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Understanding the Factors Affecting Safety Behaviours of Controllers of Site Safety (COSSs)

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Railway Accident Investigation Seminar

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- Project ran January to March 2020
- Aim of the COSS project
  - To understand what causal (human and organisational) factors contribute towards track worker accidents and near misses
- Two main activities:
  1. Analysis of 47 RAIB investigation reports (2005-2019)
     - Extracting common casual factors (e.g., distraction, lack of compliance, problems with documentation)
  2. Focus groups with track workers (n=6, with 40 workers)
     - Rating the causal factors (how important are they?) and (how frequently do they occur?)

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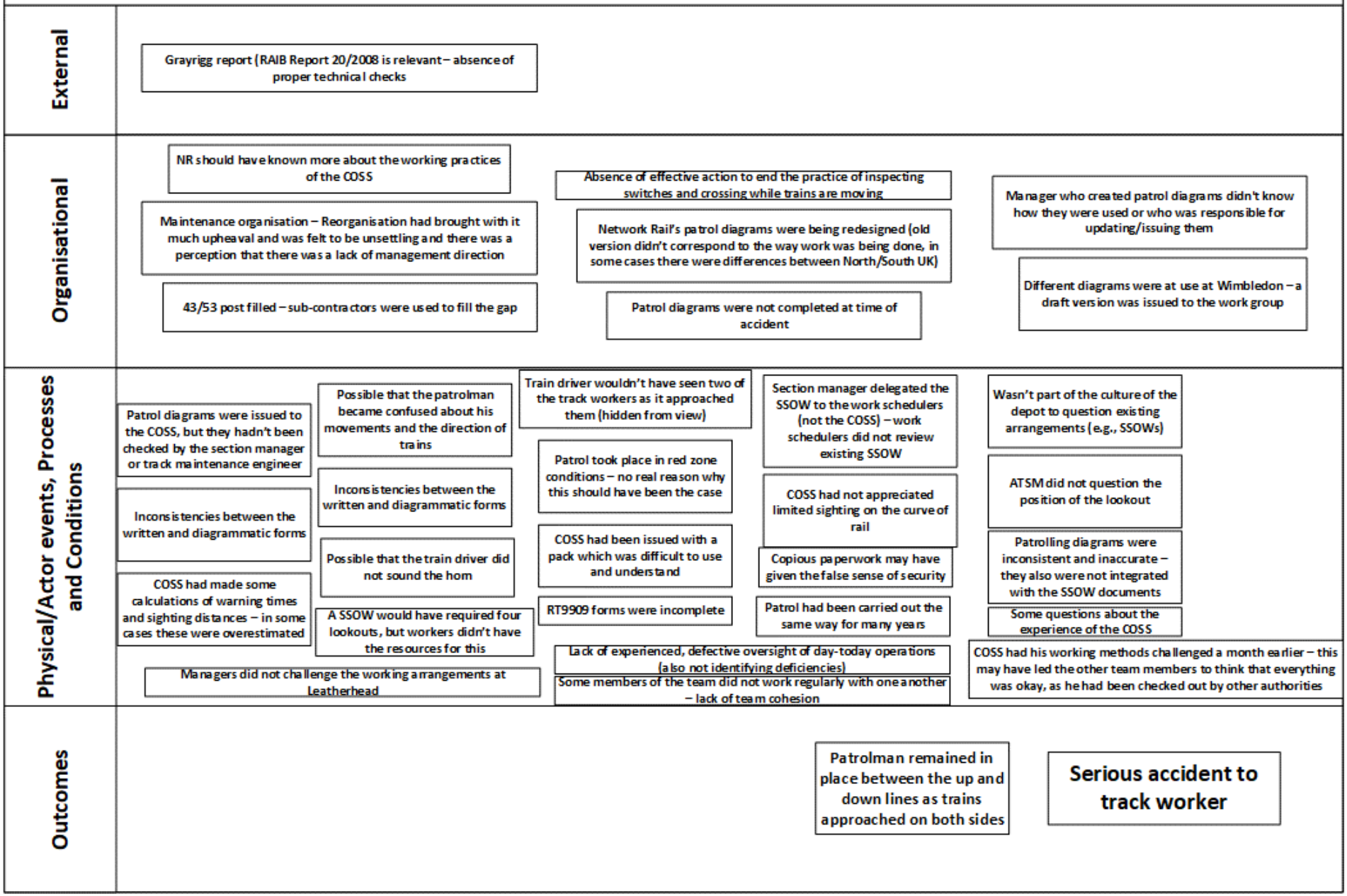
/ Previous research

- Important of support from team leaders in shaping safety attitudes (‘citizenship’) – Turner et al. 2005, 2010
- Importance of team dynamics and social/organisational factors (e.g., leadership, trust) – Naweed et al. 2019
- Large proportion of near miss events involve lookouts – Naweed et al. 2019
- ‘Authority gradients’ and the need to go beyond NTS – Luva and Naweed 2021

Activity 1: RAIB Investigation reports - Examples

RAIB ID	Location	Date	Report Number	InvType	Operator
73	Trackworker fatality at Trafford Park	26-Oct-05	16/2006	Investigation	Network Rail
37	Possession irregularity near Manor Park	19-Mar-06	26/2007	Investigation	Network Rail
189	Near miss involving a track worker at Tinsley Green Junction	17-Mar-07	43/2007	Investigation	Network Rail
199	Track worker fatality at Ruscombe Junction	29-Apr-07	04/2008	Investigation	Network Rail
227	Accident at Leatherhead	29-Aug-07	19/2008	Investigation	Network Rail
243	Track worker struck by train Grosvenor Bridge, London Victoria	13-Nov-07	19/2009	Investigation	Network Rail
247	Fatal accident to a trackworker east of Reading Station	29-Nov-07	21/2008	Investigation	Network Rail
289	Serious injury sustained by a signal technician, Kennington Junction	23-May-08	29/2009	Investigation	Network Rail
298	Collision between passenger train & 2 grinding machines Acton West	24-Jun-08	15/2009	Investigation	Network Rail
334	Trackworker struck by train, Stevenage	07-Dec-08	23/2009	Investigation	Network Rail
352	Accident at Dalston Junction	30-Mar-09	30/2009	Investigation	Network Rail
404	Fatal accident at Whitehall West junction, Leeds	02-Dec-09	15/2010	Investigation	Network Rail
432	Track worker struck by a train at Cheshunt Junction	30-Mar-10	06/2011	Investigation	Network Rail
496	Two incidents involving track workers between Clapham Jn & Earlsfield	08-Mar-11	03/2012	Investigation	Network Rail
509	Track worker struck by a train at Stoats Nest Junction	12-Jun-11	16/2012	Investigation	Network Rail
556	Track worker struck by a passing train near North Kent East Junction	02-Feb-12	B01/2012	Bulletin	Network Rail

Leatherhead, 29 August 2007



Activity 1: Causal factors From Incident Reports

1. Lack of fencing, barriers
2. Shift patterns
3. IT Systems
4. Signallers
5. Vegetation
6. Communication (Contractors)
7. Communication (Other Organisations)
8. Management action on reporting
9. Actions of PICOP
10. Planning and preparation
11. Time of day
12. Use of PPE
13. Communication (Managers)
14. Access route problems
15. Lighting
16. Knowledge and skills
17. Poor estimation
18. Noise
19. Staff shortages
20. Complexity of rules
21. Signage
22. Position of safety (POS) issues
23. Fatigue
24. Weather
25. Visibility
26. Informal, unofficial ways of working
27. Problems at the depot
28. External contractors
29. Drivers
30. Red Zone/Green Zone working
31. Safety briefings
32. Auditing (paperwork)
33. Confusion/disorientation
34. Involvement of lookouts
35. Familiarity with location
36. Habit, complacency
37. Leadership/supervision
38. Distraction
39. Communication (Team members)
40. Violations and lack of compliance
41. Situational awareness
42. Not challenging decisions
43. Lack of experience
44. Workload/time pressure
45. Set-up of SSOW
46. Network Rail (systems, processes)
47. Documentation

Activity 1: Most Frequently Occuring Casual Factors (Top 10)

Factor		
1.	Documentation	'Lack of appropriate guidance in the Rule Book, COSS handbook and other documents' (Kennington Junction 23 May 2008; RAIB Report 29/2009)
2.	Situational Awareness	'The team became engaged in the job and lost awareness of the adjacent line being open' (Clapham Junction, 17th January 2018; RAIB Safety Digest 02/2018)
3.	Lack of Compliance	'Arrangements made by COSS not authorised by relevant rules and standards' Maesyfelin Bridge, 8th April 2006; RAIB Safety Digest 04/2016)
4.	Network Rail (Systems, Processes)	'Previous incident (West Acton) which demonstrated the need for track layout information. Network Rail did not install track layout information (following on from a cost-benefit analysis)' (Sundon, 12 December 2018; RAIB Safety Digest 05/2019)
5.	Set-up of SSOW	'The SSOW was not implemented' (Shawford, 24th June 2016; RAIB Report 05/2017)
6.	Workload/Time Pressure	'Welder may have been under time pressure to finish the job' (Ruscombe Junction, 29 April 2017; RAIB Report 04/2008)
7.	Lack of Experience	'COSS and other group members did not have the experience to implement Red Zone SSOWs' (Roydon, 16th July 2012; RAIB Report 07/2013)
8.	Not Challenging Decisions	'Team members did not challenge the system of work or the PiC, who was much more experienced than them' (Egmanton, 5th October 2007; RAIB Report 11/2018)
9.	Communication (Team)	'Welder found it difficult to follow instructions from younger, less experienced staff' (Ruscombe Junction, 29 April 2017; RAIB Report 04/2008)
10.	Distraction	'Worker A possibly distracted by the work being carried out by the COSS as he was new to the job and keen to learn and had been observing in previous jobs that day' (Peterborough, 20th July 2018; RAIB Report 04/2019)

Activity 2: Focus groups – causal factors

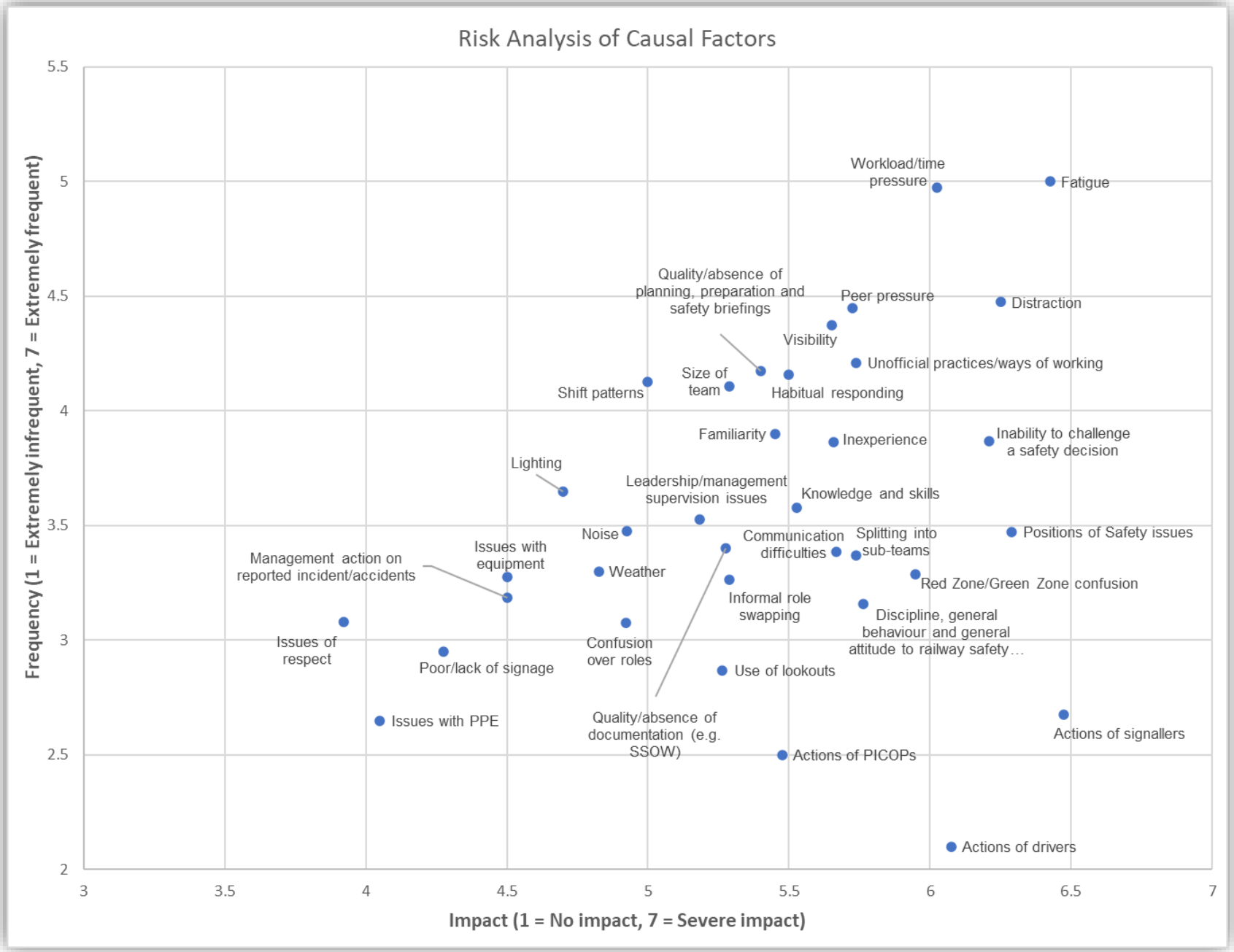
- **Frequency**
  - **How frequently does the factor contribute to near misses and incidents? (1 = 'extremely infrequently', 7 = 'extremely frequently')**
- **Impact**
  - **What would be the potential impact on safety if the factor occurred? (1 = 'no impact at all', 7 = 'severe impact')**

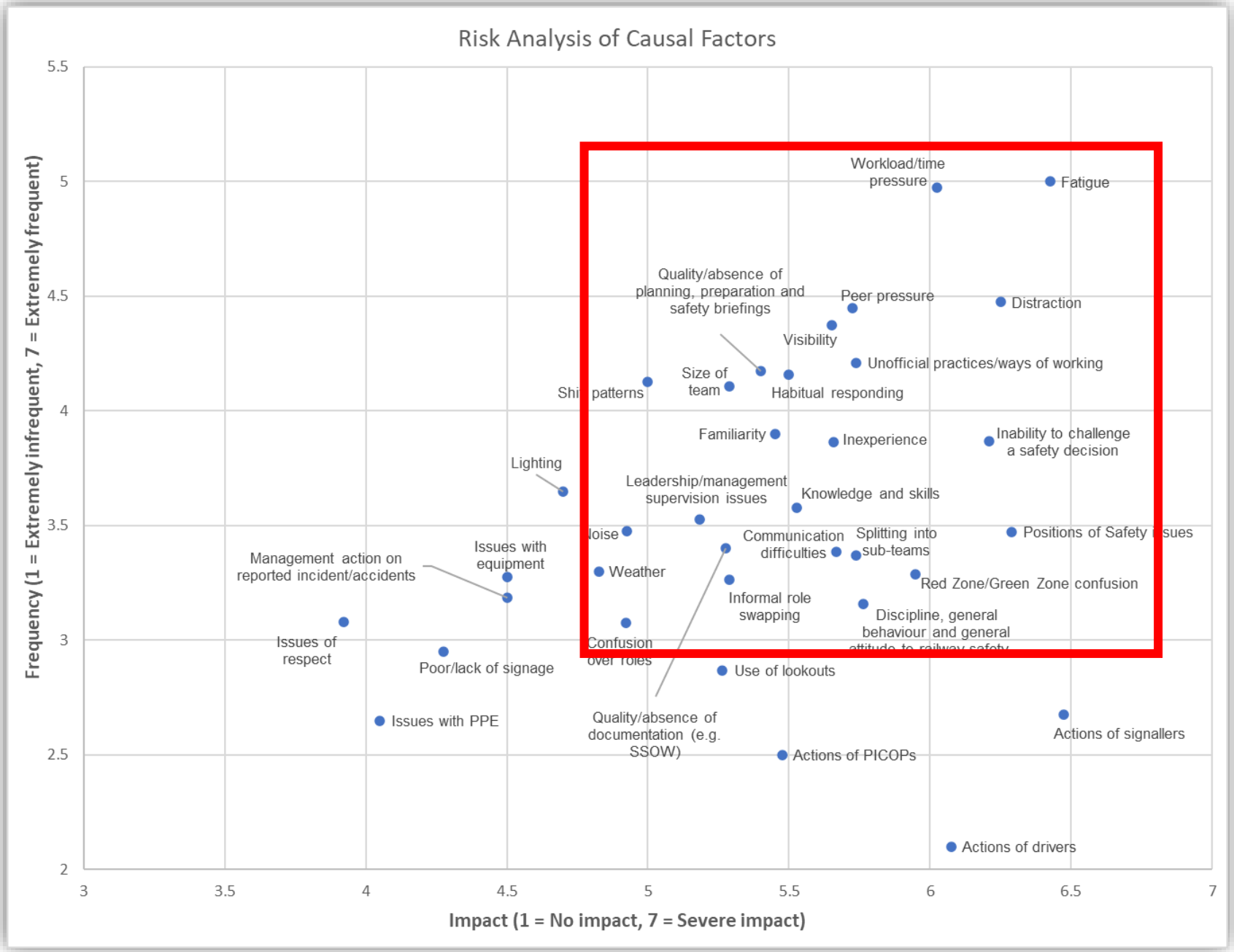
Activity 2: Frequency of Casual Factors (Top 12)

Factor	
1.	Fatigue
2.	Workload/Time Pressure
3.	Distraction (including loss of SA)
4.	Peer Pressure
5.	Visibility (e.g., curved track)
6.	Unofficial practices/ways of working
7.	Quality of planning, preparation and safety briefings
8.	Habitual responding (complacency)
9.	Shift patterns
10.	Size of team
11.	Familiarity with the work location
12.	Inability to challenge a decision

Activity 2: Impact of Casual Factors on Safety (Top 12)

Factor	
1.	Action of signallers
2.	Fatigue
3.	Positions of Safety (POS) issues
4.	Distraction (including loss of SA)
5.	Inability to challenge a decision
6.	Actions of drivers
7.	Workload/time pressure
8.	Red Zone/Green Zone confusion
9.	Discipline and attitudes to safety rules
10.	Splitting into sub-teams
11.	Unofficial practices/ways of working
12.	Peer pressure


Risk Analysis of Causal Factors
Frequency (1 = Extremely infrequent, 7 = Extremely frequent)
Impact (1 = No impact, 7 = Severe impact)
5.5
5
4.5
4
3.5
3
2.5
2
3
3.5
4
4.5
5
5.5
6
6.5
7
Workload/time pressure
Fatigue
Quality/absence of planning, preparation and safety briefings
Peer pressure
Distraction
Visibility
Unofficial practices/ways of working
Size of team
Shift patterns
Habitual responding
Familiarity
Inexperience
Inability to challenge a safety decision
Lighting
Leadership/management supervision issues
Knowledge and skills
Noise
Communication difficulties
Splitting into sub-teams
Positions of Safety issues
Issues with equipment
Management action on reported incident/accidents
Weather
Red Zone/Green Zone confusion
Informal role swapping
Discipline, general behaviour and general attitude to railway safety…
Issues of respect
Confusion over roles
Poor/lack of signage
Use of lookouts
Issues with PPE
Quality/absence of documentation (e.g. SSOW)
Actions of signallers
Actions of PICOPs
Actions of drivers


Risk Analysis of Causal Factors
Frequency (1 = Extremely infrequent, 7 = Extremely frequent)
Impact (1 = No impact, 7 = Severe impact)
5.5
5
4.5
4
3.5
3
2.5
2
3
3.5
4
4.5
5
5.5
6
6.5
7
Workload/time pressure
Fatigue
Quality/absence of planning, preparation and safety briefings
Peer pressure
Distraction
Visibility
Unofficial practices/ways of working
Size of team
Habitual responding
Familiarity
Inexperience
Inability to challenge a safety decision
Lighting
Leadership/management supervision issues
Knowledge and skills
Communication difficulties
Splitting into sub-teams
Positions of Safety
Issues with equipment
Management action on reported incident/accidents
Weather
Red Zone/Green Zone confusion
Informal role swapping
Discipline, general behaviour and general
Issues of respect
Poor/lack of signage
Use of lookouts
Issues with PPE
Quality/absence of documentation (e.g. SSOW)
Actions of signallers
Actions of PICOPs
Actions of drivers

Focus groups – Summary of themes

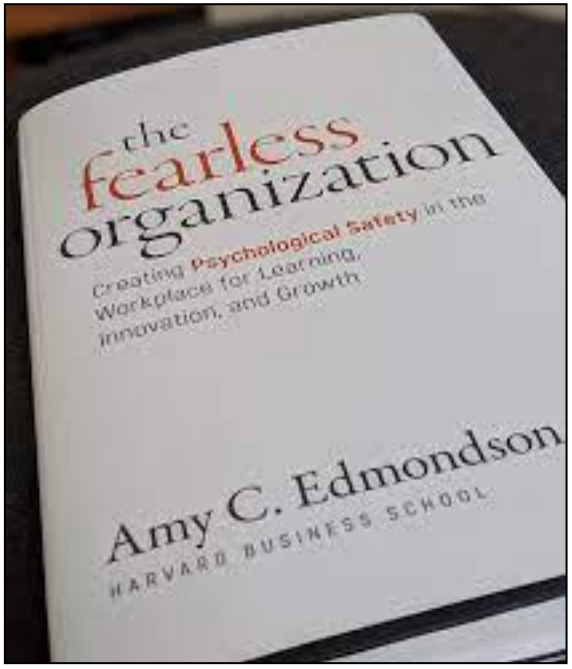
- Violations – term was disliked and some debate about the importance of improvisation (sometimes)
- Protection (green) level compared to warning (red) level working – trust factor – particularly in terms of signallers
- The role of COSS - Confusion over who's in charge with PiC - Experience/inexperience - Informal mentoring common
- Safety plans and planners - Planners should be COSS trained and/or know the local area. Paperwork overly complex and overwhelming

Focus groups – Summary of themes

- Management and supervision - relationship at times problematic - Not following through when a report is made - Not telling workers the outcome of an incident - Violating the rules Pressure to get the job done - Need to be strong to stand up to their pressure.
- Speaking up and reporting - Team working and trust are crucial here - Difference between depots on this matter (and others)
- Trust – strong emphasis - Relates to co-workers (especially lookouts), supervisors/managers, signallers and technology

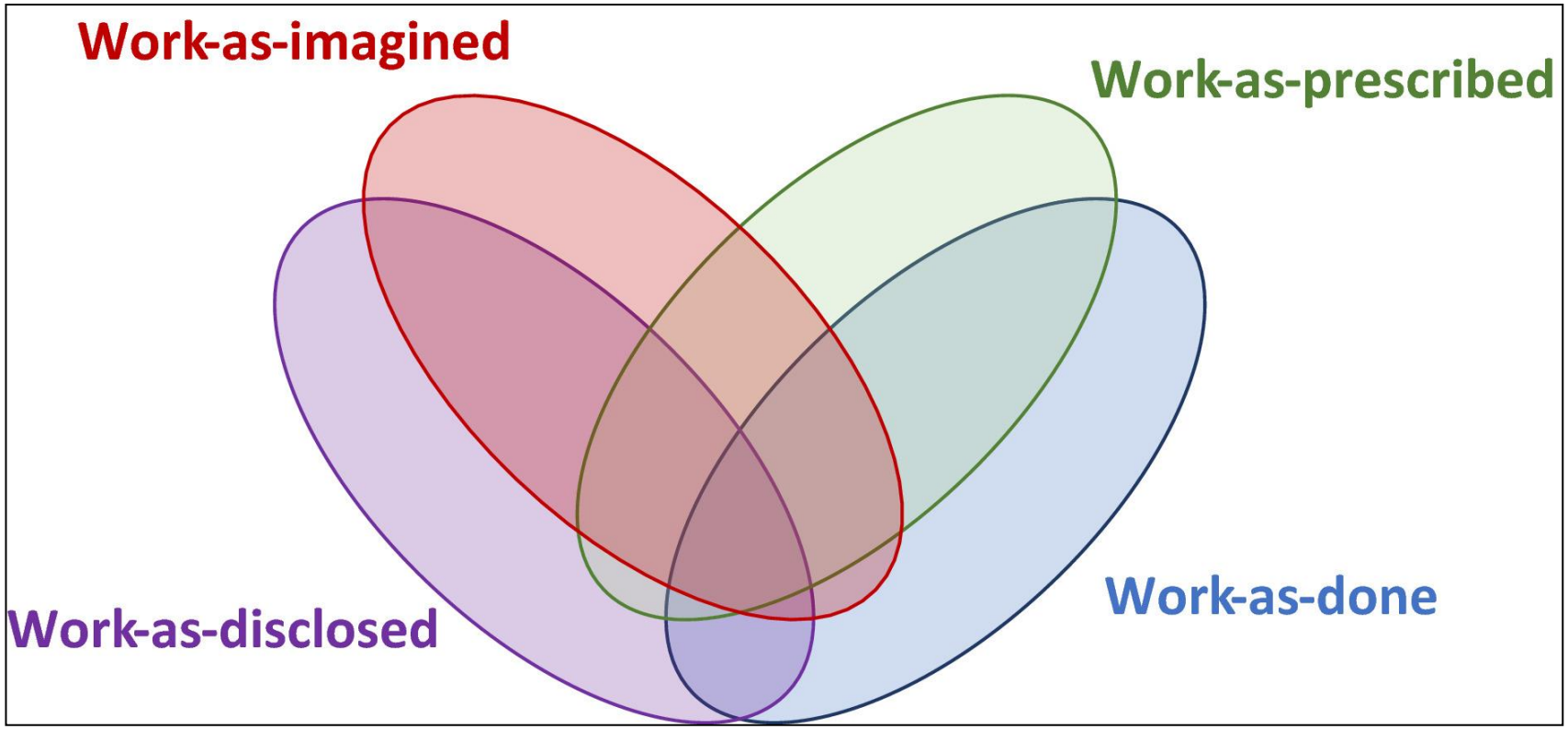
Psychological safety

- Amy Edmondson (Harvard Business School):
  - “a belief that one will not be punished or humiliated for speaking up with ideas, questions, concerns or mistakes.”



Compliance, non-compliance …. Adaptation, improvisation ….

- Steve Shorrock (varieties of human work): https://humanisticsystems.com/2016/12/05/the-varieties-of-human-work/



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Thanks to RAIB and for your attention!

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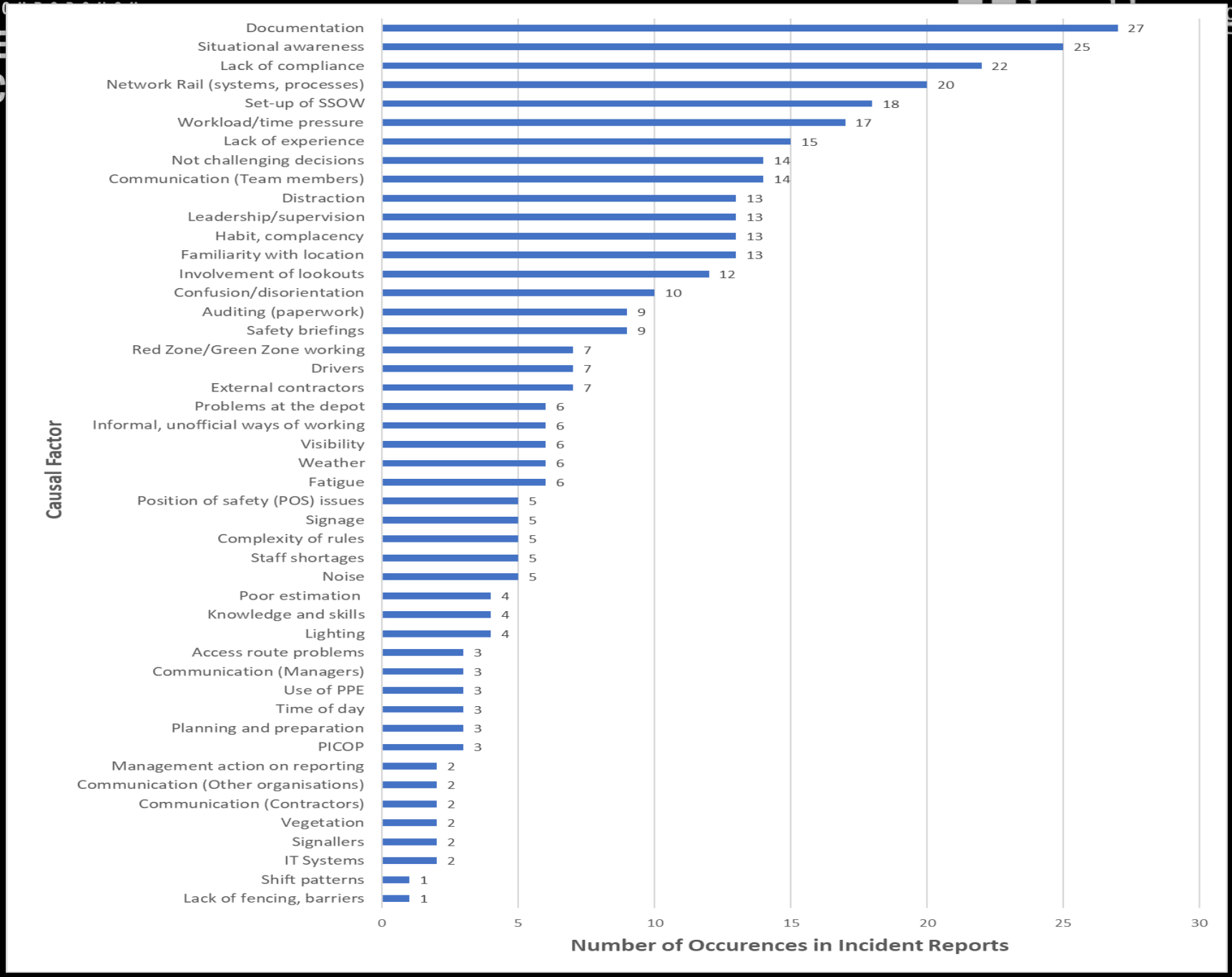
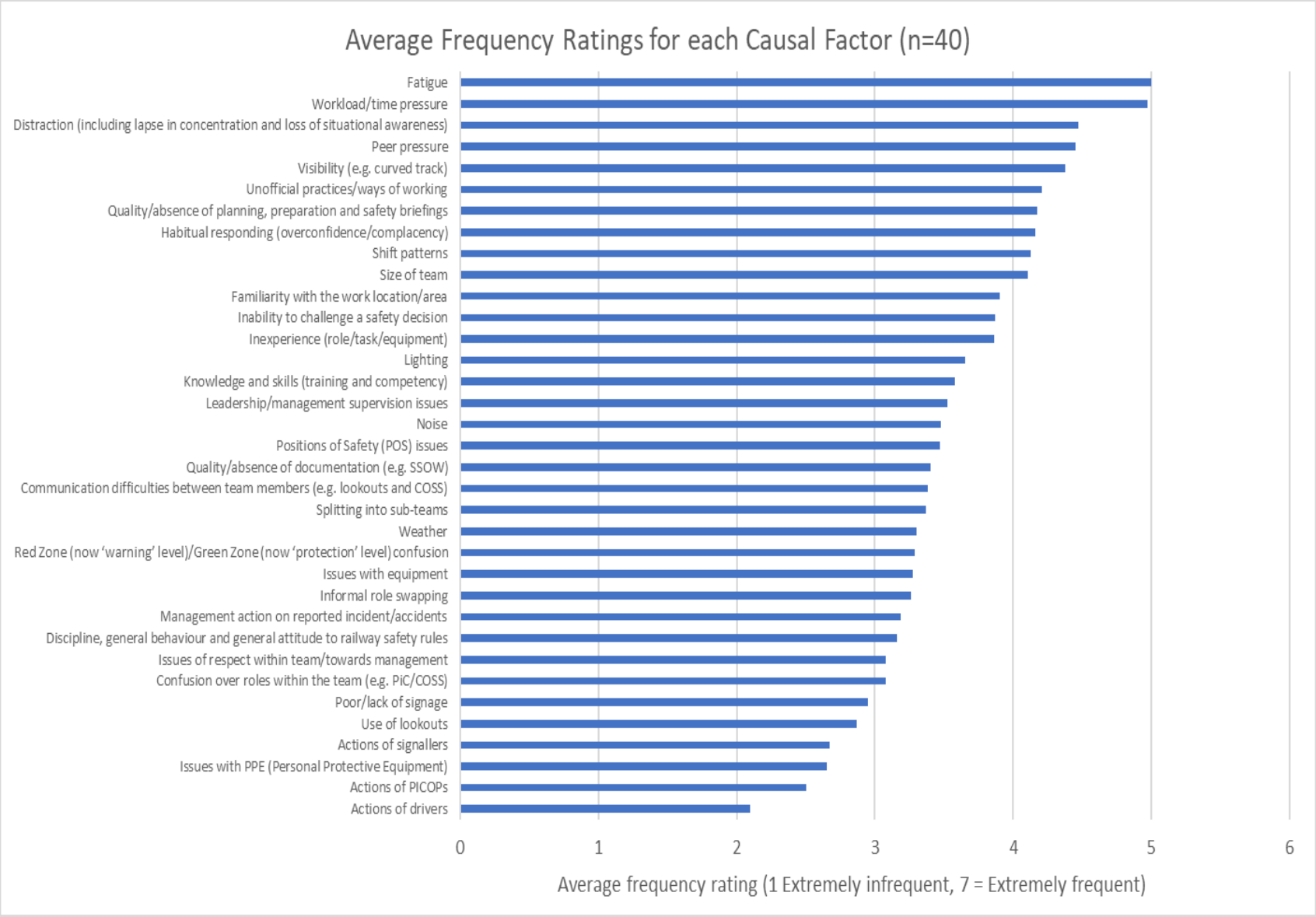
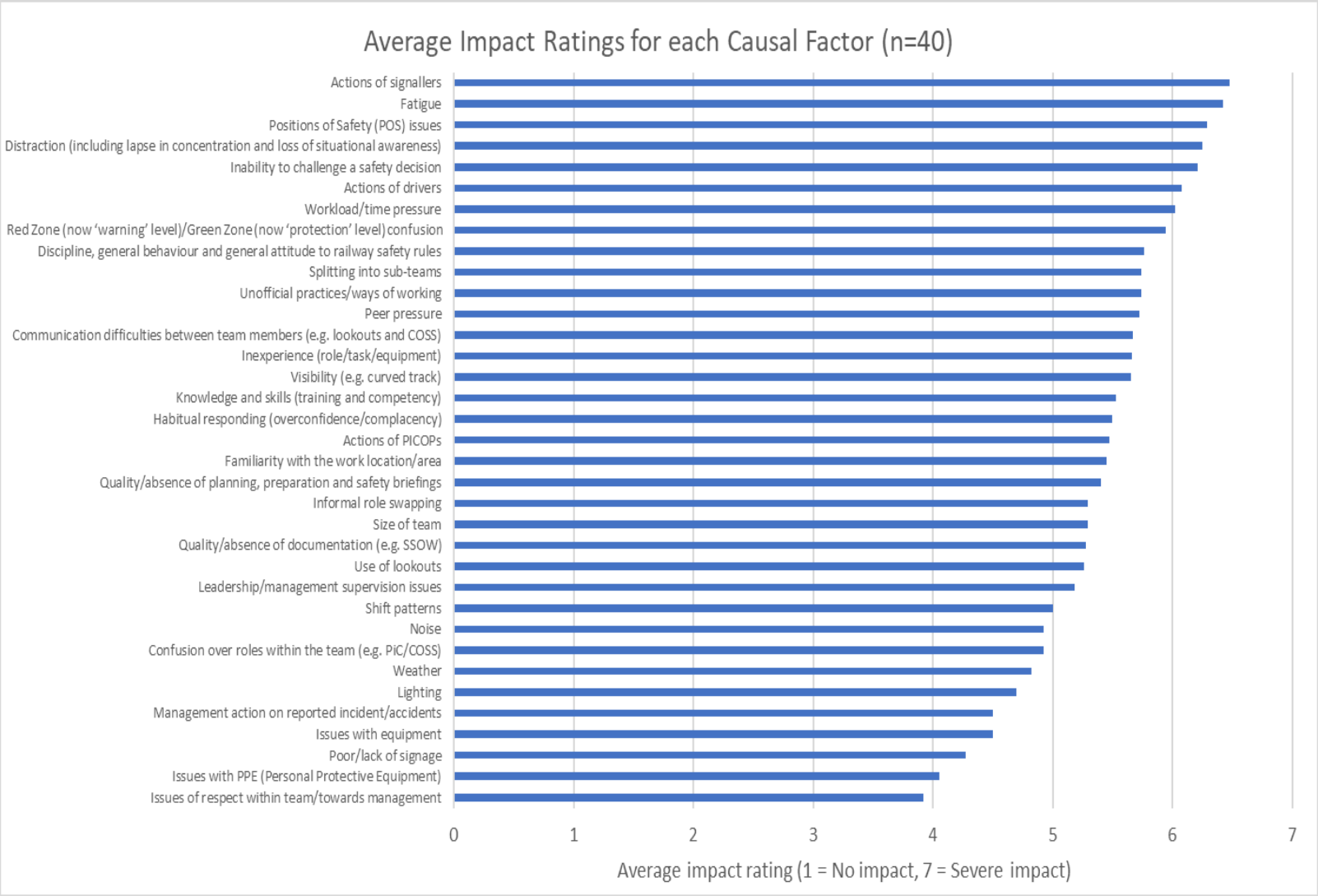
Additional Slides (if needed)


Causal Factor
Documentation 27
Situational awareness 25
Lack of compliance 22
Network Rail (systems, processes) 20
Set-up of SSOW 18
Workload/time pressure 17
Lack of experience 15
Not challenging decisions 14
Communication (Team members) 14
Distraction 13
Leadership/supervision 13
Habit, complacency 13
Familiarity with location 13
Involvement of lookouts 12
Confusion/disorientation 10
Auditing (paperwork) 9
Safety briefings 9
Red Zone/Green Zone working 7
Drivers 7
External contractors 7
Problems at the depot 6
Informal, unofficial ways of working 6
Visibility 6
Weather 6
Fatigue 6
Position of safety (POS) issues 5
Signage 5
Complexity of rules 5
Staff shortages 5
Noise 5
Poor estimation 4
Knowledge and skills 4
Lighting 4
Access route problems 3
Communication (Managers) 3
Use of PPE 3
Time of day 3
Planning and preparation 3
PICOP 3
Management action on reporting 2
Communication (Other organisations) 2
Communication (Contractors) 2
Vegetation 2
Signallers 2
IT Systems 2
Shift patterns 1
Lack of fencing, barriers 1
0
5
10
15
20
25
30
Number of Occurences in Incident Reports

Focus groups – causal factors (frequency)



Focus groups – causal factors (impact)



Age of participants

Age range	% of participants
25-34 years	30.0
35-44 years	27.5
45-54 years	15.0
55-64 years	27.5

Focus Groups

- Six groups in different locations in Britain
- 605 minutes of data recorded
- 40 participating COSSs
- Trackworker experience ranged from 6 to 43 years (mean 20 years)
- COSS experience from 1.5 to 20 years (mean 14 years)
- Nine participants had been a trackworker for >25 years
- All had PiC experience – usually within a month of focus group
- All were trained lookouts