is actually better. In addition, the work environment seems to deteriorate for male employees when the size of the business is smaller. They did not find the same tendency for women. This is perhaps attributable to horizontal labour market segregation. For example, the construction industry employs mainly men and the administration sector employs mainly women (Hasle *et al.*, 2005).

Employment relations

The nature of the employment relationship in small businesses "is not simply one of employer control versus resistance by a collective group of workers, but a more problematic mix of dissent and accommodation, conflict and cooperation involving no more than a few employees" (Lamm, 2002, p. 104). Consequently, employment relations in small businesses tend to be viewed in both a positive and negative light. First, it is proposed that employment relations practices in small businesses are superior to those in larger organisations because there are lower levels of overt conflict, less bureaucracy, the work environment is more flexible, and communication processes are simpler and easier to manage because of the flatter organisational hierarchy (Massey, 2002; Wilkinson, 1999). In contrast, employment relations practices in smaller firms are also said to be lacking because there is greater covert conflict without a union presence, poor working conditions, and a lack formality in relation to training, division of labour and recruitment (Massey, 2002; Wilkinson, 1999).

Trade union influence in small businesses is reported as being negligible because union membership is either very low or non-existent in these businesses across most countries (Wilkinson, 1999). This is attributed to the fact that owner-managers usually subscribe to a unitarist ideology (Wilkinson, 1999) and because unions prefer to concentrate their resources in larger organisations that are easier to organise (Lamm, 2002). According to Mayhew (1997a), this lack of union presence has potentially negative implications as unions provide a channel for workers to advocate for improved workplace conditions and leads to covert expressions of conflict, such as high labour turnover or absenteeism (Wilkinson, 1999). However, relationships within small workplaces occur on a more personal basis, making employee dissension over

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OHS matters more difficult than for those employees working in medium and large organisations (Frick and Walters, 1998; Walters, 2002).

Issues of worker representation in small enterprises have been extensively reviewed (Frick and Walters, 1998; Walters, 2001; Shearn, 2004; Walters, 2004; Walters *et al.*, 2005; Walters and Nichols, 2006; Trägårdh, 2008; Hovden *et al.*, 2008; Walters, 2010). As Walters (2010) suggests:

> [...] research evidence demonstrates that worker representation and consultation effectively improve health and safety outcomes in relation to management practices and safety culture, as well as safety performance in terms of injury rates.

In addition:

> [...] the research suggests joint arrangements make for better safety outcomes and that there is a relation between management consultation on general issues and those of health and safety. Overall, though, management capacity and commitment pose considerable constraints to employee representation on health and safety (Walters and Nichols, 2006).

Workplace conditions

Working conditions tend to be poorer in small businesses in comparison with larger organisations as wage rates are often lower and working conditions, including health and safety, are not of a high standard (MacMahon, 1996; Wilkinson, 1999). There is also a propensity for small business owner-managers to implement practices that foster precarious employment in order to lessen the financial impact of employment regulations, such as the exploitation of women and migrant workers (Lamm, 2002).

Employees in small businesses tend to be accepting of poorer work environments perhaps because of their vulnerable position in the labour market. In comparison with large firms, people employed by small businesses are more likely to have lower educational attainment, work part-time, and be less than 25 or over 65 years old and access public assistance (Headd, 2000). Many are either unlikely to complain to authorities because they are afraid of the consequences or refrain as a mark of loyalty and obedience to their employer (Lamm, 2002).

Owner/manager issues

As the qualitative definition of small business presented earlier emphasised, the owner, who is also typically, but not exclusively the manager, is a central figure and influencer in the small business. Indeed research indicates that small businesses are typically controlled by just one individual who is most likely to be a male operating the business with the support of family members (Haugh and McKee, 2004; Institute for Employment Studies, 2005). Consequently, there is often a strong interrelationship between the business and personal lives of the owner-manager and the business often becomes central to the self-image of that person and is dependent on their life plan, knowledge, skills and abilities (Lamm, 2002; Massey *et al.*, 2004).

In particular, the concept of owner-management and the ability of small business owners to directly influence business decisions are the fundamental distinguishing characteristics of small business and are central to most other qualitative small business definitions (Massey, 2005).

Small business owner-managers are more likely to have trade-related skills as opposed to managerial ability. They are typically from trades or "hands on" skill

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backgrounds and are usually very proficient at tasks and have a good understanding of the markets that their business operates within, but few have general management skills, and indeed do not necessarily recognise that they are important (Cameron and Massey, 1999; Champoux and Brun, 2003; Lamm, 2002; Mayhew, 1997a).

Despite this, owner-managers are personally responsible for all management functions in their businesses and essentially become a "jack of all trades". As a result, small businesses tend to operate under simple and relatively informal management structures (Mayhew, 1997a). The owner-manager is essentially the leader and it is their role is to align employees with the organisations values and to "show how things are done". This is typically done via practical and verbal means, which reflects the culture of small businesses (Biggs and Crumbie, 2000).

As the owner-manager is the key person in the small enterprise, it is their values that determine the businesses approach to health and safety management (Vickers *et al.*, 2003; Hasle and Limborg, 2006; Antonsson, 2007). Many owners however, consider health and safety to be the employees' responsibility (Vickers *et al.*, 2003; Hasle and Limborg, 2006) and often are not aware of legislative requirements (Vickers *et al.*, 2003; Caple, 2006; Hasle and Limborg, 2006; Antonsson, 2007; Legg *et al.*, 2009).

In general, small businesses owners often take a reactive and *ad hoc* approach to health and safety, as problems are usually only resolved when they become apparent. Hasle and Limborg (2006) suggest that this is due to a combination of factors. First, the owner-manager often believes that responsibility for health and safety lies with employees and secondly, that accidents are a rare experience within the individual small business. Interviews with small business owners showed that most of them had a good awareness of the most immediate risks associated with their business (Vickers *et al.*, 2003). Even in those small businesses which demonstrate a high level of health and safety awareness, assessment of risks is likely to be implicit, informal and sometimes reactive (Legg *et al.*, 2009) as opposed to more systematic and explicit approach that is promoted by the Health and Safety Executive (Vickers *et al.*, 2003).

However, the fact that small business owners usually work very long hours also requires consideration. Consequently, many simply devote time to the most pressing issues and there is less time and energy for "non-core" tasks of which health and safety is often perceived to be one (Mayhew, 1997a, 2000).

Resources

It is important to recognise that management practice in small business is shaped by resource constraints. Small businesses typically operate on an ad-hoc and reactive basis because they lack key resources, such as finance and time. Pragmatism and financial prudence are cited as common values of small business owner-managers, as businesses are typically operated under very tight budgetary constraints (Haugh and McKee, 2004). One of the greatest challenges for small business is securing financial resources to set up the business, survive and grow (Cameron and Massey, 1999; Institute for Employment Studies, 2005). Banking institutions are often reluctant to lend money to a business with no established track record, so small business owners often risk their own personal savings, inheritances or rely on the support of family members (Cameron and Massey, 1999).

A lack of financial resources is important from an OSH intervention perspective, as paying for health and safety advice, information, tools and controls will always be

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implicitly or explicitly evaluated by a cost-benefit analysis (Mayhew, 1997a). Tight budgetary constraints often mean that there is a lack of financial resources to implement health and safety initiatives, such as the installation of engineering controls, safety equipment or personal protective equipment. Economic incentives are therefore an important encouragement for small businesses to improve health and safety practices (Mayhew, 2002).

Management and organisational issues

The research on how small enterprises are managed and operated is extensive. Major topics include decision making and strategic management (Wood and Joyce, 2003; Upton *et al.*, 2001), productivity and business success (Aw, 2002; Reid and Smith, 2000; Underhill, 2001), human resource strategies (Rauch and Frese, 2000; Patton *et al.*, 2000), owner-management (James, 1999) and agency relationships (Morck and Yeung, 2003; Schulze *et al.*, 2001). In addition, there is also extensive literature on entrepreneurial characteristics and the psychology of the entrepreneur (Baron, 1998; Brandstätter, 1997; Sagie and Elizur, 1999; Stewart, 1996; Stewart and Roth, 2001; Westlund and Bolton, 2003)

The management of OSH in small enterprises has also been extensively reviewed (Mayhew, 1997a, b, 2002; Lamm, 2000; Gardner, 2000; Lentz *et al.*, 2001; Okun *et al.*, 2001; Oldershaw, 2002; Champoux and Brun, 2003; Lamm and Walters, 2003; Larsson, 2003; Barbeau *et al.*, 2004; Hasle and Limborg, 2006; Walters, 2006; Legg *et al.*, 2009). The consensus of opinion in these studies is that management in small businesses is more informal; the lines of communication are short, the communication is more often oral than written, the structure is simple and commercial pressures are very high and immediately felt. Moreover, it is impossible to separate OSH practices from other aspects of small business management such as financial management, selection and recruitment of staff, task training. Overall, small businesses' health and safety management, particularly in relation to hazardous substances, is poor.

In summary, Lamm and Walters (2003. p. 7) suggest that:

> There are a number of characteristics that distinguish the small business sector from the large business sector, such as the access to resources, the level of management skills, the influence of large businesses, the relationship with the regulatory agencies, the role of worker representation and of small business advisors, which together militate towards poor implementation and operation of participative arrangements for health and safety in the sector and also help to explain the increased risk of fatality and serious injuries in the sector. In addition, OHS is not a singular problem but part of wider issues of operating a small business, such as taxation, government policy, declining profits, under-capitalisation and increasing competition in the marketplace. The pressures of these wider issues can also contribute to poor health and safety arrangements and performance.

Barriers and challenges

In the literature concerning occupational safety and health and small businesses, the most recurring theme is the identification of problems and challenges faced by employers, employees, enforcement agencies and researchers in relation to controls and interventions.

Eakin *et al.* (2000) report several key challenges in relation to OHS and small business: a highly competitive and constantly changing economic environment, the

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nature of their organizational entities in which multiple functions are carried out by the same person, owners' limited view of what they can accomplish regarding health and safety given lack of money and expert staff, informal management structures and employment practices, and lower unionization rates, which decrease opportunities for workers to advocate for OSH.

Other characterizations of small businesses include a dependency on suppliers for information; literacy among workers is generally poor; a belief exists that the chemicals being worked with are not dangerous; there is poor knowledge of health effects; there is better perception of acute rather than long term health effects; controls are decided by custom and practice and not by risk assessment (Oldershaw, 2002).

Data on owners' behaviours toward health and safety in small businesses are limited and conflicting. In interviews, owners describe numerous barriers including limited resources, lack of in-house expertise, and production pressures (Eakin *et al.*, 2000; Barbeau *et al.*, 2004; Legg *et al.*, 2009). In summary, these barriers and challenges can be categorized into a range of factors as shown in Table I.

In addition, Brosseau and Li (2005) suggest that small business owners' intentions toward improving workplace health and safety are primarily influenced by their attitudes. Owners' outcome, normative and control beliefs all contribute to their attitudes toward workplace health and safety. Subjective norm and perceived behavioural control by workers do not have any significant impact on small business owners' behavioural intentions toward workplace health. Interventions aimed at these underlying beliefs, particularly those shown to be most highly associated with high intentioned owners, may be successful in bringing about improvements in attitudes, intentions and behaviour. Raising owners' expectations about positive employee health and business productivity outcomes may lead to long-term improvements in their attitudes, intentions and behaviour toward workplace health and safety.

Models for managing hazardous substances in SEs

A number of conceptual models have been developed that may help to enhance our understanding of health and safety interventions in small businesses and their effectiveness. These models include those developed by Lamm (1997), Antonsson *et al.* (2002); Vickers *et al.* (2003), LaMontagne *et al.* (2005); the Health and Safety Executive (2006); Antonsson *et al.* (2006) Hasle and Limborg (2006); and Pratt (2006).

Hasle and Limborg (2006) developed a useful model of intervention research in small businesses. They suggest that researchers focusing on the development of interventions for small business need to study the complete system, starting with the intermediary agency reaching out towards the smaller enterprises, then continue with methods to get in contact, and finally to study the effect in the small enterprises, which include both the process of getting the intervention accepted, the intervention itself, and the outcome.

Vickers *et al.* (2003) developed a model where they illustrate what they consider to be the main external influencers independently of each other and list different internal characteristics that influence the health and safety outcome in the small business. They emphasise that the market the small businesses operate on has the greatest impact on occupational health and safety and OSH management in the small businesses.

LaMontagne *et al.* (2003) developed an exposure prevention (EP) rating scheme to evaluate the effectiveness of the Wellworks 2 intervention with respect to the

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Factor	Authors
Economics	
Highly competitive environment	Eakin *et al.* (2000); Mayhew (2002)
Changing economic environment	Eakin *et al.* (2000)
Labour market restructuring	Quinlan (1998); Mayhew and Quinlan (1997)
Lack of funds	Eakin *et al.* (2000)
Lack of resources	Okun *et al.* (2001); Mayhew (2002); Lamm (2002)
Production pressures	Barbeau *et al.* (2004); Mayhew *et al.* (1996)
Burden of compliance	Lamm (2002)
Staff	
Multiple functions	Eakin *et al.* (2000)
Lack of expert staff	Eakin *et al.* (2000); Okun *et al.* (2001)
Lack of understanding of regulations	Lamm (1997)
"Management skills gap", reliant on advisors	Lamm and Walters (2003)
Perceptions	
Limited view of what they can accomplish	Eakin *et al.* (2000)
Understand acute more than chronic effects	Oldershaw (2002)
Management structure	
Informal structure	Eakin *et al.* (2000); Lamm (2002)
Employment practices	Eakin *et al.* (2000); Lamm (2002)
Employment relations	
Low rates of unionization	Eakin *et al.* (2000)
Decrease in OHS advocacy	Eakin *et al.* (2000)
Low rates of worker participation	Lamm and Walters (2003)
OHS management systems	
Lack of hazard management systems	Okun *et al.* (2001); Mayhew (2002); Lamm (2002)
Lack of reporting and surveillance systems	Okun *et al.* (2001); Mayhew (2002)
Controls based on custom and practice not risk assessment	Oldershaw (2002)
Communications	
Oral, not written	Oldershaw (2002); Mayhew (2002)
Informal	Oldershaw (2002); Mayhew (2002)
Dependency on suppliers for information	Oldershaw (2002)
Literacy generally poor	Oldershaw (2002)
Enforcement	
Do not trust enforcement agencies	Mayhew (1997a); Lamm (1997, 2002)
Feel alienated from the state	Mayhew and Quinlan (1997)
Believe they have not been consulted by state	Lamm (2002)
Agencies have insufficient resources	Quinlan and Mayhew (2000)
Standards	
Federal standards not applied	Lentz *et al.* (2001); Mayhew (2002)
Exemptions from record keeping	Lentz *et al.* (2001)
Insurance/compensation	
Self-employed, contractors, subcontractors often excluded	Mayhew (1997a); Lamm (2002)

Table I. Summary of barriers to OHS initiatives in small business

prevention and control of hazardous substance exposures in manufacturing businesses in the US. Wellworks-2 was a 16 month randomized, controlled trial examining the effectiveness of an integrated health promotion and occupational health protection intervention (Sorensen *et al.*, 2002), with the worksite as the unit of assignment and intervention. The central hypothesis was that blue-collar workers would be more likely

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to make changes in health risk factors that are primarily under their control (smoking and nutrition) if risk factors that were primarily under the company's control (occupational exposures to hazardous substances) were being addressed at the same time.

The EP rating scheme was designed to systematically prioritize needs for intervention on hazardous substance exposures in manufacturing work sites, and to evaluate intervention effectiveness. The rating scheme assesses the degree of upstream prevention efforts observable in a given process or similar exposure group. This provides a complement to – but not a replacement for – quantitative exposure assessment. The goal was to develop a method that could be applied with modest expense by OHS researchers and other groups engaged in workplace prevention and control efforts (e.g. independent OHS professionals, company or union OHS staff). The rating scheme was complemented by parallel evaluation with individual-level questionnaires and organizational-level assessment of OHS programs (LaMontagne *et al.*, 2004).

In a later Swedish study, Antonsson *et al.* (2006) analysed why businesses, including small businesses, do not implement known measures to reduce chemical exposure. This study developed a "measure staircase" (translation of the Swedish word "Åtgärdstrappen") that describes the knowledge that is needed and the decisions the business needs to take to be able to implement solutions to OSH problems that are effective.

The "measure staircase" model indicates that a problem can only be solved satisfactorily if the owner-manager and employees are aware of the problem (first step), accept it (second step), know the cause of the problem (third step), have knowledge of a solution (fourth step), accept the solution (fifth step), have knowledge of a supplier (sixth step) and can afford the solution (seventh step). The solution can therefore be implemented if they have the ability to do so and utilise it in a practical sense (eighth step) and finally evaluate the effect (the final step).

Pratt (2006) developed a risk control chain model, which is specific to the control of hazardous chemicals. Pratt's model has five steps. When the business deals with a hazardous substance it has to first, recognise that the hazard exists; second, understand the (degree of) risk; third, identify appropriate controls; fourthly, implement and monitor controls and which should fifthly, eliminate or minimise the risk. Pratt (2006) identifies different factors in the small business environment which have an impact on the different steps in the control chain. He distinguishes between the factors in the small business environment that the business has control over and factors external to the small business, which are beyond the immediate control.

Walters (2008) undertook a comprehensive six-country survey in the European Union (Austria, Germany, The Netherlands, Spain, Sweden and the UK) to examine the evidence of the effectiveness of current strategies for chemical risk management in small enterprises in the light of the Registration, Evaluation and Authorisation of Chemicals (REACH) regulatory reforms. The study found that preventing chemical related hazards in small enterprises requires inclusive approaches that consider the social and economic context; require development and co-ordination of efforts by all the "actors", including the supply chain, regulatory agencies and trade unions, strong sectoral infrastructure and comprehensive targeted national strategic plans. In addition, Walters (2008) advocates for more comprehensive and qualitative evaluations

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of interventions aimed at small enterprises. Walters adapted the contextual approach used by Ahrens *et al.* (2006) to support his recommendation for a comprehensive analysis of influences on the supply chain, looking for opportunities to improve how chemicals are used in SMEs.

LaMontagne *et al.* (2009) developed a refinement of the exposure prevention (EP) rating method developed for the Wellworks-2 trial and has been adapted for use in a subsequent hazardous substances intervention trial in small to medium-sized manufacturing businesses: the Healthy Directions-Small Business project (LaMontagne *et al.*, 2009). This EP rating scheme (Small Business Exposure Index, SBEI) was complemented by parallel evaluation with individual-level questionnaires and organizational-level assessment of OHS programs, or management systems, in both Wellworks-2 and Healthy Directions-Small Business.

The basis of the SBEI scoring method on the hierarchy of controls supports its face validity. Furthermore, when used as pre- and post- intervention effectiveness measures, the baseline assessment of each area serves as its own reference or control, with the final evaluation metric being a measure of change. To the extent that a given area or process does not change fundamentally over the course of the intervention (e.g. gets replaced with an unrelated process or gets phased out), this strategy overcomes limitations inherent in comparing area ratings and scores cross-sectionally as well as longitudinally (as an intervention effectiveness measure).

The SBEI exposure prevention rating method is suitable for use in small enterprises, has good discriminatory power and reliability, offers an inexpensive method for intervention needs assessment and effectiveness evaluation, and complements quantitative exposure assessment with an upstream prevention focus.

The models identified above address several factors that are important to consider and analyse when developing interventions and influencing small business chemical hazard management. Vickers *et al.* (2003) along with others have found that the nature of the business defined by the industry it belongs to and the market it operates within is the main influencer on the OSH outcomes (Antonsson, 2007; Biggs and Crumbie, 2000; Gervais, 2006; Hasle and Limborg, 2006; Larsson, 2003; Pratt, 2006; Vickers *et al.*, 2003; Walters, 2006; LaMontagne *et al.*, 2009). Many authors therefore recommend the development of industry specific interventions with a focus on the small businesses specific external intermediaries, internal culture, its needs and internal resources and processes. Walters (2008) describes other factors to consider include the "push" and "pull" effects of regulation, technological change, market demands, public opinion and influences from media and environmental organisations, which Walters argues is partly behind the REACH legislation.

The suppliers, producers and importers of hazardous chemicals play a key role in reducing exposures to hazardous chemicals. They have the legal obligation to provide information on hazardous chemicals and control strategies. These, primarily take the form of material safety data sheets (MSDS). Unfortunately, material safety data sheets are criticised for being too complicated and lengthy and are therefore not user-friendly for small businesses. Table II summarises the different characteristics of small businesses chemical risk management and the owners approach to OSH management.

Furthermore, several studies report that small businesses have a tendency to assess their OSH, chemical risk management and performance more positively than researchers when they assess their knowledge through content questions or site visits

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The characteristic	Source
Chemical risk management is perceived as difficult	Antonsson (2007)
Chemical risk management takes too much time	Antonsson (2007)
Few resources so the manager must be a multi "expert"	Antonsson (2007); Walters (2006); Biggs and Crumbie (2000)
Often no safety representative	Antonsson (2007); Walters (2006)
Believe chemicals not hazardous	Oldershaw (2002)
Understand acute more than chronic effects	Oldershaw (2002); Olsen *et al.* (2009)
Poor knowledge of health effects	Oldershaw (2002); Olsen *et al.* (2009)
Few small businesses have a hazard management system	Antonsson *et al.* (2002)
The quality of risk management is poor in small business	Walters (2006); Olsen *et al.* (2009)
Need for solutions as opposed to advice that highlights problems	Antonsson (2007); Antonsson *et al.* (2006); Pratt (2006)
Responsibility for managing hazardous substances is not defined	Biggs and Crumbie (2000)
Owners think that some one will tell them if they do not manage OSH or chemicals as the law requires	Fairman and Yapp (2005)

Table II. Small business characteristics to chemical risk management

(Simonsen *et al.*, 2003; Vickers *et al.*, 2003; Fairman and Yapp, 2005; Pratt, 2006; Laird *et al.*, 2008; Olsen *et al.*, 2009). A recent survey of small businesses OSH practices in New Zealand (Laird *et al.*, 2008; Olsen *et al.*, 2009), found that the owner-managers assessment of their knowledge of OSH legislation was very different from the researchers' assessment of their answers to content questions. Some managers with better knowledge rated their knowledge poorly while those who rated their OSH legislative knowledge more highly tended to be the least aware (Laird *et al.*, 2008; Olsen *et al.*, 2009).

Positive features and opportunities

Much has been written about barriers, challenges and difficulties faced by the small business owner in developing and implementing OHS activities in small businesses. However, little attention has been paid to the fact that small business owners are successful business operators. They have business skills and attributes that not only provide income for themselves and their immediate family, but also provide income for their employees who are a large proportion of the working population. These positive and successful features could potentially be utilised and developed in the implementation of OHS interventions.

Champoux and Brun (2003) found that most small business owners do not think that resources are a significant barrier to their improving health and safety. In a study of 223 owners of small business (fewer than 50 employees) only 37 per cent of respondents thought cost were an important barrier to health and safety improvements.

Lepoutre and Heene (2006) described factors specific to small business that relate to the adoption of socially responsible behaviour (including the health, safety and wellbeing of employees) by the owner/manager. These were classified into issue,

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personal, organizational and context characteristics. Issue characteristics refer to the situation or the matter of concern to small business socially responsible behaviour; personal characteristics relate to the values, competencies and actions of the owner-manager; organizational characteristics involve the tangible and intangible resources and structures of the firm; and context characteristics refer to the economic, social and institutional factors, which are external to the organization.

Laird and Perry (2007) adapted these characteristics within the framework of occupational safety and health, and identified potentially positive opportunities for the implementation of preventive interventions for hazardous substances management. Examples of the combination of these factors and characteristics are presented in Table III, and provides a framework from which to influence and support the small enterprise owner/manager introduce and implement chemical risk management interventions.

Utilising the Lepoutre and Heene (2006) framework, important issue characteristics for small enterprise owner/managers is that they generally wish to be regarded as a good employer, and that they are perceived to have green values with respect to the environment, and wish to be thought of as a good citizen in the local community.

In a similar way, important personal characteristics of owner/managers include their generally positive attitudes toward OHS and wish to be perceived favourably by their employees, stakeholders and customers. In addition, owner/managers are aware of their responsibilities in OHS generally, but many lack detailed technical knowledge of legislative requirements, particularly in relation to hazardous chemicals. As the owner/ managers intentions to act are primarily influenced by their attitudes, it seems important that interventions aimed at these underlying attitudes and beliefs, may be successful in bringing about improvements. As Brosseau and Li (2005) showed, that raising owners' expectations about positive employee health and business productivity outcomes may lead to long-term improvements in their attitudes, intentions and behaviour toward workplace health and safety.

A recent New Zealand study of small enterprises (hairdressers, apple growers and printers), Olsen *et al.* (2009), found a high percentage of the owner managers were still concerned about the health effects of the chemicals used, and that although a proportion of the owners had considered substitution of the most hazardous chemicals, many kept using them because they felt they achieved better results/quality in comparison to the substitutes.

The majority of owners knew that they had the main responsibility for staff health and safety but only a few were aware in detail of the principle health and safety legislation. The owners' knowledge about the health effects of, and the control measures for, the most hazardous chemicals was generally poor. However, the study found they perceived they knew more than that they actually did i.e. the owners' did not know their knowledge was poor.

The organisational characteristics important to OHS outcomes include the fact that it is thought that financial resources in small enterprises to control hazards may not be as significant an issue as previously thought (Champoux and Brun, 2003). Also, if work environment changes are implemented to control hazardous chemical exposures, these changes would be relatively easy to assess (LaMontagne *et al.*, 2009). The purchase and maintenance of equipment (hardware) in small enterprises offer an opportunity to actively focus on preventive strategies for hazard controls. Also, the majority of small

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Characteristic[a]	Example of positive characteristic or feature of the small enterprise/small enterprise owner/manager
Issue characteristics	
OHS and employment/employee relations	Owner/ manager wishes to be regarded as a "Good employer" – cares about the health, safety and well-being of employees
Environmental management	Owner/manager wishes to be regarded as having "Green" values – respectful of natural resources and the environment
Social responsibility	Owner/ manager wishes to be regarded as a "Good citizen" in local community
Personal characteristics (owner/manager)	
Attitude	Generally positive attitudes toward OHS
Sense of personal responsibility	Paternal relationship with employees
Internal locus of control	Direct and immediate
Cognitive and personality factors	Good business person/ motivated/achieve
Intention to act	Influenced by attitudes/outcomes
Knowledge/commitment	Implicit/ aware of risks generally/intend to act
Sensitive to activities related to immediate internal stakeholders	Evidence that owner cares for employees
Loyalty in the relationships with customers/ employees. Openness, honesty and fairness in business activities	Perceived favourably by employees and the local community in terms of loyalty, honesty and fairness in business activitie
Organisational characteristics (small enterprise)	
Resources/financial	Evidence of financial/resource issue conflicting
Work environment changes	Relatively easy to determine nature and extent of change to work environment
Equipment	Equipment important to SE owners
Systems	Systems (IT) are in place in the SE and can be utilised
Networking	Networking improves knowledge, attitudes and uptake of innovations
Organisational learning	Positive outcomes from organisational learning in SE
Context characteristics (external factors)	
External stakeholders (ES)	Good reputation, market perception, quality, value for money important to ES
Socio-economic context	Economic profile/ legislative framework of country important; level playing field
Small business environment	Support and incentives for compliance; positive industry culture; effective industry associations provide leadership and guidance

Note: [a] From Lepoutre and Heene (2006)
Source: Laird and Perry (2007), adapted from Lepoutre and Heene (2006)

Table III. Factors and positive characteristics of small enterprises relating to chemical risk management interventions

enterprises do have access to information systems and technology (software) and in a similar way, these systems can be utilised for preventive interventions (e.g. hazard management, incident reporting, training). Networking and organisational learning are strategies that could be extensively used for small enterprise chemical risk management programmes.

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Finally, the external context factors important to chemical risk management include, how the small enterprise is perceived by external stakeholders, the legislative framework in which the business operates, the support and incentives for compliance, the positive industry culture and effective industry associations providing leadership and guidance.

The main forces or influences that impact on the small businesses and how they are managed relate to competition, regulatory pressure and the supply chain, from the suppliers through to the contractors and the customers. A number of studies have looked at interventions to improve health and safety outcomes in small enterprises as well as their effectiveness. The studies include work by Walker and Tait (2004); Caple (2006); Lazovich *et al.* (2002); Antonsson and Alvarez (2005), Fairman and Yapp (2005) and LaMontagne *et al.* (2003, 2004, 2005, 2009).

A review of intervention studies in small enterprises shows varying types of approaches, and range from studies of the development of OHS systems and assessments (Barbeau *et al.*, 2004; Champoux and Brun, 2003; Jones *et al.*, 1999; Larsson, 2003; Brown *et al.*, 2006), training and educational interventions (Mukherjee *et al.*, 2000; Perry and Layde, 2003; Sinclair *et al.*, 2003), engineering and industrial hygiene interventions (Brosseau *et al.*, 2002; Roelofs *et al.*, 2000; Russell *et al.*, 1998; Brooke, 1998; Maidment, 1998; Jones and Nicas, 2006), and a combination of industrial hygiene, health promotion and behavioural interventions (Lazovich *et al.*, 2002; LaMontagne *et al.*, 2003, 2004, 2005; Mayhew, 1997a; Sorensen *et al.*, 1996, 1998, 2002, 2005; Brosseau and Li, 2005).

The most successful intervention methods appear to be action-oriented, low cost approaches, combining health and safety with other management goals, and based on trust and dialogue. It is suggested that intervention research should look at the whole intervention process from the external actors/influencers (for example, government agencies and intermediaries) through to the dissemination process, the uptake of the small enterprise and the effect on health and safety.

Summary and conclusions

The aim of this paper was to review the characteristics of small business and to identify not only the challenges and difficulties faced by small business owners/managers and employees in managing hazardous substances, but also some of the unique features of SEs that provide positive opportunities for interventions to reduce hazardous chemical exposures.

There is a growing field of research internationally on the occupational health and safety issues concerning managing hazardous substances in small enterprises (SEs). However, the literature is fragmented and the focus of the research is diverse and disparate. Only until very recently, has the research been examined to identify effective approaches to SEs and to suggest future research strategies. Even with this examination, conceptual frameworks for OHS and small business, particularly in relation to managing hazardous substances, are theoretically vague and empirically not well supported.

Key characteristics are identified which are important for an understanding of how small enterprises are managed and relate to the size of the enterprise, industry sector and structural issues, employment relations, workplace conditions, owner-management issues and resources.

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The management of OSH in small enterprises has been extensively reviewed in the literature, and a variety of key characteristics of small enterprises have been identified that impact the management of hazardous substances in SEs. The owner-manager is the key person in the small enterprise and it is their values that determine the businesses approach to health and safety management. Many owners consider health and safety to be the employees' responsibility and often are not aware of legislative requirements.

In general, small businesses owners often take a reactive and *ad hoc* approach to health and safety, as problems are usually only resolved when they become apparent.

In the literature concerning occupational safety and health and small businesses, the most recurring theme is the identification of problems and challenges faced by employers, employees, enforcement agencies and researchers in relation to controls and interventions.

Other characterizations of small businesses include a dependency on suppliers for information; literacy among workers is generally poor; a belief exists that the chemicals being worked with are not dangerous; there is poor knowledge of health effects; there is better perception of acute rather than long term health effects; controls are decided by custom and practice and not by risk assessment.

Data on owners' behaviours toward health and safety in small businesses are limited and conflicting. In interviews, owners describe numerous barriers including limited resources, lack of in-house expertise, and production pressures. In addition, Brosseau and Li (2005) suggest that small business owners' intentions toward improving workplace health and safety are primarily influenced by their attitudes. Interventions aimed at these underlying beliefs, particularly those shown to be most highly associated with high intentioned owners, may be successful in bringing about improvements in attitudes, intentions and behaviour.

A number of conceptual models have been developed that may help to enhance our understanding of health and safety interventions in small businesses and their effectiveness. The models identify several factors that are important to consider when developing interventions and influencing small business chemical hazard management. Vickers *et al.* (2003) along with others have found that the nature of the business defined by the industry it belongs to and the market it operates within is the main influencer on the OSH outcomes. Many authors therefore recommend the development of industry specific interventions with a focus on the small businesses specific external intermediaries, internal culture, its needs and internal resources and processes. The suppliers, producers and importers of hazardous chemicals play a key role in reducing exposures to hazardous chemicals.

A growing body of literature also confirms that models for chemical risk management and social responsibility issues can play a key role in managing hazardous chemical exposures in small enterprises. Furthermore, studies have shown that there are certain characteristics of small business that potentially provide positive opportunities for the implementation of preventive interventions (Champoux and Brun, 2003; Laird and Perry, 2007).

The main forces or influences that impact on the small businesses and how they are managed relate to competition, regulatory pressure and the supply chain, from the suppliers through to the contractors and the customers.

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A review of hazardous substances intervention studies in small enterprises shows varying types of approaches and ranged from studies of the development of OHS systems and assessments, training and educational interventions, engineering and industrial hygiene interventions, and a combination of industrial hygiene, health promotion and behavioural interventions.

The most successful intervention methods appear to be action-oriented, low cost approaches, combining health and safety with other management goals, and based on trust and dialogue. It is suggested that intervention research should look at the whole intervention process from the external actors/influencers (for example, government agencies and intermediaries) through to the dissemination process, the uptake of the small enterprise and the effect on health and safety.

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