

Social network influences on safety behaviours of employees in retail organizations

Report submitted to the IOSH Research Committee

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EXECUTIVE SUMMARY

Safety leaders must be able to influence others to ensure safe working conditions and practices and so achieve organizational safety goals. Influence is achieved not only by the validity and persuasiveness of the message, but also by the relationships between individuals. Those individuals who are well connected to many others, either directly or indirectly through others who are themselves well connected, have greater opportunity to influence than those who are distant from most people in the organization. Moreover, those individuals who sit between many others in the relationship network may be able to influence more than those who do not connect to other people. Taking a social network perspective, this study examined 1) the types of relationships individuals had with each other, and 2) their opinions and perceptions of different aspects of workplace safety. A two part questionnaire was distributed to all employees in four different retail units from three different companies. Response rates varied from 11% to 100%, permitting the construction of social networks in two of the stores only. In these cases more senior figures (managers and team leaders) and those on full-time contracts occupied the more central positions in the network, while more junior employees and those on part-time contracts were found on the periphery. Perceptions of safety across the four stores were positively skewed, but with some variation in responses between stores. However, most people agreed with each of the statements pertaining to safety knowledge, safety consciousness, safety participation, safety compliance and safety motivation. This suggests that individuals have a strong view of safety and are well trained in aspects of safety in their organizations. They were also convinced that managers were committed to safety and that safety was not a secondary consideration to performance. Nevertheless, greater uncertainty was evident when respondents were asked about shared working and mindfulness. With a very small number of exceptions, most respondents noted that managers were responsible for delivering organizational safety goals, indicating a strongly held view that the manager (not front-line employees) was the safety leader. The generally positive views of safety were well distributed throughout the networks, with some of the more strongly held views evident on the periphery, ensuring that any correlation between separation and perception were negative. However, there was a tendency for greater agreement with safety statements in the denser network. This suggests that network density rather than leader position was critical for creating positive safety perceptions, perhaps through the establishment and maintenance of social norms. As the number of ties decreases and density declines the opportunity exists for divergent views and opinions to exert their influence and the positive views of safety may dissipate.

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INTRODUCTION

Social network perspectives on human interactions accept that individuals are embedded in a web of social connections and that these ties influence individual actions and behaviours by providing enabling opportunities or limiting constraints (Emirbayer, 1997)¹. Such enablers or constraints are particularly significant where effort is discretionary and a range of possible actions are acceptable for achieving a desired outcome goal. Exceeding the desired goal is not perceived necessarily to be more beneficial than simply doing enough to satisfy requirements, although not achieving the goal would incur some form of sanction.

Assuming that network characteristics, such as density and boundedness, act as an independent variable influencing the actions and behaviours (the dependent variables) of the actors within them, rather than the converse where networks form and their characteristics are a consequence of the interaction of actors (Borgatti and Foster, 2003)², then there are several alternative explanations for the way they exert their effect (Portes, 1998³; Burt, 1992⁴).

First, in closed networks where individuals are well connected and subject to the same experiences, a sense of shared identity can result with the emergence of a common set of social norms. These norms may set the expectations within the group for acceptable and deviant behaviours. The cohesion established in these circumstances also encourages the monitoring of an individual's behaviour and actions by others in the group. The group self-monitors without the need for external inspection and audit. While this may be positive, if it prevents unacceptable or anti-social behaviour, it can also be a negative influence if it limits the aspirations and development of group members. For example, individuals may be discouraged from experimenting or seeking new ways of undertaking tasks because that is not what the group does, rather they become locked into a particular pattern of actions and ways of thinking and behaving.

Second, the position of an individual in relation to the other members of a network determines the extent to which they can influence these others. Typically those who are deeply embedded in the network are generally considered to have more influence than those in more peripheral positions, although such a central position may also place constraint on the individual. While this is the case in closed bounded networks, in more open networks, particularly those that span organizational groupings, a more peripheral position, especially if it spans a boundary, may provide the individual with more influence by virtue of its brokering role, than if the individual is more centrally located without these external contacts. Influence may therefore be a function of the closure and density of the network through the development of social norms and the position of the actors in the network.

Safety performance in organizations is dependent upon the individual not only sharing a common understanding of safety requirements and actively engaging in safety (safety participation) but also adhering to perceived safety practices (safety compliance). In circumstances such as service organizations where hazards are apparently minimal (for the organization if not the individual), risks generally low and where accidents occur infrequently, there is a strong possibility that individuals will differ in their perception of safety, their understanding of safety requirements and their knowledge of safety practices. Moreover, individual and collective attention to safety may wane as time elapses since the occurrence of an accident. In these circumstances an individual tasked with ensuring organizational safety performance must be able to influence those around them positively and to sustain this influence in the face of their experience of safety as a "dynamic non-event, p. 118" (Weick, 1987⁵). How this influence may be achieved by safety leaders in organizations is the focus of this study.

The remainder of this report is structured in the following way. A brief literature review of social network research is provided that permits the development of a number of hypotheses that may explain how social network characteristics influence perceptions of safety and self-reported safety behaviours. The sample population of four retail outlets is described. Data collection methods, mainly using existing safety scales combined in a two-part questionnaire, are described together with the

methods of data analysis. Findings from the questionnaire are reported extensively and then discussed. The discussion includes reflections on the limitations of the study, opportunities for future research and short practical recommendations.

LITERATURE REVIEW

In a recent review of organizational social network research, Kilduff and Brass (2010)⁶ identify four elements of the network approach that distinguishes it from other sociological or psychological approaches. These were; the emphasis on social relations; the embedded nature of the exchanges between actors in other social relations; the existence of patterns in social structure beyond the dyad; and the utility of social connections. Of course these four elements are inter-related, each supporting or building upon another. Nevertheless, we will use these four themes to develop a brief overview of social network research, incorporating definitions of key terms where appropriate.

1. Social Relations. The unit of observation in network research is the relationships between two (or more) actors, which allows Brass et al. (2004, p. 795)⁷ to define 'a network as a set of nodes and the set of ties representing some relationship, or lack of relationship, between the nodes.' Nodes or actors may be individuals, business units or organizations. Focusing on the individual level, Kilduff and Tsai (2003, p. 5)⁸ define networks as 'structures of constraint and opportunity negotiated and reinforced between interacting individuals.' Connections, or their absence, between individuals in a social network are often a consequence of shared attributes, for example, age; gender; ethnicity and education. According to the theory of homophily (McPherson et al., 2001)⁹ individuals possessing similar attributes are more likely to establish relationships with each other and less likely to establish relationships with those who are dissimilar. For example, Ibarra (1992)¹⁰ observed gender segregated networks in organizations, while Mehra et al. (1998)¹¹ found racial minorities were clustered on the periphery of networks, and Pilbeam and Denyer (2009)¹² observed that new recruits to a doctoral programme formed a separate cluster distinct from those students in later years of study. This tendency for individuals to connect with similar others naturally excludes those who are different, while encouraging the development of shared norms (Portes, 1998)³ amongst those who are similar. Within organizations the development of shared norms increases their stability (Popielarz, 1999)¹³.
2. Embeddedness. According to Borgatti and Foster (2003)² ties connect pairs of actors and act as a conduit for the flow of resources. These ties may be directed (i.e. one directional where a manager gives an instruction to a worker for example), or undirected. They can be dichotomous (present or absent, for example, where people are friends or not) or valued (measured on a scale, as in the strength of friendship). A set of ties of a given type (such as advice ties) defines a specific network that differs from a network comprising ties of a different type (e.g. social support), although the two may be correlated empirically (Borgatti and Foster, 2003)². Clearly ties of one type can be appropriated to serve another purpose. For example, Granovetter (1985)¹⁴ drew attention to the socially embedded nature of economic transactions, so that economic exchanges are dependent upon personal relations. This partly explains the persistence of economic transactions despite alternative and perhaps more favourable options (Uzzi, 1996)¹⁵. Connections (or ties) between individuals can therefore be used for multiple purposes - in this case for both economic and social exchanges. A tie between two actors that serves more than one purpose is a multiplex tie (Kilduff and Tsai, 2003)⁸. Studies have confirmed that ties may have different content. The resources that flow through ties are typically information, affect, goods and services as well as influence (Brass et al., 2004)⁷. Often ties that serve instrumental purposes (e.g. communication of information) and which are considered vital for task performance, are distinguished from those which serve expressive purposes (e.g. friendship) which are important conduits for social support and values (Balkundi and Harrison, 2006)¹⁶.
3. Structural Patterns. An assemblage of ties between actors in a social network creates a network structure. Dyads (two actors connected by a tie), triads (three actors connected together), cliques (three or more actors all connected by ties) and larger structures (Kilduff and Tsai, 2003)⁸ create overall patterns of connectivity or non-connectivity between actors. This allows researchers to investigate both the whole social network and the constituent parts

simultaneously (Kilduff and Brass, 2010)⁶. Two important whole network concepts are density and range. Density is defined as the actual number of ties in the network divided by the maximum number of ties that are possible (Kilduff and Brass, 2010)⁶ and reflecting the overall level of inter-relatedness between actors it can be used as an indicator of network cohesion. Networks having a greater density have more ties that are redundant in terms of paths along which information and influence can flow between two actors. These networks therefore tend to have better established norms that are more readily re-inforced through internal monitoring (Portes, 1998³; Kilduff and Brass, 2010)⁶. Network range is 'the prevalence of ties that cross institutional, organizational and social boundaries' (Reagans and McEvily, 2003, p. 247)¹⁷. Organizational structures may shape the social network of individuals in organizations and circumscribe network range. For example, shift patterns and the allocation of individuals to particular work teams may delimit the possible contacts available to an individual. Similarly the horizontal and vertical differentiation of work, respectively through work flow or task design and hierarchy, restrict the opportunities for individuals to interact with others (Brass et al., 2004)⁷. These influence network range. In emphasizing structural patterns there is a tendency to treat ties of different types as equivalent so that different tie types conveying different content are aggregated together (Kilduff and Brass, 2010)⁶. This may or may not be appropriate. Moreover, ties can differ in their relative strength (Granovetter, 1973)¹⁸, for example, ties between friends may be described as strong while those between acquaintances may be described as weak. Tie strength is a function of time, intimacy, emotional intensity and reciprocity (Granovetter, 1973)¹⁸. In any network the ties are likely to be neither all strong nor all weak, but a mixture of the two. This differentiation permits effective performance. For example, a study of new-product development projects in an electronics company (Hansen, 1999)¹⁹ revealed that weak ties were adequate for the transfer of simple codified knowledge, but strong ties were necessary for transferring complex, tacit knowledge.

4. Utility. Networks both constrain and enable actors to achieve outcomes. At the individual level this is often embraced in social capital whereby the presence or absence of connections to others provide or restrict access to resources (Adler and Kwon, 2002)²⁰. Two opposing perspectives influence discussion on the utility of networks. The 'structural-hole' perspective (Burt, 1992)⁴ compares two different potential networks surrounding a focal actor. One situates the focal actor in a densely connected team where the network is 'closed'. The other sets the focal actor as a broker between others who themselves are not connected (i.e. in the 'hole' between two others) and where the network is 'open'. The actor spanning holes has access to non-redundant information and can broker relations between others giving the actor an advantage over the others. Conversely, 'closure' focuses on the benefits to the group, arising from ties all sharing the same information, developing a common understanding and adhering to a common set of values or social norms. This is deemed particularly beneficial for collaboration; learning complex knowledge and implementing innovations; and for optimising individual performance through goal clarity (Kilduff and Brass, 2010)⁶. Obstfeld (2005)²¹ reported the value of closed cohesive rather than open networks for front-line workers delivering complex or innovative projects.

Achieving organizational safety is a collective endeavour. While a single individual or a small group of individuals may be accountable for organizational safety performance, the delivery of a safe working environment and ongoing safe working practices requires the participation of every individual within the organization. Safety is a relational activity involving interactions between individuals within groups and across organizational hierarchies, as well as the interaction of individuals with technology (e.g. machines and equipment). Relationships are important for the delivery of safety in at least four ways: individuals need support from others to work safely (Maslen, 2014)²²; individuals draw on the knowledge of others to act safely (Rooke and Clark, 2005²³; Sanne, 2008²⁴); those with responsibility for safe working must influence others to adhere to safety guidelines and to work safely (Mullen and Kelloway, 2009)²⁵; individuals need to pay attention to their surroundings and the activities of others (Weick and Sutcliffe, 2006)²⁶.

An integral constituent of safety participation is the notion of engagement. Individuals are encouraged to raise issues, voice their opinions, make suggestions and to support others in safe working practices (Kapp, 2012²⁷; Hoffmeister et al., 2014²⁸). Studies of transformational safety leadership (e.g. Barling et al., 2002²⁹; Kelloway et al., 2006³⁰) investigated the nature of the interactions between individuals with the responsibility for safety (typically supervisors) and their subordinates (often front-line workers). Those leaders who were attentive to their subordinates' needs and responsive to their concerns were perceived to be better safety leaders (Mullen and Kelloway, 2009²⁵).

Safety compliance is underpinned by the dissemination of information and knowledge. Without clear communication of what is required in terms of safe working practices between individuals, usually from higher in the organizational hierarchy to lower levels, safety compliance cannot be assured. Again studies of transactional and transformational safety leadership (Kelloway et al., 2006³⁰; Kapp, 2012²⁷) investigated the clarity of safety communications between supervisors and subordinates.

Safety leadership is portrayed normally as a relationship between an authority figure and a number of subordinates. The roles of the safety leader are several, but each requires interaction with others. The chief roles are to persuade and influence others to adopt safe working practices and then to monitor and evaluate the safety performance of individuals and/or teams.

In addition to being complex and tightly coupled (Roberts, 1990³¹), high reliability organizations are characterised by the notion of a collective mind (Weick and Roberts, 1993³²) and in particular the need for heedful (rather than heedless) interrelating and mindful organizing (Weick and Sutcliffe, 2001³³). Mindful organizing demands that individuals pay attention to their surroundings and notice small differences that could trigger larger changes resulting in catastrophic accidents. The processes that support mindful organizing have been distilled into five principles (Weick and Sutcliffe, 2006²⁶):

- Pre-occupation with failure;
- Reluctance to simplify;
- Sensitivity to operations;
- Commitment to resilience; and
- Deference to expertise.

Each of these is relational in nature either with technologies or with people.

Networks and Safety

Drawing on the core constructs of centrality, tie strength and network density described above, it is possible to consider safety performance and safety leadership of work groups in network terms.

Groups in which individuals have a large number of ties to others in the group have a higher density than those where there are fewer ties between members of the group. A greater density of ties allows better information sharing amongst group members, higher levels of collaboration, a greater chance of developing shared norms through overlapping ties and so the delivery of successful performance outcomes, in this case organizational safety both in terms of lower accident rates and improved safety behaviours. In contrast, groups with fewer ties, where individuals do not interact so frequently, are unable to share important information and are less likely to have shared norms. In these cases the prospect of successfully achieving shared performance goals is less likely (Balkundi and Harrison, 2006)¹⁶.

Hypothesis: The density of ties in a work group's social network is positively associated with safety performance or perceptions of safety behaviour.

Individuals who occupy more central positions in a network tend to have access to a greater diversity of data that either augments their power or provides information resources that enable successful task completion (Balkundi and Kilduff, 2005)³⁴. This allows them to provide information appropriately to

other members of the network and to guide others more effectively towards a common goal (Balkundi and Harrison, 2006)¹⁶. Moreover, individuals who occupy central positions are more able to act as information brokers between other members of the network, facilitating knowledge exchange and controlling the behaviour of others.

Hypothesis: The centrality of formal team leaders in a work group's social network is positively associated with safety performance or perceptions of safety behaviour.

The strength of connections between individuals is an important determinant of knowledge sharing and motivation (Reagans and McEvily, 2003)¹⁷. Ties that are reciprocated equally are stronger than those that are not, according to balance theory (Heider, 1958)³⁵. Similarly, ties that are multiplex, acting as a conduit for more than one type of resource (for example, advice and friendship) are stronger than those that convey only a single resource. Finally, individuals who communicate frequently will have stronger ties than those who communicate less frequently or not at all.

Hypothesis: Tie strength between members of a work group's social network will be positively associated with safety performance or perceptions of safety performance.

Methods

Questionnaire Design

To investigate both individual's views on safety and their connectedness to other individuals in the workplace, a two-part questionnaire was developed (see Appendix 1).

Part 1 explored the connectedness of individuals to others by drawing on questions used in other work (Borgatti and Cross, 2003³⁶; Pilbeam, 2012³⁷). The questionnaire used a 5-point Likert scale, ranging from daily, through weekly and monthly, to less than monthly and finally never, to determine how often individuals spoke to others in their organization about work in general and then specifically about safety-related matters. In order to mitigate the tendency to exaggerate the frequency of conversations, the reverse question ("who talks to you?") was also asked for both work in general and safety in particular.

In addition two other questions were asked that relate to shared leadership in teams, in particular the team environment that supports the development of shared leadership with respect to safety (Carson et al., 2007)³⁸. The first question, "who would you talk to at work about safety-related issues?" sought to identify those individuals recognised for their knowledge and understanding of safety who might show safety leadership. The second question, "who would you turn to at work for social/emotional support?" sought to identify the extent to which individuals contributed to the development of a mutually supportive team environment, where there is a sense of shared responsibility for team outcomes (Carson et al., 2007)³⁸.

The staff list was changed for each organization and incorporated into Part 1 of the questionnaire.

Part 2 of the questionnaire used a 5-point Likert scale ranging from strongly agrees to strongly disagrees, to explore the extent to which individuals either agreed or disagreed with a number of statements relating to different aspects of safety drawn principally from previously validated scales (Table 1). Seven statements relating to safety consciousness were drawn from Barling et al. (2002)²⁹. Drawing extensively on the work of others (e.g. Cheyne, et al., 1998³⁹; Flin et al., 2000⁴⁰; Neal et al., 2000⁴¹; Vredenburg, 2002⁴²; Zohar, 1980⁴³) Vinodkumar and Bhasi (2010)⁴⁴ developed scales for safety participation (four statements), safety compliance (seven statements), safety motivation (four statements), safety knowledge (five statements) and management commitment (eight statements). These scales were used in this study (Table 1). Three statements exploring different aspects of the process of collective mindfulness (*i.e.* pre-occupation with failure, commitment to resilience and deference to expertise) were drawn from the Safety Organizing Scale (Vogus and Sutcliffe, 2007)⁴⁵. A set of statements (eight statements) relating to individual values and priorities were derived from items used by Mearns et al. (2003)⁴⁶ in the Off-shore Safety questionnaire. Finally, two other sets of statements were developed to explore the concepts of shared working (five statements) and shared purpose (seven statements) that are integral to shared and distributed leadership (Currie and Lockett, 2011)⁴⁷. Unlike the other eight sets of statements these last two had not been validated by others prior to this study.

Table 1. Questions and their source by topic for safety questionnaire submitted to the three stores following an earlier pilot.

Safety Consciousness	Safety Participation	Safety Compliance	Safety Motivation	Safety Knowledge	Management Commitment	Mindfulness Precepts	Values and Priorities	Shared Purpose	Shared Working
I always wear the protective equipment or clothing required by my job	I always point out to management if any safety related matters are noticed in my company	I use all necessary safety equipment to do my job	I feel it is important to maintain safety at all times	I know how to perform my job in a safe manner	Safety is given high priority by management	We spend time as a team identifying activities that we do not want to go wrong	I work safely because I'm told to	Working safely is important to my colleagues	I am able to complete my tasks safely without the help of others
I am well aware of the safety risks involved in my job	I put in extra effort to improve the safety of the workplace	I carry out my work in a safe manner	I believe that safety at the workplace is a very important issue	I know how to use safety equipment and standard work procedures	Safety rules and procedures are strictly followed by management	We talk about mistakes and ways to learn from them	I feel there is a good safety culture in our organization	If we see someone working in an unsafe manner, we will remind them to work safely	My colleagues will always help others to work safely
I know where the fire extinguishers are located in my workplace	I voluntarily carry out tasks or activities that help to improve workplace safety	I follow correct safety rules and procedures while carrying out my job	I feel that it is necessary to put effort in to reduce accidents and incidents at workplace	I know how to maintain or improve workplace health and safety	Corrective action is always taken when the management is told about unsafe practices	When attempting to resolve a problem we take advantage of the unique skills of our colleagues	I can stop a job if I feel unsafe	My workmates try to improve safety in our work area	We need the help of safety specialists to work safely

Safety Consciousness	Safety Participation	Safety Compliance	Safety Motivation	Safety Knowledge	Management Commitment	Mindfulness Precepts	Values and Priorities	Shared Purpose	Shared Working
I do not use equipment that I feel is unsafe	I encourage my co-workers to work safely	I ensure the highest levels of safety when I carry out my job	I feel that it is important to encourage others to use safe practices	I know how to reduce the risk of accidents and incidents in the workplace	In my workplace managers/ supervisors do not show interest in the safety of workers		Safety is nothing more than common sense	My workmates always follow the correct procedures to complete a task	We need to work together to achieve a safe working environment
I inform management of any potential hazards I notice on the job		Occasionally due to lack of time I deviate from safe and correct work procedures		I know what are the hazards associated with my job and the necessary precautions to be taken while doing my job	Management considers safety to be equally important as production		Other employees in my department feel comfortable to remark about safety to each other	If my workmates noticed a safety hazard, they would take corrective action	My manager is responsible for delivering organizational safety performance goals
I know what procedures to follow if injured on my shift		Occasionally due to over familiarity with the job, I deviate from correct and safe work procedures			I feel that management is willing to compromise on safety for increasing production		I bend the safety rules to achieve a target	My colleagues act in a safe manner even when the manager is not around	

Safety Conscious-ness	Safety Participation	Safety Compliance	Safety Motivation	Safety Knowledge	Management Commitment	Mindfulness Precepts	Values and Priorities	Shared Purpose	Shared Working
I would know what to do if an emergency occurred on my shift (e.g. a fire)		It is not always practical to follow all safety rules and procedures while doing a job			When near miss accidents are reported my management acts quickly to solve the problems		I break the safety rules due to management pressure	Everyone has a responsibility to work safely	
					My company provides sufficient PPE for the workers		I am under pressure from workmates to break safety rules		

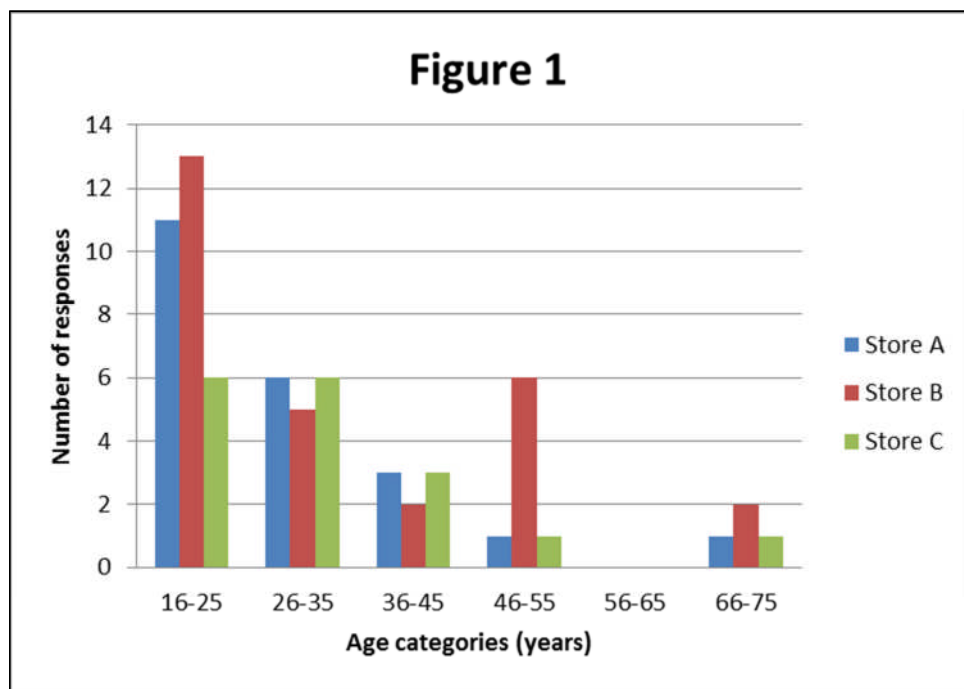
Sample

In every case the questionnaire was distributed in hard copy to individuals in the organization with the permission of the store manager. Individuals were encouraged to take part, but their right to not participate or to withdraw was guaranteed and respected where exercised.

An initial version of the questionnaire was distributed to a single store of 22 staff (store A) in April 2014. The questionnaire was revised after closer scrutiny of the questions and in the light of comments and response made by those in store A. The revised questionnaire was then distributed to all staff at three other stores, with two belonging to the same retail chain, during the summer of 2014.

The response rate from store A was 100%. Seven of the staff were male, 15 were female, and with one exception all were White British. The age profile and tenure of the respondents are shown in Figures 1 and 2 respectively. The store manager was supported by a Customer Services Manager and a Stock Manager. These three comprised the management team. The rest of the staff were front-line workers. Only six of the staff (including the three managers) were on full-time contracts. The remainder worked a variable number of hours per week, often spread over a number of days. Six of the staff, on reduced hours, worked only at weekends and one member of staff worked only on Tuesday afternoons.

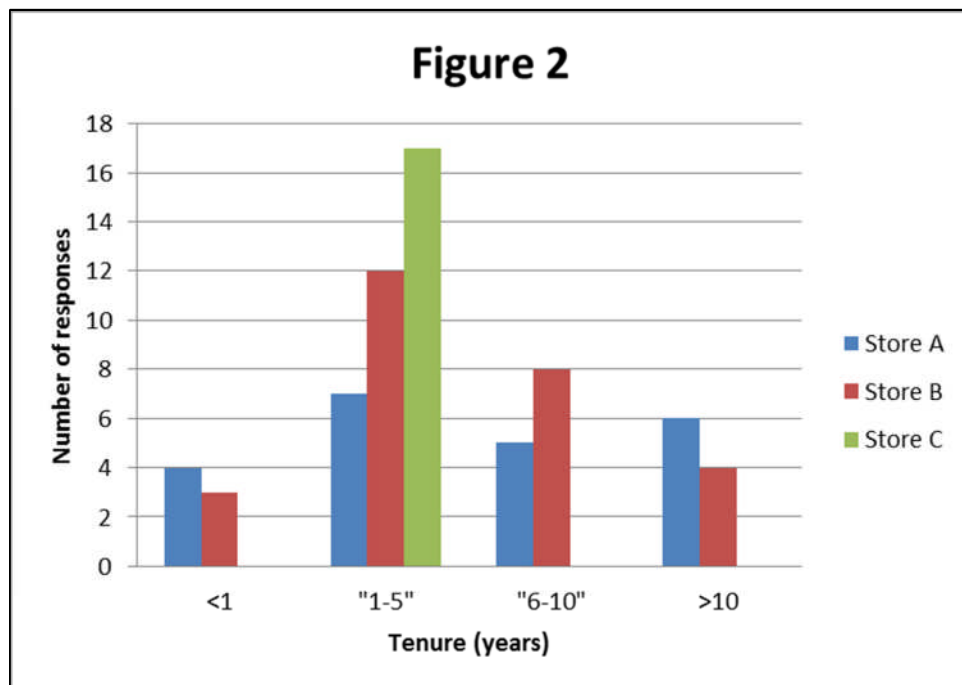
Figure 1. Number of respondents from each store in different age categories



Seventeen of 52 staff from the second store (store C) responded to the questionnaire giving a 33% response rate. The manager was clear that the partnership ethos of the store meant that staff had the right to refuse to participate in surveys, even those administered internally by the company. The low response rate ensures that a social network cannot be meaningfully produced because not enough data was given (Conway, 2014)⁴⁸. Nevertheless, the other data from Part 2 of the questionnaire have been utilized in the study. There were approximately equivalent numbers of male ($n=8$) and female ($n=9$) respondents, of whom approximately three-quarters were front-line staff ($n=12$). The remainder were team leaders. The age profile and tenure of respondents for store C are shown in Figures 1 and 2 respectively. The tenure profile reflects the recent opening of this store in the town.

Responses from the two stores from the same chain were variable (Store B). From a potential 56 respondents in one store only five completed the questionnaire, meaning a response rate of 11%. The response rate from the other store was higher. There were 34 potential respondents. Three were unavailable because of maternity leave or long-term illness. Two actively declined to complete the questionnaire asserting their rights not to do so and two failed to complete the questionnaire therefore passively declining. Twenty-seven people fully completed the questionnaire giving an overall response rate of 80% (n=34), but a response rate of 87% of those available (n=31), and a response rate of 94% for those who actively participated (n=29) and were available (n=31). Twenty eight people provided demographic information in this store. There were 16 males and 12 females. The age and tenure profiles are shown in Figures 1 and 2. There was one Manager, nine Supervisors designated variously as team leaders, warehouse controller, POS controller and 18 front-line staff described as customer advisors, stock room assistants or sales assistants. The data from Part 1 of the questionnaire were used to investigate the social networks present in this store. The data from this store were combined with the data from the five respondents from the other store to provide an overall response for store C to Part 2 of the questionnaire.

Figure 2. Length of tenure of respondents in their organization.



Data Analysis

SNA Data

Social network analysis requires an adequate specification of network boundary conditions and a sufficient response rate to accurately represent the network. In this case, the whole population of staff working in a particular store provided a bounded network that can represent the interactions that might affect safety within each of these work places. Two stores provided a sufficiently large response to create adequate adjacency matrices and then to visualize the network and permit the calculation of network metrics. These were store A where the response rate was a 100% and one of the stores from the retail chain (store B) where the response rate was approximately 90%.

The data in response to each of the six network questions from these two stores were entered into separate valued adjacency matrices so that there was one matrix per question per store. The matrix contains a series of rows corresponding to the names of each of the respondents. These are matched by columns also corresponding to the names of each respondent. A value was entered at the intersection of each row with every column to indicate the frequency of interaction (1= daily, 2 = weekly, 3 = monthly, 4 = less than monthly and 5 = never). A default of 0 represented the interaction with self. Two separate data sheets containing the demographic data of each of the respondents from the store were created.

Each of these valued adjacency matrices were dichotomized (ties either 'present' indicated by a '1' or 'absent' indicated by a '0' in the adjacency matrix) at different frequencies of interaction. This permitted the calculation of network densities and measures of individual degree centrality, closeness centrality and betweenness centrality at different interaction frequencies using the UCInet software package (Borgatti, et al., 2002)⁴⁹. In the remainder of the report we have used adjacency matrices dichotomised at daily plus weekly interactions; so a 1 would represent an interaction that occurred at daily or weekly intervals, while a 0 would indicate less frequent or no interaction. The maps were drawn using the network visualization software NetDraw 2.134 (Borgatti, 2002)⁵⁰, with data inputs from the dichotomized matrices for each question and the appropriate set of demographic data.

To investigate whether actors who are more adjacent to each other have similar perceptions of safety we created two matrices. The first contained the geodesic distances (i.e. the shortest possible pathway between two actors) between each of the actors and every other actor in the network for two questions (who they talk too generally on a daily or weekly basis? and who they talk too about safety on a daily or weekly basis?). The second contained the mean response for each individual for each of the specific safety related topics contained in Part 2 of the questionnaire.

These data sets were then correlated using the Moran/Geary statistical test. This can be found under "tools>testing hypotheses>mixed dyadic/nodal>continuous attributes" in the UCInet software. Outputs were interpreted using the Hanneman and Riddle on-line text.

Questionnaire Data

A total of 71 completed responses were available for Part 2. To ensure clear and unequivocal differences, data from the strongly agree / agree categories were combined, as were data from the strongly disagree / disagree categories, to give three possible response outcomes (agree, neither agree nor disagree, disagree). Where appropriate Chi-Square tests have been used to compare differences in counts in each category of response for specific safety related topics between the three stores (A, B and C).

Seven categories of safety information (safety consciousness, safety participation, safety compliance, safety motivation, safety knowledge, management commitment and mindfulness precepts) were common to the pilot and main study making comparisons across stores straightforward. Five

questions relating to shared working were also common, as were four questions for values and priorities. These also allowed comparisons across all three stores. Questions diverged most markedly for shared purpose with only one question in common. This is noted in the findings and the comparison between stores B and C is reported.

FINDINGS

Questionnaire Data

The data from the pilot study and the main study were combined into a single data set wherever possible to increase the volume of data in each category of questions (Figure 3). This was possible for the categories of safety consciousness, safety participation, safety compliance, safety motivation, safety knowledge, management commitment, HRO precepts and shared working. Differences between categories in the volume of data reflect the different numbers of questions that comprise each category; see questionnaire (Appendix 1) for details. Changes to the questionnaire between the pilot study and the main study limited the extent of comparable data to four questions for values and priorities with no comparison possible for shared purpose as there was only one question in common.

Figure 3. Total number of responses to between three and eight different questions in each category of safety-related questions.

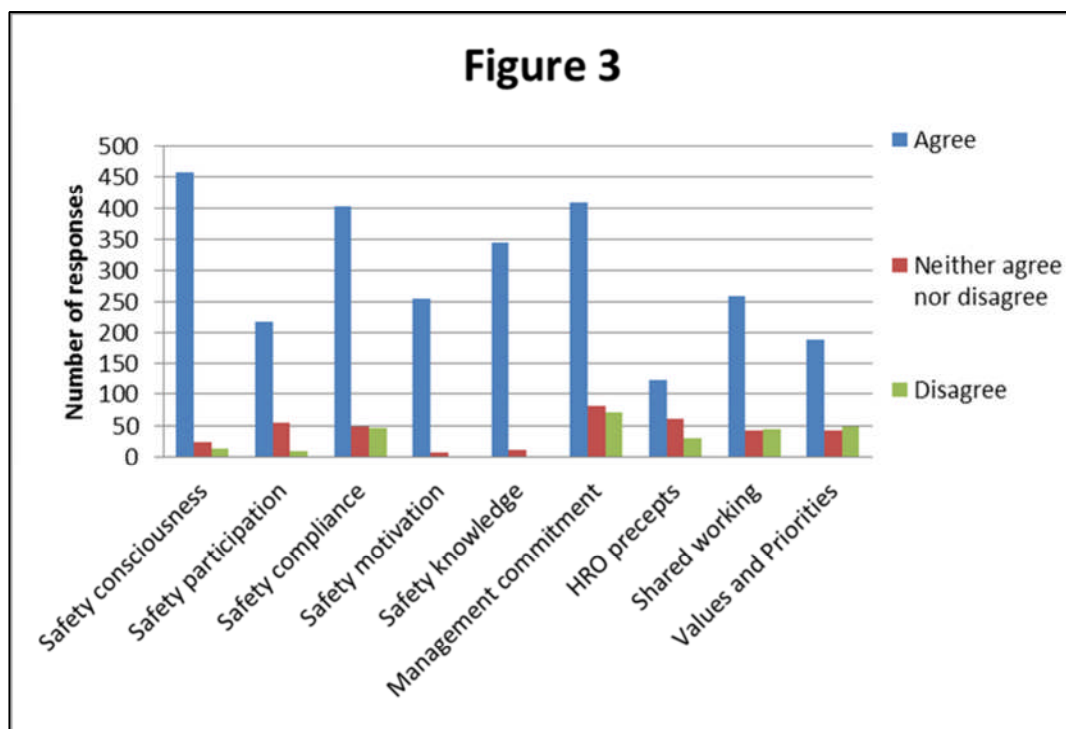
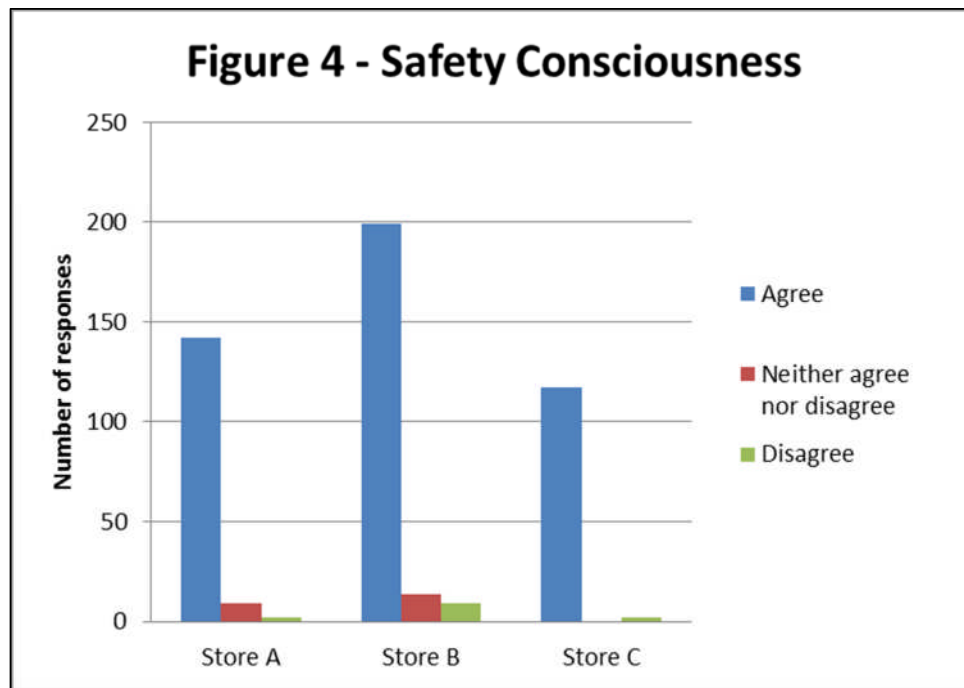


Figure 3 shows that the data is generally very positively skewed. More than 80% of respondents generally strongly agree or agree with each of the questions in every category with only 8% disagreeing or strongly disagreeing. With few exceptions therefore the modal response to each of the individual questions was strongly agree or agree. Exceptions only occurred in relation to shared working and value and priorities.

Safety Consciousness

Overall there were only 36 individual responses from 494 responses that were not positive about safety consciousness (Figure 4). For example, no-one disagreed with the statement that, “I am well aware of the safety risks involved with my job”, and only one person was unsure. Similarly, only one person disagreed with the statement, “I inform management of any potential hazards I notice on my job”.

Figure 4. Numbers of different types of responses to seven statements relating to safety consciousness from three different retail stores.

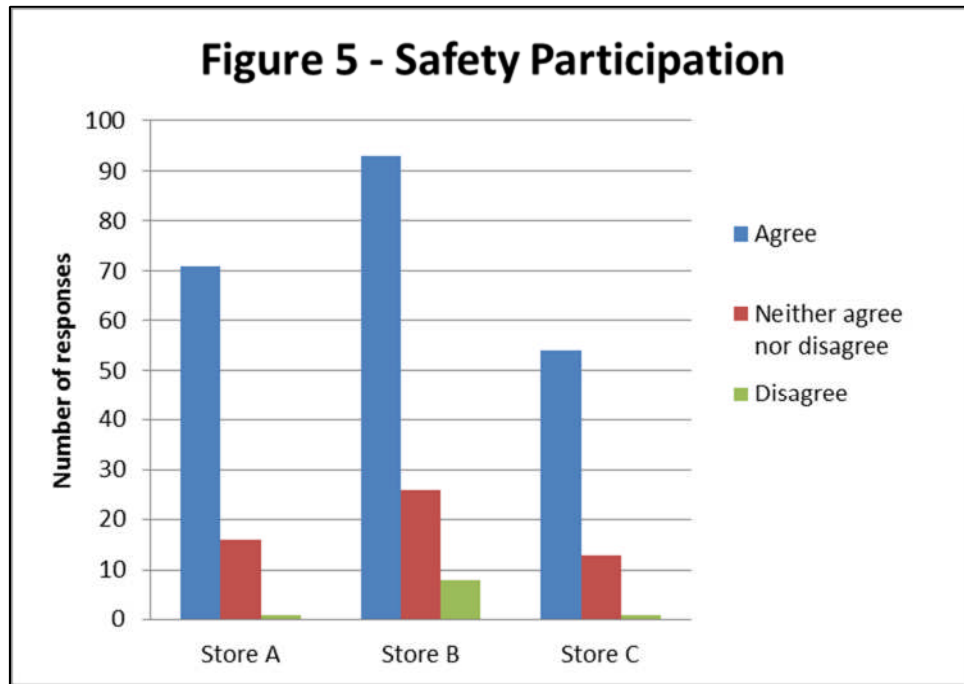


Respondents from the different stores generally answered the statements about safety consciousness in a similar way (Figure 4). In store C everyone agreed with five of the seven statements and two different individuals responded negatively to one statement each. While respondents from store A all agreed to three of the seven statements about safety consciousness, there was no such unanimity at store B where at least one person was undecided or disagreed with each statement. The greatest confusion occurred at store A in response to the statement, “I do not use equipment that I feel is unsafe”; from 22 respondents, two disagreed and four were undecided.

Safety Participation

More than three-quarters of respondents agreed with the statements concerning safety participation. While less than 5% disagreed (Figure 5). About one in five respondents were undecided about the statements relating to safety participation and in particular the statement, “I voluntarily carry out tasks or activities that help to improve workplace safety”.

Figure 5. Numbers of different types of responses to four statements relating to safety participation from three different retail stores.



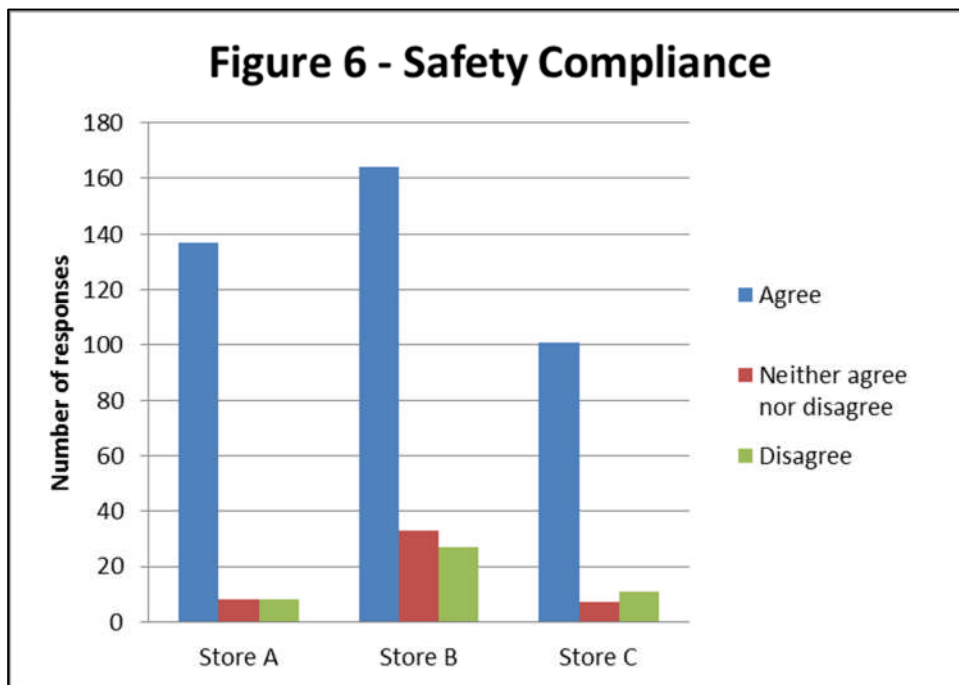
Respondents generally agreed with each of the four statements in each of the three stores. In stores A and C, no-one disagreed with three of the statements relating to safety participation and only one respondent in each store disagreed with the statement, “I voluntarily carry out tasks or activities that help to improve workplace safety”. At least one person disagreed with every statement concerning safety participation in store B (Figure 5). Proportionally, there were similar levels of uncertainty (neither agree nor disagree) about safety participation in each of the stores.

Safety Compliance

Responses to the four statements about safety compliance that did not require reverse-scoring were strongly supported. More than 90% of respondents agreed with these statements. No-one disagreed with the statements, “I carry out work in a safe manner” and “I follow correct safety rules and procedures while carrying out my job”. Only one person disagreed with the statement, “I use all necessary safety equipment to do my job”.

However, there was greater divergence of opinion with the three statements that required reverse-scoring to indicate safe working, namely, “Occasionally due to lack of time I deviate from safe and correct work procedures”, “Occasionally due to over familiarity with the job I deviate from correct and safe work procedures”, and “It is not always practical to follow all safety rules and procedures while doing a job”. At least one-third of respondents did not agree with these three statements; suggesting that deviation from safe procedures was possible.

Figure 6. Numbers of different types of responses to seven statements relating to safety compliance from three different retail stores.



A χ^2 -test shows a significant difference between the stores ($p < 0.01$; $df = 4$) in response to safety compliance. All respondents at stores A and C agreed to both of the following statements, “I carry out work in a safe manner” and “I follow correct safety rules and procedures while carrying out my job”. Only one person from store C was undecided whether “[they] use all necessary safety equipment to do my job”, and only one person from store A was undecided whether “[they] ensure the highest levels of safety when I carry out my job”. Respondents from store B, however, were slightly more undecided on these statements.

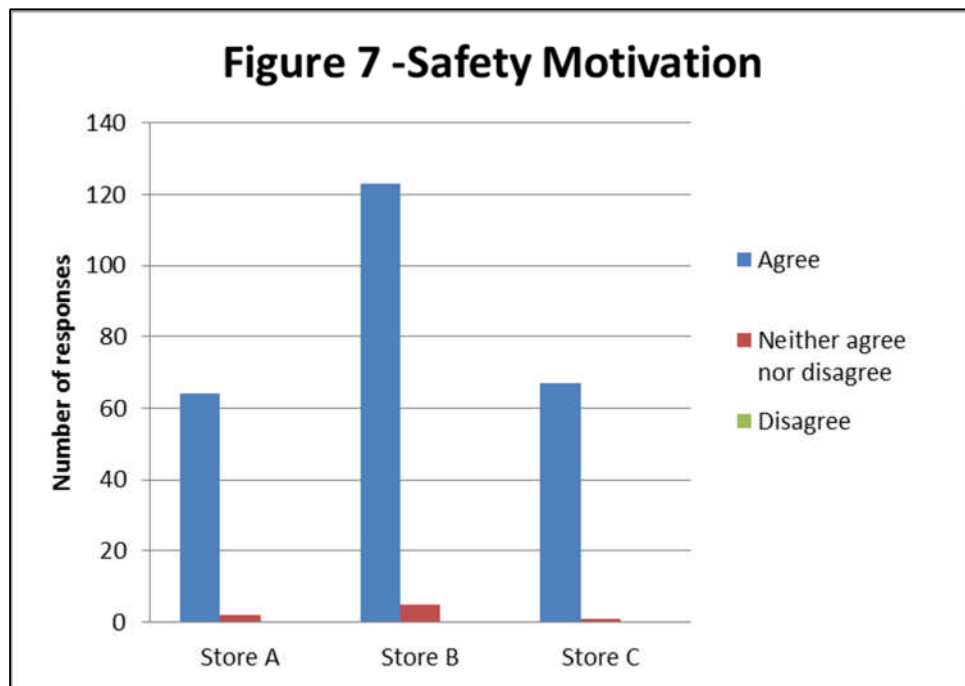
A greater difference between the stores was found with the reverse-scored statements. At least 40% of respondents from store B did not agree with any of the three reverse-scored statements, and for two of the statements 50% or more did not agree. These percentages were smaller for the other two stores, half the value in the case of store A.

Safety Motivation

Overall no-one disagreed with any of the four statements concerning safety motivation. Three or fewer respondents neither agreed nor disagreed with any one of these statements (Figure 7).

There were no discernible differences between the three stores. Everyone generally agreed with the statements that, "I feel it is important to maintain safety at all times", "I believe that safety at the workplace is a very important issue", "I feel that it is necessary to put effort in to reduce accidents and incidents at workplace", and "I feel that it is important to encourage others to use safe practices".

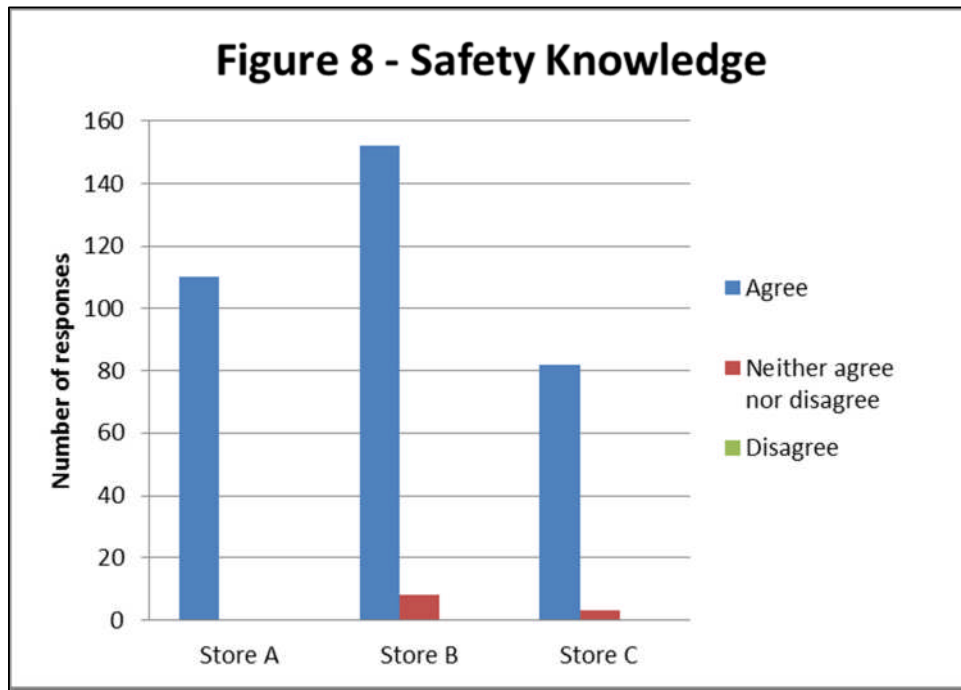
Figure 7. Numbers of different types of responses to four statements relating to safety motivation from three different retail stores.



Safety Knowledge

No-one disagreed with any of the five statements related to safety knowledge (Figure 8). Furthermore everyone agreed with the statement that, "I know how to perform my job in a safe manner".

Figure 8. Numbers of different types of responses to five statements relating to safety knowledge from three different retail stores.

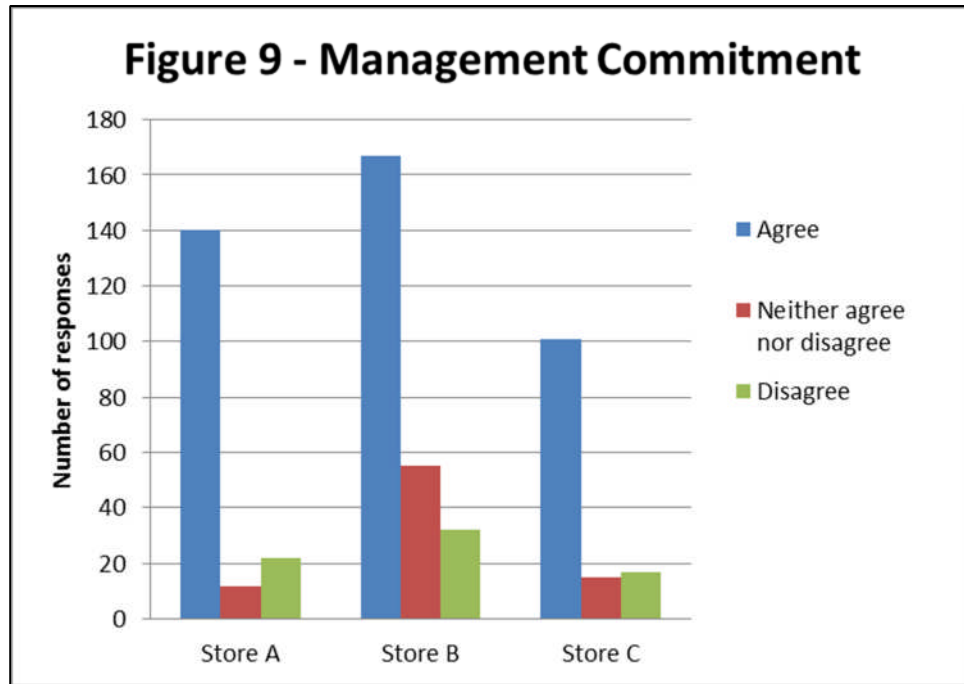


Everyone agreed with each of the five statements concerning safety knowledge at store A. Fewer than 5% of responses to any of the statements were uncertain in stores B and C.

Management Commitment

A small number of individuals (ranging from 1 to 8) disagreed with every one of the seven statements relating to management commitment. A further substantial minority ranging from 7-15 people were undecided concerning the statements about management commitment. But a majority of at least 50 respondents agreed with each statement. In contrast to the agreement to these seven statements, a majority of respondents (n=44) from across the three stores disagreed with the statement, “I feel that management is willing to compromise on safety for increasing production”, and further 14 neither agreed nor disagreed.

Figure 9. Numbers of different types of responses to eight statements relating to management commitment from three different retail stores.

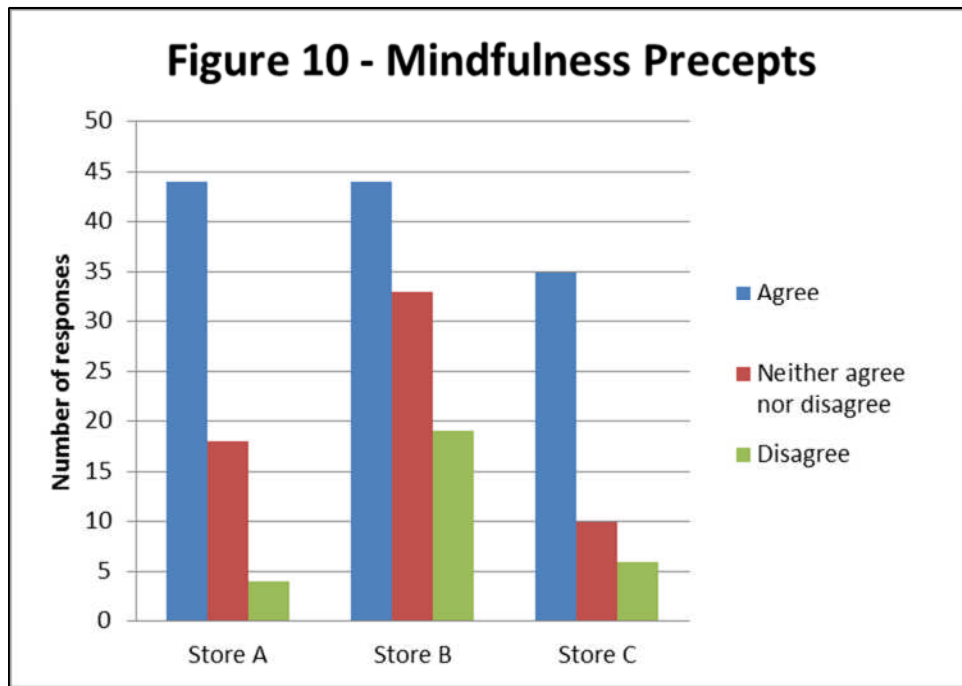


A χ^2 -test shows a significant ($p < 0.01$; $df = 4$) difference in responses from the three stores (Figure 9). In stores A and C no-one disagreed with four of the statements relating to management commitment, namely, “safety is given high priority by management”, “safety rules and procedures are strictly followed by management”, “corrective action is always taken when the management is told about unsafe practices”, and “when near miss accidents are reported my management acts quickly to solve the problems”. In store A no-one was undecided about these statements either. At least one respondent from store B disagreed with these statements and at least four more were undecided, so that overall, more than one-third of the responses to the statements about managerial commitment were negative or ambivalent. At least half of the respondents (n=16) from store B disagreed with the contentious statement noted above. This disagreement response rose to more than three-quarters (n=17) from store A.

Mindfulness Precepts

A majority of the respondents agreed with the three statements relating to mindfulness. However, more than 10% of the responses disagreed with these statements and a further approximately 30% were undecided. Least support was given to the statement, “we spend time as a team identifying activities that we do not want to go wrong”.

Figure 10. Numbers of different types of responses to three statements relating to mindfulness-precepts from three different retail stores.



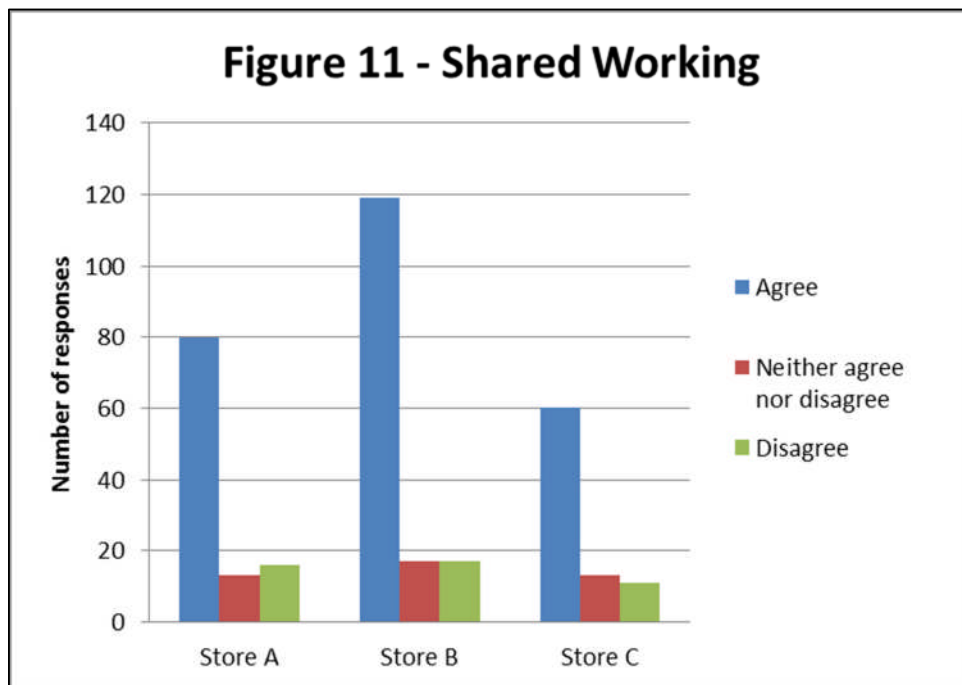
The responses to these statements about mindfulness differed significantly ($\chi^2=12.5$; $P<0.05$; $df=4$) between the three stores (Figure 10). There was more disagreement with these statements in store B than in either store A or store C. Respondents were also more ambivalent about these statements in store B than in store A. There appeared to be the least uncertainty in store C. The respondents in store A were the most likely to agree with the statements, “we talk about mistakes and ways to learn from them” and “when attempting to resolve a problem we take advantage of the unique skills of our colleagues”.

Shared Working

Most respondents agreed with the three of the five statements concerning shared working. Only four respondents did not agree with the statement, “my manager is responsible for delivering organizational safety performance goals”, and one of those who strongly disagreed was a store manager! Only one respondent disagreed with the statement, “I am able to complete my tasks safely without the help of others”, suggesting that in these stores people work as individuals and that they believe someone else is responsible for safety. Nevertheless many agreed with the statement, “we need to work together to achieve a safe working environment”

However, there was much less consensus over two other statements concerning shared working. Only half of the respondents agreed that, “my colleagues will always help others to work safely”, with over one-third disagreeing with this statement. About four out of ten respondents did not agree that, “we need the help of safety specialists to work safely”.

Figure 11. Numbers of different types of responses to five statements relating to shared working from three different retail stores.



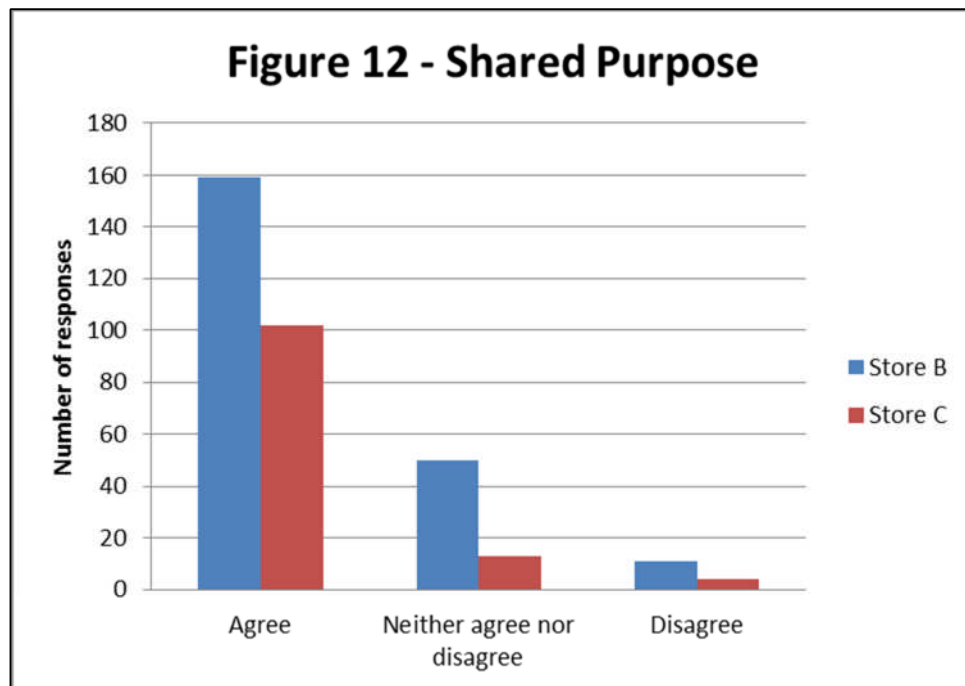
Overall there was no significant difference between stores in the response of individuals to these statements about shared working (Figure 11). Nevertheless, there was a very different response from individuals in store A compared to the response of individuals in stores B and C to the statements, “my colleagues will always help others to work safely” and “we need the help of safety specialists to work safely”. A majority of respondents in stores B and C disagreed with the first statement, but agreed with the latter statement. The opposite was the case for respondents in store A.

Shared Purpose

Only one of the eight questions in the main study was consistent with questions in the pilot. This related to being able to remind others to work safely. 67 of the 71 respondents agreed with this statement.

Considering responses to the main questionnaire from stores B and C (Figure 12), everyone in store C agreed with the statements, “working safely is important to my colleagues” and “everyone has a responsibility to work safely”. In general, there was much more uncertainty in the responses from store B, including the responses to these questions. Nevertheless, more respondents at both stores could not agree with the statements, “My workmates try to improve safety in our work area” and “My workmates always follow the correct procedures to complete a task”.

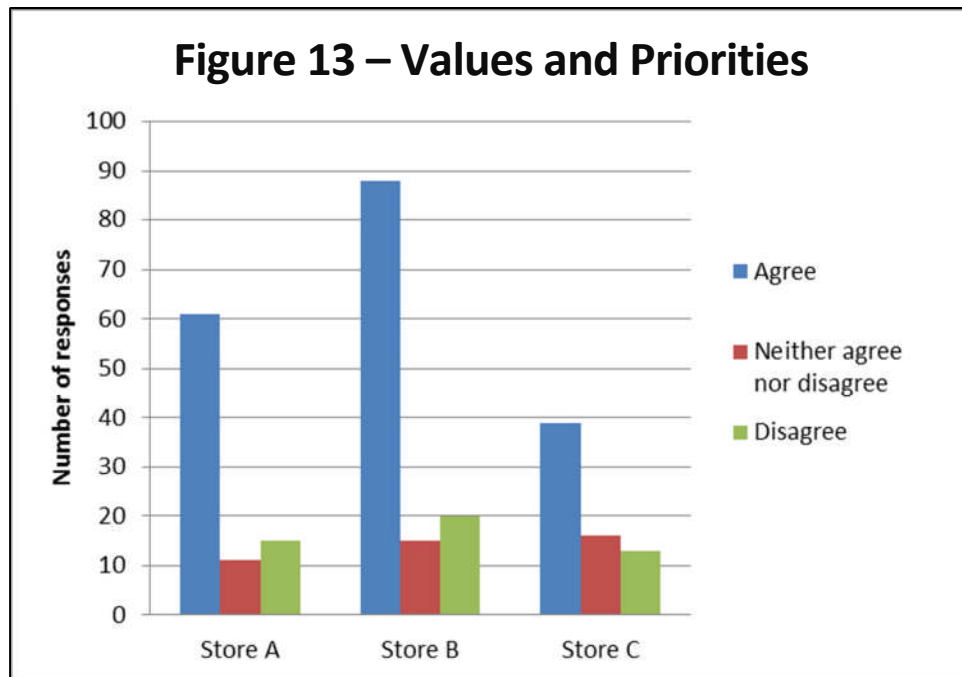
Figure 12. Number of different types



Values and Priorities

Four of the eight statements to identify individual values and priorities used in the main study were also used in the pilot study. Generally, respondents agreed with these four statements (Figure 13), but nevertheless, there was some variability. More than 60 respondents agreed with the statements, “I feel there is a good safety culture in our organization” and “I can stop a job if I feel unsafe”. Less than 30% of respondents agreed to the statement, “I work safely because I am told too”, and more than 40% disagreed. Approximately two-thirds of respondents agreed that, “safety is nothing more than common sense”, the remainder were equally divided into those who disagreed or were undecided.

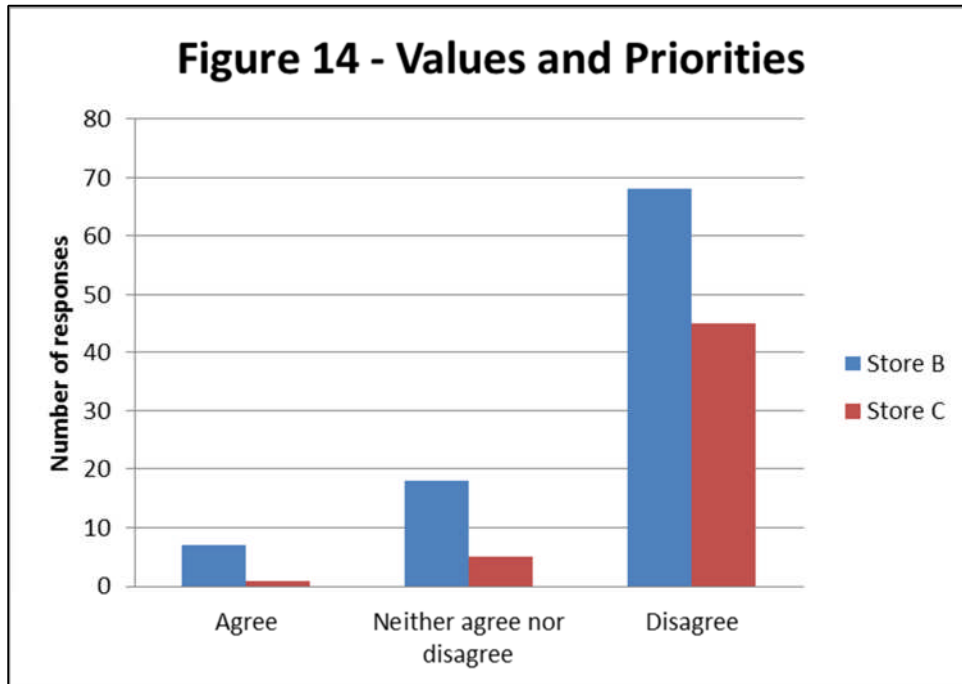
Figure 13. Numbers of different types of responses to four statements relating to values and priorities from three different retail stores.



Responses from the individuals from the different stores were broadly similar. Everyone in store A agreed with the statements, “I feel there is a good safety culture in our organization”, and that “I can stop a job if I feel unsafe”. While most respondents ($n=24$ from 30) in store B agreed that, “safety is nothing more than common sense”, respondents in store C were much less clear on this statement, with similar numbers of respondents agreeing ($n=7$), disagreeing ($n=4$) or undecided ($n=6$).

Of the other four statements to identify values and priorities answered by respondents from two stores only (stores B and C), three-quarters agreed that, “other employees in my department feel comfortable to remark about safety to each other”. Conversely, a similar proportion at least disagreed with the statements, “I bend the safety rules to achieve a target”, “I break the safety rules due to management pressure” and “I am under pressure from workmates to break safety rules”. There appeared to be greater conviction about this in store C than in store B (Figure 14).

Figure 14. Numbers of different types of responses to three statements relating to values and priorities from two different retail stores.



SNA Data

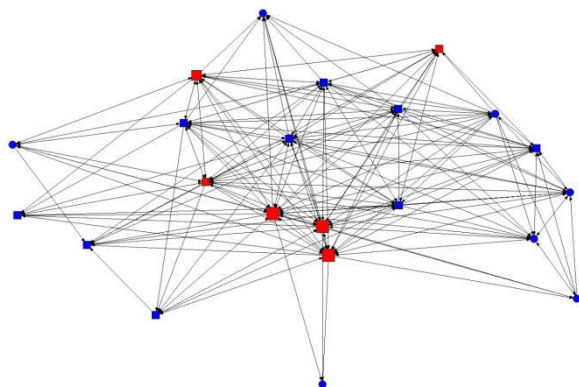
Network Visualizations

Figure 15 shows that individual employees in store A connected more frequently (daily or weekly) and with a greater range of people when talking more generally than when talking about safety. Inspecting the figures shows that in general the full-time staff (in red) were more likely ($p < 0.05$) to be found in the middle of the network (i.e. have higher centrality measures) than those who worked part-time (in blue). The managers were more likely ($p < 0.05$) to be clustered together and found in the centre of the network, irrespective of the content of the network. Those who worked restricted hours were more likely ($p < 0.05$) to be found on the periphery of the network. In the case of safety conversation (Figure 15B), one of the staff was disconnected from the remainder of the network, but evidently connected to others through general conversation (Figure 15A), where there were no observed isolates. Measures of betweenness centrality show that managers and full-time employees were more likely ($p < 0.05$) to connect others in the network than front-line employees or those working for a restricted number of hours.

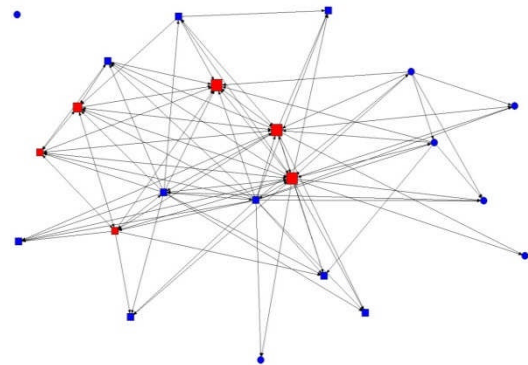
Figure 15. Visualizations of four network maps

of employees in store A indicating (a) who talked to whom generally; (b) who talked to whom specifically about safety; (c) who approached others for safety advice and (d) who sought social support from others. Red symbols indicate full-time workers. Circles represent those who worked on restricted days. Large size symbols represent managers.

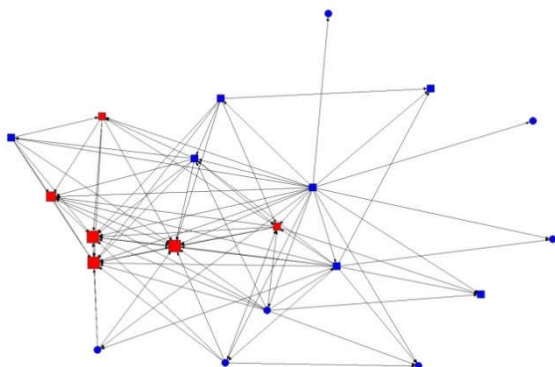
A – General conversation



B – Safety conversation



C – Safety advice



D – Social Support

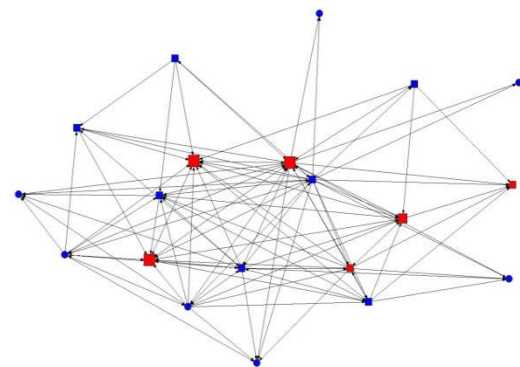
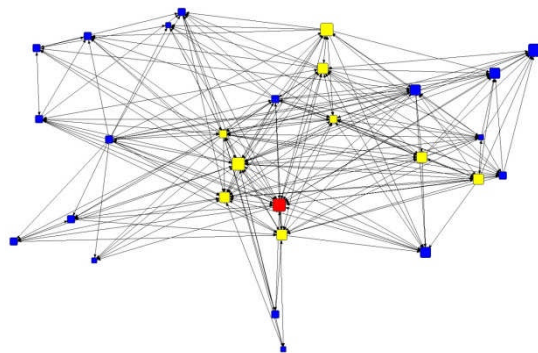


Figure 16 shows that in store B general conversations occurred more frequently (at least weekly) and with more people than other types of conversation. Figures 16B, C and D all contained a number of isolates who were disconnected from the network but were connected by general conversation. These isolates were front-line staff, many of whom were new to the organization. Typically the manager and team leaders were clustered ($p < 0.05$) in the middle of each of the networks. Those who had worked in the organization for a longer period of time were generally found in the middle of the network and situated on the paths between others ($p < 0.05$).

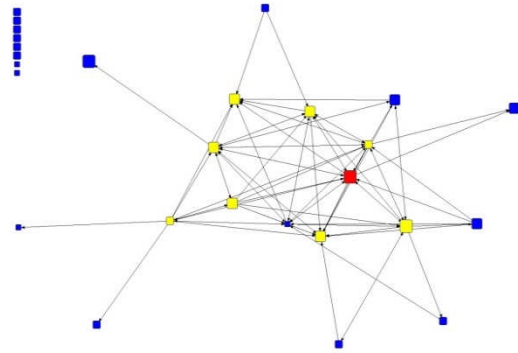
Figure 16. Visualizations of four network maps

of employees in store B indicating (a) who talked to whom generally; (b) who talked to whom specifically about safety; (c) who approached others for safety advice; and (d) who sought social support from others. A red symbol indicates a manager, yellow symbols represent team leaders, blue indicates other front-line staff. Larger symbols indicate longer tenure.

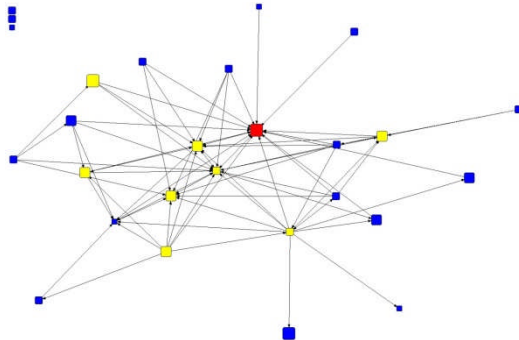
A – General conversation



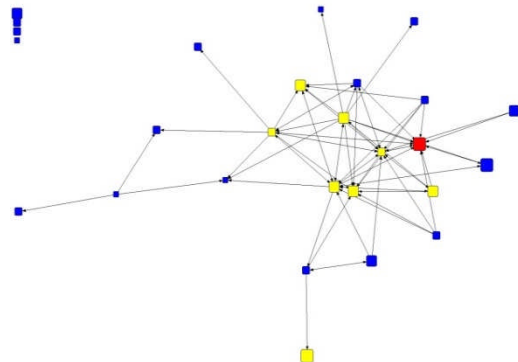
B – Safety conversation



C – Safety advice



D – Social Support



Measures of Centrality

Confirming the visualizations of the three different centrality measures for general conversations were generally different to the centrality measures for other conversations which were more similar (Table 2). For example, mean out-degree centrality was at least twice as large for general conversations compared with mean out-degree centrality for other conversation types which were similar (Table 2). This reflects the denser networks for general conversations compared to that for other conversation types.

The three measures of centrality differed between the two stores, again reflecting the differences in network density.

Out-degree centrality measures the influence one actor has in a network relative to another based on the number of other actors each is connected to. The one with more ties (i.e. connections and higher out-degree) is more influential. In both stores an individual has general conversations with approximately 10 other people, on average, and with 4-6 people for safety and support in store A but only 3 people, on average, in store B (Table 2). Given that there are more actors in store B than in store A, the density of the network for each conversation in store B is lower.

Closeness centrality indicates the positional relationship between actors in a network taking account of the indirect ties (how many geodesic steps does it take for actor A to reach actor B?). The more direct ties an actor has in the network and the fewer indirect ties beyond the direct ties, the smaller will be their “farness” from every other actor and the greater will be the actor’s closeness centrality. OutCloseness is calculated as the reciprocal of farness (1 divided by the sum of the number of steps actor A needs to take to separately reach every other network member), normalized relative to the greatest nearness (smallest farness) observed in the graph. Outcloseness measures depend on a fully connected network. In this case, only regular and frequent general conversations were fully connected. The outcloseness measures for general conversations in the two stores were similar (Table 2).

Betweenness centrality indicates the proportion of times an actor lies on a geodesic path between two other actors. Evidently, actors who do not connect others have a betweenness centrality of zero. For all conversations in both stores standard deviations for betweenness centrality are larger than their corresponding means, suggesting that there is quite a large variation in betweenness centrality amongst actors. In all of the networks there were always individuals who had scores of zero (sometimes, for example, in the case of safety advice, more than three-quarters of the respondents), while others were having quite large numbers. In many cases the senior figures (managers and team leaders) and full-time staff have larger betweenness centrality scores. Nevertheless, the small network size means that in many cases the connections are direct and not via an intermediary; actor A can connect directly with actor B without needing to go via actor C. nBetweenness centrality measures normalize the betweenness centrality expressing it as a percentage of the maximum possible “betweenness” that an actor could have had. In a small network where most actors are directly connected this number typically will be small (as shown in Table 2). nBetweenness scores were similar and small for all conversations in both stores.

Table 2. Mean and standard deviations of out-degree centrality, closeness centrality and betweenness centrality for four conversation types occurring at least weekly in two stores.

Store	Measure	Conversation type			
		General	Safety	Safety Advice	Social Support
Store A	Out-Degree (mean)	10.46	4.86	4.25	5.95
	Out-Degree (SD)	7.26	6.17	4.80	6.004
	outCloseness (mean)	63.38	23.62	12.28	49.50
	outCloseness (SD)	28.43	17.90	20.46	29.77
	Betweenness (Mean)	8.46	6.68	1.45	9.50
	Betweenness (SD)	12.03	18.05	3.49	24.09
	nBetweenness (Mean)	2.01	1.59	0.42	2.78
	nBetweenness (SD)	2.87	4.30	1.02	7.04
Store B	Out-Degree (mean)	9.9	2.96	2.89	2.59
	Out-Degree (SD)	8.00	3.64	2.66	3.28
	outCloseness (mean)	61.14	6.69	5.52	6.5
	outCloseness (SD)	18.71	2.88	1.08	2.92
	Betweenness (Mean)	17.3	8.67	5.22	9.04
	Betweenness (SD)	35.96	14.87	10.84	21.92
	nBetweenness (Mean)	2.46	1.33	0.80	1.39
	nBetweenness (SD)	5.12	2.29	1.67	3.37

Network Density

In all cases network density decreased as the frequency of interaction increased (compare columns 4 and 6 in Tables 3 and 4). A denser network of ties was reported when very irregular interactions were included in the calculation than when only regular (at least weekly) interactions were included. A significantly ($p < 0.01$) greater density of ties was reported for general conversations than for safety related conversations, although the density of this latter network was similar and not significantly different to those for safety advice and social support. The densities of networks in store A were greater than those comparable networks in store B (see Tables 3 and 4).

Table 3. Number of ties and density of networks for four different conversation types between respondents at store A.

Content of conversation	Number of respondents	Maximum number of possible ties	Number of actual ties	Proportion of actual ties - density	Number of frequent ties (at least weekly)	Proportion of frequent ties - density
General conversation	22	462	373	0.81	230	0.50
Safety conversation	22	462	253	0.55	107	0.23
Safety Advice	20	420	236	0.56	98	0.23
Social Support	20	420	277	0.66	134	0.32

Table 4. Number of ties and density of networks for four different conversation types between respondents at store B.

Content of conversation	Number of respondents	Maximum number of possible ties	Number of actual ties	Proportion of actual ties - density	Number of frequent ties (at least weekly)	Proportion of frequent ties - density
General conversation	28	756	409	0.54	276	0.37
Safety conversation	27	702	180	0.26	80	0.11
Safety Advice	27	702	204	0.29	78	0.11
Social Support	27	702	156	0.22	70	0.10

Correlations Network Distances and Safety Perceptions

Correlations between geodesic distance in the conversation networks and the perceptions of safety were inconsistent between stores and between conversation types (Table 5). Safety compliance and shared purpose were not significantly correlated with geodesic distance. Also, there were no significant correlations between perceptions of safety and distance between actors in safety conversations in store A (Table 5). Most significant correlations were greater than one, indicating a negative association. As distance increased (i.e. the number of steps in the path between actors increased) so the perception values decreased (i.e. greater agreement). In store B, both safety consciousness and safety participation increased as distance between individuals in the safety conversations increased. Also in store B, perceptions of safety motivation, safety knowledge and shared working improved as distance increased. In store A as geodesic distance increased for general conversations so the agreement with mindfulness precepts increased and conversely, the perception of management commitment worsened (because there was a positive association between these two items).

Table 5. Correlations between geodesic distance for both general and safety conversations and perceptions of safety in two retail stores using the Geary routine.

	Store A		Store B	
	General	Safety	General	Safety
Safety consciousness	0.955	1.024	1.067	1.231**
Safety participation	0.992	1.068	1.057	1.171*
Safety compliance	0.941	0.962	0.999	1.027
Safety motivation	0.931	0.824	1.307*	1.135
Safety knowledge			1.109*	1.092
Mindfulness precepts	1.275*	1.126	1.008	1.001
Management commitment	0.857*	0.949	1.016	1.057
Shared working	0.918	0.954	1.019**	0.97
Shared purpose			1.001	1.037

Significance levels: * $p < 0.05$; ** $p < 0.01$. Otherwise non-significant

Discussion

Two mechanisms of influence are evident in this study. The first mechanism positions opinion leaders and those with influence in close connection with many others in three ways. First, individuals have direct contact with as many people as possible. Second, individuals have close connections either directly or indirectly through connections to others who are well connected, and thirdly, individuals are situated between others so that they can control the information flows and broker relationships between individuals (Burt, 1992)⁴. The data in the two networks examined position members of the leadership team in the centre of the different conversational, advice and support networks investigated in this study. From these positions they are able to exert their influence by any of the three approaches outlined above. However, from the data available it is difficult to discern which, if any, of these mechanisms might be active in allowing them to influence their staff. Positions of centrality give power, but they can also be positions in which actions are constrained because of the connectivity to many others. The size of the networks in this study are small ($n < 30$) and so the largest number of connections for individuals at the centre is unlikely to be overbearing and unwieldy. Moreover, those at the centre of the networks are generally more senior with greater authority and possibly more discretion in their activities, which will reduce the experience of constraint.

The second mechanism is built on a closed network with many connections between participants. This permits the development of strong social norms and the opportunity for self-monitoring (Coleman 1988⁵¹, 1990⁵²; Portes, 1998³). Both networks are relatively dense, especially for general conversations which occur at least weekly between many of the actors. Those who work full-time and have been employed for longer in the organization were found in the middle of the network. These people are more likely to have embraced the organizational norms and can build a particular set of norms around themselves influencing those more junior staff and part-time workers who are on the periphery of the network.

For many of the respondents, safety was an important value with many agreeing or strongly agreeing with each of the 40+ statements in the questionnaire. Most felt that there was a good safety culture in their organization and that if they had a safety concern they could stop work and/or talk about it with others. They were not under pressure to break safety rules because of targets and management pressure. This was somewhat surprising not only because of a productivity incentive scheme operating in the store of one retail chain, but also because of the frequently expressed view that safety considerations are secondary to performance in many organizations (Goh et al., 2012⁵³).

In general the participants were safety compliant. Most respondents were aware of the safety requirements of their jobs, not only the possible risks but also how to work safely (including the use of specialist equipment). All were motivated to work safely and for others to work safely. To this end, most agreed with statements related to safety participation, except that some were undecided about whether "[they] voluntarily carry out tasks or activities that help to improve workplace safety".

The majority of respondents agreed that management were committed to safety, prioritising safety, taking corrective actions, adhering to safety rules and procedures. Moreover, almost everyone believed that the manager was responsible for delivering organizational safety performance goals. Leadership on safety was seen clearly to reside in a single individual rather than safety being a shared responsibility for all employees. This was reinforced by the observation that everyone worked as individuals in these stores. While this may be a function of the required roles of every employee in a retail environment, it militates against shared or distributed leadership for safety (Denis et al., 2012⁵⁴; Fitzsimmons et al., 2011⁵⁵). A lack of common purpose and shared working was indicated by the lack of agreement with statements relating to mindfulness, which require interactions with others, for example, deferring to others with expertise (Weick and Sutcliffe, 2006)²⁶.

This study sought to unravel the connection between the network position of safety leaders and safety awareness and safety behaviours of others. Specifically, it asked whether the behaviours and

perceptions of others who were safety leaders, defined as those who others turned to for advice and support, were central or peripheral in the network and whether those to whom they were connected shared the same behaviours and perceptions as they did.

Surprisingly the data on safety perceptions and safety behaviours were uniformly positive. Everyone, regardless of position generally espoused the same perceptions and behaviours about safety. In both stores, managers and team leaders were found in the middle of the networks, so it is possible that they collectively influenced the other members of staff in their network to achieve a consensus view. Potentially there is an alternative explanation. The tendency for uniformity of views was stronger in the denser network of store A than in the slightly less dense network in store B. In the case of store A there may be a stronger social norm around safety than in store B. Of course there were a number of dissenters on some questions in both stores, but there were more in the less dense network of store B. The effects of these views that diverged from the norm were not observed in safety performance data, which were uniformly high (i.e. no reported accidents or near-misses). From these data there is not an unequivocal connection between network density and safety behaviours, and so safety performance, but the suggestion is that as density decreases differences in perception and behaviours increase, and so safety performance decreases. The protection in a denser network is a result of a 'herd immunity' effect. The more people that have positive safety perceptions and behaviours, the less likely it is that those who do not hold such values can connect with similar others and create pockets of dissent and unsafe practices. This is the reverse of the 'structural holes' argument which prizes the connectivity to alternative views and information as a source of innovation. In this case, where conformity and adherence to a standard is required, alternative views and practices are seen as deviance and so spanning 'structural holes' to access different/novel information is detrimental to consensus building. This possibility is greater in networks that are open and less dense.

Limitations

There are two obvious limitations to this study. The first is the small population size of each network. Attempts to secure network data from two larger stores failed. The response rates from them were small, less than 33%. As a consequence it is unclear how larger social networks might affect safety behaviours, especially where they may be structurally or organizationally fragmented. Nevertheless, these results may have some applicability in smaller SMEs employing fewer than 30 people.

The second weakness is the cross-sectional nature of the study. To discover whether it is easier to influence others from the centre of a network or from the periphery, it would be necessary to 'seed' a network from different positions and observe the transmission and change (or not) of perceptions and values as the influence spreads. Such a longitudinal experimental study was beyond the scope of this project.

A focus group discussion with senior leaders in the field of safety in retail suggested that there were several limitations with the survey design, most noticeably in relation to the language. While the survey instruments were taken from existing scales it was felt that respondents may not actually understand what was being asked of them and that the language was unnecessarily sophisticated. Although not apparent to the researchers, there may have also been organizational issues (e.g. impending changes in the management of the store) or timing issues (e.g. proximity to periods of holiday or peak demand) which might have stimulated a particular response bias. The focus group also noted that people might have a positive bias towards safety and therefore respond in ways that they feel they should, rather than as they experience it on a day-to-day basis.

Further Research

A number of avenues for further research present themselves. Repeating the study in a context where there is a greater difference of opinion and fewer ties (a less dense network) would provide greater insight into the mechanisms by which opinions of safety and safety behaviours are influenced. These might be found in other service settings, such as hotels and warehouses, where (in our experience) there is a greater diversity of nationalities making differences of opinion more likely; where language barriers may make communications strained and therefore influence more difficult. Effective socialization of individuals into an organization, so that they espouse particular values and behave in particular ways is a vital component in assuring safety. Investigating this socialization process beyond the structural relationships warrants further investigation.

Practical Recommendations

There are a number of recommendations that would pertain to contexts in which there were small groups of individuals working together. These are as follows:

1. Safety leaders should occupy more central positions in a social network;
2. A greater number of ties in the network promote more positive views of safety through established social norms. These ties need not necessarily relate to safety specific conversations;
3. Safety leaders need to actively socialize new recruits into the organizational network;
4. If shared working is feasible and organizationally desirable, then more effort is needed to develop a shared understanding of an agreed and common purpose (in this case safe working).

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Appendix 1

The questionnaire (incorporating the Survey Respondent Information Sheet) submitted to participants at the three stores following the pilot study in store A.

Networks of influence: Practising safety leadership in low hazard environments

What is safety leadership? What do “safety leaders” do? Can you help us to understand the processes and practices that contribute to safe working in your organisation? This will lead to new approaches to safety leadership, and also to new practices, tools, diagnostics and frameworks which will help you and others to work safely.

Survey Respondent Information Sheet

We would like to explore **your** experience of Health and Safety in the work place. This will improve our understanding of the processes and practices involved in delivering safe working environments, and develop guidelines for improved practice which will in turn contribute to better safety leadership and safer working environments. The survey questionnaire has been designed to be easy to complete, and should take you no more than 10 minutes to complete.

1. What is the purpose of this study?

The aim of this project is to improve our understanding of the practices and processes that contribute to the delivery of safe working environments in service sector organisations. We know very little about this and yet minor incidents (e.g. slips, trips and falls) are not uncommon. We will explore your values concerning safety, how working with others might influence them and how these combine to create a safe working environment.

2. Who else is involved in this study?

Organizations collaborating in this work include four major retailers, one insurance company, and a conference centre. Dr Colin Pilbeam met with the Group Safety Manager at each organisation before data collection began, to answer questions, to seek approval and to make appropriate logistical arrangements. We have an advisory group including lawyers, inspectors, H&S consultants and academics, to ensure that our work is up to date with current trends and developments, and to help with clarifying the practical implications and dissemination of findings. We will ask people within each of the participating organizations to complete the questionnaire.

3. What will be involved if I decide to take part?

We will ask you to complete a survey questionnaire, which will take less than 10 minutes to complete. Questions will be about your connections to others in the work place, your beliefs and values around different aspects of safety and safe working in your organization. We will ask you to place your completed questionnaire in an unmarked envelope, which will then be returned directly to, or personally collected by, a member of the research team, so that your responses remain anonymous to others in the organization.

4. Will the information obtained in the study be confidential?

We guarantee that your participation in this study, and any information that you provide, will be treated confidentially. We will abide by all relevant sections of the Data Protection Act 1998, and guarantee conformity with its principles. Survey responses will be coded anonymously and stored on secure digital media. All original data (computer files, hard copy) will be destroyed five years after the end of the study. Information gathered will be used only for the purposes of this study and the dissemination of results. Information from different sources will be aggregated for the presentation of findings in reports and academic publications: individuals, and organizations will not be identifiable. If, for illustrative purposes, diagrams of connections are used, individual and organizational identity cues will be removed. If you would like a copy of the final report of this study, this will be provided on

request. The research team members are covered by professional indemnity insurance which provides remedies for breach of confidentiality.

5. If I have concerns about this study, or if I change my mind about taking part?

If you have any concerns either during or after the study, please contact Dr Colin Pilbeam. Your decision to take part in this study, or not, will be confidential. If you choose to be involved and then withdraw, your decision will be respected without question, and will be treated as confidential.

6. What if I would like further information about this study?

If you would like to discuss this study in more detail, please contact one of the research team members who will be happy to answer questions. They can be reached through the Cranfield switchboard: 01234 751122.

Dr Colin Pilbeam
Dr Noeleen Doherty

Dr Ross Davidson
Prof David Denyer

7. What if I have any other concerns?

If you have any other concerns or questions about this study, at any stage, please contact the Dr Colin Pilbeam, or the Group Safety Manager of your organization..

Email: Colin.Pilbeam@Cranfield.ac.uk

This project is funded by the Institution of Occupational Safety and Health

Individual Demographics

Name:.....

Gender:

Nationality:

Age:.....

Organization:

Length of time in the organization:

Role in the organization:.....

Length of time in role:.....

Individual connections:**1. Who do you talk to at work about general work related issues ?**

(Please tick the most appropriate box beside each person to indicate normal frequency)

	Daily	Weekly	Monthly	Less than monthly	Never
Person 1					
Person 2					
Etc.					

2. Who talks to you at work about general work related issues?

(Please tick the most appropriate box beside each person to indicate normal frequency)

	Daily	Weekly	Monthly	Less than monthly	Never
Person 1					
Person 2					
Etc.					

3. Who do you talk to at work about safety-related issues ?

(Please tick the most appropriate box beside each person to indicate normal frequency)

	Daily	Weekly	Monthly	Less than monthly	Never
Person 1					
Person 2					
Etc.					

4. Who talks to you at work about safety related issues?

(Please tick the most appropriate box beside each person to indicate normal frequency)

	Daily	Weekly	Monthly	Less than monthly	Never
Person 1					
Person 2					
Etc.					

5. Who would you turn to at work for **advice about safety issues**?

(Please tick the most appropriate box beside each person to indicate normal frequency)

	Daily	Weekly	Monthly	Less than monthly	Never
Person 1					
Person 2					
Etc.					

6. Who would you turn to at work for **social/emotional support**? (e.g. if something had gone wrong at work, if you wanted to celebrate an award)

(Please tick the most appropriate box beside each person to indicate normal frequency)

	Daily	Weekly	Monthly	Less than monthly	Never
Person 1					
Person 2					
Etc.					

Individual perceptions:

(Please tick the box that shows your level of agreement with each of the following statements)

	Strongly Agree	Agree	Neither Agree nor disagree	Disagree	Strongly Disagree
I always wear the protective equipment or clothing required by my job					
I am well aware of the safety risks involved in my job					
I know where the fire extinguishers are located in my workplace					
I do not use equipment that I feel is unsafe					
I inform management of any potential hazards I notice on the job					
I know what procedures to follow if injured on my shift					
I would know what to do if an emergency occurred on my shift (e.g. a fire)					
I always point out to management if any safety related matters are noticed in my company					
I put in extra effort to improve the safety of the workplace					
I voluntarily carry out tasks or activities that help to improve workplace safety					
I encourage my co-workers to work safely					
I use all necessary safety equipment to do my job					
I carry out my work in a safe manner					
I follow correct safety rules and procedures while carrying out my job					
I ensure the highest levels of safety when I carry out my job					
Occasionally due to lack of time I deviate from safe and correct work procedures					
Occasionally due to over familiarity with the job, I deviate from correct and safe work procedures					
It is not always practical to follow all safety rules and procedures while doing a job					
I feel it is important to maintain safety at all times					
I believe that safety at the workplace is a very important issue					
I feel that it is necessary to put effort in to reduce accidents and incidents at workplace					

	Strongly Agree	Agree	Neither Agree nor disagree	Disagree	Strongly Disagree
I feel that it is important to encourage others to use safe practices					
I know how to perform my job in a safe manner					
I know how to use safety equipment and standard work procedures					
I know how to maintain or improve workplace health and safety					
I know how to reduce the risk of accidents and incidents in the workplace					
I know what are the hazards associated with my jobs and the necessary precautions to be taken while doing my job					
Safety is given high priority by management					
Safety rules and procedures are strictly followed by management					
Corrective action is always taken when the management is told about unsafe practices					
In my workplace managers/supervisors do not show interest in the safety of workers					
Management considers safety to be equally important as production					
I feel that management is willing to compromise on safety for increasing production					
When near miss accidents are reported my management acts quickly to solve the problems					
My company provides sufficient PPE for the workers.					
We spend time as a team identifying activities that we do not want to go wrong					
We talk about mistakes and ways to learn from them					
When attempting to resolve a problem we take advantage of the unique skills of our colleagues					
Working safely is important to my colleagues					
If we see someone working in an unsafe manner, we will remind them to work safely					
My workmates try to improve safety in our work area					
My workmates always follow the correct procedures to complete a task					
If my workmates noticed a safety hazard, they would take corrective action					
My colleagues act in a safe manner even when the manager is not around					

	Strongly Agree	Agree	Neither Agree nor disagree	Disagree	Strongly Disagree
I am able to complete my tasks safely without the help of others					
My colleagues will always help others to work safely					
We need the help of safety specialists to work safely					
We need to work together to achieve a safe working environment					
My manager is responsible for delivering organizational safety performance goals					
Everyone has a responsibility to work safely					
I work safely because I'm told too					
I feel there is a good safety culture in our organization					
I can stop a job if I feel unsafe					
Safety is nothing more than common sense					
Other employees in my department feel comfortable to remark about safety to each other					
I bend the safety rules to achieve a target					
I break the safety rules due to management pressure					
I am under pressure from workmates to break safety rules					

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE

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