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CONSTRUCTION PROJECT LEADERS' PERCEPTIONS OF RESPIRABLE CRYSTALLINE SILICA EXPOSURE AND CONTROL: A SAFETY LEADERSHIP PERSPECTIVE IN THE UK SOCIAL HOUSING SECTOR

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Abstract

Although, there have been studies on silica dust practices in the construction industry generally. Specific attention has not been given to construction project leadership (CPL) perceptions of Silica dust safety within the social housing sector. A two-stage multi-method qualitative participatory exploratory action research approach was adopted. The first stage involved a mixed-method survey (qualitative and quantitative), with a sample of 64 mid-level management representatives. The second stage involved 8 semi-structured interviews with leaders within social housing organisations. Participants included Senior executives, Project Managers, Asset Managers, Safety Managers and Compliance Managers. Data analysis employed thematic and statistical analysis. The study discovered three key themes (Senior management; Human resource; Technical Safety) and identified nine key challenges, barriers and drivers (including economics, risk taking behaviours, project pressures, skills shortages/gaps) facing CPLs' current "*strategic, tactical, and operational*" silica dust approaches. Whilst, the findings highlight that silica dust safety culture is a complex construct, which is difficult to define, even for experts in the organisation. The results of the study have identified some of the shortcomings in project leadership practice in the UK social housing sector which will spur changes that promote greater achievement of the sector to improve silica dust management approaches.

Keywords: housing; silica dust; safety culture; leadership perceptions; qualitative research.

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1. Introduction

Respirable crystalline silica (RCS) dust, a carcinogen, presents a significant health hazard, particularly in the construction sector. Globally, almost 6 million construction workers worldwide are exposed daily [1]. RCS is prevalent in construction materials such as plaster, brick, cement, concrete, plasterboard, joint compounds, mortar, natural and engineered stone, sand, asphalt and ceramic tile. Exposure occurs during processes like drilling, cutting, chiseling, demolition and mixing or sweeping dry elements of these materials [2]. Prolonged exposure and subsequent inhalation of RCS dust increases the risk of contracting severe respiratory diseases, cancers, as well as numerous debilitating heart, renal and autoimmune diseases resulting in reduced life expectancy [3]. Global Occupational Health and Safety (OHS) bodies such as World Health Organisation (WHO) and the Institution of Occupational Safety and Health (IOSH) suggest workplace exposure to RCS particulates, leads to approximately 386,000 deaths annually [4]; and estimate that in Europe 81 per cent of those exposed are employed in construction or in manufacturing products used in construction [5]. As the third

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leading cause of death globally, Chronic Respiratory Diseases (CRDs) and conditions like COPD and silicosis continue to escalate, placing strain on health systems worldwide [6], driven by the evolving landscape of construction dust generation, resulting in a lack of quality air consumption [7].

In the UK, the Health and Safety Executive (HSE) estimated 600,000 construction workers are exposed daily to RCS dust, resulting in 600+ silica related deaths a year, with the actual number being much higher than this estimate, as silica dust health monitoring is under-reported [1]. While technological advances can help address these risks, the role safety leadership plays in the construction industry is the subject of a growing body of research. However, in practice the intense nature of the industry continues to test existing safety initiatives [8]. Despite growing studies targeted towards RCS exposure, there is concern about the gap between guidance and practice which may emanate from a lack of regulated standardised training, inadequate workplace safety measures, weak regulatory enforcement, poor exposure limit compliance and lack of enforcing effective exposure control and comprehensive surveillance programmes [4, 5, 7, 9].

With 80% of the UK's building stock already existing [10, 11] there is a need for wholesale maintenance, retrofitting, and adaptations to the current residential housing stock at scale. However, implementing various types of external and internal building fabric upgrades will generate substantial RCS dust. Hence, significant RCS dust exposure will spread beyond worksites (externally and internally), affecting the workforce and the wider public [11]. Initial findings from the current UK regional Institute for Health Research "Healthy Homes" study of 3,000 homes focused on how retrofits impact indoor air quality and residents' health [12]. As such the sector could be inadvertently creating high risk RCS environments with the potential to induce significant impacts and dangers.

Hence, RCS dust exposure in UK Social Housing repair, maintenance and improvement (RMI) projects, whether large-scale or home-based, will result in the need for an increased stringent approach to managing and controlling RCS dust exposure. Yet, there has been a distinct lack of targeted UK Housing RMI sector studies that have been directed to promoting 'best practice' workplace RCS safety practices. Therefore, this study seeks to fill this gap in knowledge and aims to assess the knowledge, awareness, behaviours and attitudes of CPLs regarding RCS dust exposure compliance, with a focus on identifying gaps and recommending targeted interventions. The objectives for the study are as follows:

- Examine construction project leaders' awareness and knowledge of RCS practice.
- Investigate leadership behaviours and decision-making influencing RCS management.
- Identify key challenges and barriers affecting effective RCS leadership.
- Explore opportunities for improving RCS management through enhanced safety leadership.

2. Literature review

The literature review focused on the RCS safety management practices in the UK Housing RMI sector towards understanding the level of its CPLs RCS safety leadership.

2.1. Respirable Crystalline Silica Safety Practices and Leadership

The construction industry has a strong tendency to focus on RCS exposure, controls, regulation, and interventions. While, in terms of the economic, social and environmental costs of occupational and wider public and environmental health RCS impacts are being tackled by industry on several fronts [12]. With many studies frequently debating compliance, education, communication, regulatory responses and the factors that comprise RCS safety practices [13]. Early empirical research focused on exploring and measuring RCS concentrations for a range of activities, materials and workplaces in the construction industry. This suggested that the multi-dimensional nature required a multi-disciplinary approach to ensure high effectiveness of control measures and a significant part of the construction worker population is indeed using them on a regular basis [14, 15]. In a study with construction workers, two factors were found to provide the best fit: management's commitment to safety, and worker's involvement in safety [16]. Later studies on the role of RCS safety leadership and management corroborated this result [17, 18]. Furthermore, research on the role of communication and collaboration [13] and emergent, socially patterned RCS hazards [19] highlight that RCS safety leadership is a complex construct.

2.2. Respirable Crystalline Silica Management

Numerous studies have brought attention to the poor management of RCS safety on construction sites [4, 7, 13, 16, 20]. Technical controls alone are insufficient as long-term protection depends on regulation, enforcement, well-defined task description, sector tailored education, consistent measurement, and employer responsibility which are not only prerequisites but core components of an effective evidence-based RCS safety system [13]. Further causation can be charged at; the lack of work process-based risk management, systematic monitoring, and data infrastructure [14]; the need for strict adherence, and continuous improvement as all are key RCS safety attributes [15]; given the lack of organisational practices, continuing compliance gaps, and poor attitudes toward monitoring and health surveillance, within micro and SME organisations [4, 7].

Numerous strategies have been applied to deal with these issues within various construction-based environments, such as eliminating the risks through the design process, implementing COSHH based risk assessments, employing work task engineering controls, and interventions [16–21]. Such tools, methods, and frameworks, range from the intense to low-key; from having a controlled RCS dust workplace environment to simply protecting the worker in an uncontrolled environment. In all cases, the primary goals are to minimise the exposure to silica and to ensure it is not greater than the UK workplace exposure standard (WES) (i.e., *existing Work Exposure Limits (WEL) of 0.1 mg/m*^{3}). Yet, from an industry perspective, questions remain regarding the gap between the application of RCS safety practices and their link to safety outcomes, particularly at different levels within an organisation.

2.3. Housing Works Respirable Crystalline Silica Management Practices

Many Housing RMI sector workers are exposed to significant RCS hazards and risks as part of their everyday work tasks [2] and many of these are well-identified and managed through project risk systems. Yet, in terms of housing-based RMI RCS control and exposure management practices and processes, there has been a lack of housing focused studies that have investigated the RCS impact. The RCS risks associated with ill health in the application of innovative materials, products, and methods (IMMs) within green buildings (GBs) during construction and renovation works have not yet been fully evaluated either [22]. Several studies investigated the potential exposure levels and risks, when undertaking renovations [11, 23, 24]. They also highlighted indirect workers, and the public are often overlooked in exposure assessments or regarded as unexposed since they are not producing or disturbing RCS based materials. Unsurprising as RCS exposure levels during construction tasks can be highly variable even when the same material, task, and control method is employed, indicating the highly task specific nature of RCS exposure and control [24]. Suggesting it is necessary to strengthen the protective facilities and improve the RCS safety processes and work tasks to reduce risks [24], otherwise RCS dust produced from housing related construction processes pose a serious health concern to construction workers, their families and the public [25–29].

Fig. 1 presents a conceptual framework derived from the literature. This positions safety leadership as the central driver influencing the effectiveness of RCS management within social housing projects. Drawing on the literature, leadership behaviours-particularly decision-making, commitment, and resource allocation-shape how safety priorities are translated into practice through workforce capability, technical safety systems, and organisational processes. Consistent with prior studies emphasising management commitment and worker engagement, the framework highlights the role of leadership in enabling skills development, enforcing control measures, and navigating project constraints such as cost and procurement pressures. These interacting elements collectively determine the effectiveness of RCS risk management outcomes, including exposure reduction and regulatory compliance. The framework therefore integrates existing theoretical insights with empirical findings to demonstrate how leadership actions operationalise safety practices in complex construction environments.

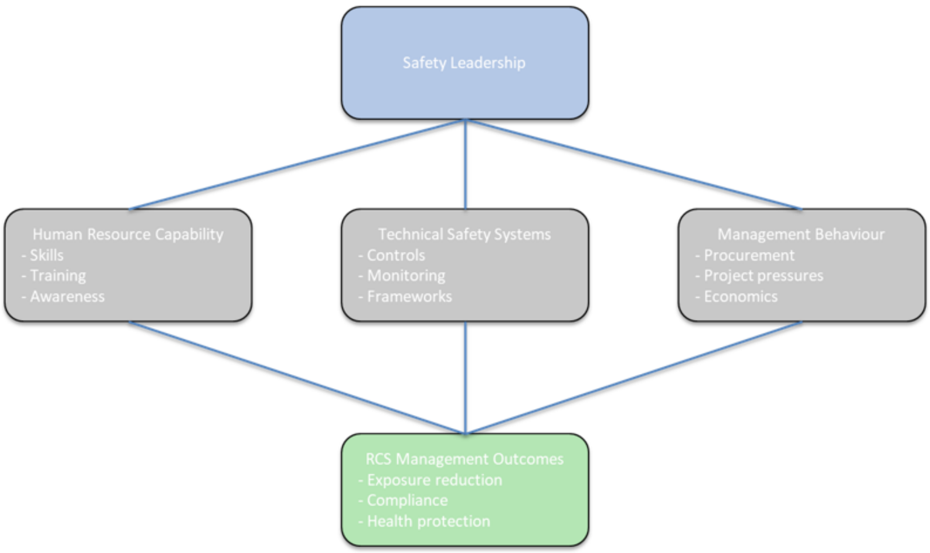

Figure 1. Conceptual Framework: Safety Leadership and RCS Management

3. Method/methodology

The study adopted an overarching concurrent two-stage multi-method (questionnaire and semi-structured interviews) qualitative action research methodology. Action research involves pursuing exploration into practice undertaken by those involved in that practice, with an aim to change and improve it and produce practical, useful knowledge [30]. Hence, the survey adopted a mixed-method (qualitative and quantitative) approach, whereby a combination of both the process of descriptive statistics, and thematic analysis was employed to discover the patterns within the sampled data, to draw conclusions (or “make inferences”) [31]. An exploratory purposeful sampling approach was considered most appropriate for this study, based on the following criteria: first-hand experience with the topic, and current job position relevancy, and applicable experience [32]. Recruited participants were from a representative range of UK Housing RMI sector senior leadership (within public and private sector housing and construction organisations) and management professionals with field operations responsibilities, geographical locations across the UK and demographic backgrounds. The profile of respondents in this research study represents a comprehensive spectrum of professionals crucial to the Housing RMI sector’s RCS dust issues and subsequent mitigation strategies. Although, overall, the profiles of the senior leaders and managers participating in this study were dissimilar to each other, allowing gaps between strategy and practice surface to the fore and be readily identified.

The interviews and questionnaire were designed to assess construction project leaders' awareness, knowledge, and decision-making in relation to RCS exposure and control. The questionnaire included a mix of closed and open-ended questions structured around key themes identified in the literature, such as health risks, exposure pathways, control measures, and safety management frameworks. A five-point Likert scale ("not aware" to "very much aware") was used to capture perceived levels of awareness. The questionnaire comprised 24 questions (n: 12 demographic and background; n:5 awareness of risks and controls; n:8 barriers and solutions). While, the interview questions and reasoning were generated from the poor management systems, approaches, practices and behaviours highlighted in the existing literature. In addition, both instruments aligned with core dimensions of safety leadership and RCS management, informed by existing research and relevant regulatory frameworks (e.g., COSHH, CDM), ensuring alignment with recognised risk factors and control strategies. Both data collection methods were carried out simultaneously, this allowed data comparison of management field operations with senior leaders and their own individual organisation's H&S leadership, policies and regulations.

In terms of the administered questionnaires, one hundred and fifty were sent out to Housing RMI sector management staff (*Construction or Project or Asset or Estates service or Compliance or Repairs or H&S or Cost Manager and Property or Building or Quantity Surveyor*) and sixty four survey questionnaires were completed – a 43% return rate – a relatively high response rate given within the construction industry a 25% to 30% response rate is considered acceptable [32]. It was designed to assess the overall perceptions and attitudes of management professionals towards RCS dust safety and their own individual awareness, knowledge and skills. The second concurrent stage undertook senior leadership professionals, whereby a combination of face-to-face and online interviews were conducted, with directors from both public and private sector entities (fundamental service components within the Social Housing ecosystem) who had between twenty-five to thirty-five plus years' experience. Recruitment continued until data saturation was reached, defined as the point at which no new themes emerged. Whilst, previously it has been recommended that qualitative studies require a minimum sample size of at least 12 to reach data saturation [33]. Given, this study is context and sector-specific and not intended for statistical generalization to the wider construction sector, a sample of 8 was deemed sufficient for the qualitative analysis and scale of this study. The interviews were conducted to identify and understand the key issues relating to RCS safety practices from the perspective of safety leaders. Interviews lasted 60 minutes, and were digitally recorded, then transcribed as verbatim records and transcriptions were provided to the interviewees to confirm their accuracy.

The data analysis utilised a combination of both descriptive statistics, and thematic analysis to discover the patterns within the sampled data, to draw conclusions (or "make inferences") [33]. Based on interview and survey feedback, thematic analysis was used to identify, analyse, and report topics arising from data collection. The study employed a combination of two similar procedural guidelines and processes [34, 35] whereby a six-step process was used which provides a flexible, and reflexive approach to analysing qualitative data: (1) data familiarisation; (2) code generation; (3) theme search; (4) theme review; (5) theme definition and naming to allow it to be grouped in a systematic way, allowing different themes and sub-themes to emerge from data and; (6) be written up. For the statistical analysis descriptive analysis was performed, namely frequency statistics in the form of percentages to summarise responses to present data clearly, represent the relative frequency and track confidence intervals (CIs). To provide result clarity, based on the questionnaire scoring frequency, the percentage scores for each question were calculated and are illustrated by using three separate chart styles (pie chart, radar, and clustered column) denoting the relevant respondent numbers and percentage scores.

4. Findings/results

The research findings described in this section were derived from the thematic analysis of senior leadership interview data and the online questionnaire with middle management, supplemented with descriptive analysis data from the survey. Key themes and descriptive data are discussed and supported covering four areas of interest: 1) awareness and knowledge of RCS safety practice; 2) challenges to RCS safety leadership behaviours; 3) barriers to RCS safety leadership; and 4) enhancing RCS safety leadership. For brevity, the questionnaire scoring frequency, and percentage scores are only illustrated where necessary (using separate chart styles (stacked bar chart, and clustered column), while the textual contents of interview data were trimmed from the transcribed data. From the thematic analysis of the interview and survey data revealed three key themes: 1) Senior management; 2) Human resources; and 3) Technical Safety. Within these themes, nine key challenges, barriers and drivers surfaced consistently; 1) *Economics; 2) *Risk taking behaviours; 3) *Poor Project OHS performance; 4) * Project pressures; 5) *Skills Gaps (employees lacking certain skills); 6) *Recruitment; 7) * Skills Shortages (not enough people with certain skills); 8) OHS standards, regulations etc; and 9) Air Quality Management.

4.1. Awareness and Knowledge level surrounding RCS Dust Exposure & Control Practice

To address objective 1 and 2 of the study - survey participants were set a series of closed questions, to investigate their awareness and knowledge level surrounding silica dust health risks, modes of transmission, generation sources, management mitigation tools, and structured H&S process management frameworks at their disposal. Initially, the total survey participants (n = 64) were asked about key demographic and professional attributes, offering insights into their gender, age, level of educational qualification, roles, experiences, and organisational contexts. For example, n = 48 (75%) were male and n = 16 (25%) female, with a mean age of 55 years old. While they were either employed directly within a housing (n = 32; 50%) or an external consulting organisation (n = 32; 50%), undertaking a range of activities bridging both on-site and off-site management activities. In terms of qualifications, most respondents had completed an undergraduate degree, n = 32 (50%) or, n = 16 (25%) being educated to Master's level or either had completed a professional degree. Therefore, the respondents can be deemed well educated and considered knowledgeable, which enhances the validity and reliability of the survey findings.

Fig. 2 highlights their responses to the serious health risks and potential effects, and generally there appeared to be a relatively diverse understanding of the various health effects ranging from either being very aware (n = 32, 50%) or aware (n = 24, 37.5%). However, quite concerningly, a small portion of the respondent population (Cost managers/Quantity surveyors, n = 16) were completely unaware of the threat of contracting silicosis (n = 8, 12.5%), and COPD (n = 16, 25%), which are highly common effects of elevated RCS exposure and third leading cause of death globally [6].

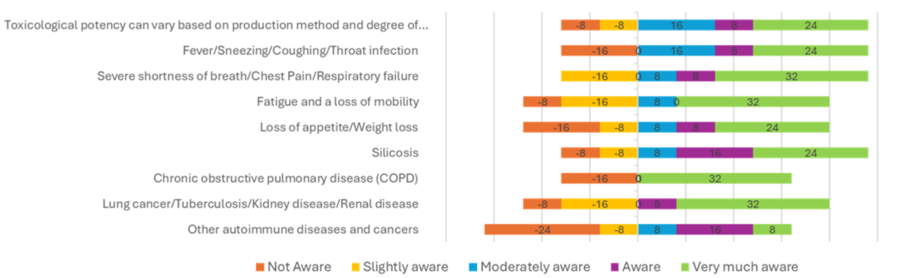

Figure 2. Level of awareness on the health effects and serious health risks of silica dust exposure

Yet in contrast, many respondents (n = 56, 87.5%) when asked about their level of awareness on the mode of transmission of silica dust identified inhalation as their recognised primary transmission route. While n = 32 (50%) (Architect/Designer n = 8, Quantity surveyors, n = 16, Technical Services Manager, n = 8) were unaware of both systemic absorption through the skin and ingestion by inadvertently swallowing RCS dust. Suggesting that professionals from a design/specification/procuring role, in comparison to professional roles involved in on-site construction works had a lower level of knowledge and understanding of RCS risks and hazards. However, paradoxically, when asked about their level of awareness on the work activity RCS dust sources, while most were very much aware (n = 40, 67.5%) or aware (n = 48, 80%) of the key sources (i.e., Drilling, Cutting, Sanding, Chiselling, Demolition, Mixing, Handling, Sweeping). Disconcertingly n = 8 (12.5%) was unaware that drilling holes in existing walls/ceilings, plastering activities (plastering (n = 16, 25%) produce high levels of RCS dust over a short timeframe.

Fig. 3 highlights their level of awareness of silica dust mitigation tools and available structured construction H&S process management frameworks, at their disposal. The consistent response of 'very aware' or 'aware', totaling between n = 32 (50%) and n = 40 (67.5%) emerged across seven tools (e.g. RAMS, hierarchy of control, enforcement, understanding safe systems and procedures of work etc). However, unexpectedly n = 8 (12.5%) and n = 16 (25%) stated they were unaware of the need for implementing a 'hierarchy of control', a key risk management component of COSHH, 2002, and the employment of a project silica exposure mitigation plan. Whilst, in terms of H&S management frameworks, despite the relatively well-known need to employ CDM, COSHH and a Construction Phase Plan (CPP). An apparent lack of awareness of a Construction Environmental Management Plan (CEMP) and Indoor Air Quality (IAQ) management plan with n = 24 (50%) and n = 16 (25%) emerged. While n = 8 (12.5%) were not aware of the need for an IAQ a significant element in aligning projects with a project's CEMP.

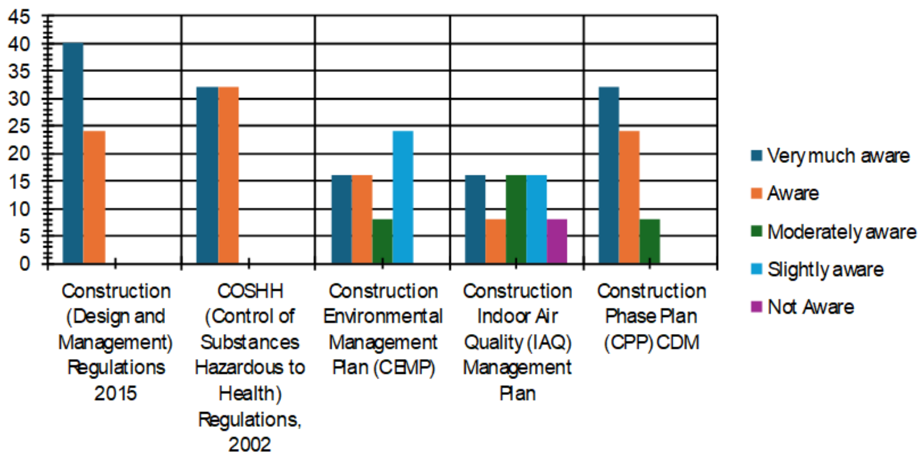

Figure 3. Level of awareness on key H&S process management frameworks

In the interviews, to address objective 1 and 2 of the study - the senior leaders were asked about their leadership perceptions and their individual awareness, understanding, and knowledge towards silica dust exposure and control practices. As can be seen in Table 1, three key themes emerged: the first major theme to emerge from the analysis was a focus on the technical side of RCS safety, with many (n = 6, 75%) demonstrating a lack of assigned importance of engineering controls, water suppression, proper PPE/RPE, and health surveillance. Coupled with several interviewees (n = 3, 37.5%) mentioning RCS H&S data shortcomings, such as a lack of understanding of the volume of RCS dust produced in common construction tasks. Suggesting such inadequacies compound the difficulty of selecting the most appropriate tools, methodologies and frameworks to reduce exposure and their integration with sustainability and ambient air quality standards.

This was evidenced by the responses that related to technical safety skills as many (n = 6, 75%) stressed current RCS leadership skills and knowledge was achieved through a combination of previous working experience and tacit knowledge. Hence, RCS skills development was understood to be a secondary thought from an organisational perspective, with senior leaders commenting on how there is a "*tendency to offload all H&S to externals such as CDM advisors*". Although they conceded that there were cost implications of engaging with specialist H&S advice. Highlighting such economic decisions were taken due to inherent deficiencies in knowledge and competency of their existing workforce (management and operatives).

The second key theme identified from the data related to human resource capability and capacity. All respondents (n = 8, 100%) were unanimous that skills shortages and gaps were major issues internally as an organisation as well as externally when procuring both contractor and professional services. While, the consensus (n = 6, 75%) was the most complex and difficult part of a project, was assembling an appropriately skilled design and installation team. It was observed that while deficiencies in available talent resulted in a distinct project delivery and recruitment shortcoming, the perceptions were often grounded as a component or a reflection of the broader leadership and business approach. The centrality of this theme is evidenced by a number of responses around leaders' view of human resource as a "*barrier*", a "*blocker*" or a "*challenge*" of the fragmented nature of the industry, coupled with an inherently adversarial tendering disposition of project contracts. Some interviewee responses (n = 2) included a statement about the relative priority given to RCS safety, for example, whether RCS safety was "*based on economics*". Although, they underscored that the associated management and work practices and processes "*require distinct skills*".

Table 1. Key Interview Themes (Source: Authors' construct, 2025)

No.	Theme	Examples
1	Technical Safety - knowledge, skills, and data	"*Distinct housing sector skills and knowledge inadequacies between sector practice, guidance, standards and frameworks*"; "*Current deficiencies in both non-occupational and occupational RCS H&S data relevance, granularity, precision, and interpretation*"
2	Human resource – capability and capacity	"*a shortage of expertise in the procurement, design and management team for RCS control and exposure*"; "*shortcomings in available talent with the required skill set results in recruitment inadequacies*"
4	Senior Management - actions, behaviours and practices	"*requires an increase in senior leaders putting silica in the same risk category as asbestos and the other big six safety areas and for people on the ground to see people at the top talking to them about it*"; "*Adversarial procurement processes are the real issue allied with the predilection to select the lowest price and not on who is most suitably experienced and qualified*"

The third and final theme recognised in the leaders' perceptions centered on the inextricably linked nature of senior management culture with organisational performance, risk management, and leadership effectiveness. All interviewees (n = 8, 100%) said that from their perspective the lack of cost benefit analysis or return on investment data with operational and the upfront capital costs was "*very typical when dealing with H&S as a whole*". Many, from a leadership business capacity openly suggested they suffered from "*an amalgamation of poor leadership understanding, knowledge and short-term thinking driven by a culture of adversarial procurement, self-preservation coupled with resistance to change and a focus on immediate accidents rather than chronic illnesses*". Contrastingly, they were in full agreement (n = 8, 100%) that there needed to be a formal mechanism, with several calling for a similar approach to asbestos management and control. Whereby there is a need to prioritise dust control, which should be driven by regulatory compliance and economic structural mechanisms such as procurement requirements, contractual agency, and RCS dust standards.

4.2. Challenges and Barriers to RCS safety behaviour

To address objective 3 of the study – the study analysed the findings from both the survey and the interview series. From the survey executed, respondents were posed an open-ended question surrounding potential implementation challenges and/or barriers regarding management and field RCS dust practice. Given the number of barriers and challenges identified: economics; culture and behaviours; poor project H&S performance; project pressures; skills gaps; recruitment; skills shortages; RCS H&S standards, regulations etc; and air quality management. Fig. 4 underscores the top three responses identified and considered most appropriate to demonstrate the consensus amongst participants.

Skills gaps and skills shortages were seen as significant challenges and are barriers to overcome by n = 52 (87.5%). While they can be viewed as individual issues, realistically they are inevitably integrated together as one. Similarly, economics and the high investment and running cost of management monitoring and managing RCS exposure was rated as a top three challenge and barrier by with n = 48 (75%) of respondents. While the last option of the top three, surrounded the sector's current culture and behaviours towards RCS exposure and control with n = 40 (62.5%) identifying this as a challenge and/or a barrier. This is reflected less strongly here than in the themes derived from the interview data, surrounding awareness and knowledge of RCS practice. However, responses also referred to the lack of ownership from clients and/or senior leaders complicating these issues, so the frequency could also be reflective of a lack of alignment and support for RCS safety culture. Interestingly, the other sector barriers and challenges whilst not rating as high were identified by n = 32 (50%) of respondents, mirroring technical safety being a key theme identified in the interviews. It is possible that supporting a RCS safety culture as well as driving a "best practice" exposure approach and the various levels at which they operate responses tended to be from a slightly different perspective, based on participating practitioners representing only the "best" and "worst" end of their practice in terms of RCS dust safety culture within their own individual organisations.

When interviewing the senior leaders about what they thought were the key challenges and barriers to both creating and maintaining a RCS safety culture, (deemed the broader cross-cutting strategic sector and project level issues). The interviewees discussed a range of similar obstacles, echoing both the literature and the survey, housed within the key three thematic areas shown in Table 1.

In terms of the senior management thematic area, four key areas were identified, namely, economics, culture and behaviours, poor project OHS performance, and project pressures. Consistently, they all stressed the challenge of RCS management culture was inextricably linked to the key barrier of economics and its associated strategic challenges (e.g. project funding, budget constraints, etc.) remarking "*they were of equal standing*". Collectively it was suggested there was a need "*to evenly spread the project share costs of H&S*". A common statement was that "*budgeting for construction dust is viewed as a subsidiary responsibility of contractors*". However, the feelings surrounding these issues were highly emotive, with several leaders candidly admitting, from a leadership business ca-

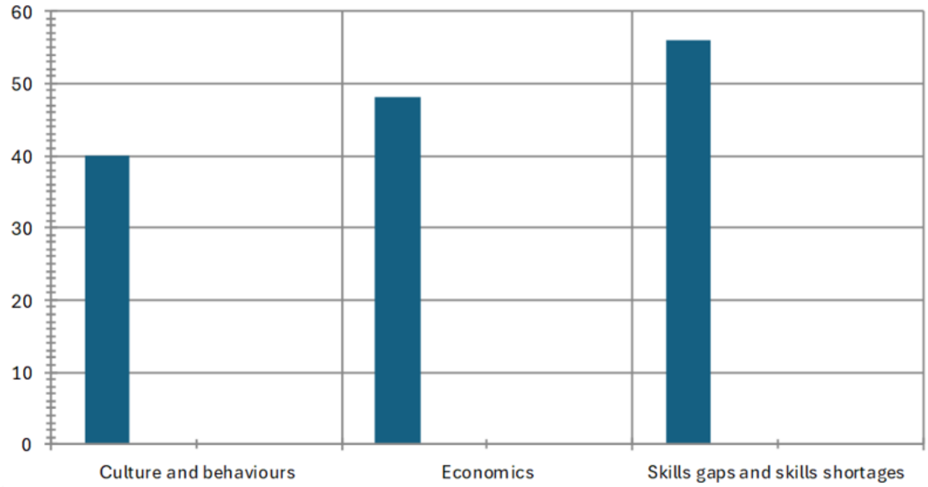

Figure 4. Key potential implementation challenges and/or barriers

pacity "*at the time of the decision to carry out repair works, a lack of structured and collaborative approach perpetuates poor project delivery and performance resulting in inadequate management approaches*". This extended to site practices as well, with responses indicating that RCS safety leadership should be reflected in project work processes and practices and viewed as a key driver to implementing "best practice" RCS protection and control methods.

Within the technical safety theme, the interviewees discussed a range of technical safety issues. However, three key challenges and barriers consistently materialised, namely; skills gaps, the raft of H&S contractual requirements, standards, regulations, along with the lack of understanding and use of key H&S construction process management frameworks. The main points raised in relation to technical safety were around clarity and simplicity. Some interviewees felt that there was an information overload, while others considered that due to the lack of skills development a positive RCS safety leadership was not effectively translated through the organisational levels. Offering an often-typical leadership inference that there is a tendency to "*contractually pass the risk to the supply chain*". Some interviewees even suggested that there was concern about that legislative requirements were viewed as complex and requiring "*a lot of administration and paperwork*" to enable compliance.

The final theme, human resource difficulties, focused on skills shortages/gaps and recruitment. With many senior leaders remarking they faced a continual decline in workforce numbers and had a continued reliance on external labour markets for recruitment and retention. A couple of interviewees offered recruitment being highly interconnected to skills shortages, while responses within this theme also reflected an emphasis on "*adversarial procurement processes as the real issue that required attention*" pronouncing "*it creates a restrictive and combative tendering nature*". It was viewed as a "*pinch point*" that impeded successful implementation of RCS safety practices, not only in relation to recruitment but also in terms of having to deal with skills and competency gaps. However, some senior leaders thought that education was not enough to address changes to RCS safety leadership to change behaviours, and that ultimately the emphasis should be on leaders demonstrating their commitment, not espoused values not matching actual senior leadership behaviours.

4.3. Enhancing RCS safety leadership

To address objective 4 of the study – the study analysed the findings from the interview series. Interviewees were asked about what key opportunities and recommendations are needed to enhance or improve senior leadership approach to RCS safety culture and drive more "best practice" silica dust exposure and control practices into projects. The emergent data was housed under the three reoccurring themes, as shown in Table 2.

Table 2. Key Interview Themes (Source: Authors' construct, 2025)

No.	Theme	Examples
1	Technical Safety - off/on-site technical safety activities and processes	"*guidance would improve and increase the possibilities of using a framework*" and highlighted "*as a by-product*", could, "*prompt contractors to adopt a more pertinent management function*"; "*any improvement whether managerial or actual work processes needs to be tried and tested, to be torn apart, to be criticised to allow lasting improvements to be made*"
2	Human resource – specific practical project related knowledge, skills and abilities	"*offering a structured roadmap approach to the silica dust management process*"; "*opportunities are inextricably linked to the range of education and training challenges facing the sector, at an industry wide and project level.*"
4	Senior Management - supervision; planning and administrative processes	"*having greater access to hard evidence from real life projects would be extremely valuable would be a highly effective way to show pay back for all scales of projects from straight forward to complex projects*"; "*lack of structured and collaborative approach facilitates continuation of poor project delivery and RCS management performance*"; "*provide more of an opportunity to support continuous improvement.*"

The view on RCS safety leadership and practices in the future was very positive, despite the considerable number of barriers and challenges identified in Section 4.1.3. Many interviewees expressed a view that continuous effort would lead to an improved culture, management and practice. One interviewee remarked "*we need to deal with the structural mechanisms... like better training for senior leadership*". In terms of opportunities for improvement, other comments related to improved ownership and understanding ranging from developing a formal RCS dust mechanism (akin to Asbestos management and control) to seeking to developing sector-specific technical guidance to exploring innovative contractual/procurement mechanisms such as incentivising "best practice". Collectively, it was felt there was the need for demonstration projects highlighting the potential time, cost and quality benefits, offering the ROI and CBA findings as a benchmark, to drive change objectively. However, if such continuous improvement mechanisms were to be viewed as justifiable, and sustainable, it was recognised that "*pace of change*" was a critical consideration. Although they caveated that "*invariably across the sector there were difficulties in keeping informed of the latest processes and tools available to improve RCS dust safety performance*".

5. Discussions

Findings from the study corroborate existing literature that like the rest of the construction industry, the UK Social Housing sector has struggled to define, describe and measure RCS safety leadership, given its complexity [13, 17–19]. Numerous RCS studies across various construction domains and sectors have established the importance of effective behaviours, compliance, education, and the consistent implementation of RCS standards, regulations, tools, methods, in fostering and maintaining a positive RCS safety leadership [1, 4, 13, 22, 26, 27]. This study has confirmed the relevance and importance of these interplays within a Social Housing RMI context. Moreover, from the findings of the management professionals survey and senior leadership interviews, in practice all organisations have indeed been applying an RCS safety culture concept to their H&S practices. Perhaps less obvious in the literature but clear and consistent across this study was the concept of the economic challenges and subsequent barriers around ensuring sufficient budgeting as being critical to supporting RCS management and cultural ambitions.

From the survey findings, based on the statistical data, the indication was that despite widespread industrial guidance and scholarly research into RCS hazards, there was still a significant portion of management who lacked understanding and knowledge of the health risks and effects, and that RCS based construction tasks can be highly variable, and intervention specific. A similar pattern occurred regarding environmental sustainability and stricter air quality frameworks as RCS dust mitigation scaffolds despite them being legally required documents for all construction projects in the UK, regardless of size, duration, or complexity. Suggesting a gap in knowledge, as it appears to be relatively unknown amongst those tasked with managing and mitigating RCS dust exposure. Yet such key understandings are fundamental to designing, planning, specifying, and managing primary and secondary exposure control methods, measures and tools. Signifying there appeared to be a heavy reliance on contractor self-managing and monitoring in terms of complying with implemented RCS control procedures and safe systems of work. Conceivably adopting an inter-disciplinary approach to knowledge management is a way of providing a competency management pathway for leaders and management professionals to continuously improve to achieve "best practice" RCS dust management. Conceivably, this perspective is perhaps feasibly a step too pervasive for the Social Housing RMI sector.

In essence, the study's interviews findings, resonated with both the literature review and the study's survey, which in turn, constructed more robust evidence, by acknowledging that the challenges/barriers/improvement areas, and potential actions identified suggests that they had a coherent idea of the issues and opportunities facing RCS leadership within the Social Housing RMI sector. Implying, a more integrated approach, within a highly collaborative working environment in which shared values and goals are the vision, can lead to real improvement. As such understanding would help move CPLs towards supporting the underlying management patterns, the need for constant feedback loops, and decision-making interconnectedness. Additionally, they were homogeneous in their view that nine identified areas were major concerns, although on reflection, the consensus was that they were not only connected and similar – but also key to business growth as well as delivering improvements in project work quality, efficiency and value. Suggesting that the current "*strategic, tactical, and operational*" approaches despite being the areas of most concern, are in fact areas ripe for improvement.

6. Conclusions

The key aim of the study was to assess the knowledge, awareness, behaviours and attitudes of CPLs regarding RCS dust exposure compliance, with a focus on identifying gaps and recommending targeted interventions. To fulfil the research study's aim, the research set four specific objectives (see Section 1), whereby Objectives 1, 2, 3, and 4 were achieved through a synthesis of literature and findings from a construction project management practitioners' survey alongside interviews with senior leaders.

Overall, based on the key reasoning from management professionals and senior leaders comments and perceptions, and from both qualitative and quantitative analyses the emergent discourse illustrated the following: most of these study groups currently have deficiencies in knowledge and competency, which in turn, can lead to both RCS safety performance and quality deficiencies as well as reduce workforce productivity quality and importantly impact organisational profitability.

The important conclusion is that, no longer, can the complexity of RCS dust leadership, its management, and its related processes, and practices be ignored. However, it should be noted that in terms of the literature, no evidence exists with respect to RCS dust management, its associated work practices, processes and leadership within Social Housing RMI research studies. In view of the paucity of research surrounding RCS safety leadership, and its practice, within a Social Housing RMI context. Insights gained from this research are therefore critical to both researchers, leaders and practitioners attempting to integrate RCS safety leadership theory and practice to provide a deeper understanding of developing and maintaining a positive RCS safety environment. Given that this research has important applications within the RCS safety leadership field, further research would be beneficial to continue to explore the role of leaders' perceptions in developing and maintaining positive safety improvements in organisations. Further research would also be beneficial to explore the quantification of RCS dust exposure involved in common Social Housing RMI work processes, practices, activities, and tasks to provide a baseline in terms of harmonised management approaches, protection standards, and work practice.

Limitations

The study was bounded by several limitations. First, the study focused exclusively on UK Social Housing RMI sector only and not replicable to any other targeted populations. Secondly, methodologically, the research employed a predominant qualitative approach resulting in cross-sectional study data, signifying the study could not make any assessment of causality about the relationships it was considering. Third, as the data was all self-reported, and voluntary, introducing potential problems of bias at an individual level. Raising the possibility of research participants representing only the 'best' end of their practice in terms of RCS dust safety culture within their own individual organisations. These limitations may affect the generalisability of findings beyond the specific geographic area studied and constrain the depth of quantitative insights that could have been gained from alternative methods.

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