A Transport for NSW and Northwest Rapid Transit
Collaborative Initiative

LEADERSHIP AND SAFETY PERFORMANCE

RESEARCH REPORT - May 2018

Authors

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1- INTRODUCTION

This report presents the methodology and associated results of research undertaken on the Sydney Metro Northwest project, formerly the North West Rail Link. Sydney Metro Northwest is the first stage of the Sydney Metro program of works, Australia's biggest public transport project being delivered by the NSW Government. The $8.3 billion Sydney Metro Northwest runs from Rouse Hill to Chatswood and will be Australia's first fully-automated metro rail system.

The $3.7 billion Operations, Trains and Systems contract was awarded to Northwest Rapid Transit (NRT) in September 2014. The Public Private Partnership was, at the time, the largest ever awarded in NSW and will see NRT deliver Sydney Metro in the first half of 2019 and operate and maintain it for the next 15 years. This contract involves delivering eight new railway stations, 36 kilometres of new metro rail, Sydney's new metro trains and upgrading the railway between Chatswood and Epping to metro standards. NRT combines the experience of the world's number one commercial rapid transit operator with Australia's most experienced railway contractors. NRT compromises CPB, John Holland, MTR, Plenary and UGL. A workforce of approximately 2,500 is engaged daily to complete the four year project.

2- CONTEXT FOR RESEARCH

Sydney Metro Northwest is led by a select few large construction contracting companies, all with varying specialities and capabilities. Project leaders are critical to lead the execution of work particularly in the context of safety performance. At Sydney Metro Northwest, approximately 2,500 workers every day take direction and are influenced, directly and indirectly, by those personnel occupying leadership positions. These leaders include project managers, area managers, site managers and superintendents. Such leaders are ultimately responsible for all those working under their direction. Within NRT, this can include one individual being responsible for anywhere up to 500 people. Such responsibility is not without its challenges, including managing the safety outcomes of all such personnel.

In the context of leadership in the Australian construction environment the authors undertook research to identify and better understand what leadership characteristics influence desirable safety performance. More importantly the research undertaken sought to identify what knowledge, skills and experiences of project leaders ultimately lead to an inherent value for the safety of others, a lived social and moral responsibility.

This research was conducted at the Sydney Metro Northwest project.

2.1 Aim

This research aimed to investigate and inform the understanding of how those occupying leadership positions develop an inherent value for safety and how such individuals; through their leadership positions integrate that value such that it translates into safety performance.

2.2 Objectives

This research set out to achieve the following objectives:

- To define safety leadership for the purpose of this paper
- To evaluate whether leadership is independent of safety leadership
- To better understand how safety leadership is developed
- To determine the impact that leadership has on safety performance and risk perception
- To identify leadership insights to assist the transition of the project from civil construction to rail operations
- To share learnings across projects during the NSW construction industry boom and further Sydney Metro projects
- To ensure these learnings and insights are captured as the legacy from the Sydney Metro Northwest project

3- METHODOLOGY

■ 3.1   Safety leadership

In order to standardise the context of this research, the researchers set out to define the term safety leadership, prior to the conduct of any research activities.

The field of safety leadership is broad and while attempts have been made to define "safety leadership", such attempts are often inadequate and are generally vague. Such observations are supported by Gardner et al., (2011) who reported that the complexity of the definition has increased over the last few years. Regardless of complexity, transparent safety leadership is a characteristic in clear demand (Long, 2013), requiring leaders to demonstrate their commitment by being visible and actively engaging with workers on a personal level to promote safety within their sphere of influence (Massin, 2012).

Massin (2012) and Ciulla (2004) both report the concept of safety leadership is an attribute which relies on moral obligation. Massin (2012) suggests such moral obligations are an extension of a company's social responsibility, and in circumstances where leaders lack ethical abilities Ciulla (2004) report such circumstances can be a recipe for chaos.

Cooper (2015) states that safety leadership is "the art of utilising the influencer factor for persuasion coupled with distinct efforts to enhance the culture of the safety value within the organisation". Davis and Gardner (2012) further support this definition and of note, observe safety leadership to utilise the components of safety values which are coupled with various leadership types. Despite Copper's (2015) definition of safety leadership, it is critical the reader understands that "safety leadership" per se, is not a standalone leadership style. Rather it is an integrated attribute that relies on an inherent value for the safety of others and a personal value which is underpinned by a social responsibility and a moral obligation.

In the context of this research, safety leadership is the inherent value described above and possessed by an individual who is in control and can thus affect control over workplace safety performance.

3.2   People

Research participants identified in this study were those occupying leadership positions at Sydney Metro Northwest, described in Section 1. In order to identify such, the NRT hierarchical organisational structure was utilised for purposes of identifying persons occupying positions that included project managers, area managers, site managers and superintendents. Once identified, contact with each person was made to invite participation in the study.

The study participants were considered by the researchers as the most critical component of the study as those invited to participate are considered to be the individuals at large scale construction sites who are empowered to make decisions, who are responsible for leading and influencing approximately 2,500 workers every day.

A total of 26 participants were recruited into the study and are considered to be representative of the NRT leaders, working under the direction of Sydney Metro North West.

3.3   Timeframe

NRT activities are executed at a rapid pace, with significant progress accomplished each week. As such, timeliness was an important driver throughout the research to ensure sufficient time was afforded for purposes of communicating potential insights to the NRT project team to enable enhanced safety performance, where possible.

The research was conducted between November 2017 and April 2018.

3.4   Study design

The study was a qualitative descriptive design, established for purposes of comprehensively summarising, in everyday terms, specific events experienced by the individual study participants and the study cohort. The design did not seek to identify causality but rather elicit results to explore correlations and relationships in findings. This design was considered the most appropriate.

The research was completed in three stages, detailed in Figure 1 with each stage conducted to inform the next. As this research was looking to achieve the stated objectives it was important the research design was well structured and each step was deliberate.

Stage 1	– Agreed safety leadership definition – Design of research methodology – Design survey questions
Stage 2	– Survey 26 participants – Design interview questions – Interview 26 participants
Stage 3	– Quantitative data analysis – Qualitative data analysis – Identification of themes and insights

Figure 1 – Research activities

3.4.1 Survey

The study participant survey was designed to inform an understanding of the leadership group demographics, along with informing an understanding of the potential intrinsic factors that contribute to an individual's understanding and safety leadership development.

- A purposely created survey was designed and developed for purposes of collecting demographic information from each study participant; including age, industry experience, education level, years of service with current employer, position, length of experience leading people, number of people responsible for and development of initial awareness of safety as a concept

- The survey included a total of eight (8) questions which were uploaded onto a web-based survey platform (Survey Monkey)

- Each study participant independently completed the survey one week prior to being formally interviewed by the research team

3.4.2 Design of interview questions

The design of the interview questions were informed by the results of the survey (Section 3.4.1) in the context of a standardised interview protocol as the questions provided the research team greater opportunity to expand upon the insights and experiences of the study participants once face to face.

The interview protocol is further detailed in Table 1, along with rationale for each question.

Table 1 – Interview questions

Questions	Reasoning
1. How has your employer contributed to your knowledge on safety? Who was the most significant employer in contributing to this knowledge? (Differentiate from formal training and 'this is how we do things')	This question was created as a result of the information received from the quantitative survey results which asked participants where they first became aware of "safety". Further questioning sought to understand the depth and influence of the employer on the study participants knowledge and understanding.
2. What has been the most effective influence in your career regarding safety?	Seeking to identify intrinsic or tacit influence or motivator within individual study participants.
3. Is there someone past or present that stands out that shapes your understanding regarding safety and why?	Identification of individuals and or mentors that had shaped the study participants safety understanding. Seeking to identify what features of successful leaders do the study participants remember and which management style and positive influence elements do the study participants try to replicate.
4. Have you ever been involved or know someone that has been involved in a serious workplace incident? What personal impact has this had?	Seeking to understand how the incident impacted the study participant, along with seeking to understand what the study participant took away from the event. Did they do any of the following: • Share their story • Use their experience for education amongst colleagues • How does it affect their perception on safety
5. How do you consider the current safety standard within your sphere of influence?	To understand if self-reflection and self-awareness occurs and the perception of one's performance. To gauge what the study participant believes is an acceptable safety standard.
6. Can you explain your current safety model used on your site? (How do you perceive the safety resource on your site/ allocated to you?)	Seeking to identify ideas that could be shared, lateral thinking and unique ideas. Seeking to further understand how study participants use safety within their projects, which includes systems and resources.
7. How do you manage and influence external factors and stakeholders in your work zones?	Seeking to understand how the study participant manages potential conflict. Seeking to understand how the study participant deals with safety concerns outside of their area of control.
8. How do you identify your critical risks? (What are the tools you used?) How do you know they are being managed effectively?	Seeking to identify critical thinking on risk identification and effectiveness of their controls. What thought process and or systems are utilised by the study participant to identify, manage and treat risks.

3.4.3 Interview process

The sequence of interview questions was deliberate, commencing with personal questions and transitioning to professional questions. Rationale for such was to establish and build upon rapport by getting the study participant comfortable to promote openness and honesty such that they would share their personal experiences, particularly those applicable in the work environment.

The questions and interview approach were designed to avoid formulaic or organisational/policy responses. Each interview was 30 minutes in duration and conducted within the participants' place of work.

The facilitation of interviews was performed with one scribe and one interviewer and was maintained for all 26 interviews.

3.4.4 Scoring criteria

Interview responses were scored for purposes of semi-quantifying the impact of each answer and to provide an overall "score" for each study participant [1].

To calculate scores, a numeric scale ranging between one (1) and seven (7), 1 being the least and 7 being the highest was applied to each participant's response. A total score for each participant was calculated [1], where 49 was the highest possible score and a score of 7 was the lowest possible outcome.

Numeric scoring, along with associated descriptors for each score are provided in Table 2. A scoring scale of 1 to 7 was identified as the most suitable and efficient method of differentiating between participant responses without over complicating the multiple and complex response options to which responses needed to be classified and subsequent data need to be managed.

Psychometric literature consulted to inform the scoring system suggested the greater the number of scale points, the better scoring systems are, however notably a diminishing return is evident after such scales exceed 11 points (Nunnally, 1978).

Table 2 – Quantitative scoring descriptors

Score/ rating	Criteria Comprehension - Communication - Content
1 Very poor	The participant did not comprehend the question The participant provided no response The participant did not provide an example
2 Poor	The participant struggled to comprehend the question The participant provided an incomplete response The participant provided an irrelevant example
3 Below average	The participant did not fully address the question The participant provided an inadequate response The participant provided insufficient example
4 Average	The participant comprehended the question The participant provided a satisfactory response The participant provided a generic example
5 Good	The participant reflected their understanding in the question The participant provided an articulate response The participant provided a relevant example
6 Very good	The participant comprehensively understood the question The participant provided an articulate and well thought out response The participant provided a specific and relevant example
7 Exceptional	The participant demonstrated a complete understanding of the question The participant provided an articulate, well thought out and meaningful response The participant provided a specific, innovative and relevant example

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[1] Question four (4) was not scored due to the fact that not all participants had experienced a significant incident or fatality during their career. The data for this question could not be equated effectively to include in this report.

TEMPUS ST
THE GARDEN SHIRE

USE HILL STATION

2 metres above ground

erchange

ide spaces

New taxi rank

Parking and storage for 45 bicycles

Footpath and pedestrian upgrades

4- RESULTS

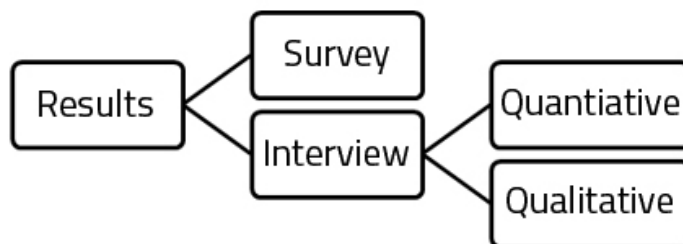The results have been presented in two parts as illustrated in Figure 2.

Figure 2 – Research results

4.1 Survey Results

Figure 3 – Participant gender

The study included a total of twenty six participants;

- 2 study participants were female;
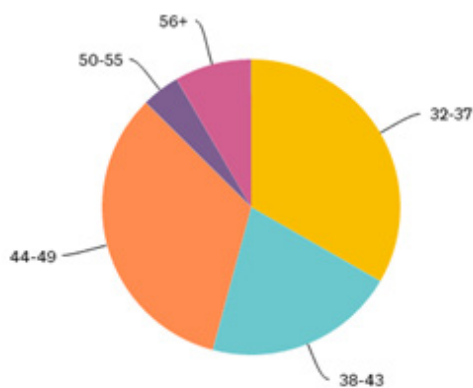- 24 study participants were male.

Figure 4 – Participant age range

- Ages ranged between 32 and 58
- The most represented age groups in the cohort were:
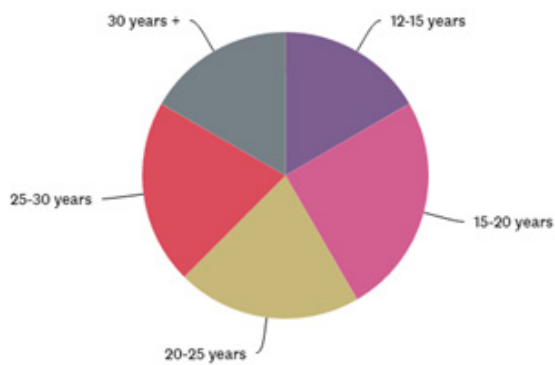 o 32 – 37 years (33%)
  o 44 – 49 years (33%)

Figure 5 – Years of construction industry experience

- Years of construction industry experience ranged between 12 – 30+ years
- The most years of experience represented in the cohort were:
  o 15 – 20 years (25%)
  o 20 – 25 years (21%)
  o 25 – 30 years (21%)
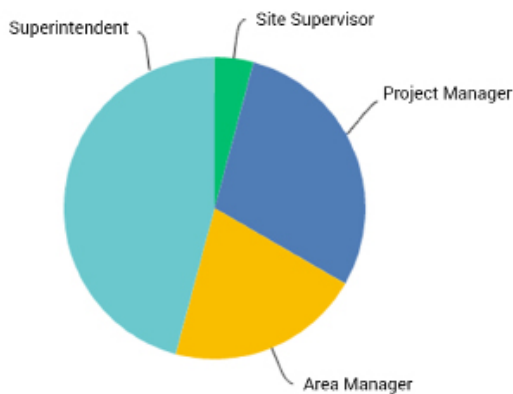- Within this cohort alone, there is a significant number of years' experience working in the construction industry.

Figure 6 – Current leadership position

- The study included a total of twenty six participants;
- All participants occupied leadership positions, and included:
  o 1 Site Supervisors (4%)
  o 11 Superintendents (46%)
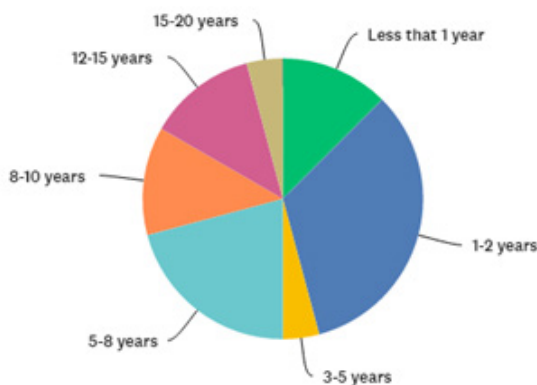 o 6 Area Managers (21%)
  o 8 Project Managers (29%)

Figure 7 – Years of service with current employer

- Years of service with current employer ranged between <1 – 20 years
- The least number of years of service represented in the cohort were:
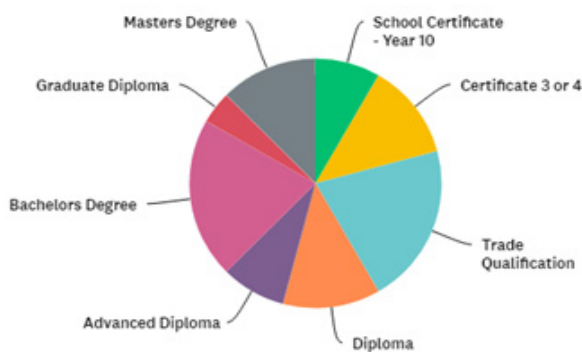 o < 1 year (12.5%)
  o 1 – 2 years (33%)

Figure 8 – Highest level of education

- Highest level of education was the question with the most diversity across responses.
- This illustrated the broad spectrum of participants' foundation of knowledge.
- Distribution in highest education level of education was exceptionally broad and ranged from School Certificate (Year 10) to Master's Degree.
- The variation observed between levels of education within this cohort is considered remarkable.
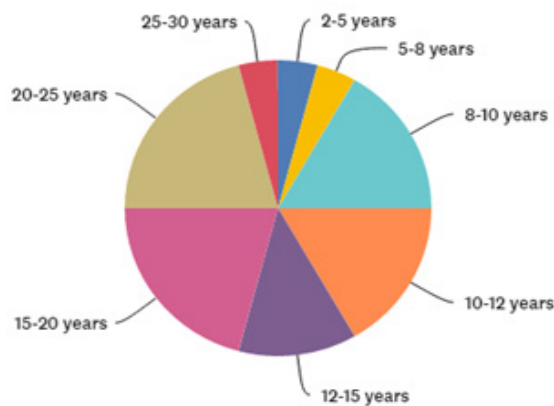
Figure 9 – Years of experience leading people

- Years of experience leading people ranged between 2 – 30 years
- The most years of experience represented in the cohort were:
  o 10 – 12 years (17%)
  o 15 – 20 years (21%)
  o 20 – 25 years (21%)
- There appears to be significant number of years' experience leading people in this cohort – very similar to number of years in the construction industry.
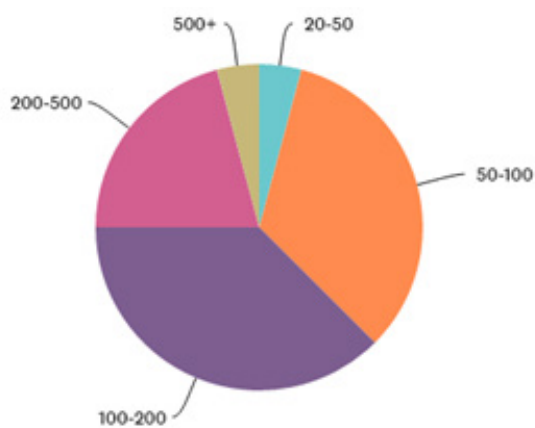

Figure 10 – Number of people participant is responsible for

- The results indicate the participants lead and manage large groups of people.
  This result was core to the research as it illustrates the importance of leadership if one participant in the construction industry can have an influence and ultimate responsibility of so many people.
- The majority of bulk of study participants is accountable for many persons, which is quite remarkable.
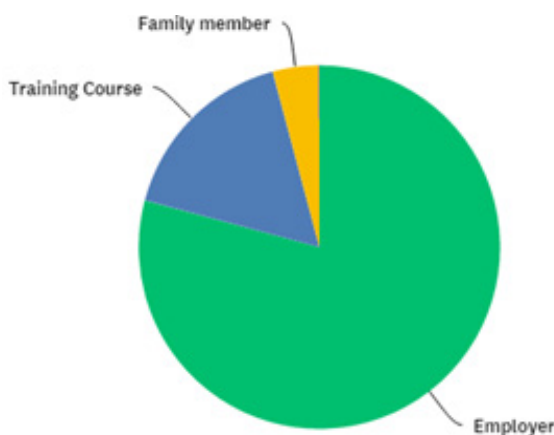

Figure 11 – How did you first become aware of work health and safety?

- 79% of participants stated their employer was who made them aware of work health safety (WHS)
- These results lead to the design of the first interview question as it was important to understand further who, how and why the employer was the most chosen response.

4.2 Quantitative interview scoring analysis

Each of the interview questions was scored using Table 2 - Quantitative scoring descriptors described in Section 3.4.4.

Overall, participants total scores ranged between 29 and 45, with an average score of 38.47 and the median of 40.
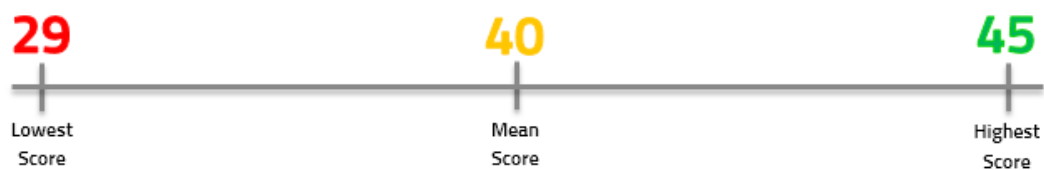
Notable results to highlight include:

- There were 12 participants (46%) who reported having experienced a workplace fatality within their working career.
- The average score of participants who reported having experienced a fatality within their working career was 41; this is above the cohort's average of 38.47.

- The average score recorded when participants were asked how they identify their critical risks, the tools they use, and knowledge of effective management (question 8) was 5.2 out of 7. The average score of question 8 of someone who experienced a fatality was 5.6 out of 7; this is above the cohort's average of 5.2.

What is interesting to note when observing the range of scores for each question is the distribution for the group as a whole is heavily weighted toward the right (refer to Figure 12) and therefore demonstrate the safety leadership characteristics of the group are considered desirable.

This is further reinforced when the total score for each participant is grouped into one of the following three categories:

  - Less than desirable;

  - Desirable; and

  - Exceeds expectations.

Such is demonstrated in Figure 13, and has been included to show pictorially the variation in safety leadership for the group as a whole. It should be noted that this graph has not been included to single out any one person who participated in the study, rather has been included to demonstrate the opportunity available to improve those with less than desirable behaviors such that project directors can ensure less variation in performance across multiple project sites.
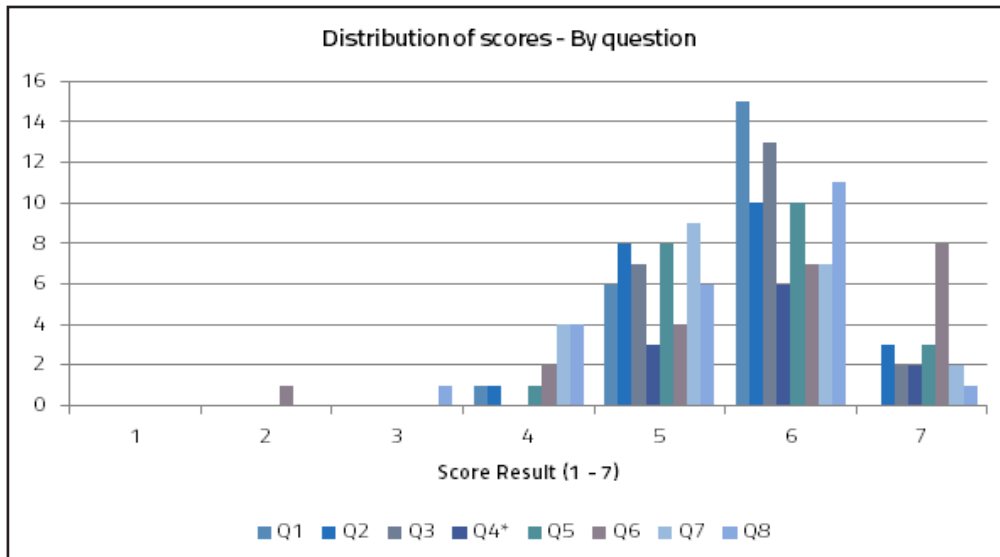
Figure 12 – Distribution of scores – By question
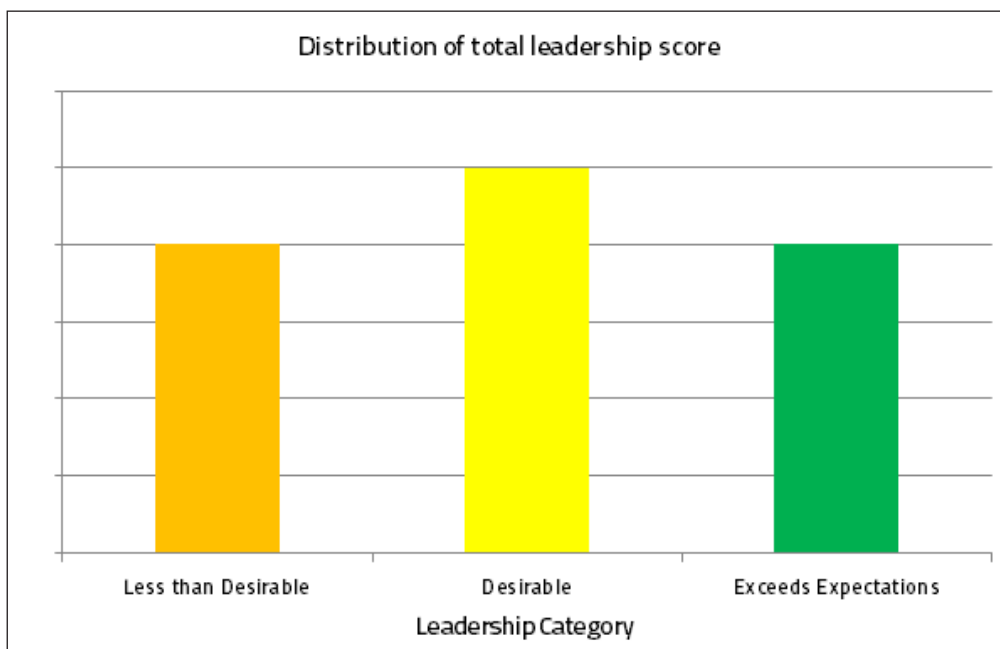
Figure 13 – Distribution of total leadership score

■ 4.3 Qualitative interview analysis

• 79% of participants said their employer contributed to the majority of their safety knowledge and awareness. This emphasises the importance and responsibility of the role the employer has to educate workers and leaders in safety. These leaders are obtaining the majority of their technical safety knowledge and behaviours directly from their employer. This is a pivotal opportunity to develop and deliver key messages when first engaging with your workforce at any level of the organisation.

• 69% of participants noted that simple and consistent safety messages and safety management systems were far more effective to understand and communicate expectations to their workforce. It was

noted that multiple messages embedded in a complex safety management system made it difficult to engage and utilise the system. It was experienced by some participants it was hard to manage from project to project (even working for the same employer) if there was a lack of consistency in both design and application of the safety management system.

• All participants had someone they modelled in the way they influence safety in their current project sites. Depending on the mentor, they developed their understanding for genuine safety leadership values from someone that was at work.

• 46% of participants had experienced a fatality in the workplace. The experiences articulated by these participants had a strong relationship to increased risk awareness and perception, as they all scored above average on the risk score. The impact it had on the participant was increased safety management and diligence. Employers obviously cannot rely on their workforce experiencing fatalities to keep the bar of safety performance high. However, in almost half of participants, experiencing a fatality or significant incident was identified as key factor that influences their safety value.

• All participants believed sharing their experiences could have an impact on individuals. Story telling with a purpose has the ability to engage and influence the workforce in communicating key messages. It is important that organisations foster opportunities for sharing and learning from each other. This may take a structured and formal approach but the interview evidence suggests an informal approach yields positive outcomes.

• The majority of participants believed their construction site which was in their sphere of influence was performing well but had opportunities to improve. Participants could use their safety metrics to measure and describe their performance but 96% of the participants used subjective and qualitative language to describe their site performance instead of metrics. This demonstrated a good level of self-awareness across the sites and the inclination to use lead descriptors and indicators when speaking about, or measuring their own or their team's safety performance instead of lag indicators and metrics.

• The majority of participants openly believed that communication and relationships were the key influence to achieve positive outcomes.

• 40% of participants were critical of the application of safety management of some contractors within a joint venture structure as it lacked consistency across the entire workforce on the project.

• 85% of leaders said that their experience shaped the way they managed risk. There was a large variation in responses in how participants identified risks. The first action of initial risk identification was through the lens of personal experience reviewing the work methodology. Participants did not refer to using a process or system to complete this initial step however the majority of participants held collaborative risk identification workshops with their subcontractors as their subsequent step. Participants referred to the systematic risk management process to manage and treat risks. The possible downside with using experience in identifying risk is that the assessed level of risk may be highly influenced by a person's risk perception (Zhang, 2015) which then may result in appropriate control measures not being adopted or an individual, experienced-led approach may not easily translate across a workforce with varying skills and experience levels.

• An observation from both the survey and interview data acknowledged the positive level of diversity across the participants, excluding gender which is noted in the survey results (only two females made up the twenty six participants). It is noted that diversity is not just gender or ethnicity, but rather a collection of one's experience which for the purpose of this report is specifically, age, industry experience, people management experience, and level of education. The observation from this cohort of participants is the intersection of experience and complimentary nature of skill set and diversity of thought. The ability to harness this diversity across the cohort to problem solve and manage risk more effectively is pivotal to

the project's success to date. It is important that there is a structured mechanism to be able to share and trade collective insights across organisations. Ciulla (2004) observes that in general leadership, information is based on a need to know basis and by hierarchical systems. Safety leadership calls for compulsory sharing of information that pertains to safety across project sites from many different perspectives.

4.3.1 Desirable behaviours

Overall the findings of this study allowed the researchers to identify and describe the characteristics of "safety leadership", such include, however are not limited to:

- Communicating expectations to their workforce;
- Fostering opportunities for sharing and learning from each other;
- Not applying safety metrics as a means of measuring performance;
- recognising the values of risk assessment and applying the results to make decisions and allocate resources;
- Believing safety activities are the responsibility of all persons working under their direction, rather than delegating "safety" to a safety person in their team;
- Recognising the value of mentoring and role modelling; and
- Recognising the importance of consultation and relationship management.

5- CONCLUSION

Safety leadership is not a standalone 'leadership model'. It is a combination of authenticity, transparency and consideration for the value of the wellbeing of the workforce's position to make or influence the decision making process. Throughout this research, interviewed participants all agreed that the health, safety and wellbeing of the workers was paramount. While they were diverse in their approach, their ultimate objectives were consistent in this regard.

In the context of this research, it is clear that employers have a large responsibility to educate both leaders and workers in safety. Project leaders obtain the majority of their safety knowledge and behaviours directly from their employer. Such training and education was noted to be better retained and useful when simple and consistent safety messages were used, while being underpinned by straight forward safety management systems.

This research showed that while strong safety management systems were in place, the research participants tended to rely on their experience and open collaborative relationships with other contractors in way they managed risk onsite. This appeared to be somewhat of strength on the assessed project, due to the wide ranging diversity of background and experience on the participants' site.

Safety systems have a place in all organisations; however the primary focus for implementation of organisations systems must be the leaders. These people are individuals who influence, lead, develop and maintain the positive safety culture and subsequently determine the organisations safety outcomes.

6- INDUSTRY RECOMMENDATIONS

- The first impression of safety in an organisation to new employees is often shaped by strong safety leadership from the management and site-based leaders. Leaders in organisations should deliver and present messages related to safety where possible with delegation of this task to safety professionals being avoided where possible. This demonstrates commitment from the organisation and leaders to the value of safety.

- Safety messages need to be simple, consistent and engaging. They should be designed for the target audience and focus on the moral advocacy in lieu of the legislative obligation. This approach should reinforce a culture of we care about our employees and others.

- Leaders must recognise that they are indeed role models that influence others to adopt positive safety behaviours and values. Education and training of leaders is paramount about communicating the strong moral and ethical values of safety and should be considered in the personal develop plans for all emerging and existing leaders.

- Foster meaningful safety related stories from leaders within your organisation. These can be used to share with people in safety related messaging across the organisation that can be powerful and engaging as they have personal impact. Multi-site and multi-team projects.

- Industry needs to move to performance measures that matter to leaders and drive positive behaviours. Lead indicators need to be at the forefront of how business measures safety performance as it resonates with the workforce.

- When recruiting for leadership roles it is important to consider diversity within a team or leadership peer group. Diversity in regards to age, gender, industry experience, education level and people management experience may offer enhanced risk perception throughout the leadership of an organisation.

- When recruiting for leadership roles ask individuals if they have experienced a fatality or significant incident in their workplace throughout their career and how this has influenced or shaped their approach to safety leadership. This answer may indicate the level of importance they place on safety as a value and their approach to effective risk management.

- Mentoring or other programs that expose emerging leaders within an organisation to experienced and established leaders with a strong safety leadership culture may provide the opportunity for informal learning and development in leadership style, communication and risk management.

- Organisation and specifically joint ventures need to acknowledge the benefits of diversity in leadership but the risk of inconsistent application of systems and processes. Equal focus should be applied to the developing and considering how systems and processes are to be communicated and implemented

- It is recommended to review safety leadership training programs in the context of this research. For example, it is important to put sufficient effort and resources into engagement and training with project leaders on safety. Such training programs would benefit from:

    i. Using a storytelling approach, told by persons with valuable and relevant experiences

    ii. Embedding succinct key messages into the training program

    iii. Supporting such a training program with a robust, yet straight forward, safety management system

    iv. An ongoing structured mechanism to be able to share and trade collective experiences across project sites.

It is recommended that organisations foster the capacity that facilitates sharing and learning from each other.

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GRAPHICAL SUMMARY OF INTERVIEW DATA

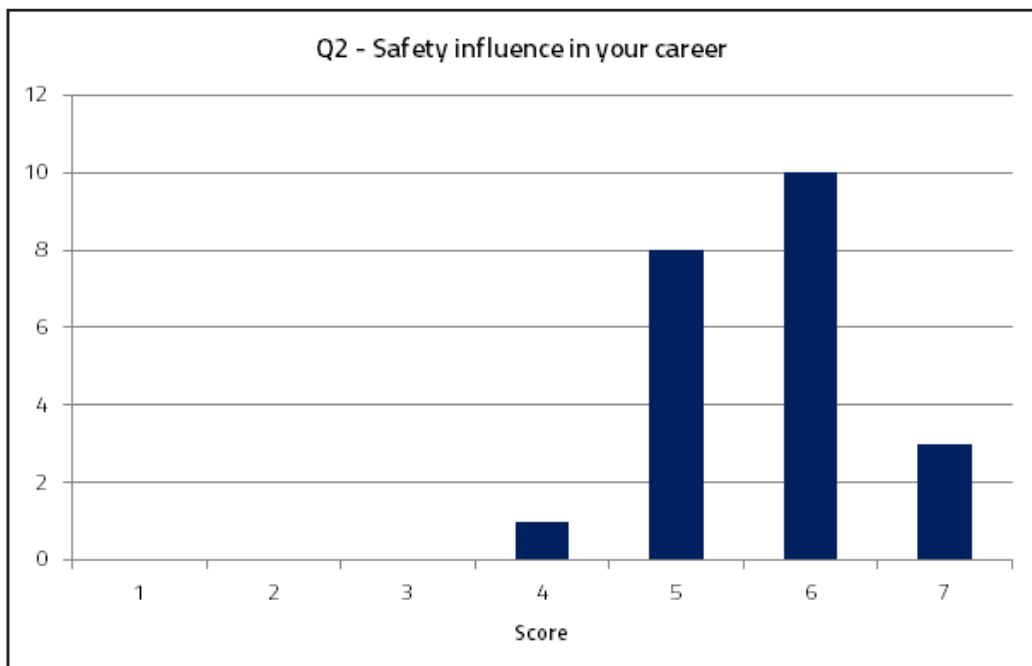**Figure 14 – Employer contribution to safety knowledge**

Figure 15 – Safety influence in your career

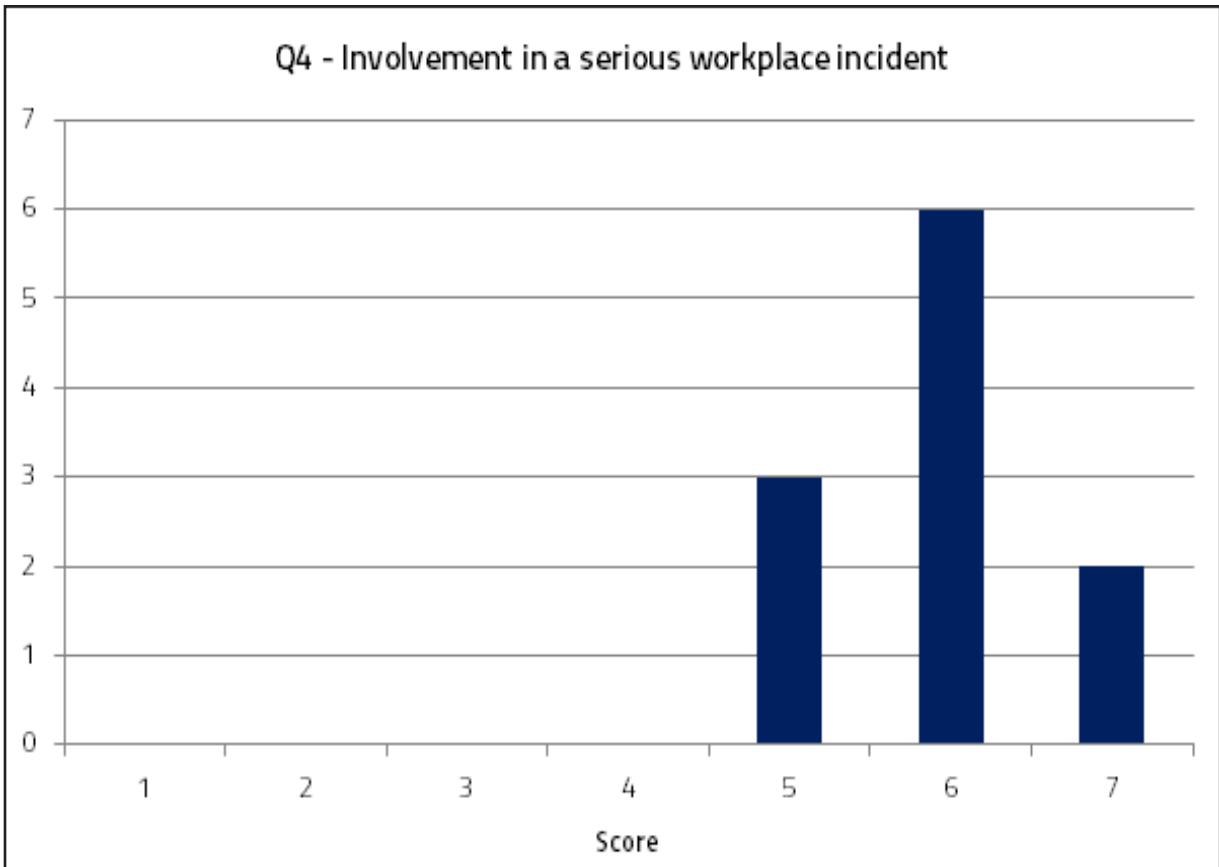**Figure 16 – Someone past or present that has shaped your understanding of aafety**

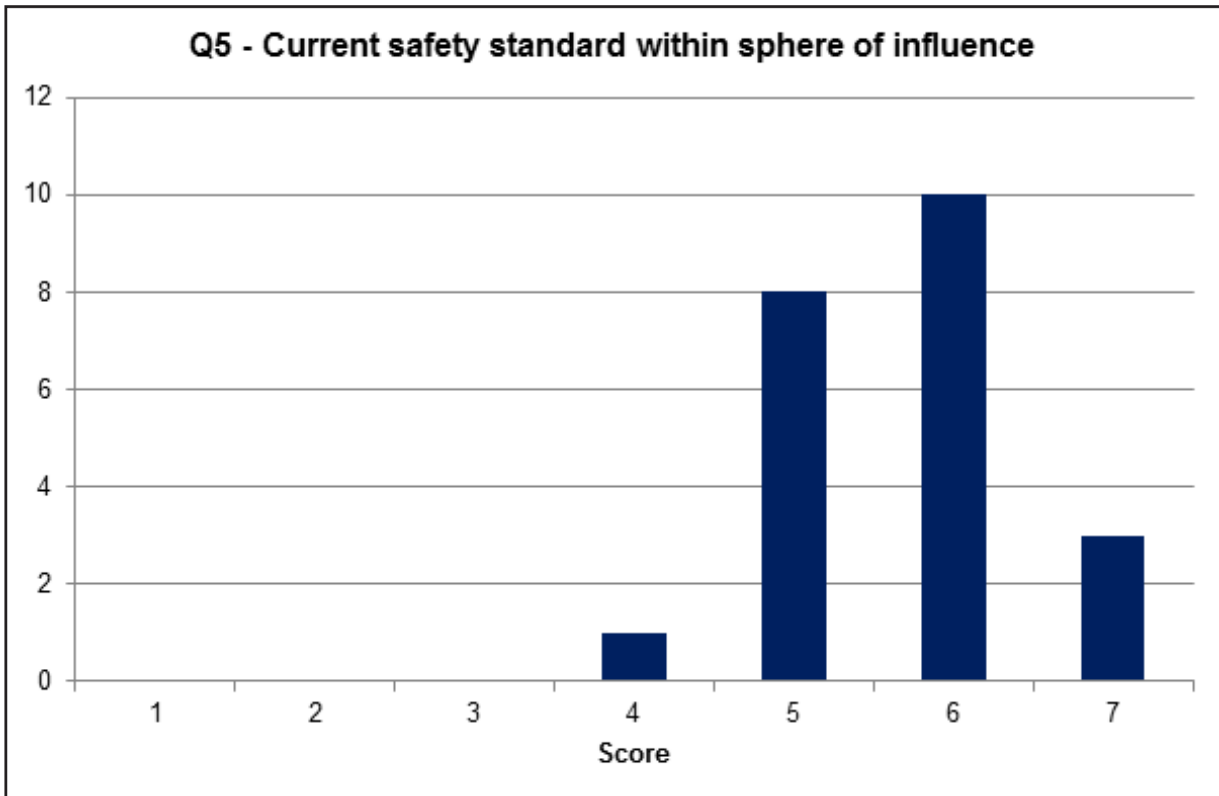**Figure 17 – Involvement in a serious workplace incident**

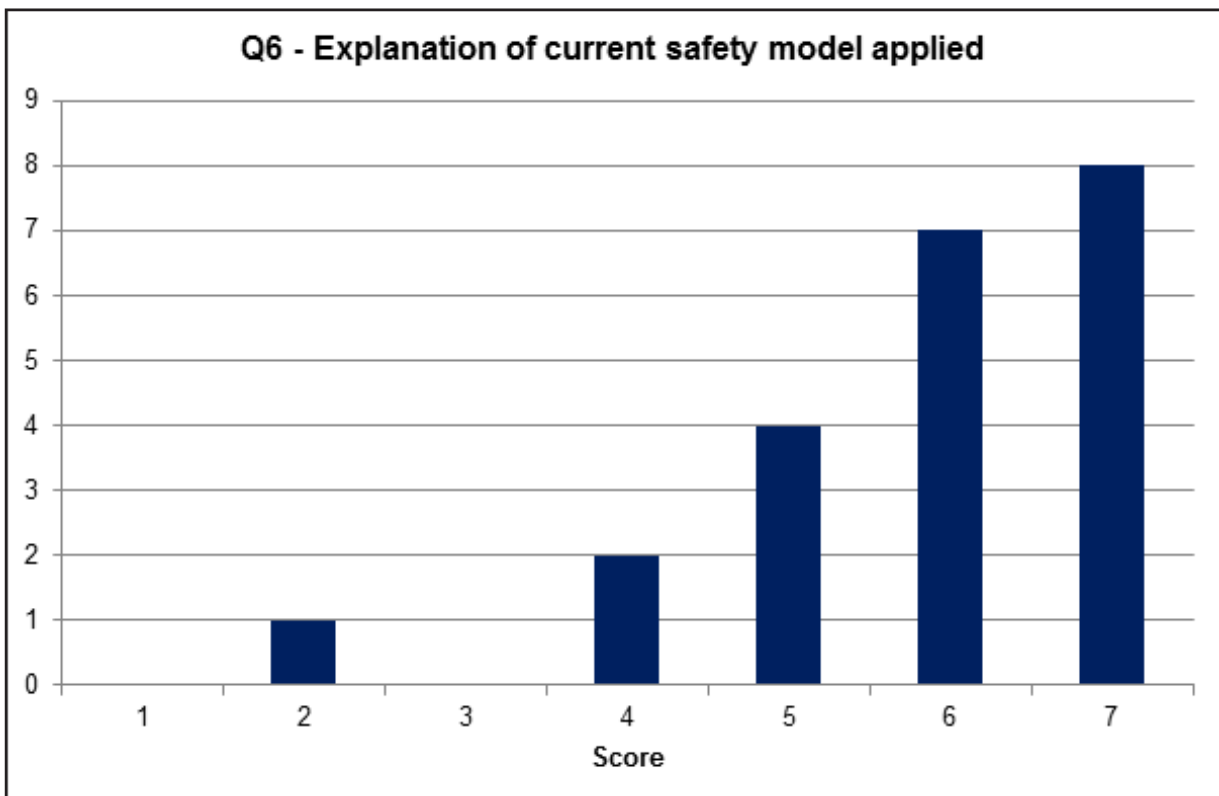**Figure 18 – Current safety standard within sphere of influence**

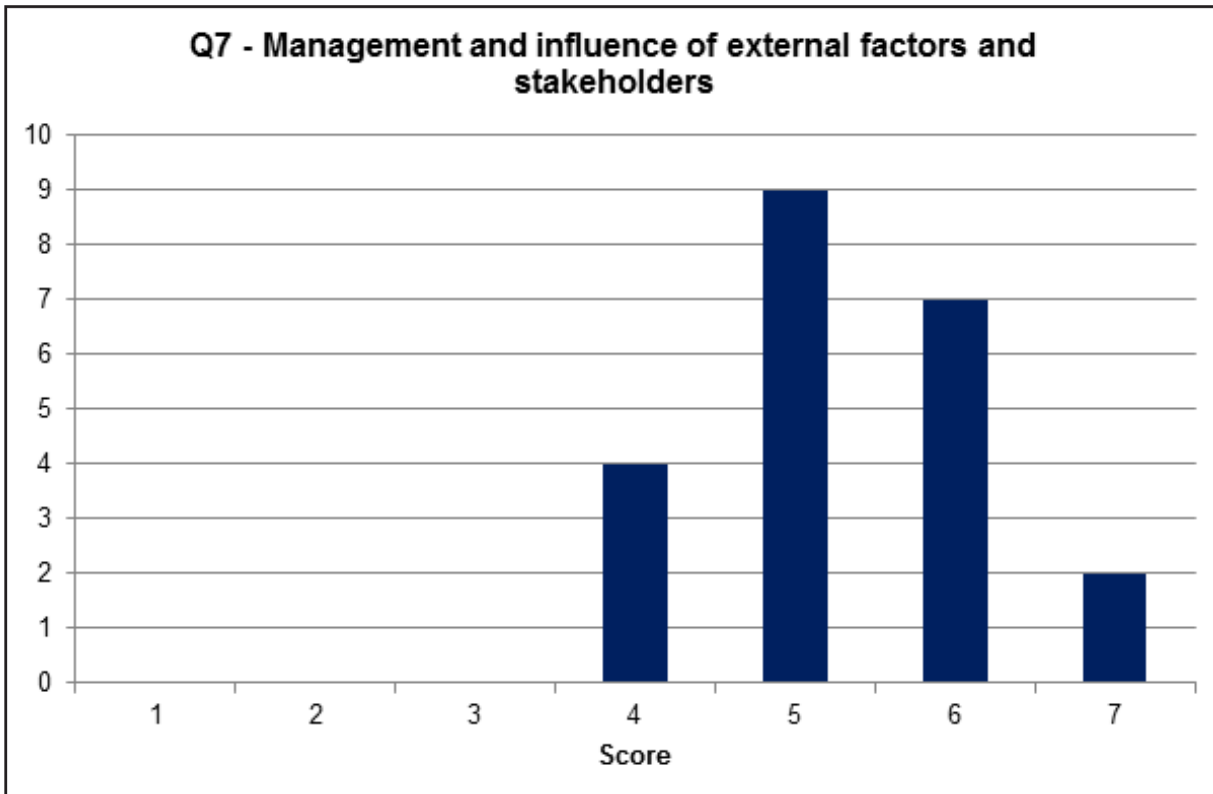**Figure 19 – Explanation of current safety model applied**

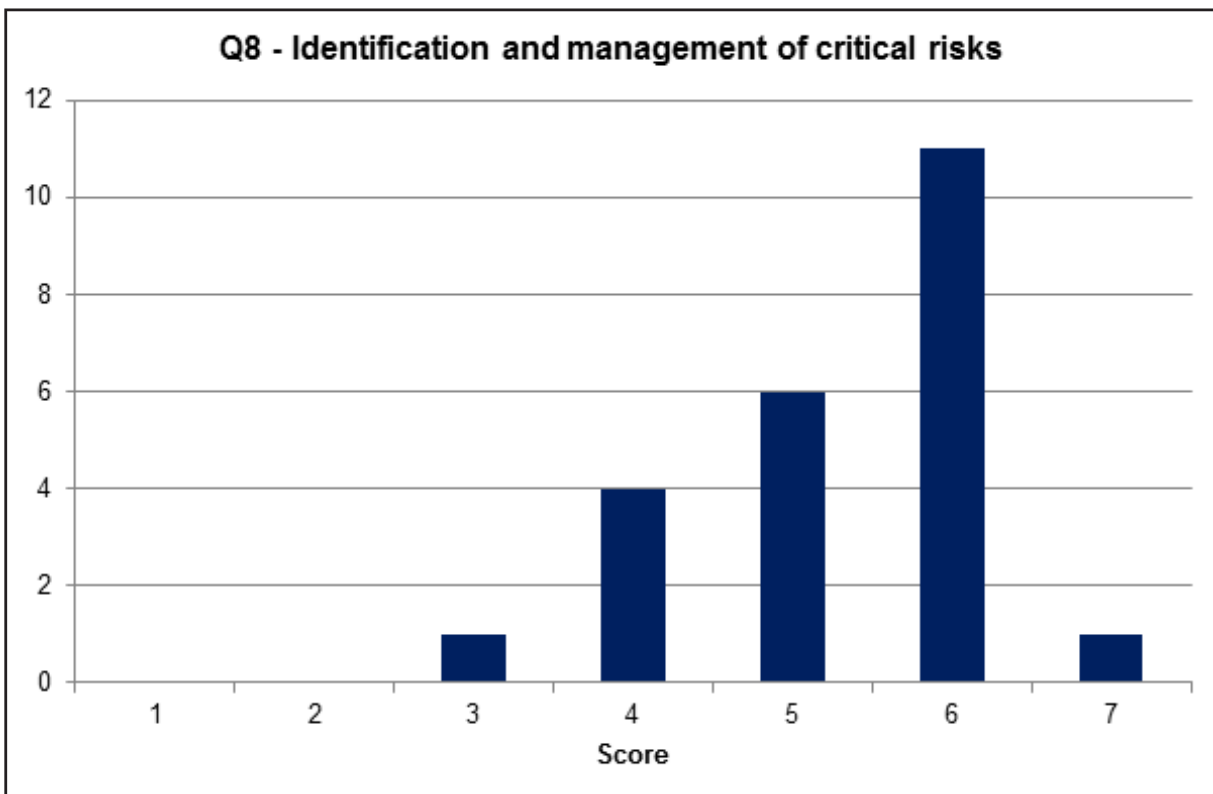**Figure 20 – Management and influence of external factors and stakeholders**

Figure 21 – Identification and management of critical risks