



PROSAFE: ACHIEVING ZERO HARM TARGET CONFERENCE

JOHANNESBURG, 18-19 OCTOBER 2012

**OPTIMISING YOUR HEALTH AND SAFETY (H&S)
PERFORMANCE AND REAPING THE BENEFITS THEREOF**

PROFESSOR JOHN SMALLWOOD, DIRECTOR, ACHASM

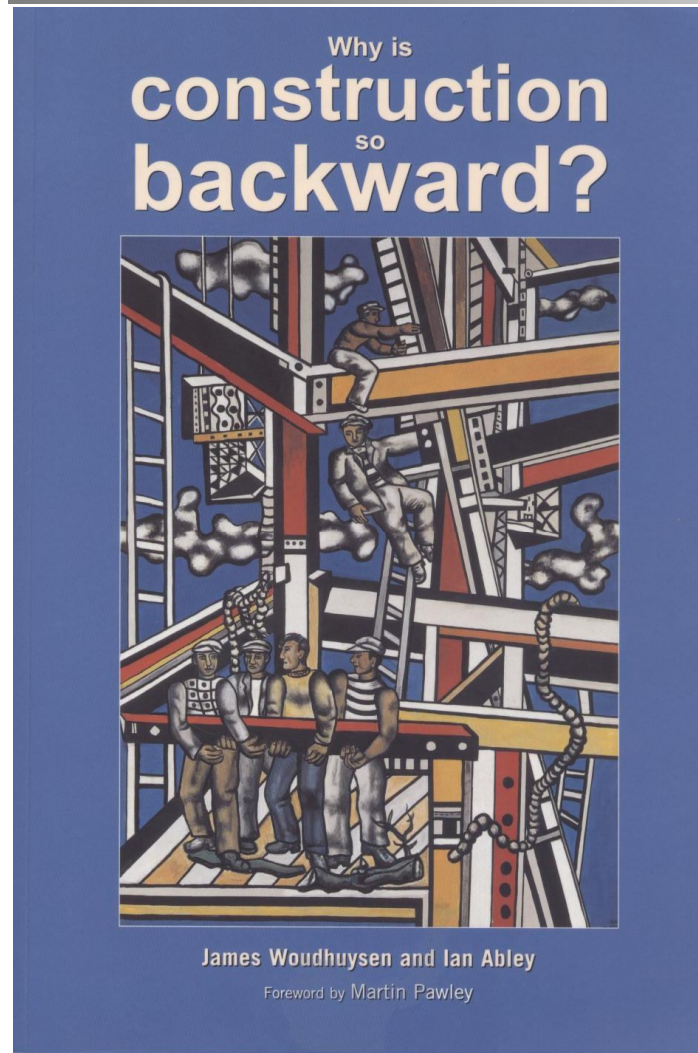


Focus of presentation

- **Assessing the cost of accidents in organisations**
- **Utilising health and safety as the catalyst for overall organisation performance**
- **Addressing the synergy between health and safety and other project parameters**
- **Realizing the ROI in health and safety programmes**



Why is construction so backward?



(Woudhuysen and Abley, 2004)



Introduction (1)



Figure 1: Construction H&S – the macro environment (Smallwood, 1995a)



Introduction (2)



Pretoria North Shopping Centre slab collapse, October, 1996 (Davis, 1996)



Introduction (3)



Investec Office Complex scaffolding collapse, Sandton, August, 1997 (Prinsloo, 1997)



Introduction (4)



Investec Office Complex scaffolding collapse, Sandton, August, 1997 (Prinsloo, 1997)



Introduction (5)



Sombre ... workers survey the scene yesterday at the Investec building where they say heavy marble tiles caused an overload.

Investec Office Complex scaffolding collapse, Sandton, August, 1997 (Nesbitt, 1997)



Introduction (6)



Disaster area: The construction of a road bridge near Injaka Dam turned into disaster when it collapsed, instantly killing 12 people and injuring 15. Two of the injured died later. Insert - A reminder to workers of the dangers of working on a construction site. Full update on page 2. Photographs by Raymond Travers.

Injaka Bridge collapse, Mpumalanga, July, 1998 (Travers, 1998)



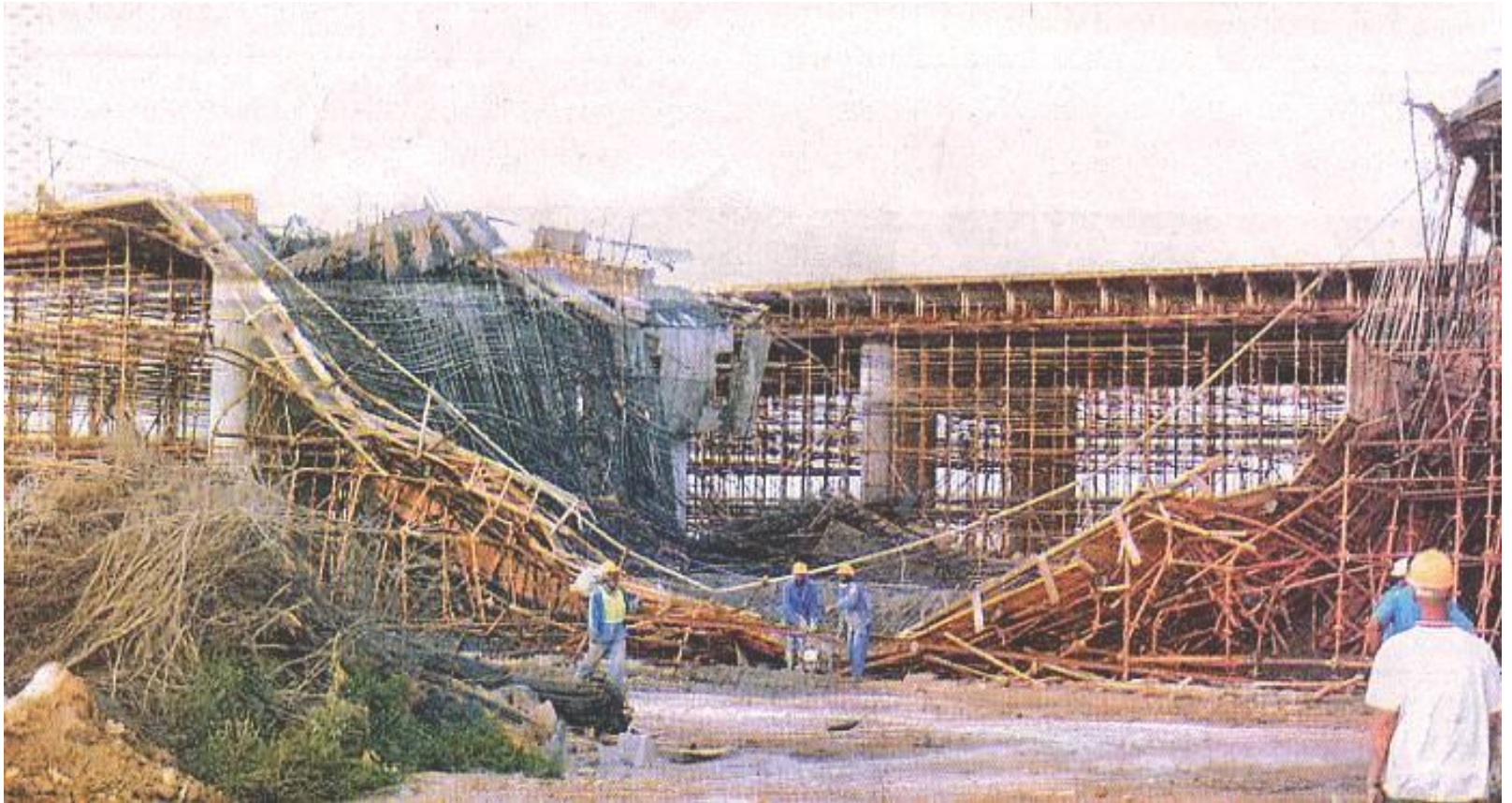
Introduction (7)



Coega Bridge collapse, Port Elizabeth, November, 2003 (Markman, 2003)



Introduction (8)



Coega Bridge collapse, Port Elizabeth, November, 2003 (Markman, 2003)



Introduction (9)

Wall of death

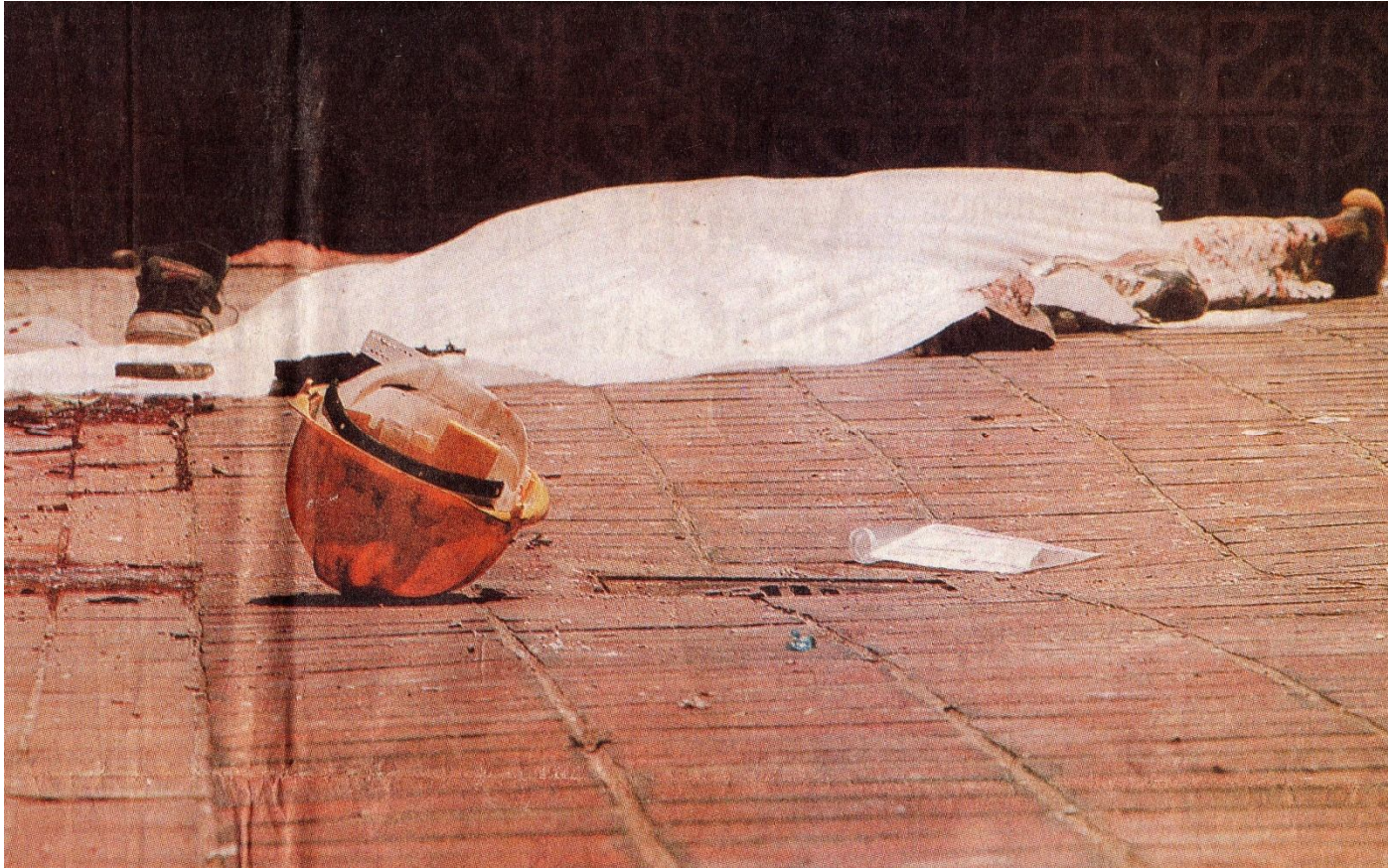


Tragic recovery...The body of the first construction worker removed from a mountain of soil that buried him while working with a jackhammer last week. Chris Fey

Wall (earth) collapse, Randburg, February, 1999 (Frey, 1999)



Introduction (10)



Suspended platform (scaffold) collapse, Hillbrow, February, 2001 (Safodien, 2001)



Direct and indirect cost of accidents (1)

- **Direct:**
 - **Medical**
 - **Wages**
- **Indirect:**
 - **Lost time – injured worker**
 - **Lost time – idle workers**
 - **Lost time – management and supervision**
 - **Time spent by First Aiders etc.**
 - **Damage to plant, equipment, tools and materials**
 - **Incidental costs due to disruption**
 - **Loading of assessments**



Direct and indirect cost of accidents (2)

- **Reduced productivity**
- **Idle plant and equipment**
- **Legal action**
- **Penalties**
- **Overheads in general**
- **Funeral**
- **Negative image**
- **Loss of goodwill**
- **Opportunity cost**
- **Reduced equity (share price)**



Ratio of direct to indirect cost of accidents (1)

- **According to Hinze – USA (Levitt and Samelson, 1993):**
 - **Excluding cost of liability claims:**
 - **Indirect = 2.94 / x direct (non-lost-time)**
 - **Indirect = 2.53 / x direct (lost-time)**
 - **Including cost of liability claims:**
 - **Indirect = 4.2 / x direct (non-lost time)**
 - **Indirect = 20.3 / x direct (lost-time)**
- **According to University of Washington – USA (Hinze, 1992):**
 - **Indirect = 1.67 / x direct (non-minor injuries)**
 - **Indirect = > 5 / x direct (injuries < US \$ 50)**
 - **Both exclude claims and material damage**
- **According to Construction Industry Institute – USA (Grossman, 1991) Indirect = 20 / x direct cost**
- **South Africa – indirect 14.2 / x direct (Smallwood, 2000)**



Ratio of direct to indirect cost of accidents (2)

Case 1 - Glass chip in the eye (Smallwood, 1995b):

During 1992, in preparation for the re-glazing of a window a glazier's assistant had to remove the broken glass and old putty from the window frame while the glazier collected the replacement glass from a supplier.

During the absence of the glazier a small chip of glass lacerated the assistant's left eye while he was removing the remnants of the glass and putty. The assistant found himself alone, in pain and without any first aid.



Ratio of direct to indirect cost of accidents (3)

▪ Direct cost:		
▪ Doctor's consultation fee and medication		55.00
▪ Indirect cost:		
▪ Unproductive time	5.11	
▪ Conveyance of assistant to office	70.31	
▪ Conveyance of assistant to doctor	35.61	
▪ Compensation for loss of wages	102.20	
▪ Loss in glazier productivity	31.00	
▪ Investigation	41.57	
▪ Report	19.69	
▪ Opportunity cost		
(10% of direct and indirect)		<u>36.05</u>
▪ Total cost		<u>396.54</u>



Ratio of direct to indirect cost of accidents (4)

Case 2 - Sprained toe (Smallwood, 1995b)

In the latter part of 1992, a garage door rigger tripped over and struck his left big toe against a steel cable lying on the workshop floor, which at the time was covered in steel off cuts, cables and door mechanisms. The rigger, experiencing pain, then reported the incident which occurred in the late afternoon.



Ratio of direct to indirect cost of accidents (5)

▪ Direct cost:		
▪ Doctor's consultation and X-ray		133.14
▪ Wages (part)	280.00	<u>413.14</u>
▪ Indirect cost:		
▪ First aid		6.00
▪ Conveyance of rigger to doctor and for X-rays		100.00
▪ Compensation for loss of wages		420.00
▪ Loss in assistants' productivity		102.20
▪ Investigation		45.12
▪ Report		23.24
▪ Opportunity Cost (10% of direct and indirect)		<u>111.97</u>
▪ Total cost		<u>818.53</u> <u>1 231.67</u>



Ratio of direct to indirect cost of accidents (6)

- **Case 1 - Glass chip in the eye:**

▪ Cost type	-	Direct	:	Indirect
▪ Amount	-	R55.00	:	R341.54
▪ Ratio	-	1	:	6.21

- **Case 2 - Sprained toe:**

▪ Cost type	-	Direct	:	Indirect
▪ Amount	-	R413.14	:	R818.53
▪ Ratio	-	1	:	1.98



Impact of inadequate H&S

Aspect	Response (%)
Productivity	87.2
Quality	80.8
Cost	72.3
Client perception	68.1
Environment	66.0
Schedule	57.4

Table 1: Aspects negatively affected by inadequate health and safety according to project managers (Smallwood, 1996).

95.8% stated that inadequate or the lack of H&S increases overall project risk



Synergy overview (1)

Relationship		Impact (%)					II	Rank (within)	Rank (overall)
		Major No							
Phenomenon	Parameter	1	2	3	4	5			
Inadequate H&S	Productivity	27.3	54.5	18.2	0.0	0.0	3.09	1=	14=
	Worker satisfaction	45.4	18.2	36.4	0.0	0.0	3.09	1=	14=
	Quality	18.2	45.4	36.4	0.0	0.0	2.82	3	21=
	Client satisfaction	27.3	27.3	18.2	27.3	0.0	2.73	4	23=
	Cost	36.4	45.4	9.1	9.1	0.0	2.64	5	25=
	Environment	27.3	9.1	54.5	9.1	0.0	2.55	6=	28=
	Project time	18.2	45.4	9.1	27.3	0.0	2.55	6=	28=
Accidents	Cost	72.7	9.1	18.2	0.0	0.0	3.55	1	7
	Worker satisfaction	63.6	27.3	0.0	9.1	0.0	3.46	2	8=
	Productivity	45.4	45.4	9.2	0.0	0.0	3.36	3	10=
	Project time	27.3	45.4	27.3	0.0	0.0	3.00	4	17=
	Quality	9.1	45.4	27.3	18.2	0.0	2.46	5=	31=
	Client satisfaction	36.3	27.3	9.1	27.3	0.0	2.46	5=	31=
	Environment	9.1	18.2	45.4	27.3	0.0	2.09	7	33

Table 2: Impact of various phenomena on various project parameters (II: 0 – 4) (Smallwood, 2001) (Part A).



Synergy overview (2)

Relationship		Impact (%)					II	Rank (within)	Rank (overall)
		Major	No						
Phenomenon	Parameter	1	2	3	4	5			
Poor productivity	Project time	90.0	10.0	0.0	0.0	0.0	3.90	1	1
	Cost	90.9	0.0	9.1	0.0	0.0	3.81	2	3
	Client satisfaction	36.4	45.4	9.1	9.1	0.0	3.09	3	14=
	Quality	27.2	36.4	36.4	0.0	0.0	2.91	4	20
	Worker satisfaction	45.4	9.1	18.2	27.3	0.0	2.73	5	23=
	H&S	27.3	27.3	18.1	27.3	0.0	2.55	6	28=
	Environment	9.1	18.2	36.4	9.1	27.3	1.55	7	36
Rework	Productivity	72.7	27.3	0.0	0.0	0.0	3.73	1	4=
	Cost	63.6	36.3	0.0	0.0	0.0	3.63	2	6
	Project time	54.5	36.4	9.1	0.0	0.0	3.46	3	8=
	Worker satisfaction	45.4	36.4	18.2	0.0	0.0	3.27	4	12
	Client satisfaction	54.5	18.2	18.2	9.1	0.0	3.18	5	13
	Quality	27.3	45.4	27.3	0.0	0.0	3.00	6	17=
	H&S	36.4	27.2	9.1	18.2	9.1	2.64	7	25=
	Environment	9.1	9.1	54.5	18.2	9.1	1.91	8	34=

Table 2: Impact of various phenomena on various project parameters (II: 0 – 4)
(Smallwood, 2001) (Part B).



Synergy overview (3)

Relationship		Impact (%)					II	Rank (within)	Rank (overall)
		Major No							
Phenomenon	Parameter	1	2	3	4	5			
Poor project time performance	Cost	81.8	18.2	0.0	0.0	0.0	3.82	1	2
	Client satisfaction	90.9	0.0	0.0	9.1	0.0	3.73	2	4=
	Productivity	45.4	45.4	9.2	0.0	0.0	3.36	3	10=
	Quality	27.3	54.5	9.1	9.1	0.0	3.00	4	17=
	Worker satisfaction	36.3	27.3	18.2	18.2	0.0	2.82	5	21=
	H&S	27.3	27.3	27.3	18.1	0.0	2.63	6	27
	Environment	9.1	18.2	45.4	9.1	18.2	1.91	7	34=

Table 2: Impact of various phenomena on various project parameters (II: 0 – 4) (Smallwood, 2001) (Part C).



Improvement scenarios – 2003 Analogy (1)

- **Facts:**

- Compensation insurance (CI) = R2.20 / R100.00 wages (building)
- Claims ratio (CR) =
$$\frac{\text{CI claims}}{\text{CI assessments}}$$

- **Rebates and loadings:**

- 50% = 10.0% Rebate
- 24% = 36.0% Rebate
- 75% = 16.0% Loading
- 100% = 75.0% Loading



Improvement scenarios – 2003 Analogy (2)

- **Based upon:**

- Wages = 27% of turnover
- Therefore per R1m turnover, CI assessments are:

$$1\ 000\ 000 \times 0.27 = R270\ 000 \times \frac{100.00}{102.20}$$

$$= \frac{(R264\ 188)}{R\ 5\ 812\ \text{CI assessments}}$$

- Indirect costs = 7 / x Direct costs
(+/- 50% of 14.2 / x direct)

- **Known:**

- Direct costs = CI claims



Improvement scenarios – 2003 Analogy (3)

Cost	Contractor		
	A	B	C
CR	50%	75%	100%
CI assessments (Rs)	5 812	5 812	5 812
CI claims (Rs)	2 906	4 359	5 812
Indirect cost (Rs) (7 / x direct cost)	20 342	30 513	40 684
Total COA (Rs)	23 248	34 872	46 496

Table 3: Total cost of accidents (COA) scenarios for contractors with differing CRs per R1m turnover



Improvement scenarios – 2003 Analogy (4)

Turnover (Rm)	Contractor			
	A	B	C	A-C
1	23 248	34 872	46 496	23 248
10	232 480	348 720	464 960	232 480
50	1 162 400	1 743 600	2 324 800	1 162 400
100	2 324 800	3 487 200	4 649 600	2 324 800
500	11 624 000	17 436 000	23 248 000	11 624 000
1 000	23 248 000	34 872 000	46 496 000	23 248 000
1 500	34 872 000	52 308 000	69 744 000	34 872 000
2 000	46 496 000	69 744 000	92 992 000	46 496 000

Table 4: Total COA scenarios for contractors with differing CRs for various annual turnovers



Impact of accidents / H&S performance on gross profit

Financial Component	Contractor			
	A	B	C	D
CR	50%	75%	100%	24%
Bidding cost (Rs)	952 381	952 381	952 381	952 381
5% Mark-up (Rs)	47 619	47 619	47 619	47 619
Gross bid (Rs)	1 000 000	1 000 000	1 000 000	1 000 000
Initial cost (Rs)	(952 381)	(952 381)	(952 381)	(952 381)
Gross profit before rebate / loading and indirect COA (Rs)	47 619	47 619	47 619	47 619
Rebate / (Loading) (Rs)	581	(930)	(4 360)	2 092
Gross profit after rebate / loading and before indirect COA (Rs)	48 207	46 689	43 259	49 711
Indirect COA (Rs)	(20 342)	(30 513)	(40 684)	(9 765)
Gross profit (Rs)	27 859	16 175	2 576	39 945
Gross profit (%)	2.93	1.70	0.27	4.19
Improvement on / Decrease mark-up (%)	(43.47)	(66.07)	(94.67)	(16.27)

Table 5: Impact of rebates / loadings and indirect COA on gross profit for differing CRs



H&S is a profit centre not a 'cost'

- **6.5% of the value of completed construction in the USA (The Business Roundtable, 1995)**
- **8.5% of tender price in the UK (Health & Safety Executive, 1997)**
- **Based upon the value of construction work completed in the year 2002, namely R 56 343m (South African Reserve Bank, 2003) the total COA could have been between 4.3% (R 2 401.2m / R 56 343m), and 5.4% (R 3 041.5m / R 56 343m) (Smallwood, 2004)**
- **Cost of prevention is between 1% and 2% (Smallwood, 2004)**

Research findings (3)

Aspect / Intervention / Stakeholder	Response %						MS	Rank
	Unsure	Minor Major						
		1	2	3	4	5		
H&S rules	9.5	0.0	0.0	14.3	14.3	61.9	4.53	1
H&S induction	4.5	0.0	0.0	9.1	27.3	59.1	4.52	2
H&S awareness	4.5	0.0	4.5	4.5	22.7	63.6	4.52	3
Management commitment to H&S	4.5	0.0	0.0	13.6	22.7	59.1	4.48	4
Management accountability for H&S	4.5	0.0	4.5	4.5	27.3	59.1	4.48	5
Hazard identification and risk assessment	4.5	0.0	0.0	4.5	45.5	45.5	4.43	6
H&S inspections	4.5	0.0	0.0	13.6	27.3	54.5	4.43	7
Integration of H&S into all activities / tasks	9.5	0.0	0.0	9.5	33.3	47.6	4.42	8
H&S Coordinator / Manager	5.6	0.0	0.0	16.7	22.2	55.6	4.41	9
Toolbox talks	9.1	0.0	0.0	18.2	18.2	54.5	4.40	10
Safe work procedures (SWPs)	4.5	0.0	0.0	9.1	40.9	45.5	4.38	11
H&S training	4.5	0.0	0.0	13.6	31.8	50.0	4.38	12
H&S management system (H&SMS)	5.0	0.0	5.0	15.0	15.0	60.0	4.37	13
Site management	4.8	0.0	0.0	4.8	52.4	38.1	4.35	14
H&S policy	4.5	0.0	4.5	13.6	22.7	54.5	4.33	15
Focus on H&S	4.8	0.0	0.0	9.5	47.6	38.1	4.30	16
Worker participation	4.8	0.0	0.0	14.3	38.1	42.9	4.30	17

Table 6: Extent to which aspects / interventions / stakeholders contributed to respondents' organisations receiving a rebate from FEM (MS = 1 – 5) (Smallwood, 2011) (Part A)

Research findings (4)

Aspect / Intervention / Stakeholder	Response %						MS	Rank
	Unsure	Minor Major						
		1	2	3	4	5		
Incident investigation	9.1	0.0	4.5	9.1	31.8	45.5	4.30	18
Management involvement in H&S	4.5	0.0	4.5	9.1	36.4	45.5	4.29	19
H&S Officer	4.5	0.0	0.0	22.7	22.7	50.0	4.29	20
H&S education	9.1	0.0	0.0	13.6	40.9	36.4	4.25	21
H&S Consultant	20.0	0.0	0.0	20.0	20.0	40.0	4.25	22
H&S culture (refer to * at the bottom of table)	4.5	0.0	0.0	22.7	27.3	45.5	4.24	23
H&S disciplinary procedure	19.0	0.0	4.8	14.3	23.8	38.1	4.18	24
H&S plans	4.8	0.0	0.0	28.6	23.8	42.9	4.15	25
H&S legislation (OH&S Act & COID Act)	4.8	0.0	4.8	14.3	38.1	38.1	4.15	26
H&S meetings	4.5	0.0	0.0	22.7	36.4	36.4	4.14	27
Client	11.1	5.6	0.0	5.6	44.4	33.3	4.13	28
Construction Regulations	9.1	0.0	9.1	4.5	45.5	31.8	4.10	29
H&S goal setting	15.8	0.0	5.3	15.8	31.6	31.6	4.06	30
Allocation of financial resources to H&S	9.1	0.0	4.5	22.7	27.3	36.4	4.05	31
Medical surveillance	20.0	0.0	5.0	20.0	25.0	30.0	4.00	32
First line supervision	4.5	0.0	0.0	36.4	27.3	31.8	3.95	33
H&S specification	9.5	0.0	0.0	33.3	28.6	28.6	3.95	34

Table 6: Extent to which aspects / interventions / stakeholders contributed to respondents' organisations receiving a rebate from FEM (MS: 1 – 5) (Smallwood, 2011) (Part B)

Research findings (5)

Aspect / Intervention / Stakeholder	Response %						MS	Rank
	Unsure	Minor Major						
		1	2	3	4	5		
Recognition of H&S performance	14.3	0.0	4.8	23.8	28.6	28.6	3.94	35
H&S measurement	10.0	0.0	15.0	15.0	20.0	40.0	3.94	36
Quality management system (QMS)	15.0	0.0	5.0	25.0	25.0	30.0	3.94	37
H&S message / theme for the month or week	11.8	0.0	5.9	23.5	29.4	29.4	3.93	38
Feedback on H&S performance	4.5	4.5	0.0	27.3	31.8	31.8	3.90	39
Improvement process e.g. Total quality management (TQM)	21.1	0.0	5.3	26.3	21.1	26.3	3.87	40
H&S Representatives	4.8	0.0	4.8	33.3	28.6	28.6	3.85	41
Partnering (refer to ** at the bottom of table)	9.1	9.1	0.0	18.2	36.4	27.3	3.80	42
Project manager	5.3	0.0	15.8	21.1	26.3	31.6	3.78	43
Participation in H&S competitions	7.1	7.1	14.3	14.3	21.4	35.7	3.69	44
H&S notice board	6.3	0.0	6.3	43.8	25.0	18.8	3.60	45
Participation in H&S star gradings	16.7	8.3	8.3	16.7	25.0	25.0	3.60	46
H&S incentives	18.8	0.0	12.5	25.0	31.3	12.5	3.54	47
Client appointed H&S Agent	5.6	5.6	5.6	38.9	22.2	22.2	3.53	48
H&S newsletter	15.4	7.7	23.1	23.1	15.4	15.4	3.09	49
Designer	11.1	22.2	11.1	22.2	11.1	22.2	3.00	50
H&S suggestion box	14.3	14.3	14.3	28.6	14.3	14.3	3.00	51
Unions	15.4	30.8	7.7	30.8	0.0	15.4	2.55	52

Table 6: Extent to which aspects / interventions / stakeholders contributed to respondents' organisations receiving a rebate from FEM (MS: 1 - 5) (Smallwood, 2011) (Part C)



Management of H&S and complexity

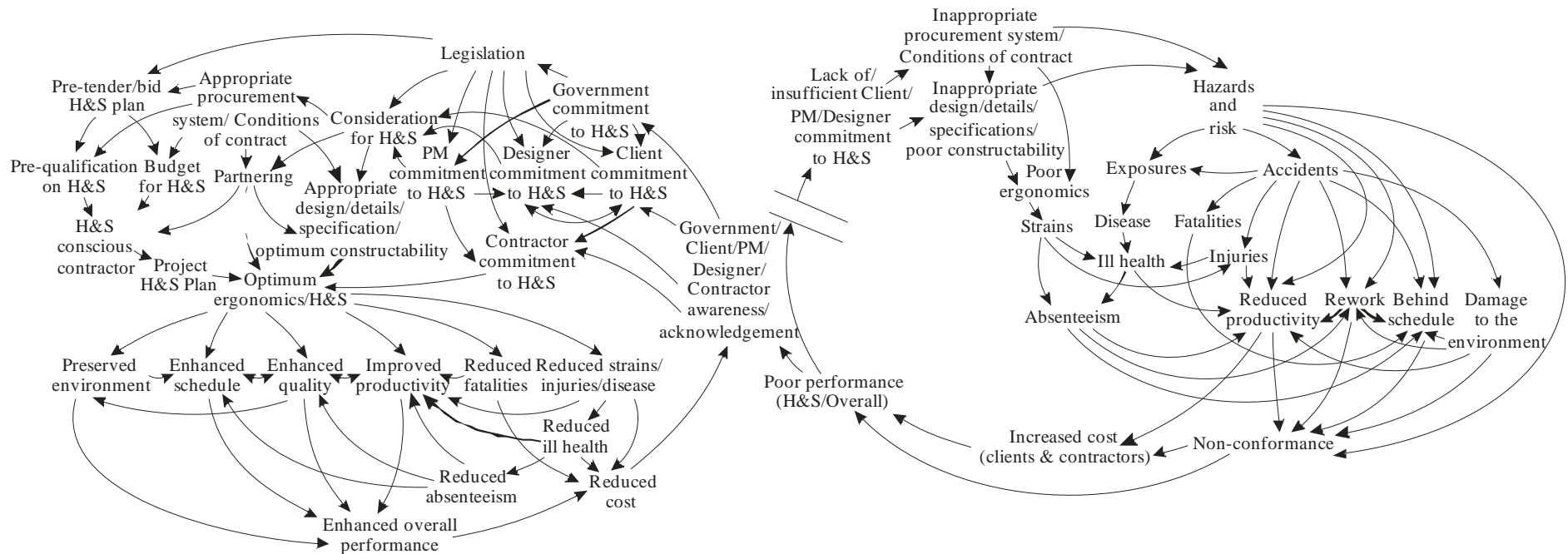


Illustration 1: The holistic role of project managers (PMs) in H&S and the role of H&S in overall performance. (Smallwood, 2005)



Roadmap

- **What is measured gets managed**
- **COA > COP = Motivation to optimise H&S performance**
- **Need to know the COP and the COA**
- **Appropriate cost reporting system or case studies**



Association of Construction Health and Safety Management (ACHASM)

www.achasm.co.za



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